OXFORD

NEW COUNTDOWN

THIRD EDITION

ENHANCED BLENDED EDITION

Step by Step Solutions

SPACE FOR T/V

Preface

When children enter school, most of them have a certain amount of fascination for numbers and shapes. Quite often, however, this fascination is short-lived as they face difficulty in understanding facts and concepts in the classroom. This leads to rote learning which is devoid of any real joy and as a consequence most students drift away from the subject. The root cause for this unfortunate situation is lack of practical work, both inside and outside the classroom, and teaching from textbooks that do not excite a child's mind.

This successful series has always aimed to increase this fascination for numbers in young minds by introducing mathematical skills to them in a manner in which they are encouraged to use as many senses as possible including hearing, seeing, and doing. As a result, they get a sense of discovery and excitement as they move from one level of knowledge to the next and in this way enhance their problem-solving and thinking skills too.

The ***New Countdown Enhanced Blended Third Edition*** reinforces this objective by presenting the magic of numbers in a friendly, fun-filled way (the Play-way Method) where children hear, see, and touch everyday objects, ask questions and get answers, and end up working in the books. Illustrated with child-centred, cheerful pictures, and engaging activities, this book promises to create a 'learning environment' rather than a 'teaching' one for the child.

This series is a carefully structured and graded mathematics course comprising eight books from the three levels of pre-primary to class 5. The pattern followed in the entire series ensures development in all areas of a child's growth through basic multi-focal knowledge, emphasising number skills, and mathematical concepts. It conforms to the broad guidelines set by all major syllabi.

Key features

- Specific learning objectives and key mathematical vocabulary are listed at the beginning of each chapter
- Clear presentation of key mathematical concepts
- Integration of concepts and their application in real-life situations
- Solved examples of all concepts
- Colourful illustrations and photographs supplement explanations
- Practice exercises offer ample reinforcement of concepts
- Challenge and Maths Champ features offer challenging questions
- Mindbender puzzles create additional interest in the topics
- Important information and learning tips are provided under the headings: Note, Remember, Quick Reference, Do you know, Hint, Important, and Mathema-Trick
- Fun Activity videos are embedded in QR codes to make the subject interesting
- Annotated videos make the learning interactive and fun

BOOK 4

Contents

1 Whole Numbers and Operations

YOUR DIGITAL RESOURCE

In this unit students will learn to:

- identify place values of digits up to one hundred thousand (100,000).
- read numbers up to one hundred thousand (100,000).
- write numbers up to one hundred thousand (100,000).
- write numbers in words up to one hundred thousand (100,000).
- compare and order numbers up to 5 digits.
- add numbers up to 5 digits.
- solve real-life number stories involving addition of numbers up to 5 digits.
- subtract numbers up to 5 digits.
- solve real-life situations involving subtraction of numbers up to 5 digits.
- multiply numbers up to 5 digit by numbers up to 3 digit.
- solve real-life situations involving multiplication of numbers up to 5 digit by 3-digit.
- divide numbers up to 4 digit by numbers up to 2 digit.
- solve real-life situations involving division of numbers up to 4 digit by a number up to 2 digits.
- solve real-life situations using appropriate operations of addition, subtraction, multiplication and division of numbers up to 2 digits.
- recognise a given increasing and decreasing pattern by stating a pattern rule.
- describe the pattern found in a given table or chart
- complete the given increasing and decreasing number sequence

MATH FLASH

You have already learnt:

- to read and write numbers in words and figures up to 5 digits
- to identify place value of numbers up to 5 digits
- to compare and order 5-digit numbers
- to represent numbers on a number line
- to add and subtract numbers up to 4 digits
- to multiply and divide 2-digit numbers by a 1-digit number

KEY VOCABULARY

place value, compare, order, operation, multiplier, multiplicand, product, divisor, dividend, quotient, remainder, pattern, rule

Numbers

6-digit numbers and their place value

Now, we will learn to find the place value of numbers up to 6 digits. The place values in a 6-digit number are hundred thousand (HTh), ten thousand (TTh), thousand (Th), hundred (H), ten (T), and ones (O).

We know that the smallest 3-digit number is 100 and the biggest 3-digit number is 999.

Step 1 To get the next number we add 1 to 999.

999 + 1 = 1000. This is the smallest 4-digit number.
The biggest 4-digit number will be 9999.

Step 2 To get the next number we add 1 to 9999.

9999 + 1 = 10 000; is the smallest 5-digit number.
The biggest 5-digit number is 99 999.

Step 3 To get the next number we add 1 to 99 999.

99 999 + 1 = 100 000; is the smallest 6-digit number.
The biggest 6-digit number is 999 999.

We can put these numbers in the place value table as follows:

HTh	TTh	Th	H	T	O
			1	0	0
		1	0	0	0
	1	0	0	0	0
1	0	0	0	0	0

From the given examples, we notice that whenever we add 1 to any given biggest number, the number of digits increases by one and hence the first digit of new number shifts one column to the left.

Example:

HTh	TTh	Th	H	T	O
4	5	9	2	6	9

We say: 4 hundred thousands, 5 ten thousands, 9 thousands, 2 hundreds, 6 tens, and 9 ones.

We can group numbers in the table as follows.

Thousand			Unit		
HTh	TTh	Th	H	T	O
4	5	9	2	6	9

Therefore, 459 269 written in words will be:
Four hundred fifty-nine thousand two hundred and sixty-nine.

Examples:

1. Write 635089 in words.
   Make a place value table.

Thousand			Unit		
HTh	TTh	Th	H	T	O
6	3	5	0	8	9

The given number in words is six hundred and thirty-five thousand and eighty-nine.

2. Write the given number in figures.
Seven hundred and ninety-three thousand one hundred and twenty-four.

Thousands			Units		
HTh	TTh	Th	H	T	O
7	9	3	1	2	4

Hence, the given number in figures is 793 124.

3. What is the value of the ringed digit?

a. 67(9) 205 — **9 thousand or 9000**

b. 285 (1)61 — **1 hundred or 100**

c. 9(6)0 013 — **6 ten thousands or 60 000**

d. (5)41 851 — **5 hundred thousands or 500 000**

4. Write the given number in thousands, hundreds, tens, and ones.

112 588 — **112 thousands 5 hundreds 8 tens 8 ones**

Writing 6-digit numbers in expanded form

Examples:

1. Write the following numbers in expanded form.

a. 683 945
683 945 = 600 000 + 80 000 + 3000 + 900 + 40 + 5

b. 430 180
430 180 = 400 000 + 30 000 + 0000 + 100 + 80 + 0

2. Look at the expanded form and write the six digit number.

a. 400 000 + 70 000 + 6000 + 300 + 10 + 5
= 476 315

b. 200 000 + 40 000 + 0000 + 100 + 70 + 0
= 240 170

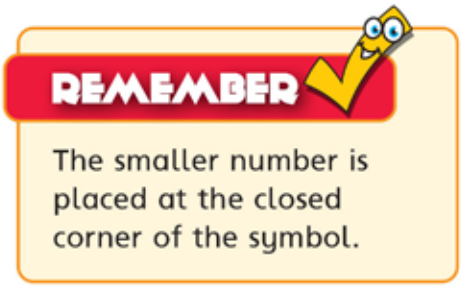
Comparing 5-digit numbers

We have already learnt that comparing two numbers means to identify the difference between the two numbers, and to decide if one number is smaller than, greater than or equal to other number. We use symbols <, >, or = for comparing the numbers.

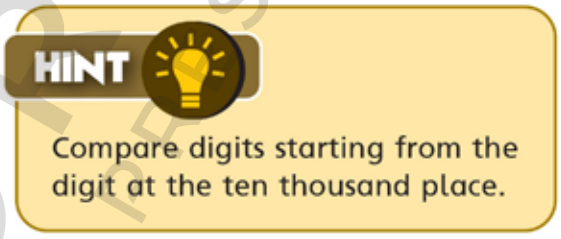
<	less than	5 < 6
>	greater than	9 > 4
=	equal to	3 = 3

Examples:

32 413 > 30 413
70 806 < 86 502
12 397 = 12 397



The smaller number is placed at the closed corner of the symbol.



Compare digits starting from the digit at the ten thousand place.

Ordering 5-digit numbers

We already know that to put a given set of numbers in order means to write them from smallest to largest number (ascending order) or write them from largest to smallest number (descending order).

Examples:

1. Write the given numbers in ascending order.
   68 696, 58 696, 78 696, 38 696, 79 696

   Ascending order: 38 696, 58 696, 68 696, 78 696, 79 696

2. Write the given numbers in descending order.
   12 305, 13 205, 13 325, 12 235

   Descending order: 13 325, 13 205, 12 305, 12 235

▶ Exercise 1a

1. Fill in the blanks.
   a. In (8)52 610, the place value of the ringed digit is hundred thousand.
   b. 200 000 + 00 000 + 0000 + 400 + 50 + 9 = 200 459.
   c. Insert space to express 725895 in International number system. 725 895.
   d. The predecessor of 801 001 is 8 001 000.
   e. The successor of 316 999 is 317 000.

2. State whether the following are true or false.
   a. The predecessor of 600 000 is 600 999. (False) 599,999
   b. The successor to 561 100 is 561 200. (False) 561 101
   c. A number at hundred thousand place has five zeroes on its right. (True)
   d. Place value is the value of the position of a digit in a number. (True)
   e. The place value of 6 in 682 817 is 600 000. (True)

3. Select the correct answer from the given options.
   a. The predecessor of 115 999 is
      Ⓐ 15 999 Ⓑ 115 989 Ⓒ 115 998 Ⓓ 116 000
   b. Four hundred and ninety thousand in figures is
      Ⓐ 490 000 Ⓑ 400 9000
      Ⓒ 4900 000 Ⓓ 49 000
   c. The successor of 962 111 is
      Ⓐ 62 111 Ⓑ 962 111
      Ⓒ 962 101 Ⓓ 962 112
   d. 463 110 written in expanded form is
      Ⓐ 463 + 110
      Ⓑ 400 000 + 60 000 + 3000 + 100 + 10 + 0
      Ⓒ 400 + 60 + 3 + 100 + 10
      Ⓓ 40 000 + 6000 + 300 + 10
   e. The predecessor of 843 002 is
      Ⓐ 843 001 Ⓑ 834 000
      Ⓒ 835 002 Ⓓ 834 003

4. Write the names of these numbers, in words.

a. 672 072 six hundred and seventy two thousand and seventy two

b. 509 453 five hundred and nine thousand, four hundred and fifty three

c. 300 801 three hundred thousand, eight hundred and one

d. 790 000 seven hundred and ninety thousand

e. 250 685 two hundred and fifty thousand, six hundred and eighty five

f. 854 792 eight hundred and fifty four thousand, seven hundred and ninety two

g. 101 111 One hundred and one thousand, one hundred and eleven

h. 970 420 nine hundred and seventy thousand, four hundred and twenty

5. Write the numbers in figures.

a. Two hundred and six thousand, three hundred and sixty-six 206 366

b. One hundred and fifty-five thousand, six hundred and four 155 604

c. Nine hundred and six thousand three hundred and fifty-two 906 352

d. Seven hundred and twenty-five thousand one hundred and twenty 725 120

e. One hundred and forty-two thousand one hundred and eleven 142 111

f. Six hundred thousand and nine 600 009

g. Eight hundred thousand nine hundred and four 800 904

h. Ninety three thousand four hundred and forty-two 93 442

6. Write these numbers in thousands, hundreds, tens, and ones.

a. 211 589 211 thousand 5 hundreds 8 tens 9 ones

b. 364 711 364 thousand 7 hundreds 1 ten 1 one

c. 972 045 972 thousand 0 hundred 4 tens 5 ones

d. 656 902 656 thousand 9 hundreds 0 tens 2 ones

e. 340 265 340 thousand 2 hundreds 6 tens 5 ones

7. Write the value of the circled digit.

a. 6 4 (9) 7 6 7 9 thousands

b. 8 9 9 (4) 5 6 4 hundreds

c. 2 1 6 (0) 1 5 0 hundreds

d. 3 4 (8) 0 2 7 8 thousands

e. 2 0 4 8 (7) 9 7 tens

f. 5 6 (7) 2 8 5 7 thousands

g. 1 (8) 9 6 2 7 80 thousands

8. Write each number in expanded form.

a. 152 796 = 100000 + 50000 + 2000 + 700 + 90 + 6

b. 318 248 = 300 000 + 10 000 + 8000 + 200 + 40 + 8

c. 627 051 = 600 000 + 20 000 + 7000 + 000 + 50 + 1

d. 904 870 = 900 000 + 0 + 4000 + 800 + 70 + 0

e. 530 612 = 500 000 + 30000 + 000 + 600 + 10 + 2

9. Look at these expanded forms, then write the number.

a. 200 000 + 70 000 + 1000 + 500 + 50 + 1 = 271 551

b. 800 000 + 30 000 + 0000 + 400 + 20 + 9 = 830 429

c. 900 000 + 00 000 + 9000 + 900 + 90 + 9 = 909 999

d. 700 000 + 40 000 + 3000 + 000 + 50 + 6 = 743 056

e. 100 000 + 80 000 + 2000 + 100 + 00 + 3 = 182 103

f. 300 000 + 90 000 + 4000 + 200 + 60 + 0 = 394260

10. Fill in the symbols > or <.

a. 30 241 [<] 40 232
b. 42 569 [>] 41 658
c. 74 250 [>] 68 990
d. 55 643 [<] 55 792
e. 80 753 [>] 80 029
f. 46 329 [>] 46 192
g. 48 521 [<] 49 991
h. 21 062 [>] 21 049
i. 47 863 [>] 47 859
j. 10 198 [>] 10 197

11. Write these numbers in ascending order.

a. 34 829, 34 769, 34 932, 33 199
33199, 34769, 34829, 34932

b. 62 629, 65 090, 64 999, 65 099
62629, 64 999, 65 090, 65 099

c. 25 500, 25 509, 25 499, 25 599
25 499, 25 500, 25509, 25 599

d. 90 195, 90 145, 90 159, 90 194
90 145, 90 159, 90 194, 90 195

12. Write these numbers in descending order.

a. 34 819, 38 149, 28 944, 28 491
38 149, 34819, 28944, 28 491

b. 43 892, 43 961, 43 691, 44 001
44 001, 43961, 43892, 43 691

c. 26 568, 27 486, 34 688, 38 492
38 492, 34688, 27486, 26 568

d. 29 091, 29 109, 29 901, 29 190
29 901, 29109, 29 109, 29 091

Addition

Adding big numbers is simple, provided we remember to write our columns carefully, and to work from right to left.

$$\begin{array}{r} 62\,246 \\ +\,24\,321 \\ \hline 86\,567 \end{array} \qquad \begin{array}{r} {\scriptstyle 1\ 1\ 1\ 1} \\ 36\,134 \\ +\ 95\,987 \\ \hline 132\,121 \end{array}$$

Do not forget to start with the ones, then add the tens, then the hundreds, then the thousands, then the ten thousands, and lastly the hundred thousands.

Subtraction

If we write our columns carefully, and remember to work from the ones column first, we find that subtraction with big numbers is easy.

$$\begin{array}{r} 93\,467 \\ -\ 21\,246 \\ \hline 72\,221 \end{array} \qquad \begin{array}{r} {\scriptstyle 8\ 14\ 15\ 17\ 1} \\ 95\,68\,16 \\ -\ 47\,79\,7 \\ \hline 47\,889 \end{array}$$

CHALLENGE

Write the number which is

- 200 less than 1100
- 500 less than 3560
- 1000 less than 9686

Exercise 1b

1. Fill in the blanks.
   a. 10 000 + 6000 + 900 + 5 16 905.
   b. 12 500 − 6900 = 5600.
   c. 100 more than 99 990 equals to 100 090.
   d. 250 must be added to 10 005 to make 10 255.
   e. 49 396 − 39 310 = 10 086.

2. State whether the following are true or false.
   a. 375 + 405 + 163 equals 943. (True)
   b. 400 more than 69 843 is 69 443. (False) it is 70 243
   c. 7000 less than 97 536 is 90 536. (True)
   d. Asif has Rs 89 512 and Fahad has Rs 89 601. Fahad has more money than Asif. (True)
   e. Anas spent Rs 28 000 to purchase a TV. Salman bought a TV for Rs 25 555. Salman paid more money for his purchase. (False) Anas spent more

3. Select the correct answer from the given options.
   a. The sum of the largest 5-digit number and the smallest 4-digit number is
      (A) 19 999
      (B) 100 999
      (C) 10 999
      (D) 10 099
   b. 25 000 plus 25 000 is equal to
      (A) 75 000
      (B) 52 500
      (C) 50 000
      (D) 2525
   c. 2400 + 180 + 9 is equal to
      (A) 4290
      (B) 2409
      (C) 2580
      (D) 2589
   d. The difference between 99 999 and 1000 is equal to
      (A) 89 999
      (B) 80 001
      (C) 98 999
      (D) 8000
   e. Take away 87 452 from 90 005
      (A) 2553
      (B) 36 531
      (C) 17 453
      (D) 77 358

4. Add the following.
   a. 43 846 + 35 017 = 78 863
   b. 53 865 + 69 530 = 123395
   c. 65 357 + 32 986 = 98 343
   d. 32 943 + 28 127 = 61070

5. Write the number which is:
   a. 200 more than 25 000 25 200
   b. 1000 more than 20 000 21000
   c. 900 more than 60 100 61 000
   d. 400 more than 50 960 51 360

6. Subtract the following.

   a.
   ```
    74638
   -  9424
   -------
    65 214
   ```

   b.
   ```
    95003
   -  87675
   ---------
     7328
   ```

   c.
   ```
    50239
   - 14914
   -------
    35 325
   ```

   d.
   ```
    76204
   - 50956
   -------
    25 248
   ```

7. Write these vertically and subtract.
   a. 36 738 − 12 849 23 889
   b. 25 670 − 10 302 15 368
   c. 20 003 − 18 976 1027
   d. 50 000 − 36 082 13 918
   e. 75 000 − 12 525 13 918

8. Subtract 100 from each of the following numbers.
   a. 46 952 46 852
   b. 50 000 49 900
   c. 30 510 30 410
   d. 81 000 80 900

9. Subtract 500 from each of the following numbers.
   a. 85 620 85 120
   b. 84 320 83 820
   c. 50 540 50 040
   d. 9010 8510

▶ Real-life Story Sums

Read the problems carefully. Decide whether you should add or subtract to solve them. Write complete statements.

1. A factory made 64 750 jute bags on Monday and 51 060 more on Tuesday. How many bags were made altogether? 64750 + 51060 = 180560
2. In an election, Mr Kamal got 56 720 votes and Mrs Abid got 58 986 votes. Who got more votes and how many more? 58 986 - 56 720 = 2266
   Mrs Abid got more votes

3. A library has 46 918 books of English and 10 862 books of Urdu. What is the total number of books? 46 918 + 10862 = 57780 books

4. A shopkeeper earned Rs 70 920 in one year. If his expenses for the same year were Rs 59 486, how much money did he save? 70920 - 59486 = Rs 11434

5. Find the difference between the largest 4-digit number and the smallest 5-digit number. 10 000 - 9999 = 1

6. A school in the village needs Rs 40 000 for new furniture. Mr Abdul donated Rs 15 000. How much more money must be collected? 40 000 - 15 000 = Rs 25000

7. A man bought a house for Rs 956 780. He sold it for Rs 120 000 less than the cost price. How much did he sell the house for?
956 780 - 120 000 = 836 780

Multiplication

We have learnt the method of multiplication of numbers in previous classes. Now we will learn to multiply up to 4-digit numbers with 2-digit numbers.

Each part of a multiplication sum has a special name in math.

243	→ multiplicand
× 46	→ multiplier
1458	(243 × 6)
9720	(243 × 40)
11178	→ product

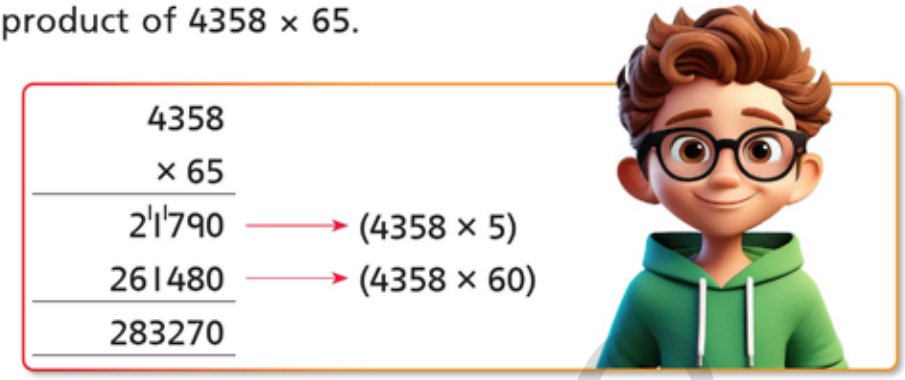
The multiplicand is the number or quantity to be multiplied.

The multiplier is the number or quantity by which the multiplicand is to be multiplied.

The product is simply the end result (answer) of the multiplication.

Example:

Find the product of 4358 × 65.



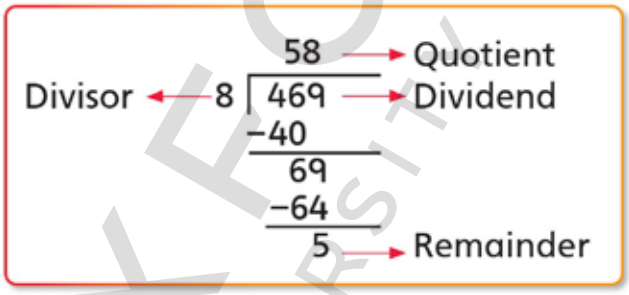
$$\begin{array}{rl} 4358 & \\ \times\ 65 & \\ \hline 21790 & \longrightarrow (4358 \times 5) \\ 261480 & \longrightarrow (4358 \times 60) \\ \hline 283270 & \end{array}$$

We multiply by the ones of the multiplier first, then the tens of the multiplier. Then add to get the product.

Division

We have already done division of 2-digit numbers by 1-digit divisors.

We have also learnt the special words used for the different parts of a division.



Division of 4-digit numbers by 2-digit numbers

It is easy to work with 4-digit dividends if we carry out our division steps carefully.

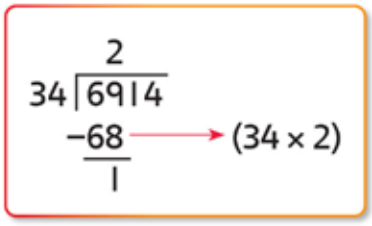
Example:

6914 ÷ 34

First, we look at the thousands.

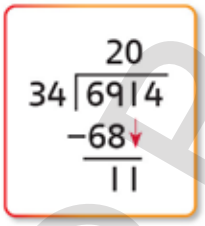
6 < 34, so we put the 6 thousands together with the 9 hundreds.

69 > 34, so now we can divide.

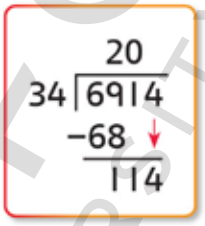


Next, we take the remainder of 1 hundred with the 1 in the tens column.

11 < 34, so we write 0 in the tens column of the quotient.

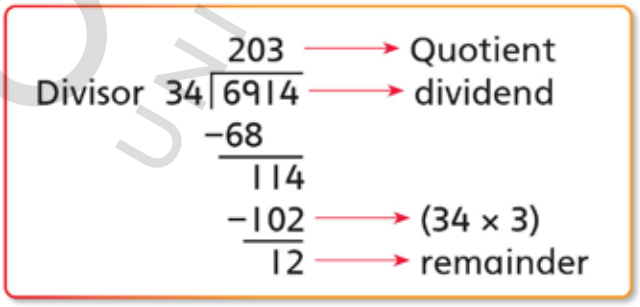


Next, we take the remainder of 11 tens with the 4 in the ones column:



114 > 34, so now we can easily divide.

Then, we work as shown below:



6914 ÷ 34 = 203 rem 12

▶ Exercise 1c

1. Fill in the blanks.
   a. In 3256 × 28 ; 3256 is called the Multiplicand.
   b. The quantity by which the multiplicand is to be multiplied is known as multiplier.
   c. The number which divides a dividend is called a divisor.
   d. 8 400 ÷ 100 = 84.
   e. If the dividend is 348 and the divisor is 12, then the remainder is zero.

2. State whether the following are true or false.
   a. When 1485 is divided by 6 the remainder is zero. (False) rem 3
   b. In 429 ÷ 8; the number 429 is the dividend. (True)
   c. If we divide 3696 by 12, the quotient is 308. (True)
   d. The product of two numbers is 4800. If one of the numbers is 100, the other number will be 480. (False) 48 000
   e. 1008 × 35 is 350 280. (False) 35 280

3. Select the correct answer from the given options.
   a. The result of multiplication of two numbers is called the
      Ⓐ multiplier Ⓑ sum
      Ⓒ product Ⓓ quotient
   b. 1500 × 20 equals
      Ⓐ 300 Ⓑ 30 000
      Ⓒ 3000 Ⓓ 300 000
   c. If we divide 4592 by 26 the remainder is
      Ⓐ 6 Ⓑ 26
      Ⓒ 16 Ⓓ 0
   d. The number left in the end of a long division is called the
      Ⓐ divisor Ⓑ dividend
      Ⓒ quotient Ⓓ remainder
   e. If the cost of one book is Rs 525, then to find the cost of 13 books we will
      Ⓐ multiply Ⓑ add
      Ⓒ divide Ⓓ subtract

4. Multiply the following.

a. 1964 × 79 = 155 156

b. 8547 × 73 = 623 931

c. 8501 × 90 = 765 090

5. Write these vertically and multiply.

a. 2562 × 69 176 778

b. 8009 × 20 160 180

c. 4098 × 62 254 076

d. 4571 × 43 196 553

c. 4098 × 62
4098 × 2 = 8196
4098 × 60 = 245 880
8196 + 245 880 = 254 076

6. Find the product when:

a. multiplicand 5829, multiplier 43 250 647

b. multiplicand 1835, multiplier 97 177 995

b. 1835 × 97
1835 × 7 = 12 845
1835 × 90 = 165 150
12 845 + 165 150 = 177 995

7. Divide the following.

a. 28 ⟌ 4042 144 r10

b. 26 ⟌ 1064 40 r24

c. 31 ⟌ 6485 209 r6

d. 18 ⟌ 1002 55 r12

e. 43 ⟌ 5629 130 r39

f. 39 ⟌ 2084 53 r17

g. 4618 ÷ 29 159 r7

h. 9320 ÷ 86 108 r32

i. 3047 ÷ 53 57 r26

j. 6593 ÷ 72 91 r41

k. 3271 ÷ 49 66 r37

l. 4818 ÷ 35 137 23

c. 35 ⟌ 4818 → 137
351
131
−105
268
245
23

8. Divide the following, then multiply to check.

a. Dividend 399, divisor 17 23 r8

b. Dividend 4082, divisor 62 65 r52

c. Dividend 6351, divisor 49 129 r30

d. Dividend 5641, divisor 13 433 r12

e. Dividend 3001, divisor 81 37 r4

f. Dividend 82 721, divisor 94 880 r1

9. Write the quotients in the blanks.

a. 4900 ÷ 49 = 100

b. 6500 ÷ 10 = 650

c. 8000 ÷ 20 = 300

d. 5100 ÷ 17 = 300

e. 4800 ÷ 40 = 120

f. 8400 ÷ 12 = 700

▶ Real-life Story Sums

Solve the problems, writing complete statements.

1. A leaking tap wastes 3750 ml of water in 1 hour. How much water will be wasted in a day? 3750 x 24 = 90,000 mL
2. Rehan found out that he can save 4726 ml of water every day by not leaving the tap open continuously, during his bath. How much water can be saved in 25 days in this manner? 4726 x 25 = 118 150 mL
3. There are 1440 minutes in a day. How many minutes are there in 8 weeks? 8 x 7 = 56 days 1440 x 56 = 80 640 min
4. Thirty children made 5280 paper bags. How many did each child make? 5280 ÷ 30 = 176 bags
5. How many pieces of cloth can be cut from a 1550 m long cloth, if each piece is 25 m long? 1550 ÷ 25 = 62 pieces
6. From several orchards, delicious apples are packed in boxes of 72 each. How many boxes will be required for 936 apples? 936 ÷ 72 = 13 boxes
7. Five doctors travel from Karachi to Lahore to attend a conference. The total bill for their train tickets is Rs 9675. How much does each doctor pay? 9675 ÷ 5 = Rs 1935 each
8. How many hours are there in 2700 minutes? 2700 ÷ 60 = 45 hrs
9. Eleven friends shared the bill at lunch. Their total expense for lunch was Rs 9955. How much money must each friend contribute? 9955 ÷ 11 = Rs 905 each

Number Pattern

Look at the sequence.

1, 2, 3, 4, 5, ___ , ___ , ___

What will be the next three numbers?

You may say 6, 7, 8.

There is a rule to find the next number in the given sequence. Add 1 to each number you get the next number.

In the above sequence 5 + 1 = 6, 6 + 1 = 7, and 7 + 1 = 8

Adding 1 every time is the rule to find the next number.

So, 1, 2, 3, 4, 5, ___, ___, ___ is a number pattern and the rule is, add 1 to each number.

The rule can be addition, subtraction, multiplication, and division.

A number sequence following a rule makes a **Pattern**.

Example 1: Find the rule and write next two numbers in following pattern.

2, 4, 6, 8, ___, ___

Rule: Add 2 to each term.

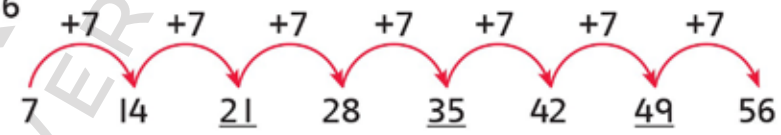
2, 4, 6, 8, 10, 12

Example 2: Find the rule and write the missing numbers.

7, 14, ___, 28, ___, 42, ___, 56

Rule: Multiples of 7.

7, 14, 21, 28, 35, 42, 49, 56



▶ Exercise 1d

1. Find the rule, then find the next two numbers in the following patterns.

   a. 4, 6, 8, 10, 12, 14

   Rule: Add 2

   b. 6, 9, 12, 15, 18, 21

   Rule: Add 3

c. 25, 20, 15, 10, 5, 0

Rule: subtract 5

d. 11, 22, 33, 44, 55, 66

Rule: Add 11, multiples of 11

e. 10, 20, 30, 40, 50, 60

Rule: Add 10, multiples of 10

2. Find the rule and write the missing numbers.

a. 16, 21, 26, 31, 36, 41.

Rule: Add 5.

b. 4, 8, ____, 16, 20, ____, 28.

Rule: Add 4, multiples of 4

c. 55, 50, 45, 40, 35, 30.

Rule: Subtract 5.

d. 27, 24, 21, 18, 15, 12, 9.

Rule: Subtract 3.

e. 9, 18, 27, 36, 45, 54, 63.

Rule: Add 9.

A pattern is described by describing the pattern rule.

Example 1: Write first five numbers of a pattern using the rule:
Divide by 2. Start with 64.
The pattern will be:
64, 32, 16, 8, 4

Example 2: Write first six numbers of a pattern using the rule:
Subtract 9 from each term. Start with 54.
The pattern will be:
54, 45, 36, 27, 18, 9

▶ Exercise 1e

Write first six numbers of a pattern. Use the rules given below.

1. Add 7. Start with 33. 33, 40, 47, 54, 61, 68
2. Subtract 10. Start with 90. 90, 80, 70, 60, 50, 40
3. Multiply by 10. Start with 7. 7, 70, 700, 7000, 70 000, 700000
4. Divide by 2. Start with 96. 96, 48, 24, 12, 6, 3
5. Add 15. Start with 20. 20, 35, 50, 65, 80, 95

Increasing number patterns are patterns in which numbers of the sequence or arrangement increase. In increasing number patterns, we add or multiply the terms.

Example 1:

8, 15, 22, 29, 36, 43

Rule: Add 7 to each term.

Example 2:

7, 14, 28, 56, 112

Rule: Multiply each term by 2.

Decreasing number patterns are patterns in which numbers of the sequence or arrangement decrease. In decreasing number patterns, we subtract or divide the terms.

Example 1:

73, 63, 53, 43, 33, 23

Rule: Subtract 10 from each term.

Example 2:

81, 27, 9, 3, 1

Rule: Divide each term by 3.

▶ Exercise 1f

Complete the number pattern. Identify the increasing and decreasing number pattern.

1. 39, 43, 47, 51, 55, 59. Increasing number pattern
2. 32, 16, 8, 4, 2, 1. Decreasing number pattern
3. 5, 10, 20, 40, 80. Increasing number pattern
4. 11, 22, 33, 44, 55. Increasing number pattern
5. 70, 62, 54, 46, 38, 30. Decreasing number pattern
6. 81, 27, 9, 3. Decreasing number pattern

ACTIVITY

Make flash cards of number patterns with a missing number. Give them 4 options to choose the correct answer.

7, 15, 23, 31, 39, 47

45 38 31 24

Rule = Add 8

YOUR DIGITAL RESOURCE

2 Factors and Multiples

In this unit students will learn to:

- identify divisibility rules for 2, 3, 5, and 10.
- use divisibility tests for 2, 3,5 and 10 on numbers up to 5 digits.
- identify and differentiate 2-digit prime and composite numbers
- find factors of a number up to 50.
- list the first ten multiples of a 1-digit number.
- differentiate between factors and multiples
- factorise a number by using prime factors.
- determine common factors of two or more 2-digit numbers.
- determine common multiples of two or more 2-digit numbers.

MATH FLASH

You have already learnt:

- times tables
- to identify even and odd numbers
- that even numbers can be arranged in pairs without leaving a remainder.
  For example, 8 can be arranged as: ▪▪▪▪
- that odd numbers cannot be arranged in pairs as they always leave a remainder.
  For example, 9 can be arranged as: ▪▪▪▪▪

KEY VOCABULARY

divisibility, prime, composite, factors, prime factors, Highest common factor, HCF, multiples, Least common multiple, LCM,

Tests of divisibility

Divisibility rules of whole numbers are very useful to find out if a number can be divided by 2, 3, 4, 5, 6, 7, 8, 9, 10. With the help of these rules we do not need to do long divisions. These rules help us to test if one number is divisible by another number without doing a lengthy calculation. We use these tests to find out the factors that make up a number.

Rules of divisibility

Rule 1

Any number with 0, 2, 4, 6, 8 at the unit place is divisible by 2. All even numbers are divisible by 2.

Rule 2

If the digits of any number add up to a number which is divisible by 3, then the original number is also divisible by 3.

Rule 3

Any number with 0 or 5 at the unit place is divisible by 5.

Rule 4

Any number with 0 at the unit place is divisible by 10.

Examples

1. Is 138 divisible by 2?

Solution:
Yes, because 138 is an even number and it has 8 at its units place. According to rule 1, it is divisible by 2.

2. Is 105 divisible by 3?

Solution:
Add the digits.

1 + 0 + 5 = 6; 6 is divisible by 3.

Therefore, 105 is also divisible by 3.

3. Is 593 divisible by 3?

Solution:

Add the digits: 5 + 9 + 3 = 17

17 is not divisible by 3.

Hence, the original number 593 is not divisible by 3.

DO YOU KNOW?

- 'Divisible by' and 'can be exactly divisible by' means the same.
- Every number is divisible by 1.

4. a. Is 195 divisible by 5?

Solution:

Yes, 195 is divisible by 5, because it has 5 at the unit place.

b. Is 230 is divisible by 5?

Solution:

Yes, 230 is divisible by 5, because it has 0 at the unit place.

c. Which of the following numbers are divisible by 5? Circle them and give reason.

Solution:

(780), (225), 192, 263

780 and 225 are divisible by 5, because they have 0 and 5 at their unit places.

5. Is 240 divisible by 10?

Solution:

Yes, 240 is divisible by 10 because it has 0 at the unit place.

6. a. Is 4055 divisible by 5 and 10?

Solution:

4055 is divisible by 5 because it has 5 at the unit place, but 4055 is not divisible by 10 because its unit place is not 0.

b. Is 1850 divisible by 5 and 10?

Solution:

1850 is divisible by 5 because it has 0 at the unit place.
1850 is divisible by 10, because it has 0 at the unit place.

▶ Exercise 2a

1. Fill in the blanks.
   a. A number is divisible by ___5___ if it has 5 at the unit place.
   b. 156 is divisible by ___2___ and ___3___. 156 ÷ 2 = 78 156 ÷ 3 = 52
   c. If a number has 0 at the unit place, it is divisible by ___2___, ___5___ and ___10___.
   d. If the sum of digits is divisible by 3, then the number itself is divisible by ___3___.
   e. All even numbers are divisible by ___2___.
2. State whether the following are true or false.
   a. 20 589 is divisible by 3. (___True___)
   b. 160 is divisible by 2. (___True___)
   c. 225 is divisible by 5 and 10. (___False___) not divisible 10
   d. Any number which is divisible by 10 is divisible by 5. (___True___)
   e. 5563 is divisible by 5. (___False___) 1112 r3
3. Select the correct answer from the given options.
   a. 6234 is divisible by
      (A) 5 (B) 2 and 3 (C) 2 and 10 (D) 2 and 5
   b. 4600 is divisible by
      (A) 5 only (B) 2 and 10 (C) 2 and 5 (D) 2, 5 and 10
   c. 525 is divisible by
      (A) 5 and 3 (B) 2 and 5 (C) 5 only (D) 10
   d. A number can be divided by 5 if the digit at the unit place is
      (A) even (B) 5 or 0 (C) 5 only (D) odd but not 5
   e. 5 × 3 is divisible by
      (A) 5 and 3 (B) 5 only (C) 3 only (D) 2 only
4. Which of the following numbers are divisible by 2?
   a. 200 b. 126 c. 427 d. 187
   e. 134 f. 2032 g. 139 h. 345
5. Which of the following numbers are divisible by 3?
   a. 624 b. 2358 c. 130 d. 3612
6. Which of the following numbers are divisible by 5?
   a. 2900 b. 6954 c. 4085 d. 840,050

7. Which of the following numbers are divisible by 10?

a. 7281 b. 81 080 c. 10 000 d. 90 005
e. 52 010 f. 40 185 g. 4002 h. 8760

8. Use the rules of divisibility to check whether each given number is divisible by 2, 3, 5, or 10. Write Yes or No.

Numbers	Divisible by			
	2	3	5	10
1872	Yes	Yes	No	No
53 250	Yes, 26625	Yes, 17750	Yes, 10650	Yes, 5325
673 655	No	No	Yes, 134731	No
2971	No	No	No	No
4720	Yes, 2360	No	Yes, 944	Yes, 472

Prime and composite numbers

Prime numbers

Numbers which can divide a given number leaving no remainder are called **factors** of the given number.

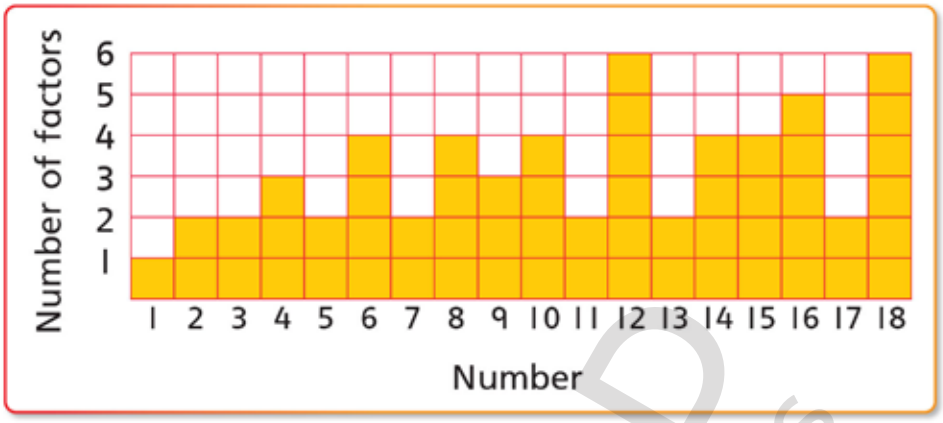
A prime number has only two factors that is 1 and the number itself. We can say if a number cannot be divided exactly by any other number except 1 or itself, then it is a **prime number**.

Look at the following table.

Number	Factors
1	1
2	1, 2
3	1, 3
4	1, 2, 4
5	1, 5
6	1, 2, 3, 6
7	1, 7
8	1, 2, 4, 8
9	1, 3, 9

Number	Factors
10	1, 2, 5, 10
11	1, 11
12	1, 2, 3, 4, 6, 12
13	1, 13
14	1, 2, 7, 14
15	1, 3, 5, 15
16	1, 2, 4, 8, 16
17	1, 17
18	1, 2, 3, 6, 9, 18

This result can be shown on a column graph.



We see that 2, 3, 5, 7, 11, 13 and 17 have only two factors, that is 1 and the number itself.

Numbers which have **only two** different factors—the number itself and 1 have a special name. They are called **prime numbers**.

Number 1 is **not** a prime number because it has only one factor.

Co-prime numbers

Now look at this pair of numbers: 2 and 3

What are the factors of this pair?
factors of 2: 1, 2
factors of 3: 1, 3

Here is only one common factor, and that common factor is 1.
Two numbers which have only 1 as their common factor are called **co-prime numbers**.

Example:
Are 9 and 16 co-prime numbers?

Solution:
factors of 9: 1, 3, 9
factors of 16: 1, 2, 4, 8, 16

Yes, 9 and 16 are co-prime numbers.

A magic way of showing all prime numbers from 1–100.

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

Take a colour pencil or crayon and follow the given steps.

Step 1 Do not colour the cell containing the number 1.

Step 2 2 is a prime number. Except for 2 itself, colour all cells containing multiples of 2 (4, 6, 8, 10, and so on).

Step 3 3 is a prime number. Except for 3 itself, colour all cells containing multiples of 3 (6, 9, 12, and so on). You may have already coloured some of the numbers.

Step 4 5 is a prime number. Except for 5 itself, colour all squares containing multiples of 5 (10, 15, and so on). You may have already coloured some of these numbers.

Step 5 7 is a prime number. Except for 7 itself, colour all squares containing multiples of 7 (14, 21, and so on). Many of these squares will already be coloured.

1. Look at your chart.

   Why are we not asked to colour multiples of 4 or 6? they have been covered

2. Look at the chart again and write down all the numbers which have been left uncoloured. How many such numbers are there altogether? 1, 2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47, 53, 59, 61, 67, 71, 73, 79, 83, 89, 97.

All the numbers which are coloured are composite numbers.

All the numbers left uncoloured are prime numbers. Make a list of these. Each has only 2 factors: itself and 1.

Composite numbers

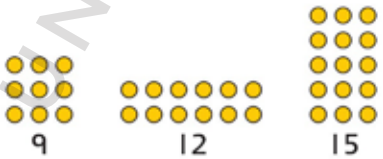
We already know that prime numbers are numbers which have only two different factors.

All other numbers (except the number 1) have three or more different factors. They, too, have a special name: **composite numbers**.

Composite means made up of several or many different parts.

We can say that if a number can be divided exactly by numbers other than 1 and the number itself, it is a **composite number**.

By arranging pebbles, we discover that composite numbers can always be arranged in exact rectangles.



Prime numbers cannot be arranged in this way.

▶ Exercise 2b

1. Fill in the blanks.
   a. Composite numbers have more than two factors.
   b. Each prime number has exactly two factors.
   c. 1 is neither prime nor a composite number.
   d. 50 is a composite number.
   e. Every prime number except 2 is odd.

2. State whether the following are true or false.
   a. 10 is a prime number. (false)
   b. 1, 3, and 13 are factors of 13. (False) 3 is not
   c. 8 is a composite number because it has four factors. (True)
   d. 45 is a composite number. (True)
   e. 18 is a prime number because it has two factors only. (False)

3. Select the correct answer from the given options.
   a. The smallest prime number is.
      (A) 6 (B) 1
      (C) 2 (D) 3
   b. The composite numbers have
      (A) one factor (B) more than two factors
      (C) two factors (D) uncountable factors
   c. The largest prime number less than 30 is
      (A) 23 (B) 21
      (C) 20 (D) 29
   d. 47 is
      (A) a prime number (B) a factor of 50
      (C) an even number (D) a composite number
   e. 38 is
      (A) a composite number (B) a multiple of 9
      (C) a prime number (D) an odd number

4. Check whether the numbers given in the table below are prime or composite. Write (P) for each prime number and (C) for each composite number.

a. 15 C	b. 31 P	c. 24 C	d. 21 C	e. 32 C
f. 25 C	g. 29 P	h. 3 P	i. 37 P	j. 17 P
k. 45 C	l. 11 P	m. 18 C	n. 33 C	o. 25 C
p. 54 C	q. 35 C	r. 83 P	s. 57 P	t. 41 P

5. Which of the following are co-prime numbers?

a. 3 and 5 b. 31 and 62 c. 4 and 9 d. 14 and 25
e. 36 and 49 f. 72 and 55 g. 40 and 4 h. 5 and 10

Factors

Alia has 12 pebbles. She has arranged them in different ways as shown in the table below.

1. in **ones**

$12 \times 1 = 12$

2. in **twos**

$6 \times 2 = 12$

3. in **threes**

$4 \times 3 = 12$

4. in **fours**

$3 \times 4 = 12$

5. in **sixes**

$2 \times 6 = 12$

6. in **twelves**

$1 \times 12 = 12$

The 12 pebbles have been arranged in ones, twos, threes, fours, sixes, and twelves, with none left over.

From the given example, we conclude that 12 can be divided completely by 1, 2, 3, 4, 6, and 12.

$12 \div 1 = 12$ rem 0
$12 \div 2 = 6$ rem 0
$12 \div 3 = 4$ rem 0
$12 \div 4 = 3$ rem 0
$12 \div 6 = 2$ rem 0
$12 \div 12 = 1$ rem 0

NOTE

When a number is divided by one of its factors, there is no remainder.

Numbers which can divide a given number leaving no remainder are called **factors** of the given number.

Here **1, 2, 3, 4, 6,** and **12** are called **factors** of the number 12.

Examples:

Find all the factors of

a. 15 b. 49 c. 32 d. 45

a. 15

Solution

$15 \div 1 = 15$ rem 0
$15 \div 3 = 5$ rem 0
$15 \div 5 = 3$ rem 0
$15 \div 15 = 1$ rem 0

or

$1 \times 15 = 15$
$3 \times 5 = 15$

Stop when numbers begin to repeat.

∴ factors of 15 are 1, 3, 5, and 15.

b. 49

Solution

$49 \div 1 = 49$ rem 0
$49 \div 7 = 7$ rem 0
$49 \div 49 = 1$ rem 0

or

$1 \times 49 = 49$
$7 \times 7 = 49$

(factors will repeat from here onwards)

∴ factors of 49 are 1, 7, and 49.

c. 32 (use rules of divisibility to find factors.)

Solution:

$32 \div 1 = 32$ or $32 \div 32 = 1$ rem 0
$32 \div 2 = 16$ or $32 \div 16 = 2$ rem 0
$32 \div 4 = 8$ or $32 \div 8 = 4$ rem 0
$32 \div 8 = 4$ or $32 \div 4 = 8$ rem 0

or

$1 \times 32 = 32$
$2 \times 16 = 32$
$4 \times 8 = 32$
$8 \times 4 = 32$

(factors will repeat from here onwards)

∴ factors of 32 are 1, 2, 4, 8, 16, and 32.

d. 45

Solution:

$45 \div 1 = 45$
$45 \div 3 = 15$
$45 \div 5 = 9$
$45 \div 45 = 1$

1×45
3×15
5×9

∴ factors of 45 are 1, 3, 5, 9, 15, and 45.

REMEMBER

- Factors of a number are limited.
- Every number is a factor of itself.
- 1 is a factor of every number.

In the above examples we notice that the number 1 and the number itself appear in every list.

$1 \times 15 = 15$; $1 \times 49 = 49$; $1 \times 32 = 32$, and $1 \times 45 = 45$.

▶ Exercise 2c

1. Fill in the blanks.
   a. One is a factor of all the numbers.
   b. Factors of 6 are 1, 2, 3, and 6.
   c. 1, 2 are factors of 2.
   d. The factors of 20 are 1, 2, 4, 5, 10, and 20.
   e. 13 is a prime number.

2. State whether the following are true or false.
   a. 7 is a factor of 45. (False) 1, 3, 5, 9, 15 and 45 are factors of 45
   b. If a number divides another number completely, then the first number is a factor of the other number. (True)
   c. 6 and 8 have an equal number of factors. (True)
   d. A number is always a factor of itself. (True)
   e. 45 is a factor of 9. (False) 1, 3, and 9 are factors of 9

3. Select the correct answer from the given options.
   a. 2 and 7 are factors of
      (A) 3 (B) 7
      (C) 14 (D) 2
   b. 10 is not a factor of
      (A) 32 (B) 240
      (C) 20 (D) 60
   c. All possible factors of 50 are
      (A) 10, 5 (B) 1, 2, 5, 10, 25, and 50
      (C) 1, 5, 25, 50 (D) 5, 10, 50
   d. 8 is not a factor of
      (A) 2 (B) 8
      (C) 16 (D) 32
   e. Which of the following is a factor of every number?
      (A) 0 (B) 1
      (C) 2 (D) 10

4. Find the factors of the following numbers.
   a. 9 1, 3, and 9 b. 11 1 and 11 c. 18 1, 2, 3, 6, 9, and 18
   d. 21 1, 3, 7, and 21 e. 24 1, 2, 3, 4, 6, 8, 12 and 24 f. 35 1, 5, 7, and 35

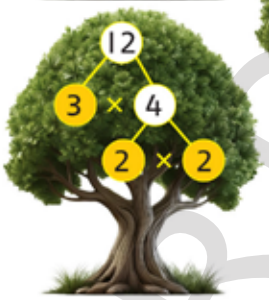
5. Write Yes or No.
   a. Is 12 a factor of 36? Yes
   b. Is 7 a factor of 45? No
   c. Is 6 a factor of 42? Yes
   d. Is 20 a factor of 50? No
   e. Is 16 a factor of 48? Yes

6. Write down the factors of these numbers. How many factors does each number have?
   a. 25 3 (1, 5, 25) b. 36 9 (1, 2, 3, 4, 6, 9, 12, 18, 36) c. 54 8 (1, 2, 3, 6, 9, 18, 27, 54) d. 32 6 (1, 2, 4, 8, 16, 32) e. 45 6 (1, 3, 5, 9, 15, 45) f. 50 6 (1, 2, 5, 10, 25, 50)

Prime factorisation

Let us take the composite number 12 and think of it as the topmost part of a tree. Let us now go down the tree by thinking of the factors that make 12:

Here, the factors are 2 and 6. 2 is a prime number, but 6 is a composite number. We can break 6 down to its prime factors, 2 and 3.



Here, the factors are 3 and 4. 3 is a prime number, but 4 is a composite number. We can break 4 down to its prime factors, 2 and 2.

2, 2, 3 are the **prime factors** of 12.

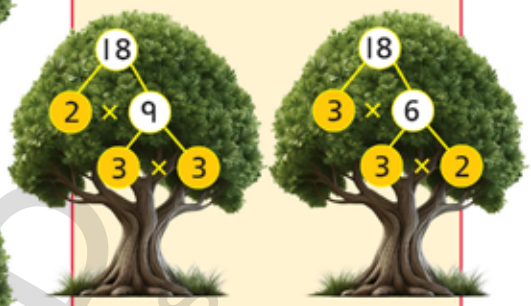
When we break down a number to its prime factors, we call that the **prime factorisation** of that number.

Prime factors can never be composite numbers.

Example:

Find Prime factors of 18

Solution:



Prime factors of 18 are 2, 3, 3

An easy method to break up larger numbers into their prime factors is the **division method.**

Let us first find the prime factors of 36 and 45, using the division method.

36 is an even number, so we divide by 2:

$2\overline{)36}$

$2\overline{)18}$ we divide by 2 again

$3\overline{)9}$ we divide by 3

$3\overline{)3}$ we divide by 3 again

1

The prime factors of 36 are **2, 2, 3, and 3.**

45 is an odd number, but it can be divided by 3.

$3\overline{)45}$

$3\overline{)15}$ we divide by 3 again

$5\overline{)5}$ we divide by 5 again

1

The prime factors of 45 are **3, 3,** and **5.**

▶ Exercise 2d

1. Fill in the blanks.
   a. 2, 3, 5 are prime factors of 30.
   b. The prime factors of 41 are 1 and 41.
   c. There are two prime factors of 58.
   d. The prime factors of 10 are 2 and 5.
   e. Prime factor can never be a composite number.
2. State whether the following are true or false.
   a. The prime factor of a number divides the number completely. (True)
   b. The prime factors of 100 are 2, 3, 5, 5, 10. (False) 1, 2, 3, 4, 5, 20, 25, 50, 100
   c. A factor tree is used to find prime factors. (True)
   d. Prime factors of numbers are prime numbers. (True)
   e. 2 is the only prime factor of the number 6. (false) and 3
3. Select the correct answer from the given options.
   a. 3, 3, 3, and 5 are prime factors of
      Ⓐ 27 Ⓑ 45 Ⓒ 15 Ⓓ 135
   b. The prime factors of 110 are
      Ⓐ 5, 11 Ⓑ 2, 5, 11 Ⓒ 2, 2, 5, 5 Ⓓ 2 and 55
   c. The prime factors of 50 are 2, 5 and
      Ⓐ 2 Ⓑ 1 Ⓒ 5 Ⓓ 10
   d. The prime factor is always
      Ⓐ a prime number Ⓑ the smallest factor
      Ⓒ a composite number Ⓓ the biggest factor

e. Prime factorisation means
   - (A) dividing the number into two parts
   - (B) finding the product of the number
   - (C) multiplying the number with prime numbers
   - (D) breaking a number into prime factors

4. Draw factor trees to show the prime factors of the given numbers.

a. 15	b. 20	c. 14	d. 8
e. 21	f. 22	g. 16	h. 27
i. 42	j. 30		

5. Draw as many different factor trees as you can to show the prime factors of these numbers.

a. 40 b. 48 c. 60 d. 24 e. 50 f. 72

6. Find the prime factors of these numbers using the division method.

a. 84 b. 117 c. 333 d. 126 e. 520 f. 99

Common Factor

Look at these 2 sets of factors:

factors of 12: 1, 2, 3, 4, 6, 12
factors of 18: 1, 2, 3, 6, 9, 18

Did you notice that some of the factors, that is 1, 2, 3, and 6, appear in both sets?

Because these factors are common to two different numbers, we call them **common factors.** Common factors can also be found using a Venn diagram.

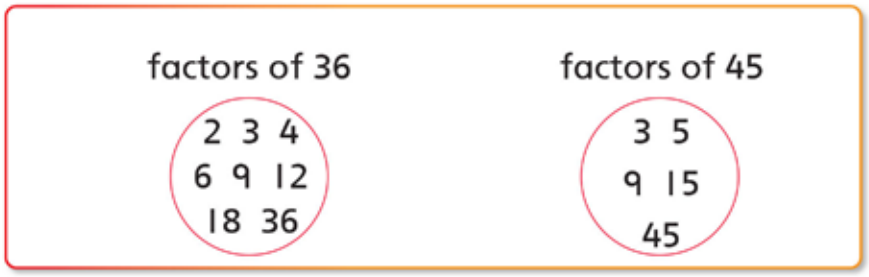
Look at the factors of 36 and 45:

36 = 1, 2, 3, 4, 6, 9, 12, 18, 36
45 = 1, 3, 5, 9, 15, 45

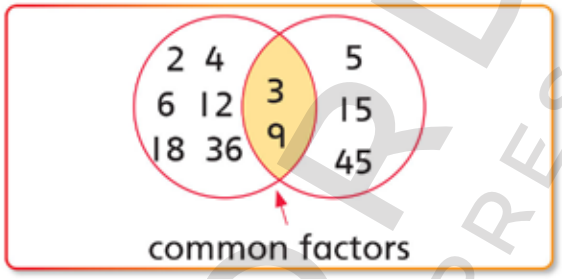
The common factors of 36 and 45 are 3 and 9.

This can be illustrated using a diagram.

The rectangle below contains two loops with all factors of 36 and 45.



Let us now combine the two loops, one showing the factors of 36 and the other showing the factors of 45.



∴ the common factor of 36 and 45 are 3 and 9.

Such diagrams as shown above are called **Venn diagrams**.

Now look at these sets of factors:

factors of 24: **1, 2, 3,** 4, **6,** 8, 12, 24
factors of 18: **1, 2, 3, 6,** 9, 18

The common factors of 24 and 18 are 1, 2, 3, and 6.

So far, we have been looking at the common factors of pairs of numbers. Now let us take 3 numbers: 16, 32, and 40.

factors of 16: **1, 2, 4, 8,** 16
factors of 32: **1, 2, 4, 8,** 16, 32
factors of 40: **1, 2, 4,** 5, **8,** 10, 20, 40

The common factors of 16, 32, and 40 are 1, 2, 4, and 8.

To find the common factors of two or more numbers using prime factorisation method we must first find the prime factors of the given numbers.

Example:

Find the common factors of 12 and 21 using prime factorisation method.

Solution:

2 | 12
2 | 6
3 | 3
1

3 | 21
7 | 7
1

HINT

Start with the smallest possible prime number which completely divides the number leaving no remainder.

Keep on dividing till you reach 1.

$12 = 2 \times 2 \times 3$

$21 = 3 \times 7$

$\therefore$ common factor of 12 and 21 is 3.

Example:

Find the common factors of 52, 78, and 130 by prime factorisation method.

Solution:

2 | 52
2 | 26
13 | 13
1

2 | 78
3 | 39
13 | 13
1

2 | 130
5 | 65
13 | 13
1

$52 = 2 \times 2 \times 13$; prime factors of 52 are 2, 2, 13

$78 = 2 \times 3 \times 13$; prime factors of 78 are 2, 3, 13

$130 = 2 \times 5 \times 13$; prime factors of 130 are 2, 5, 13

$\therefore$ common factors of 52, 78, and 130 are 2 and 13

Higher Order Thinking Skills

Highest Common Factor (HCF)

Highest Common Factor (HCF) is the greatest factor common in the given numbers. We can solve real-life story sums using HCF. To solve real-life story sums involving HCF we should remember some keywords such as maximum, greatest, largest, and equal.

Example:

A 12 feet long and 8 feet wide room's floor is to be covered with tiles. What should be the maximum size of the tile to be used?

Solution:

Maximum is the keyword, so we will find the HCF of 12 and 8, by finding their prime factors.

Find the prime factors of 12, 8.

2	12
2	6
3	3
	1

2	8
2	4
2	2
	1

$12 = 2 \times 2 \times 3$

$8 = 2 \times 2 \times 2$

HCF of 12 and 8 is $2 \times 2 = 4$.

$\therefore$ the size of the tile should be 4 square feet.

▶ Exercise 2e

1. Fill in the blanks.
   a. The common factor of 2 and 3 is 1.
   b. The common factors of 32 and 4 are 2 and 4.
   c. The common factors of 8 and 16 are 2, 4, 8.
   d. The common factor of 8, 10, and 12 is 2.
   e. The common factor of 12 and 18 are 2, 3, and 6.

2. State whether the following are true or false.
   a. 4 and 6 have no common factors. (False) 1 and 2
   b. 1, 2, 3, and 4 are the only common factors of 12 and 24. (False) 6 and 12 too
   c. 20 is the common factor of 10 and 20. (False) 1, 2, 5, 10
   d. Two or more prime numbers have no common factors. (True)
   e. The common factors of 20, 30, and 40 are 2, 5, and 10. (False) 1, 2, 5, 10

3. Select the correct answer from the given options.
   a. The common factor of 42, 56, and 63 is
      (A) 7 (B) 6 (C) 3 (D) 21
   b. 13 is the common factor of
      (A) 39 and 42 (B) 26 and 52 (C) 52 and 56 (D) 45 and 65
   c. The product of 3 and common factor of 81 and 45 is
      (A) 45 (B) 81 (C) 5 (D) 15
   d. The common factors of 26 and 78 are
      (A) 13 only (B) 1
      (C) 1, 2 and 13 only (D) 1, 2, 13 and 26
   e. Which of the following is a common factor of 85 and 95?
      (A) 5 (B) 17 (C) 25 (D) 19

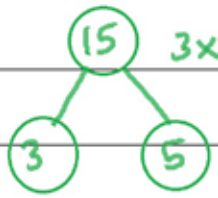
4. Write the factors of these pairs of numbers, and circle the common factors.
   a. 10, 18 b. 12, 1
   c. 25, 15 d. 16, 20
   e. 10, 32 f. 14, 21

5. Find the common factors of the following pairs of numbers.
   a. 32, 24 1, 2, 4, 8 b. 50, 25 1 and 5
   c. 48, 30 1, 2, 3, 6 d. 42, 70 1, 2, 7, 14
   e. 64, 88 1, 2, 4, 8 f. 76, 28 1, 2, 14

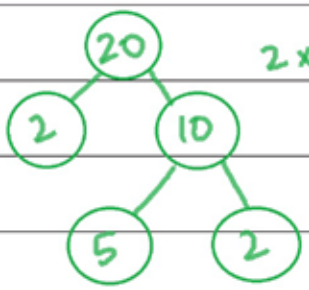
6. Find the common factors of each of the following sets.
   a. 9, 12, and 15 1 and 3 b. 5, 25, and 35 1 and 5
   c. 18, 20, and 24 1 and 2 d. 18, 27, and 39 1 and 3
   e. 12, 16, and 20 1, 2, and 4 f. 14, 49, and 28 1 and 7

7. Use the division method to find the prime factors of these numbers. (Hint: Use rules of divisibility)
   a. 30 2 × 3 × 5 b. 320 2 × 2 × 2 × 2 × 2 × 2 × 5
   c. 45 3 × 3 × 5 d. 55 5 × 11

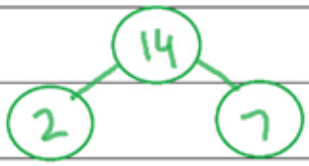
Exercise 2d

4. a. 

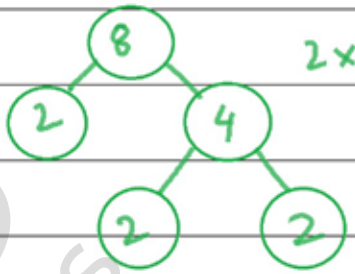
3×5

b. 

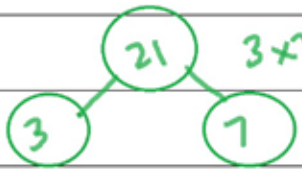
$2 \times 2 \times 5$

c. 

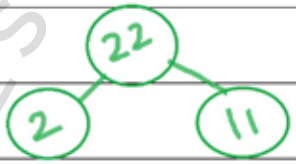
2×7

d. 

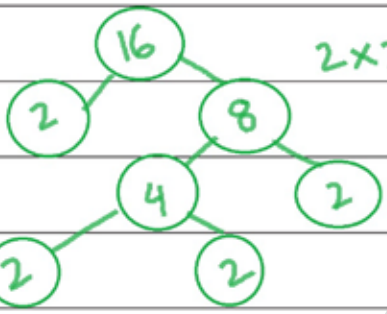
$2 \times 2 \times 2$

e. 

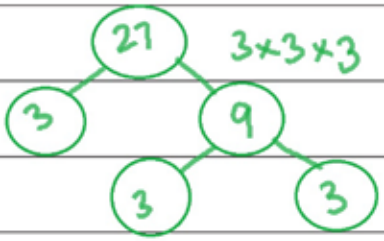
3×7

f. 

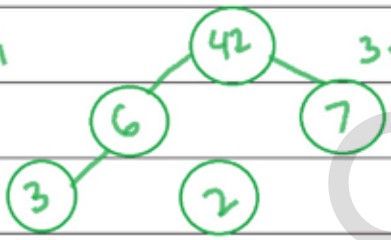
2×11

g 

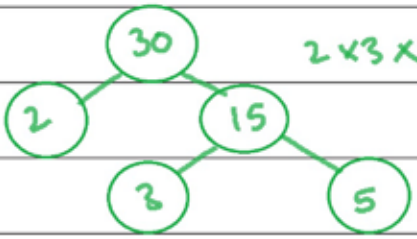
$2 \times 2 \times 2 \times 2$

h. 

$3 \times 3 \times 3$

i 

$3 \times 2 \times 7$

j. 

$2 \times 3 \times 5$

8. Circle the pairs that are co-prime numbers.

a. 4 and 8
b. 2 and 10
c. 5 and 9
d. 2 and 17
e. 5 and 10
f. 14 and 4

Higher Order Thinking Skills

▶ Real-life Story Sums

Solve the problems, writing complete statements.

1. Arif brought 40 chocolate bars and 60 marshmallows to distribute among his friends on his birthday. Find the maximum number of students to whom he can divide the sweets evenly. highest common factors of both these numbers is 20. 20 students.
2. There are two pieces of ribbons having length 75 metres and 90 metres. If equal pieces are cut from the two pieces of ribbons, what will be the maximum length of each piece? 15 meters
3. Find the greatest number which divides 96 and 64. 16
4. Two drums contain 35 l and 45 l of water respectively. What will be the maximum capacity of a container that exactly measures the water in two drums? highest common factor is 5 = 5 litres
5. What is the greatest number that divides 30, 36, and 96 exactly? 6

Multiples

When we divide each of the following numbers by 10 we get a quotient with no remainder.

100 ÷ 10 = 10	rem 0
1000 ÷ 10 = 100	rem 0
10 000 ÷ 10 = 1000	rem 0

Here 100, 1000, and 10 000 are known as multiples of 10.

A multiple is therefore, a number which can be divided by another number, without leaving any remainder.

Examples:

6 is a multiple of 2.
6 ÷ 2 = 3 rem 0

6 is also a multiple of 3.
6 ÷ 3 = 2 rem 0

56 is a multiple of 7.
56 ÷ 7 = 8 rem 0

56 is also a multiple of 8.
56 ÷ 8 = 7 rem 0

We learned earlier that even numbers can be made into pairs, while odd numbers cannot be made into pairs, leaving a remainder.

We can now describe even numbers.

All even numbers are multiples of 2.

Example: List the first ten even and odd numbers.

Solution:

Even numbers: 2, 4, 6, 8, 10, 12, 14, 16, 18, 20
Odd numbers: 1, 3, 5, 7, 9, 11, 13, 15, 17, 19

CHALLENGE

a. If we add an even number to another even number, we get an ____ number.

b. If we add an odd number to another odd number, we get an ____ number.

c. If we add an even number to an odd number, we get an ____ number.

REMEMBER

- Multiples of a number are unlimited.
- Every number is a multiple of 1.

Common multiple

Look at these two sets of the first ten multiples of 2 and 3.

multiples of 2: 2, 4, 6, 8, 10, 12, 14, 16, 18
multiples of 3: 3, 6, 9, 12, 15, 18, 21, 24, 27, 30

What is special about the sets?

Some multiples appear in both of them. We can show the pairs by looping them like this:

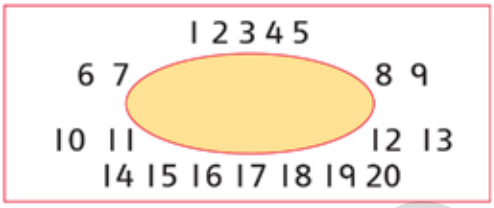
multiples of 2: 2, 4, (6), 8, 10, (12), 14, 16, (18)

multiples of 3: 3, (6), 9, (12), 15, (18), 21, 24, 27, 30

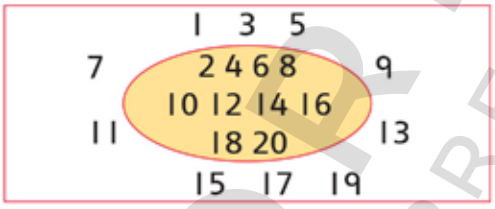
Because 6, 12, and 18 are all multiples of both 2 and 3, we give them a special name. We call them **common multiples.**

Let us find common multiples using a Venn diagram.

The rectangle below contains all whole numbers from 1 to 20, and a closed loop with no numbers at all.

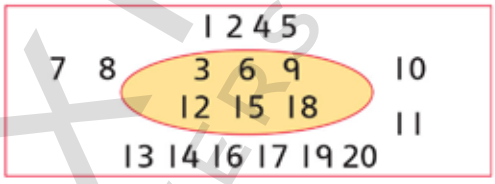


Let us place all the multiples of 2 inside the loop.

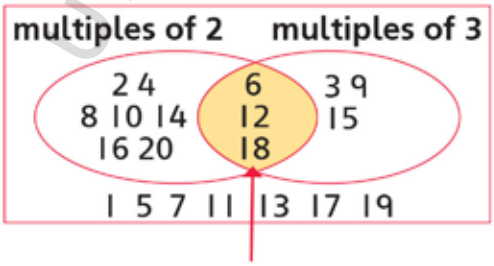


All the numbers left outside the loop are not multiples of 2.

Let us place all the multiples of 3 inside another loop in another diagram.



Let us now combine the two loops, one showing the multiples of 2 and the other showing the multiples of 3.



These are the **common multiples** of 2 and 3.

Higher Order Thinking Skills

Lowest Common Multiple (LCM)

Now let us find the lowest common multiple of two or more than two numbers.

Example 1: Find the LCM of 6 and 8 by using the first 10 multiples of each number.

Solution:

multiples of 6: 6, 12, 18, (24), 30, 36, 42, (48), 54, 60

multiples of 8: 8, 16, (24), 32, 40, (48), 56, 64, 72, 80

common multiples: 24, 48

∴ LCM of 6 and 8 is 24.

We can also find the LCM of more than two numbers by using the same method.

Example 2: Find the LCM of 2, 3, and 4 by using the first ten (or more) multiples of each number.

Solution:

multiples of 2: 2, 4, 6, 8, 10, (12), 14, 16, 18, 20, 22, (24)

multiples of 3: 3, 6, 9, (12), 15, 18, 21, (24), 27, 30

multiples of 4: 4, 8, (12), 16, 20, (24), 28, 32, 36, 40

common multiples: 12, 24

∴ LCM of 2, 3, and 4 is 12.

Example 3: Find the LCM of 21, 14 and 7 by listing first six multiples.

Solution:

multiples of 21: 21, (42), 63, 84, 105, 126

multiples of 14: 14, 28, (42), 56, 70, 84

multiples of 7: 7, 14, 21, 28, 35, (42)

common multiple: 42

42 is the only common multiple in the given list and it is the lowest common multiple.

∴ the LCM of 21, 14, and 7 is 42.

Example 4:

Calculate the LCM of 12, 16, and 24 considering the first 8 multiples.

Solution:

multiples of 12: 12, 24, 36, (48), 60, 72, 84, (96)

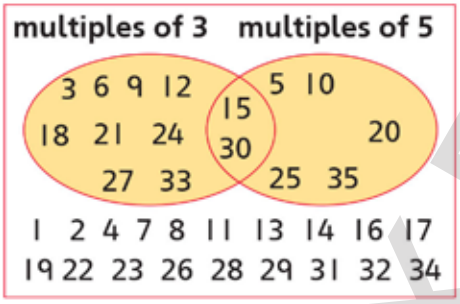
multiples of 16: 16, 32, (48), 64, 80, (96), 112, 128

multiples of 24: 24, (48), 72, (96), 120, 144, 168, 192

common multiples: 48, 96

48 < 96, therefore, 48 is the lowest common multiple (LCM) of 12, 16 and 24.

Look carefully at this Venn diagram. It shows the multiples of 3 and 5 and their common multiples (up to the number 35).



REMEMBER

A whole number is always a multiple of itself. 3 is a multiple of 3, and 5 is a multiple of 5, because $3 \times 1 = 3$ and $5 \times 1 = 5$.

Now look at the common multiples of 3 and 5.

There are 2 common multiples shown: 15 and 30.

15 < 30, therefore, 15 is the **Lowest Common Multiple (LCM)** of 3 and 5.

We can find the lowest common multiple (LCM) by prime factorisation.

Finding the LCM of bigger numbers like 144 and 96 would be tedious if we use the multiple method.

An easy method is to break up large numbers into their prime factors, and then find the LCM by the prime factorisation method.

Example: Find the LCM of 48 and 45.

Solution: Let us first find the prime factors of 48 and 45.

2	48
2	24
2	12
2	6
3	3
	1

3	45
3	15
5	5
	1

$48 = 2 \times 2 \times 2 \times 2 \times 3$

$45 = 3 \times 3 \times 5$

To find the LCM of 48 and 45, we multiply together all their prime factors. However, we include their common prime factors only once.

Hence, the LCM of 48 and 45 = $2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 5 = 720$.

Now let us find the LCM of three numbers by the prime factorisation method.

Example: Find the LCM of 30, 54, and 72.

Solution:

2	30
3	15
5	5
	1

2	54
3	27
3	9
3	3
	1

2	72
2	36
2	18
3	9
3	3
	1

REMEMBER

Take only one of the common factors and multiply by all the other factors.

$30 = 2 \times 3 \times 5$

$54 = 2 \times 3 \times 3 \times 3$

$72 = 2 \times 3 \times 2 \times 2 \times 3$

LCM of 30, 54, and 72 is: $2 \times 3 \times 2 \times 2 \times 3 \times 3 \times 5$

LCM of 30, 54, and 72 = 1080.

We can solve real-life story sums using the LCM.

To solve real-life story sums involving LCM, we should remember some keywords, such as together, least, same, and all.

Example: The signal lights on two towers flashed after every 30 and 40 seconds. If they flashed together at 7:30 p.m., when will they next flash together?

Solution

'Together' is the key word, so we will find the LCM of 30 and 40, by finding their prime factors.

2	30
3	15
5	5
	1

2	40
2	20
2	10
5	5
	1

$30 = 2 \times 3 \times 5$

$40 = 2 \times 2 \times 2 \times 5$

$\therefore$ LCM of 30 and 40 = $2 \times 2 \times 2 \times 3 \times 5 = 120$ seconds.

Hence the two signals will flash together after every 120 seconds or 2 minutes.

Hence, after 7:30 p.m., they will flash together at 7:32 p.m.

▶ Exercise 2f

1. Fill in the blanks.
   a. The fourth multiple of 15 is 60.
   b. $4 \times 9 = 36$, so 36 is the multiple of 4 and 9.
   c. The first three common multiples of 5 and 6 are 30, 60, 90.
   d. The first three multiples of 9 are 9, 18, 27.
   e. The first four multiples of 10 are 10, 20, 30, 40
2. State whether the following are true or false.
   a. The LCM of two numbers is divisible by both the numbers. (True)
   b. The multiple of 14 are 2 and 7. (False)
   c. Multiples of 17 are 17, 34, 51, 68. (True)
   d. The multiples of 5 are 10, 15 and 30. (True)
   e. Multiples of a number are finite. (False) 'infinite

3. Select the correct answer from the given options.

a. 14, 21, and 28 are multiples of

Ⓐ 1 Ⓑ 14 Ⓒ 28 Ⓓ 7

b. 36, 48, 72 are multiples of

Ⓐ 8 Ⓑ 12 Ⓒ 9 Ⓓ 48

c. Which of the following is a common multiple of 20 and 25?

Ⓐ 25 Ⓑ 5 Ⓒ 10 Ⓓ 500

d. The first 4 multiplies of 15 are

Ⓐ 15, 30, 40, and 50 Ⓑ 30, 60, 90, and 105

Ⓒ 15, 30, 45, and 60 Ⓓ 3, 5, 15, and 30

e. 8 is a multiple of

Ⓐ 72 Ⓑ 18 Ⓒ 4 and 5 Ⓓ 2 and 4

4. Find the first three common multiples of these pairs of numbers.

a. 18 and 24 b. 12 and 16 c. 30 and 12

d. 20 and 25 e. 24 and 32 f. 18 and 54

g. 8, 16, and 24 h. 10, 15, and 25 i. 16, 48, and 96

j. 36, 60, and 72 k. 25, 40, and 50 l. 11, 22, and 44

Higher Order Thinking Skills

▶ Real-life Story Sums

Solve the problems, writing complete statements.

1. What is the least number of children, who may be arranged in rows of 12, 15 and 9? 180 children

1. taking out common multiple
12: 12, 24, 36, 48, 60, 180 ✓
15: 15, 30, 45, 60, 75, 180 ✓
9: 9, 18, 27, 36, 45, 60, 90, 180 ✓

2. Three bells toll at an interval of 4, 5, and 6 seconds. After how much time will they toll together? 60 seconds or 1 minute

3. Saima goes to her friend every 15 days and Laiba goes to same friend every 18 days. After how many days Saima and Laiba will visit the friend together? 15 = 15, 30, 45, 60, 75, 90 ✓ 90 days
18 = 18, 36, 54, 72, 90 ✓

4. What is the least number which can be exactly divided by 36, 64, and 72? 576

3 Fractions

YOUR DIGITAL RESOURCE

In this unit students will learn to:

- recognise like and unlike fractions.
- compare two unlike fractions by converting them to equivalent fractions with the same denominator.
- simplify fractions to the lowest form
- identify (unit, proper, improper) fractions and mixed numbers.
- convert improper fractions to mixed numbers and vice versa
- arrange fractions in ascending and descending order.
- add fractions with like denominators
- subtract fractions with like denominators
- multiply a fraction (proper, Improper) and mixed number by a whole number
- multiply two fractions (proper, Improper) and mixed numbers
- divide a fraction(proper, Improper) and mixed numbers by a whole number
- analyse real life situations involving fractions by identifying appropriate number operations

MATH FLASH

You have already learnt:

- about fractions
- what is half ($\frac{1}{2}$) and quarter ($\frac{1}{4}$) of a shape
- about unit fractions. For example, $\frac{1}{3}$, $\frac{1}{5}$, and $\frac{1}{9}$
- to find equivalent fractions
- to order and compare fractions
- to add and subtract like fractions
- to divide fractions

KEY VOCABULARY

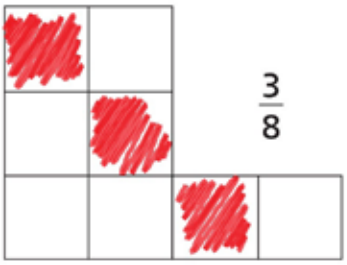
fraction, numerator, denominator, proper, improper, mixed, like fractions, unlike fractions, convert, equivalent, order, compare

Remembering fractions

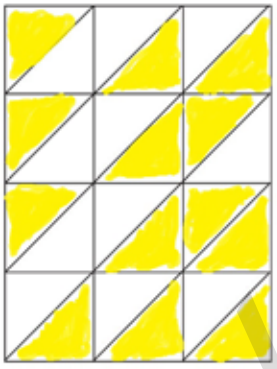
1. Colour the correct fraction of each shape.

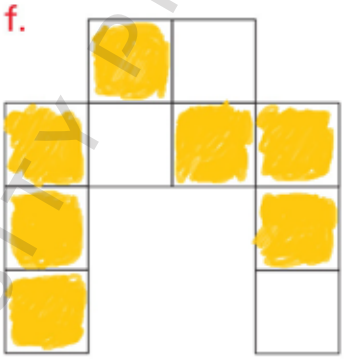
a.  $\frac{2}{6}$

b.  $\frac{3}{4}$

c.  $\frac{3}{8}$

d.  $\frac{8}{10}$

e.  $\frac{13}{24}$

f.  $\frac{7}{10}$

2. Write the fraction for the coloured part of each shape.

a. 

$\frac{2}{6} = \frac{1}{3}$

b. 

$\frac{5}{8}$

c. 

$\frac{4}{8} = \frac{1}{2}$

d. 

$\frac{2}{5}$

Example:

$\frac{3}{4}$

Exercise 2f

4. a. 18 and 24

18 = 18, 36, 54, 72, 90, 108, 126, 144, 162, 180, 198, 216...

24 = 24, 48, 72, 96, 120, 144, 168, 192, 216, 240...

common multiples = 72, 144, 216

b. 12 and 16

= 48, 96, 144

c. 30 and 12

= 60, 120, 180

d. 20 and 25

= 100, 200, 300

e. 24 and 32

= 96, 192, 288

f. 18 and 54

= 54, 108, 162

g. 8, 16 and 24

8 = 8, 16, 24, 32, 40...

16 = 16, 32, 48, 64, 80...

24 = 24, 48, 72, 96, 120...

common multiples = 48, 96, 144

h. 10, 15 and 25

= 150, 300, 450

i. 16, 48 and 96

= 96, 192, 288

j. 36, 60 and 72

= 360, 720, 1080

k. 25, 40 and 50

= 200, 400, 600

l. 11, 22 and 44

11 = 11, 22, 33, 44, 55, 66, 77, 88, 99, 110, 121, 132...

22 = 22, 44, 66, 88, 110, 132...

44 = 44, 48, 88, 132, 176, 220...

common multiples: 44, 88, 132

3. Write fractions to match the words.

a. Numerator 5, denominator 7

$\frac{5}{7}$

b. Denominator 10, numerator 3

$\frac{3}{10}$

c. Denominator 8, numerator 5

$\frac{5}{8}$

Example:

Denominator 6, numerator 4

$\frac{4}{6}$

4. Write $>$, $<$, or $=$.

a. $\frac{3}{7} < \frac{6}{7}$

b. $\frac{5}{8} > \frac{3}{6}$

c. $\frac{5}{8} = \frac{5}{8}$

d. $\frac{6}{8} < \frac{6}{7}$

Example:

$\frac{2}{5} < \frac{3}{5}$; $\frac{3}{4} > \frac{3}{6}$

5. Write in ascending order.

a. $\frac{2}{7}, \frac{6}{7}, \frac{4}{7}, \frac{3}{7}$ → $\frac{2}{7}, \frac{3}{7}, \frac{4}{7}, \frac{6}{7}$

b. $\frac{7}{8}, \frac{1}{8}, \frac{3}{8}, \frac{5}{8}$ → $\frac{1}{8}, \frac{3}{8}, \frac{5}{8}, \frac{7}{8}$

c. $\frac{3}{10}, \frac{5}{10}, \frac{7}{10}, \frac{4}{10}$ → $\frac{3}{10}, \frac{4}{10}, \frac{5}{10}, \frac{7}{10}$

d. $\frac{2}{9}, \frac{8}{9}, \frac{6}{9}, \frac{4}{9}$ → $\frac{2}{9}, \frac{4}{9}, \frac{6}{9}, \frac{8}{9}$

Example:

$\frac{3}{2}, \frac{2}{5}, \frac{4}{5}, \frac{1}{5}$

Ascending order:

$\frac{1}{5}, \frac{2}{5}, \frac{3}{5}, \frac{4}{5}$

6. Write in descending order.

a. $\frac{4}{6}, \frac{2}{6}, \frac{3}{6}, \frac{5}{6}$ → $\frac{5}{6}, \frac{4}{6}, \frac{3}{6}, \frac{2}{6}$

b. $\frac{8}{7}, \frac{1}{7}, \frac{4}{7}, \frac{3}{7}$ → $\frac{8}{7}, \frac{4}{7}, \frac{3}{7}, \frac{1}{7}$

c. $\frac{3}{9}, \frac{7}{9}, \frac{1}{9}, \frac{5}{9}$ → $\frac{7}{9}, \frac{5}{9}, \frac{3}{9}, \frac{1}{9}$

d. $\frac{2}{10}, \frac{4}{10}, \frac{8}{10}, \frac{9}{10}$ → $\frac{9}{10}, \frac{8}{10}, \frac{4}{10}, \frac{2}{10}$

Example:

$\frac{3}{5}, \frac{2}{5}, \frac{4}{5}, \frac{1}{5}$

Descending order:

$\frac{4}{5}, \frac{3}{5}, \frac{2}{5}, \frac{1}{5}$

7. Write words in the blanks.

a. Fractions with different denominators are called unlike fractions

b. In like fractions, the greater the numerator, the greater the fractional number.

c. In the pair of fractions $\frac{2}{7}$ and $\frac{3}{7}$, $\frac{3}{7}$ is 7 than $\frac{2}{7}$.

d. In the pair of fractions $\frac{3}{8}$ and $\frac{3}{9}$, $\frac{3}{8}$ is 7 than $\frac{3}{9}$.

8. Write fractions in the box.

a. $\frac{4}{10} + \frac{3}{10} = \boxed{\frac{7}{10}}$

b. $\frac{7}{9} - \frac{3}{9} = \boxed{\frac{4}{9}}$

c. $\frac{2}{9} + \frac{3}{9} + \frac{3}{9} = \boxed{\frac{8}{9}}$

Example:

$\frac{2}{8} + \frac{5}{8} = \frac{2+5}{8} = \frac{7}{8}$

9. Solve the following.

a. $\frac{1}{8}$ of 48 tickets = 6 tickets

b. $\frac{1}{6}$ of 2460 km = 410 km

c. $\frac{1}{10}$ of 120 kg = 12 kg

d. $\frac{1}{9}$ of Rs 36 = Rs 4

Example:

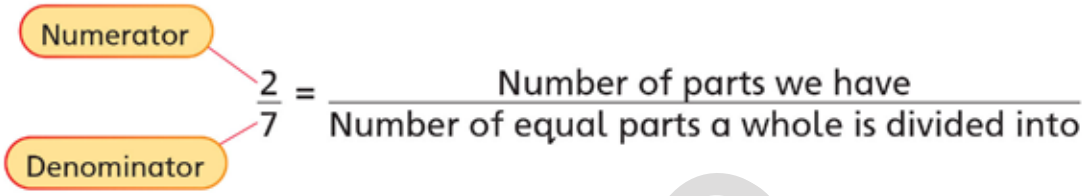
$\frac{1}{3}$ of 36 pens

$36 \div 3 = 12$ pens

Fractions

Let us recall what a fraction is:

A fraction is a part or portion of a whole. It has two parts, for example:



Other examples of fraction are: $\frac{2}{3}$, $\frac{3}{4}$, $\frac{3}{5}$, etc.

These fractions can also be represented in shapes.

$\frac{2}{3}$ $\frac{3}{4}$ $\frac{3}{5}$

Like fractions

Like fractions have the same denominator.

$\frac{1}{8}$ $\frac{6}{8}$ $\frac{7}{8}$

$\frac{1}{8}$, $\frac{6}{8}$, and $\frac{7}{8}$ are **like fractions** because they all have the same **denominator 8.**

Example:

Pick like fractions.

$\frac{3}{7}$, $\frac{8}{11}$, $\frac{5}{7}$, $\frac{9}{10}$, $\frac{2}{5}$, $\frac{10}{7}$

Solution:

Like fractions are $\frac{3}{7}$, $\frac{5}{7}$, and $\frac{10}{7}$.

Unlike fractions

Unlike fractions have different denominators.

 $\frac{1}{6}$  $\frac{4}{10}$  $\frac{3}{8}$

$\frac{1}{6}$, $\frac{4}{10}$, and $\frac{3}{8}$ are **unlike fractions** because each has a different **denominator.**

Example:

Pick the unlike fractions.

$\frac{3}{5}$, $\frac{4}{5}$, $\frac{7}{6}$, $\frac{9}{13}$, $\frac{15}{17}$, $\frac{2}{5}$

Solution:

Unlike fractions are $\frac{7}{6}$, $\frac{9}{13}$, and $\frac{15}{17}$.

Equivalent fractions

When we multiply the numerator and the denominator of a fraction by the same number (not 0), we get an **equivalent fraction**:

$\frac{1}{3} \overset{\times 2}{\underset{\times 2}{}} = \frac{2}{6} \overset{\times 2}{\underset{\times 2}{}} = \frac{4}{12}$

$\frac{1}{3}$, $\frac{2}{6}$, and $\frac{4}{12}$ are equivalent fractions.

When we **divide** the numerator and the denominator of a fraction by the **same** number (not 0), we get an **equivalent fraction**:

$\frac{18}{20} \overset{\div 2}{\underset{\div 2}{}} = \frac{9}{10}$; $\frac{24}{42} \overset{\div 3}{\underset{\div 3}{}} = \frac{8}{14} \overset{\div 2}{\underset{\div 2}{}} = \frac{4}{7}$

So, $\frac{18}{20}$ and $\frac{9}{10}$ are equivalent fractions as are $\frac{24}{42}$, $\frac{8}{14}$, and $\frac{4}{7}$.

Comparing fractions

We see that half of the yellow circle is not the same as the half of the red circle. This is because the yellow circle is not of the same size as the red circle.

Remember we can only compare fractions with the same denominator.

To compare fractions with the **same numerator** we follow two simple steps.

Example:

Compare $\frac{1}{5}$ and $\frac{1}{6}$.

Solution:

Here we see that the two denominators are different, that is not of the same size. Since we cannot compare fractions of different sizes directly, we must first make their denominators the same.

Step 1

Find equivalent fractions of $\frac{1}{5}$ and $\frac{1}{6}$ to make them like fractions.

$\frac{1}{5} = \frac{2}{10} = \frac{3}{15} = \frac{4}{20} = \frac{5}{25} = \frac{6}{30}$

$\frac{1}{6} = \frac{2}{12} = \frac{3}{18} = \frac{4}{24} = \frac{5}{30}$

Step 2

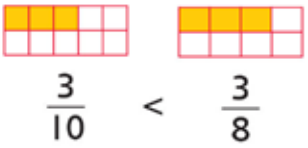
Now we can easily compare:

$\frac{6}{30} > \frac{5}{30}$

$\therefore \frac{1}{5}$ is greater than $\frac{1}{6}$.

Hence, we conclude that to compare unlike fractions with the **same numerator**, the greater the denominator, the smaller the value of the fraction.

Examples:



$\frac{3}{10} < \frac{3}{8}$

$\frac{7}{10} < \frac{7}{8}$, $\frac{4}{12} > \frac{4}{15}$,

To compare like fractions with the **same denominator**, the greater the numerator, the greater the value of the fraction.

Examples:

$\frac{3}{8} > \frac{2}{8}$, $\frac{5}{16} < \frac{7}{16}$, $\frac{4}{9} > \frac{1}{9}$

Comparing fractions with different denominators

Look at this pair of unlike fractions: $\frac{3}{4}$ and $\frac{5}{8}$.

Their denominators are different, and so are their numerators. How can we compare them?

Let us look more closely at the two denominators: $\frac{3}{4}$ and $\frac{5}{8}$.

So let us change $\frac{3}{4}$ into an equivalent fraction with denominator 8:

$\frac{3}{4} = \frac{6}{8}$

We can now easily compare our two fractions:

$\frac{3}{4}$ or $\frac{6}{8}$ > $\frac{5}{8}$

Here, 8 is the **common denominator** of the two fractions.

To compare like fractions, compare the numerators. The fraction with the greater numerator is the greater fraction.

When we want to find the common denominator of two unlike fractions, we simply multiply the numerators and denominators with same numbers to make the denominators of both the fractions same.

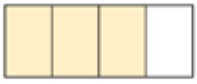
Example:

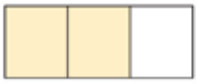
Compare $\frac{3}{4}$ and $\frac{2}{3}$.

Solution:

Converting the given fractions into equivalent fractions.

Making the denominators equal to 12

$\frac{3 \times 3}{4 \times 3} = \frac{9}{12}$  $\frac{3}{4} =$  $\frac{9}{12}$

$\frac{2 \times 4}{3 \times 4} = \frac{8}{12}$  $\frac{2}{3} =$  $\frac{8}{12}$

$\frac{9}{12}$ and $\frac{8}{12}$ are like fractions and are also equivalent fractions with the same denominator.

We can now compare our like fractions.

$\frac{9}{12} > \frac{8}{12}$ or $\frac{3}{4} > \frac{2}{3}$

Rule

In unlike fractions, the LCM of the denominators is the least common denominator.

Ordering fractions

Arranging fractions in ascending and descending order

To arrange fractions in ascending or descending order we find equivalent fractions of all given fractions with a common denominator. Then arrange them in the required order by comparing.

Examples:

Arrange the following fractions in:

a. ascending order

b. descending order

1. $\frac{3}{5}$, $\frac{7}{10}$ and $\frac{9}{20}$

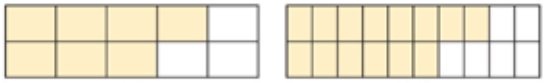
Solution:

Now we find equivalent fractions of the given fractions, to change them into like fractions.

$\frac{3}{5} = \frac{3 \times 4}{5 \times 4} = \frac{12}{20}$

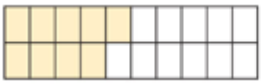
$\frac{3}{5}$ $\frac{12}{20}$

$\frac{7}{10} = \frac{7 \times 2}{10 \times 2} = \frac{14}{20}$



$\frac{7}{10}$ $\frac{14}{20}$

$\frac{9}{20}$ will remain the same.



$\frac{9}{20}$

The equivalent fractions are $\frac{12}{20}$, $\frac{14}{20}$, and $\frac{9}{20}$.

Now we compare our like fractions and arrange them in ascending order, that is from lowest to highest.

$$\frac{9}{20}, \frac{12}{20}, \frac{14}{20}$$

Hence, the ascending order of the given fractions will be

$$\frac{9}{20}, \frac{3}{5}, \frac{7}{10}$$

The descending order, that is highest to lowest, is:

$$\frac{14}{20}, \frac{12}{20}, \frac{9}{20}$$

The descending order of the given fractions will be

$$\frac{7}{10}, \frac{3}{5}, \frac{9}{20}$$

2. $\frac{2}{3}$, $\frac{4}{5}$ and $\frac{1}{2}$

Solution:

Making equivalent fractions:

$\frac{2}{3} = \frac{2 \times 10}{3 \times 10} = \frac{20}{30}$

$\frac{4}{5} = \frac{4 \times 6}{5 \times 6} = \frac{24}{30}$

$\frac{1}{2} = \frac{1 \times 15}{2 \times 15} = \frac{15}{30}$

The equivalent fractions are: $\frac{20}{30}$, $\frac{24}{30}$, and $\frac{15}{30}$

Ascending order is

$\frac{15}{30}, \frac{20}{30}, \frac{24}{30}$ or

$\frac{1}{2}, \frac{2}{3}, \frac{4}{5}$.

Descending order is

$\frac{24}{30}, \frac{20}{30}, \frac{15}{30}$

or $\frac{4}{5}, \frac{2}{3}, \frac{1}{2}$

Simplification of fractions to the lowest term

The fractions $\frac{1}{2}$, $\frac{2}{4}$, $\frac{3}{6}$, $\frac{4}{8}$ ... are all equivalent fractions.

But the fraction $\frac{1}{2}$ is in its simplest form. Its numerator and denominator cannot be made any smaller.

A fraction where the numerator and denominator cannot be reduced any further is said to be a fraction in its **lowest term**.

To find out whether a fraction is in its lowest terms, remember the common factors, HCF, and tests of divisibility:

Examples: Reduce $\frac{40}{72}$ to its lowest term.

Solution:

a. By the tests of divisibility we establish that the numerator and the denominator can be divided by 8.

b. By prime factorisation, we know that the HCF of 40 and 72 is 8.

We reduce the fraction:

$$\frac{40}{72} \begin{matrix} \leftarrow \div 8 \\ \leftarrow \div 8 \end{matrix} = \frac{5}{9}$$

$\therefore \frac{5}{9}$ is in its lowest term.

▶ Exercise 3a

1. Fill in the blanks.

a. $\frac{1}{10}$, $\frac{2}{10}$, $\frac{9}{10}$ are like fractions. (same denominator)

b. $\frac{1}{8}$, $\frac{1}{10}$, $\frac{1}{12}$ are unlike fractions. (different denominator)

c. $\frac{20}{32}$ and $\frac{5}{8}$ are equivalent fractions.

d. $\frac{3}{5}$ is smaller than $\frac{5}{6}$.

e. $\frac{2}{11}$, $\frac{4}{11}$, $\frac{6}{11}$, and $\frac{8}{11}$ are in ascending order.

2. State whether the following are true or false.

a. $\frac{3}{11}, \frac{3}{10}, \frac{3}{9}, \frac{3}{4}$ are in descending order. (False) $\frac{3}{4}, \frac{3}{9}, \frac{3}{10}, \frac{3}{11}$

b. The reduced form of $\frac{5}{15}$ is $\frac{1}{3}$. (True)

c. $\frac{3}{5}$ is greater than $\frac{7}{10}$. (False) less than

d. The common denominator of $\frac{5}{6}$ and $\frac{3}{4}$ will be 12. (True)

e. Like fractions have the same denominators. (True)

3. Select the correct answer from the given options.

a. The lowest form of $\frac{100}{275}$ is

100 20 4
275 55 11

(A) $\frac{10}{5}$ (B) $\frac{4}{15}$ (C) $\frac{4}{11}$ (D) $\frac{20}{55}$

b. $\frac{2}{9}, \frac{1}{4}, \frac{7}{12}$ arranged in descending order are

(A) $\frac{1}{4}, \frac{7}{12}, \frac{2}{9}$ (B) $\frac{7}{12}, \frac{1}{4}, \frac{2}{9}$ (C) $\frac{2}{9}, \frac{1}{4}, \frac{7}{12}$ (D) $\frac{7}{12}, \frac{2}{9}, \frac{1}{4}$

c. The reduced form of $\frac{128}{336}$ is

64 32 16 8
128
336
168
84 42 21

(A) $\frac{32}{56}$ (B) $\frac{3}{7}$ (C) $\frac{8}{21}$ (D) $\frac{64}{168}$

d. $\frac{15}{64}$ and $\frac{3}{8}$ are

(A) equal fractions
(B) like fractions
(C) equivalent fractions
(D) unlike fractions

e. Unlike fractions have

(A) the same denominators
(B) 1 as denominator
(C) different denominators
(D) the same numerators

4. Circle the sets of like fractions.

a. $\frac{3}{12}, \frac{2}{11}, \frac{5}{12}$

b. $\frac{9}{20}, \frac{8}{10}, \frac{16}{20}$

c. $\frac{4}{14}, \frac{1}{15}, \frac{6}{15}$

d. $\frac{91}{100}, \frac{96}{101}, \frac{89}{100}$

5. Write whether the following pairs of fractions are like or unlike.

a. $\frac{3}{12}, \frac{5}{12}$ like fractions b. $\frac{10}{15}, \frac{12}{15}$ like fraction c. $\frac{18}{20}, \frac{19}{21}$ unlike fractions d. $\frac{11}{20}, \frac{19}{20}$ like fractions

e. $\frac{6}{15}, \frac{8}{14}$ unlike fractions f. $\frac{4}{9}, \frac{4}{11}$ unlike fraction

6. Rewrite these fractions so that they have a common denominator.

a. $\frac{1}{2}$ and $\frac{1}{4}$ $\frac{2}{4}, \frac{1}{4}$ b. $\frac{3}{5}$ and $\frac{7}{15}$ $\frac{9}{15}, \frac{7}{15}$ c. $\frac{2}{3}$ and $\frac{5}{6}$ $\frac{4}{6}, \frac{5}{6}$ d. $\frac{1}{18}$ and $\frac{1}{6}$ $\frac{1}{18}, \frac{3}{18}$

e. $\frac{3}{10}$ and $\frac{36}{40}$ $\frac{12}{20}, \frac{15}{20}$ f. $\frac{2}{7}$ and $\frac{5}{14}$ $\frac{4}{14}, \frac{5}{14}$ g. $\frac{1}{4}$ and $\frac{25}{50}$ $\frac{5}{20}, \frac{8}{20}$ h. $\frac{3}{4}$ and $\frac{5}{6}$ $\frac{9}{12}, \frac{10}{12}$

7. Rewrite these pairs of fractions so that they have a common denominator. Then fill in the correct symbol > or <.

a. $\frac{2}{7} < \frac{3}{10}$ b. $\frac{4}{11} < \frac{3}{8}$ c. $\frac{4}{5} > \frac{3}{8}$ d. $\frac{9}{14} < \frac{19}{28}$

e. $\frac{7}{10} > \frac{8}{15}$ f. $\frac{11}{12} > \frac{9}{10}$ g. $\frac{2}{9} < \frac{3}{7}$ h. $\frac{5}{9} < \frac{20}{27}$

8. Write the following fractions in ascending order.
[Hint: find a common denominator]

a. $\frac{4}{5}, \frac{7}{10}, \frac{9}{20}$ $\frac{9}{20}, \frac{7}{10}, \frac{4}{5}$ b. $\frac{5}{6}, \frac{4}{9}, \frac{13}{18}$ $\frac{4}{9}, \frac{13}{18}, \frac{5}{6}$ c. $\frac{3}{9}, \frac{5}{6}, \frac{2}{3}$ $\frac{3}{9}, \frac{2}{3}, \frac{5}{6}$ d. $\frac{11}{16}, \frac{5}{8}, \frac{3}{4}$ $\frac{5}{8}, \frac{11}{16}, \frac{3}{4}$

e. $\frac{3}{4}, \frac{5}{6}, \frac{3}{8}$ $\frac{3}{8}, \frac{3}{4}, \frac{5}{6}$ f. $\frac{3}{10}, \frac{1}{4}, \frac{7}{20}$ $\frac{1}{4}, \frac{3}{10}, \frac{7}{20}$ g. $\frac{2}{3}, \frac{8}{21}, \frac{4}{7}$ $\frac{8}{21}, \frac{4}{7}, \frac{2}{3}$ h. $\frac{5}{12}, \frac{3}{8}, \frac{11}{24}$ $\frac{3}{8}, \frac{5}{12}, \frac{11}{24}$

Types of fractions

Unit fractions

A fraction with the numerator 1 is known as a unit fraction. For example $\frac{1}{4}$, $\frac{1}{5}$, and $\frac{1}{100}$ are unit fractions.

Proper fractions

Fractions such as $\frac{1}{4}$, $\frac{2}{5}$, and $\frac{7}{8}$ have a special name. They are called proper fractions.

The numerator of each fraction is less than its denominator.

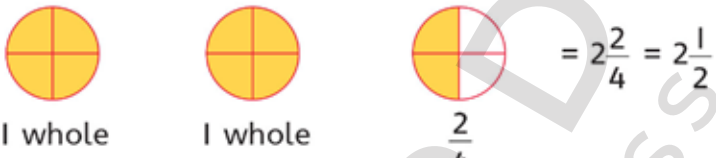
Improper fractions

Fractions such as $\frac{4}{4}$, $\frac{5}{4}$, and $\frac{8}{3}$ also have a special name. They are called improper fractions.

The numerator of an improper fraction is equal to or greater than its denominator.

Mixed fraction

A mixed fraction is made up of a whole number and a proper fraction.



Let us now change mixed numbers into improper fractions:

Example: $2\frac{1}{3}$

How many thirds altogether? $2\frac{1}{3} = \frac{3}{3} + \frac{3}{3} + \frac{1}{3} = \frac{7}{3}$

Short method:

Step 1

Multiply the whole number by the denominator of the proper fraction:

Whole — $2\frac{1}{3}$ — Numerator, Denominator

$2 \times 3 = 6$

Step 2

Add the numerator of the proper fraction to it: **6 + 1 = 7**

Step 3

Put the new numerator over the denominator: $\frac{7}{3}$.

So, $2\frac{1}{3} = \frac{7}{3}$

Let us convert improper fractions into mixed numbers.

Example:

$\frac{9}{4}$ as a mixed number can be expressed as:

Short method:

Divide 9 by 4.

$$4\overline{)9}\quad 2,\ -8,\ 1$$

Hence, $\frac{9}{4} = 2\frac{1}{4}$

Examples:

1. Convert $\frac{69}{4}$ into a mixed fraction.

Solution: Divide 69 by 4

$$4\overline{)69}\quad 17,\ -4,\ 29,\ -28,\ 1$$

Hence, $\frac{69}{4} = 17\frac{1}{4}$.

2. Convert $\frac{41}{5}$ into a mixed fraction.

Solution

$$5\overline{)41}\quad 8,\ -40,\ 1$$

Hence, $\frac{41}{5} = 8\frac{1}{5}$

3. Convert $8\frac{1}{3}$ into an improper fraction.

Solution: $8\frac{1}{3}$ is a mixed fraction.

Multiply the whole number by the denominator.

$8 \times 3 = 24$

Now add the numerator to the product.

$24 + 1 = 25$ is the new numerator.

The required improper fraction is $\frac{25}{3}$.

$\therefore \quad 8\frac{1}{3} = \frac{25}{3}$

4. Convert $16\frac{3}{7}$ into an improper fraction.

Solution:

$16 \times 7 = 112$

$112 + 3 = 115$ is the new numerator.

$16\frac{3}{7} = \frac{115}{7}$

$\therefore \frac{115}{7}$ is the required improper fraction.

▶ Exercise 3b

1. Fill in the blanks.
   a. The fraction with the numerator 1 is called a unit fraction.
   b. Mixed fractions have a whole number and a proper fraction combined.
   c. In an improper fraction the numerator is greater than the denominator.
   d. In a fraction, if the numerator is smaller than the denominator, then it is a proper fraction.
   e. $3\frac{7}{9}$ is a mixed fraction.

2. State whether the following are true or false.
   a. Improper fractions can be converted into a mixed fraction. (True)
   b. $\frac{85}{7}$ can be written as $12\frac{1}{7}$. (True)
   c. $\frac{1}{6}, \frac{2}{9}$ are improper fractions. (False) unequal fractions
   d.  $= 2\frac{3}{8}$ (True)
   e. The combination of a whole number and an improper fraction is called a mixed fraction. (False) mixed fraction is a combination of whole number and proper fraction.

3. Select the correct answer from the given options.
   a. $\frac{456}{13}$ can be written as $13 \times 35 = 455 + 1 = 456$
      Ⓐ $35\frac{11}{13}$ Ⓑ $35\frac{1}{13}$ $35\ \frac{1}{13}$ Ⓒ 35 Ⓓ $\frac{1}{13}$
   b. $\frac{1}{5}$ is
      Ⓐ a unit fraction Ⓑ a proper fraction
      Ⓒ an improper fraction Ⓓ a mixed fraction

c. $6\frac{1}{7}$ can be written as

$6 \times 7 = 42 + 1 = 43 = \frac{43}{7}$

(A) $\frac{43}{7}$ (B) $\frac{42}{7}$ (C) $\frac{14}{7}$ (D) $\frac{13}{7}$

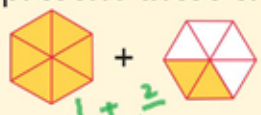
d. $\frac{3}{7}$ is

(A) an improper fraction (B) a unit fraction
(C) a mixed fraction (D) a proper fraction

e. In a proper fraction, the denominator is

(A) greater than the numerator (B) less than the numerator
(C) equal to the numerator (D) a multiple of the numerator

4. Represent these shapes as mixed fractions.

a.  $1\frac{2}{6}$ $1 + \frac{2}{6}$

b.  $1\frac{3}{4}$ $1 + \frac{3}{4}$

c.  $2\frac{3}{8}$ $1 + 1 + \frac{3}{8}$

5. Express these mixed numbers as improper fractions.

a.  $1\frac{3}{4}$ $\frac{7}{4}$

b.  $2\frac{1}{6}$ $\frac{13}{6}$ $2 \times 6 = 12 + 1 = 13$

c.  $2\frac{2}{5}$ $2 \times 5 = 10 + 2 = 12$, $\frac{12}{5}$

6. Change these mixed numbers into improper fractions.

a. $3\frac{1}{4} = \frac{13}{4}$ b. $2\frac{3}{10} = \frac{23}{10}$ c. $3\frac{7}{8} = \frac{31}{8}$ d. $1\frac{5}{12} = \frac{17}{12}$

e. $5\frac{1}{4} = \frac{21}{4}$ f. $2\frac{6}{8} = \frac{22}{8}$ g. $3\frac{5}{7} = \frac{26}{7}$ h. $6\frac{4}{11} = \frac{70}{11}$ $6 \times 11 = 66 + 4 = 70$

7. Change these into mixed fractions.

a. $\frac{9}{2}$ $4\frac{1}{2}$ b. $\frac{15}{4}$ $3\frac{3}{4}$ c. $\frac{45}{8}$ $5\frac{5}{8}$ d. $\frac{7}{3}$ $2\frac{1}{3}$

e. $\frac{50}{7}$ $7\frac{1}{7}$ f. $\frac{36}{11}$ $3\frac{3}{11}$ g. $\frac{8}{5}$ $1\frac{3}{5}$ h. $\frac{22}{10}$ $2\frac{2}{10}$

i. $\frac{62}{8}$ $7\frac{6}{8}$ j. $\frac{12}{7}$ $1\frac{5}{7}$ k. $\frac{30}{8}$ $3\frac{6}{8}$ l. $\frac{35}{6}$ $5\frac{5}{6}$

$8 \times 7 = 56$, $56 + 6 = 62$

$6 \times 5 = 30$, $30 + 5 = 35$

Addition of fractions

Addition of fractions with like denominators

Addition of like fractions is very simple. We add the numerators only, the denominator remains the same.

$$\frac{3}{10} + \frac{4}{10} = \frac{7}{10}$$

Look at this addition

$$\frac{5}{8} + \frac{6}{8} = \frac{11}{8} = 1\frac{3}{8}$$

The answer $\frac{11}{8}$ is an improper fraction and can be written as a mixed fractions ($1\frac{3}{8}$).

Higher Order Thinking Skills

Addition of fractions with unlike denominators

Fractions with unlike denominators can be added by making the denominators the same.

Example:

Add: $\frac{2}{5} + \frac{3}{10}$

First make the denominators the same.

$$\frac{2 \times 2}{5 \times 2} + \frac{3}{10} = \frac{4}{10} + \frac{3}{10}$$

Now add the numerators and write the denominator as it is.

$$\frac{4 + 3}{10} = \frac{7}{10}$$

Addition of mixed fractions

Look at this sum: $4\frac{2}{3} + 5\frac{3}{4}$

We first write the fractions with a common denominator, and add:

$\frac{2}{3} + \frac{3}{4} = \frac{8}{12} + \frac{9}{12} = \frac{17}{12} = 1\frac{5}{12}$

We next add the whole numbers: $4 + 5 = 9$

Last we add together our fractions and our whole numbers:

$1\frac{5}{12} + 9 = 10\frac{5}{12}$

Example 1

$4\frac{1}{3} + 3\frac{1}{6}$

$\frac{1}{3} + \frac{1}{6} = \frac{2}{6} + \frac{1}{6} = \frac{3}{6} = \frac{1}{2}$

$4 + 3 = 7$

$7 + \frac{1}{2} = 7\frac{1}{2}$

Example 2

$1\frac{5}{6} + 2\frac{2}{3}$

$\frac{5}{6} + \frac{2}{3} = \frac{5}{6} + \frac{4}{6} = \frac{9}{6} = 1\frac{1}{2}$

$1 + 2 = 3$

$1\frac{1}{2} + 3 = 4\frac{1}{2}$

Subtraction of fractions

Subtraction of fractions with like denominators

When we subtract like fractions we subtract the numerators and write the denominator as it is.

Let us subtract:

$\frac{6}{7} - \frac{2}{7} = \frac{4}{7}$

Higher Order Thinking Skills

Subtraction of fractions with unlike denominators

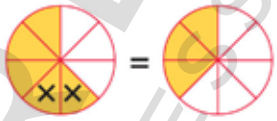
When we subtract unlike fractions, we must first rewrite the fractions so that they have a common denominator.

Let us take $\frac{5}{8} - \frac{1}{4}$.

Here, the common denominator is 8.

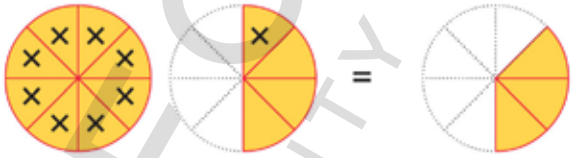
So we change $\frac{1}{4}$ into $\frac{2}{8}$, converting our unlike fractions into like fractions.

It is now easy to subtract.



Subtraction of mixed fractions

It is simple to subtract mixed numbers involving like fractions.



$1\frac{4}{8} - 1\frac{1}{8} = \frac{3}{8}$

We first subtract the fractions: $\frac{4}{8} - \frac{1}{8} = \frac{3}{8}$

Next we subtract the whole numbers: $1 - 1 = 0$. Our answer is $\frac{3}{8}$.

Example

$4\frac{7}{8} - 2\frac{5}{8}$

First we rewrite the fractions with a common denominator and then subtract.

$\frac{7}{8} - \frac{5}{8} = \frac{2}{8} = \frac{1}{4}$

Next, we subtract the whole numbers: $4 - 2 = 2$

Answer is $2\frac{1}{4}$

Look at this subtraction: $3\frac{1}{3} - 1\frac{3}{4}$

Step 1

We can rewrite 3 as follows.

$(2 + 1)\frac{1}{3} - 1\frac{3}{4}$

Step 2

Make the denominators the same.

$(2 + 1)\frac{1^{\times 4}}{3_{\times 4}} - 1\frac{3^{\times 3}}{4_{\times 3}}$

$(2 + 1)\frac{4}{12} - 1\frac{9}{12}$

Step 3

Rewrite to get the same denominator.

$(2 + \frac{12}{12})\frac{4}{12} - 1\frac{9}{12}$

$(2 - 1)\frac{12}{12} + \frac{4}{12} - \frac{9}{12}$

$(2 - 1)\frac{12 + 4 - 9}{12}$

$= 1\frac{7}{12}$

We can solve this sum by another method.

$3\frac{1}{3} - 1\frac{3}{4}$

$\frac{10}{3} - \frac{7}{4}$ convert to an improper fraction

$\frac{10^{\times 4}}{3_{\times 4}} - \frac{7^{\times 3}}{4_{\times 3}}$ make the denominators the same

$\frac{40}{12} - \frac{21}{12}$ subtract

$\frac{40 - 21}{12} = \frac{19}{12} = 1\frac{7}{12}$

Exercise 3c

1. Fill in the blanks.

   a. $\frac{12}{11} - \frac{1}{11} = \frac{1}{9} + \frac{8}{9} =$ $\frac{9}{9} = 1$.

   b. The sum of $\frac{9}{13}$ and $\frac{4}{13}$ is equal to $\frac{13}{13} = 1$.

   c. $(\frac{4}{5} + \frac{7}{5}) + \frac{11}{5} =$ $(\frac{11}{5}) + \frac{11}{5} = \frac{22}{5} = 4\frac{2}{5}$.

   d. $\frac{15}{22} - \frac{5}{11} =$ $\frac{5}{22}$. convert $\frac{5}{11} = \frac{10}{22}$

   e. $4\frac{1}{4} + 3\frac{1}{4} =$ $\frac{17}{4} + \frac{13}{4} = \frac{30}{4}^{15} = \frac{15}{2} = 7\frac{1}{2}$

2. State whether the following are true or false.

   a. $\frac{3}{5} + \frac{4}{5} = 2\frac{1}{5}$ (False) $\frac{7}{5} = 1\frac{2}{5}$

   b. $1 + \frac{2}{3} = \frac{7}{9} + \frac{8}{9}$ (True)

   c. To add or subtract like fractions we add or subtract numerators and denominators separately. (False)

   d. The sum of $\frac{3}{4}$ and $\frac{5}{4}$ is equal to $2\frac{1}{12}$. (False) $\frac{8}{4} = 2$

   e. The difference between $\frac{12}{11}$ and $\frac{1}{11}$ is 1. (True)

3. Select the correct answer from the given options.

   a. If $\frac{9}{13}$ is added to $\frac{6}{13}$, which of the following is incorrect? $\frac{15}{13}$

   (A) result is a whole number

   (B) $\frac{9}{13} + \frac{6}{13} = \frac{6}{13} + \frac{9}{13}$

   (C) $\frac{15}{13}$

   (D) $1\frac{2}{13}$

   b. $\frac{5}{8} - \frac{3}{8}$ is equal is

   (A) $\frac{1}{8}$ (B) $\frac{2}{8}$ (C) $\frac{8}{16}$ (D) $\frac{2}{16}$

$\frac{21}{4} - \frac{11}{4} = \frac{10}{4} = \frac{5}{2} = 2\frac{1}{2}$

c. The difference of $5\frac{1}{4}$ and $2\frac{3}{4}$ is equal to

Ⓐ $2\frac{1}{2}$ Ⓑ $3\frac{1}{4}$ Ⓒ $3\frac{3}{4}$ Ⓓ $2\frac{1}{4}$

d. The sum of $3\frac{2}{5}$ and $4\frac{3}{5}$ is equal to

Ⓐ $7\frac{1}{5}$ Ⓑ $7\frac{2}{5}$ Ⓒ 8 Ⓓ $8\frac{1}{5}$

e. The common denominator of $\frac{9}{14} + \frac{5}{18}$ is

Ⓐ 18 Ⓑ 14 Ⓒ 126 Ⓓ 2

4. Add the following fractions.

a. $\frac{3}{4} + \frac{1}{4} = 1$ b. $\frac{3}{15} + \frac{8}{15} = \frac{11}{15}$ c. $\frac{5}{6} + \frac{1}{6} = \frac{6}{6} = 1$

d. $\frac{9}{10} + \frac{3}{10} = \frac{12}{10}$ e. $\frac{7}{22} + \frac{3}{22} = \frac{10}{22}$

5. Add these mixed fraction, giving your answer is in its lowest term.

a. $5\frac{3}{5} + 2\frac{1}{5}$ $7\frac{4}{5}$ b. $2\frac{3}{8} + 3\frac{1}{8}$ $5\frac{1}{2}$ c. $4\frac{5}{9} + 3\frac{1}{9}$ $7\frac{6}{9} = 7\frac{2}{3}$

d. $9\frac{7}{10} + 2\frac{1}{10}$ $11\frac{4}{5}$ e. $2\frac{1}{10} + 3\frac{7}{10}$ $5\frac{4}{5}$ f. $8\frac{1}{6} + 2\frac{5}{6}$ $11\frac{6}{6} = 11$

g. $1\frac{3}{8} + 2\frac{3}{8}$ $3\frac{3}{4}$ h. $6\frac{7}{10} + 3\frac{3}{10}$ 10

6. Subtract the following giving your answer in its lowest term.

a. $\frac{11}{12} - \frac{5}{12}$ $\frac{6}{12} = \frac{1}{2}$ b. $\frac{7}{12} - \frac{1}{12}$ $\frac{1}{2}$ c. $\frac{14}{15} - \frac{9}{15}$ $\frac{1}{3}$ d. $\frac{12}{13} - \frac{2}{13}$ $\frac{10}{13}$

7. Subtract the following mixed fractions..

a. $6\frac{1}{2} - 4\frac{1}{2}$ 2 b. $9\frac{5}{6} - 4\frac{1}{6}$ $5\frac{2}{3}$ c. $5\frac{3}{4} - 1\frac{3}{4}$ $\frac{1}{3}$

d. $7\frac{8}{9} - 5\frac{5}{9}$ $2\frac{3}{9} = 2\frac{1}{3}$ e. $7\frac{9}{10} - 2\frac{1}{10}$ $5\frac{4}{5}$ f. $8\frac{2}{3} - 3\frac{1}{3}$ $5\frac{1}{3}$

g. $2\frac{2}{3} - 1\frac{1}{3}$ $1\frac{1}{3}$ h. $4\frac{3}{10} - 2\frac{1}{10}$ $2\frac{1}{5}$ i. $5\frac{9}{10} - 1\frac{7}{10}$ $4\frac{1}{5}$

j. $7\frac{5}{8} - 4\frac{7}{8}$ $2\frac{2}{3}$ k. $3\frac{3}{5} - 1\frac{2}{5}$ $2\frac{1}{5}$ l. $6\frac{2}{5} - 4\frac{1}{5}$ $2\frac{1}{2}$

m. $9\frac{3}{11} - 6\frac{2}{11}$ $3\frac{1}{11}$ n. $8\frac{4}{9} - 2\frac{1}{9}$ $6\frac{1}{3}$ o. $10\frac{5}{6} - 8\frac{1}{6}$ $2\frac{4}{6} = 2\frac{2}{3}$

8a. $\frac{2}{7} = \frac{4}{14}$ $8\frac{4}{14} - 4\frac{3}{14} = 4\frac{1}{14}$

8. Subtract by regrouping.

a. $8\frac{2}{7} - 4\frac{3}{14}$ $4\frac{1}{14}$ b. $7\frac{1}{4} - 2\frac{3}{5}$ $4\frac{13}{20}$ c. $9\frac{5}{8} - 3\frac{3}{4}$ $5\frac{7}{8}$

d. $10\frac{1}{2} - 6\frac{4}{5}$ $3\frac{7}{10}$ e. $11\frac{1}{9} - 8\frac{2}{3}$ $2\frac{4}{9}$ f. $9\frac{2}{5} - 3\frac{3}{4}$ $5\frac{13}{20}$

▶ Real-life Story Sums

Solve the problems, writing complete statements.

1. Parvez cycles $1\frac{1}{4}$ km in the morning and $3\frac{1}{4}$ km in the evening. How far does he cycle altogether? $\frac{5}{4} + \frac{13}{4} = \frac{18}{4} = 4\frac{1}{2}$ km

2. Tania and Rida were making some paper flowers. Tania used $1\frac{7}{10}$ m of paper and Rida $1\frac{1}{10}$ m. How much paper did they use altogether? $\frac{17}{10} + \frac{11}{10} = \frac{28}{10} = 2\frac{4}{5}$ m

3. After a batsman hit, the ball travelled $70\frac{3}{4}$ m. In the next hit, the ball travelled $90\frac{1}{4}$ m. How much further did the second ball travel than the first? $\frac{283}{4} - \frac{361}{4} = \frac{78}{4} = 19\frac{1}{2}$ m

4. On Monday morning, Sana buys $8\frac{1}{4}$ kg of potatoes. By Friday morning, only $1\frac{3}{4}$ kg of them are left. How much of the potatoes has Sana used up? $\frac{33}{4} - \frac{7}{4} = \frac{26}{4} = 6\frac{1}{2}$ kg

5. At the start of a journey, Mrs Khan has $15\frac{2}{5}$ l of petrol in her car. By the time she reaches her destination, only $3\frac{3}{5}$ l of petrol is left. How much petrol has the car used? $\frac{77}{5} - \frac{18}{5} = \frac{59}{5} = 11\frac{4}{5}$ m

Multiplication of fractions

Multiplying a fraction by a whole number

When a fraction is multiplied by 1, the result is the same fraction.

Example 1:

$\frac{3}{8} \times 1 = \frac{3 \times 1}{8} = \frac{3}{8}$

Multiplying a whole number by a fraction

Example 2:

Step 1

Write the whole number 4 as a fraction: $\frac{4}{1}$

$\frac{4}{1} \times \frac{3}{8}$

Step 2

Multiply the numerators → $\frac{4 \times 3}{}$

Multiply the denominators → $\frac{}{1 \times 8}$

Step 3

Simplify the fraction $= \frac{12^{\div 4}}{8_{\div 4}} = \frac{3}{2} = 1\frac{1}{2}$

Or we can also solve by finding a common numerator and denominator. Here 4 divides both 4 and 8.

$= \frac{\cancel{4}^{1}}{1} \times \frac{3}{\cancel{8}_{2}} \times \frac{1 \times 3}{1 \times 2} = \frac{3}{2} = 1\frac{1}{2}$

Examples 3:

$8 \times 1\frac{2}{5}$

$= \frac{8}{1} \times \frac{7}{5} = \frac{8 \times 7}{1 \times 5} = \frac{56}{5} = 11\frac{1}{5}$

Examples 4:

$\frac{5}{7} \times 7$

$= \frac{5}{7} \times \frac{7}{1} = \frac{5 \times 7}{7 \times 1} = \frac{5\cancel{35}}{\cancel{7}_{1}} = 5$

Multiplying a fraction by a zero

When a fraction is multiplied by zero, the result is zero.

Example 5: $\frac{2}{5} \times 0 = \frac{2 \times 0}{5} = \frac{0}{6} = 0$

Multiplying a fraction by a fraction

To multiply fractions we follow the given steps.

Step 1 Convert mixed fractions into improper fractions.

Step 2 Multiply the numerators of the fractions.

Step 3 Multiply the denominators.

Step 4 Simplify the fraction to its lowest term.

Example 1: $\frac{4}{5} \times \frac{2}{5}$

Solution

$= \frac{4 \times 2}{5 \times 5} = \frac{8}{25}$

Example 2: $\frac{3}{7} \times \frac{6}{11}$

Solution

$= \frac{3 \times 6}{7 \times 11} = \frac{18}{77}$

Example 3: $\frac{3}{4} \times \frac{2}{3}$

Solution

$= \frac{{}^{1}\cancel{3} \times \cancel{2}^{1}}{{}_{2}\cancel{4} \times \cancel{3}_{1}} = \frac{1 \times 1}{2 \times 1} = \frac{1}{2}$

Example 4: $\frac{14}{6} \times \frac{12}{9}$

Solution

Changing the fractions into their lowest term, we get

$\frac{14}{6} = \frac{7}{3}$; $\frac{12}{9} = \frac{4}{3}$

$\frac{7}{3} \times \frac{4}{3} = \frac{7 \times 4}{3 \times 3} = \frac{28}{9} = 3\frac{1}{9}$

or we can solve as below also,

$\frac{14}{6} \times \frac{12}{9} = \frac{14 \times \overset{2}{\cancel{12}}}{\underset{1}{\cancel{6}} \times 9} = \frac{14 \times 2}{1 \times 9} = \frac{28}{9}$

$= 3\frac{1}{9}$

Example 5: $4\frac{2}{3} \times 6\frac{4}{5}$

Solution

Convert mixed fractions into improper fraction.

$= \frac{14}{3} \times \frac{34}{5}$

$= \frac{14 \times 34}{3 \times 5} = \frac{476}{15} = 31\frac{11}{15}$

Division of Fractions

To understand the division of fractions, we must first know what a reciprocal is.

To get the reciprocal of a fraction, we just turn it upside down.

Examples:

Fraction	Reciprocal
$\frac{2}{5}$	$\frac{5}{2}$
$\frac{3}{4}$	$\frac{4}{3}$
$\frac{1}{7}$	$\frac{7}{1}$ or 7

REMEMBER

Multiplicative inverse is another word used for reciprocal.

In the last example we see that the reciprocal of $\frac{1}{7}$ is 7. Thus, the reciprocal of 5 will be $\frac{1}{5}$.

Dividing two fractions is the same as multiplying the first fraction by the reciprocal of the second fraction.

First we find the reciprocal of the second fraction.

Next we multiply the two fractions by changing the division sign to a multiplication sign.

When a fraction is multiplied by its reciprocal, the product is always 1.

Dividing a fraction by a whole number

Example:

Divide $\frac{7}{9}$ by 42.

Solution:

$\frac{7}{9} \div 42$ (write the reciprocal of 42 as $\frac{1}{42}$)

$= \frac{1}{\cancel{7}} \times \frac{1}{\cancel{42}_{6}}$ (change the division sign to a multiplication sign and simplify)

$= \frac{1 \times 1}{9 \times 6}$

$= \frac{1}{54}$

> Two numbers whose product is 1 are the reciprocal of each other.
>
> Example: $\frac{3}{4} \times \frac{4}{3} = 1$; $\frac{1}{3} \times 3 = 1$

Dividing a whole number by a fraction

Example: Divide 25 by $\frac{5}{11}$.

Solution:

$= \frac{\overset{5}{\cancel{25}}}{1} \times \frac{11}{\cancel{5}_{1}}$ (write the reciprocal of $\frac{5}{11}$ as $\frac{11}{5}$)

$= \frac{5 \times 11}{1 \times 1}$ (change the division sign to a multiplication sign and simplify)

$= 55$

Dividing a fraction by a fraction

Example 1: $\frac{3}{5} \div \frac{4}{7}$

Solution:

$= \frac{3}{5} \times \frac{7}{4}$ (reciprocal of $\frac{4}{7}$ is $\frac{7}{4}$)

$= \frac{3 \times 7}{5 \times 4} = \frac{21}{20}$ (change the sign)

$= 1\frac{1}{20}$ (simplify)

Example 2: $\frac{15}{16} \div \frac{55}{48}$

Solution:

$= \frac{\overset{3}{\cancel{15}}}{\underset{1}{\cancel{16}}} \times \frac{\overset{3}{\cancel{48}}}{\underset{11}{\cancel{55}}}$

$= \frac{3 \times 3}{1 \times 11}$

$= \frac{9}{11}$

Example 3: $3\frac{3}{8} \div 4\frac{1}{5}$

$= \frac{27}{8} \div \frac{21}{5}$ (first convert the mixed fraction to an improper fraction)

$= \frac{\overset{9}{\cancel{27}}}{8} \times \frac{5}{\underset{7}{\cancel{21}}}$ (reciprocal of $\frac{21}{5}$ is $\frac{5}{21}$)

$= \frac{9 \times 5}{8 \times 7}$

$= \frac{45}{56}$

Example 4: $5\frac{1}{13} \div \frac{11}{2}$

Solution:

$\frac{66}{13} \div \frac{11}{2}$

$= \frac{\overset{6}{\cancel{66}}}{13} \times \frac{2}{\underset{1}{\cancel{11}}}$

$= \frac{6 \times 2}{13 \times 1}$

$= \frac{12}{13}$

▶ Exercise 3d

1. Fill in the blanks.

a. $\frac{3}{5} \times$ ____ $= \frac{2}{3}$. $\frac{10}{9}$

b. $\frac{1}{4} \div \frac{9}{10} =$ ____. $\frac{5}{18}$

c. $3\frac{1}{10} \times \frac{20}{31} =$ ____. 2

d. ____ $\div \frac{4}{7} = \frac{5}{4}$. $\frac{5}{7}$

e. $\frac{4}{7} \times \frac{7}{8} =$ ____. $\frac{1}{2}$

9. $\frac{2}{3} \div \frac{3}{5}$ $\frac{2}{3} \times \frac{5}{3} = \frac{10}{9}$

b. $\frac{1}{4} \times \frac{10}{9} = \frac{10}{36} = \frac{5}{18}$

c. $\frac{31}{10} \times \frac{20}{31} = 2$

d. $\frac{5}{14} \times \frac{14}{7} = \frac{5}{7}$

e. $\frac{4}{7} \times \frac{7}{8} = \frac{1}{2}$

2. State whether the following are true or false.

a. The product of a fraction and its reciprocal is 1. (True)

b. The reciprocal of 3 is $\frac{5}{3}$. (False) $\frac{1}{3}$

c. $\frac{112}{36} \times \frac{12}{16}$ is equal to $3\frac{1}{3}$. (False) $\frac{\cancel{112}^{7}}{\cancel{36}_{3}} \times \frac{\cancel{12}}{\cancel{16}} = \frac{7}{3}$

d. $\frac{175}{14} \div 25$ is equal to $\frac{1}{2}$. (True)

e. $81 \times \frac{2}{9}$ equals to 9. (False) $\overset{9}{\cancel{81}} \times \frac{2}{\cancel{9}_{1}} = 18$

3. Select the correct answer from the given options.

a. $42 \div \frac{1}{7}$ is equal to $42 \times 7 = 294$

Ⓐ 6 Ⓑ $\frac{1}{294}$ Ⓒ 294 Ⓓ $\frac{42}{7}$

b. $\frac{4}{5} \times \frac{7}{5}$ is same as

Ⓐ $\frac{4}{5} \times \frac{5}{7}$ Ⓑ $\frac{7}{5} \times \frac{4}{5}$ Ⓒ $\frac{4}{5} \times 7$ Ⓓ $\frac{4}{5} \times \frac{1}{5}$

c. $95 \times \frac{5}{19}$ is equal to $\overset{5}{\cancel{95}} \times \frac{5}{\cancel{19}_{1}} = 25$

Ⓐ 25 Ⓑ $95 \times \frac{19}{5}$ Ⓒ 1 Ⓓ 31

d. $4\frac{1}{2} \div 1\frac{4}{5}$ is equal to $\frac{\cancel{9}^{2}}{\cancel{2}_{1}} \times \frac{5}{\cancel{9}_{1}} = 2$

Ⓐ $8\frac{1}{10}$ Ⓑ $2\frac{1}{2}$ Ⓒ $\frac{2}{5}$ Ⓓ $4\frac{2}{5}$

e. $7 \times \frac{1}{35}$ is equal to $\cancel{7}^{1} \times \frac{1}{\cancel{35}_{5}}$

Ⓐ $\frac{1}{5}$ Ⓑ 245 Ⓒ 5 Ⓓ $\frac{1}{245}$

4. Solve the following sums.

a. $\overset{5}{\cancel{35}} \times \frac{5}{\cancel{7}_{1}}$ 25 b. $84 \times \frac{1}{9}$ $9\frac{1}{3}$ c. $\frac{3}{\cancel{4}_{2}} \times \overset{7}{\cancel{14}} = \frac{21}{2} = 10\frac{1}{2}$ d. $\frac{1}{\cancel{8}_{4}} \times \overset{17}{34} = 4\frac{1}{4}$

5. Multiply the following fractions and reduce to the lowest term.

a. $\frac{1}{\cancel{6}_{2}} \times \frac{\cancel{9}^{3}}{\cancel{12}_{4}} = \frac{1}{8}$ b. $\frac{2}{5} \times \frac{4}{7} = \frac{8}{35}$ c. $\frac{1}{3} \times \frac{1}{5} = \frac{1}{15}$ d. $\frac{\cancel{7}^{1}}{\cancel{15}_{5}} \times \frac{\cancel{3}}{\cancel{14}_{2}} = \frac{1}{10}$

e. $\frac{\overset{2}{\cancel{8}}}{\cancel{9}_{3}} \times \frac{\cancel{3}}{\cancel{4}_{1}} = \frac{2}{3}$

6. Solve the following multiplication sums.

a. $4\frac{1}{5} \times 3\frac{3}{4}$ b. $2\frac{1}{2} \times 6\frac{1}{4}$ c. $7\frac{1}{5} \times 4\frac{1}{6}$ d. $2\frac{1}{7} \times 5\frac{5}{6}$

e. $5\frac{4}{9} \times 2\frac{2}{7}$

7. Divide the following numbers.

a. $6 \div \frac{1}{9}$ b. $30 \div \frac{1}{20}$ c. $14 \div \frac{2}{13}$ d. $23 \div \frac{23}{5}$

8. Divide.

a. $\frac{1}{9} \div 3$ b. $\frac{5}{8} \div 15$ c. $\frac{3}{7} \div 24$ d. $\frac{3}{5} \div 6$

9. Multiply the following fractions.

a. $\frac{3}{4} \times \frac{8}{18}$ b. $\frac{2}{3} \times \frac{6}{7}$

10. Multiply the following fractions simultaneously.

a. $\frac{1}{3}, \frac{4}{5}, \frac{5}{8}$ b. $2\frac{1}{2}, 1\frac{1}{4}, 3\frac{1}{5}$

Real-life Story Sums

Solve the problems, writing complete statements.

1. Asad ran $\frac{5}{3}$ kilometres each day. How many kilometres did he run in 2 days?
2. Two children share $\frac{1}{6}$ of a cake. What fraction does each get?
3. Rafay reads $5\frac{1}{4}$ pages of a book daily. How many pages will he read in $3\frac{1}{3}$ days?
4. If $4\frac{1}{2}$ m cloth is used to make a dress, then how much cloth will be needed for 5 such dresses?
5. $6\frac{1}{2}$ l of milk fills $2\frac{1}{2}$ buckets fully. How much milk can be filled in one bucket?

4 Decimals

YOUR DIGITAL RESOURCE

In this unit students will learn to:

- recognise a decimal number as an alternative way of writing a fraction.
- express a decimal number as a fraction whose denominator is 10, 100 or 1000.
- identify and recognise the place value of a digit in decimals (up to 3-decimal places).
- convert a given fraction to a decimal if
  - Denominator of the fraction is 10, 100 or 1000.
  - Denominator of the fraction is not 10, 100 or 1000 but can be converted to 10,100 or 1000.
- convert a decimal (up to 3-decimal places) to fraction.
- add and subtract 3-digit numbers (up to 2 decimal places).
- multiply a 2-digit number (up to 1 decimal place) by 10, 100, and 1000.
- multiply a 2-digit number with 1decimal placeby a 1-digit number.
- divide a 2-digit number with 1decimalplace by a 1-digit number
- solve real life situations involving 2-digit numbers with 1 decimal place using appropriate operations.
- round off a whole number to the nearest 10, 100, and 1000.
- round off decimal (with 1 or 2 decimal places) to the nearest whole number.

MATH FLASH

You have already learnt:

- about fractions, that is dividing a shape in equal parts—halves ($\frac{1}{2}$) and quarters ($\frac{1}{4}$)
- about other fractions.
  For example: $\frac{1}{7}, \frac{3}{4}, \frac{5}{6}, \frac{9}{10}$
- to differentiate between numerator and denominator.
  For example: $\frac{6}{7}$ → numerator → denominator
- round off a whole number to the nearest 10 and 100.

KEY VOCABULARY

power, decimals, decimal place, tenth, hundredth, thousandth, power, convert, conversion, round off, estimate, estimation

Thinking about Decimals

In Book 3, we learned about Roman numerals.

The Romans had their own special language, **Latin.** Many words used in modern English come from the Latin language.

Many words used in math also have Latin roots. For example, **divide** comes from the Latin word *dividere* (which means 'to separate'), and **subtract** comes from the Latin word *subtrahere.*

Another very important math word with a Latin root is **decimal.** It comes from the Latin word *decimus,* which means 'tenth'. The Latin word for the numeral X (10) is *decem.*

Use a pocket calculator to see how simple the decimal fraction is.

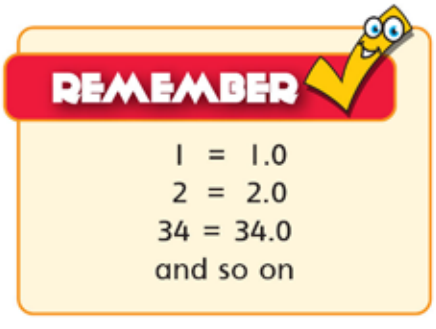
$\frac{1}{10}$ means "1 divided by 10."
Press 1
Now, press ÷
Now, press 1 and 0
Lastly, press =

Look at the display: the answer shown will be 0.1.

In daily life, a decimal fraction is used for all measurements except time.

What is the reason for its wide usage?

A decimal fraction is the extension of our decimal number system. Therefore, working with decimal fractions is as simple as working with whole numbers (unlike working with fractions). It is because of this reason that the metric system of measurement is used the world over.



We already know that when we divide a whole number or a set into 10 equal parts, each of those parts is called a **tenth** and is written $\frac{1}{10}$:

$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$

One whole = ten tenths

But there is another way in which we can write the fraction $\frac{1}{10}$.
This is called the **decimal way**:

$\frac{1}{10} = 0.1$

Look at this point: 0.1

You will remember seeing it in money: for example, Rs 16.50 and Rs 49.15, or in measurements: 6.350 kg, 5.25 cm.

We call this point the **decimal point**. It separates a whole number from a fractional number. The whole number is to the left of the decimal point.

Examples:

We write : 0.9
We say : zero point nine

We write : 87.5
We say : eighty-seven point five

We write : 287.3
We say : two hundred and eighty-seven point three

Tenths

Similarly, when we divide a square into **ten equal parts** we call each part '**one tenth**' and write $\frac{1}{10}$ or **0.1** (zero point one).

0.1 (zero point one)

Now look at this shape:

The coloured part of the shape is $\frac{4}{10}$.
In decimals, we write it as 0.4.

We say: zero point four.

Examples:

1. Write the coloured part of the shape as a fraction and as a decimal.

   a.  $\frac{6}{10} = 0.6$

   b.  $\frac{1}{10} = 0.1$

   c.  $\frac{2}{10} = 0.2$

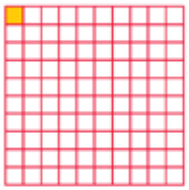
2. Write these fractions as decimals.

   a. $\frac{2}{10} = 0.2$

   b. $\frac{9}{10} = 0.9$

Hundredths

What happens when we divide a square into **one hundred equal parts**, that is each tenth is divided into 10 equal parts?



0.01 (zero point zero one)

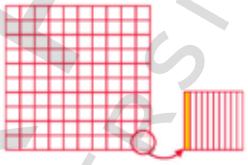
We call each part **'one hundredth'**.

We write $\frac{1}{100}$, or **0.01** (zero point zero one).

Thousandths

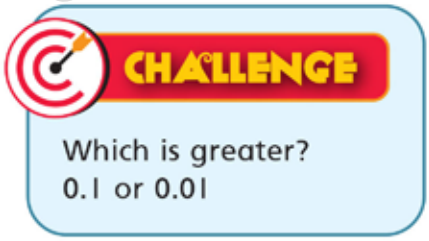
Suppose we divide our square into 1000 equal parts?

We can do this by taking each one hundredth square and dividing it into tenths:



If we do this to each small square, we shall have divided our big square into 1000 equal parts (100 × 10 = 1000).

We call each part **one thousandth**. We write this as $\frac{1}{1000}$ or **0.001** (zero point zero zero one).



Decimal places

Place-value chart

Let us write 0.1, 0.01, and 0.001 in the place-value charts, with tenth, hundredth, and thousandth places.

	H	T	O	.	t
$\frac{1}{10}$			0	.	1

	H	T	O	.	t	h
$\frac{1}{100}$			0	.	0	1

We have added another column, hundredths, or 'h' to the right of the tenths 't' column.

	H	T	O	.	t	h	th
$\frac{1}{1000}$			0	.	0	0	1

We have added another column, thousandths, or 'th' to the right of the hundredth 'h' column.

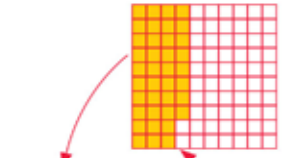
Now look at the following place-value table with tenth, hundredth and thousandth places.

	H	T	O	.	t	h	th
$\frac{1}{10}$			0	.	1		
$\frac{1}{100}$			0	.	0	1	
$\frac{1}{1000}$			0	.	0	0	1

Remember to add the decimal point between O and t, to separate the whole number from the decimal part.

It is easy to put **tenths** and **hundredths** into the place-value chart, provided we remember to add a new column for the 'h':

	H	T	O	.	t	h
$\frac{3}{10}$ =			0	.	3	
$\frac{38}{100}$ =			0	.	3	8



3 tenths 8 hundredths

Remember: $\frac{38}{100}$ = three tenths and eight hundredths.

Now look at this decimal number: **9.1**.

We know that as a fraction, $9.1 = 9\frac{1}{10}$

In our place-value table, we show it like this:

H	T	O	.	t	h	th
		9	.	1		

To show this decimal number, we need to use only **one place** to the right of the decimal point.

This decimal number has only **one decimal place.**

What about this decimal number: **9.11**?

In fraction form, $9.11 = 9\frac{11}{100}$

We show it like this:

H	T	O	.	t	h	th
		9	.	1	1	

We need to use **two places** to the right of the decimal point.

So this decimal number has **two decimal places**.

Now let us look at **9.111**.

We know it equals $9\frac{111}{1000}$.

We show it like this:

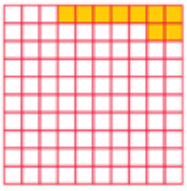
H	T	O	•	t	h	th
		9	•	1	1	1

Here, **three places** to the right of the decimal point are used.

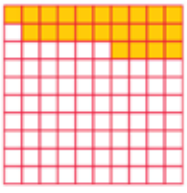
This decimal number has **three decimal places**.

Examples:

Write the coloured part of the shape as a fraction and as a decimal.

1. 

   The shaded part = $\frac{9}{100}$ = 0.09

2. 

   The shaded part = $\frac{23}{100}$ = 0.23

3. Write $\frac{18}{100}$ as a decimal.

   $\frac{18}{100}$ = 0.18

4. Write 0.52 as a fraction.

   0.52 = $\frac{52}{100}$ = $\frac{13}{25}$ (reduced form).

5. Write as a decimal number.
   7 tenths 2 hundredth 5 thousandths
   = 0.725

REMEMBER

1. The number of digits **after** the decimal point gives the number of places in a decimal number.
2. Zeros to the right of a decimal point **after the digits** have no value.
   Example: 7.990 = 7.99
3. Zeros to the left of a decimal point **before the digits** have no value.
   Example: 09.789 = 9.789
   13.602 has 3 decimal places (the zero in the hundredths is counted)
   13.620 has 2 decimal places (the zero at the end is not counted)

   013.6020 = 13.602

6. Place $482\frac{3}{100}$ in the place value table

H	T	O	.	t	h
4	8	2	•	0	3

7. How many decimal places are in 12.99 and 0.527?
   12.99 has two decimal place.
   0.527 has three decimal places.

REMEMBER

t is for tenth

h is for hundredth

Look at this number in the place-value table:

H	T	O	.	t	h	th
4	6	5	•	8	9	3

We read this as **four hundred and sixty-five point eight nine three.**

4 is in the hundreds place

6 is in the tens place

5 is in the ones place

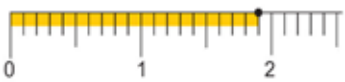
8 is in the tenths place

9 is in the hundredths place

3 is in the thousandths place

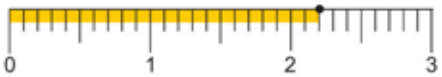
Decimals: the number line

Look at the given number line.
A part has been shaded and a point is marked on it.
The point is 1.9 cm from the left end.



Example:

Write the coloured part as a fraction and as a decimal.



$2\frac{2}{10}$ cm = 2.2 cm

Decimals and fractions

Some fractions can easily be converted to decimals, provided their denominators are factors of 10 or 100.

For example, $\frac{1}{2}$, $\frac{3}{4}$, $\frac{2}{5}$, $\frac{1}{20}$, and $\frac{3}{25}$ can **all** be written in decimal form.

This is because the **denominator** of each of these fractions is a **factor of 10 or of 100.**

$\frac{1}{2}$ has a denominator which is a factor of 10.

To turn $\frac{1}{2}$ into a decimal, we must first change it into an equivalent fraction with denominator 10:

$$\frac{1}{2} \xrightarrow{\times 5} \frac{5}{10} = 0.5$$

(Check on a grid to see if $\frac{5}{10}$ = one half of the square.)

$\frac{3}{4}$ has a denominator which is a factor of 100.

We change it into an equivalent fraction with denominator 100:

$$\frac{3}{4} \xrightarrow{\times 25} \frac{75}{100} = 0.75$$

(Check on a grid to see if $\frac{75}{100}$ = three quarters of the square.)

When we change a decimal into a fraction, we may need to reduce the fraction to its lowest terms:

$0.75 = \frac{75}{100}$

HCF of 75 and 100 is 25, therefore, divide the fraction by 25.

$$\frac{75}{100} \xrightarrow{\div 25} \frac{3}{4} \qquad \therefore 0.75 = \frac{3}{4}$$

Similarly, fractions whose denominators are **factors of 1000** can also be converted to decimals.

To change $\frac{19}{200}$ into a decimal, we first change it into an equivalent fraction with a denominator of 1000:

$$\frac{19}{200} \xrightarrow{\times 5} \frac{95}{1000} = 0.095$$

When we change a decimal into a fraction, we may need to reduce the fraction to its lowest terms:

Example:

$1.504 = 1\frac{504}{1000}$

HCF = 8

$$\frac{504}{1000} \xrightarrow{\div 8} \frac{63}{125}$$

$\therefore 1.504 = 1\frac{63}{125}$

▶ Exercise 4a

1. Fill in the blanks.
   a. $\frac{1}{100}$ as a decimal is written as 0.01.
   b. 0.51 as a fraction is written as $\frac{51}{100}$.
   c. Complete the sequence 0.1, 0.3, 0.5, 0.7. Rule: add 0.2
   d. In 527.819, the place value of 9 is thousandths.
   e. 0.75 as a fraction is written as $\frac{75}{100}$.

2. State whether the following are true or false.

a. The place value of 3 in 49.135 is tenth. (False) it's the hundredth

b. $\frac{37}{100}$ as a decimal fraction is written as 3.7. (False) 0·37

c. $\frac{247}{10}$ as a decimal fraction is 24.7. (True)

d. 60.01 as a fraction is written as $60\frac{1}{1000}$. (False) $\frac{6001}{100}$

e. 32.156 is a number with three decimal places. (True)

3. Select the correct answer from the given options.

a. In the figure  , the shaded part expresses

(A) $\frac{4}{100}$ (B) $\frac{4}{10}$

(C) 0.04 (D) 0.004

b. 0.053 represents a number up to

(A) hundredth decimal place (B) thousandth decimal place

(C) two decimal places (D) tenth decimal place

c. In the decimal number 0.59, there are

(A) 9 tenths and 5 hundredths (B) 5 hundredth and 9 thousandths

(C) 9 units and 5 tens (D) 5 tenths and 9 hundredths

d. In the hundred squares grid the shaded part represents

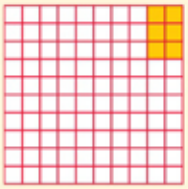
(A) 0.32 (B) 0.032

(C) 32 (D) 3.2

e. The shaded part representing 0.7 in a grid will be

(A) 

(B) 

(C) 

(D) 

4. Look carefully at the decimal number lines.
Write the coloured part as a fraction and as a decimal.

a. 

1.7 = $1\frac{7}{10}$

b. 

2.1 = $2\frac{1}{10}$

c. 

1.4 = $1\frac{4}{10}$

d. 

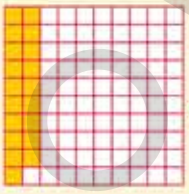
0.5 = $\frac{5}{10}$

e. 

2.5 = $2\frac{5}{10}$

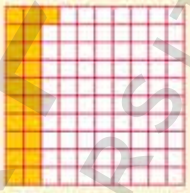
5. Show the coloured part of these squares as a fraction and as a decimal.

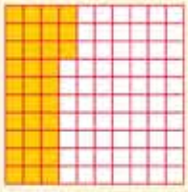
a. 
$\frac{4}{100}$
0.04

b. 
$\frac{19}{100}$
0.19

c. 
$\frac{7}{100}$
0.07

d. 
$\frac{3}{100}$
0.03

e. 
$\frac{21}{100}$
0.21

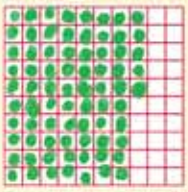
f. 
$\frac{33}{100}$
0.33

6. Colour squares to match the decimal numbers.

a. 
0.02

b. 
0.18

c. 
0.51

d. 
0.75

7. Place the following numbers into a place-value table.

a. $283\frac{3}{10}$ b. $24\frac{5}{10}$ c. $410\frac{1}{10}$ d. $500\frac{51}{100}$

e. $605\frac{5}{10}$ f. $328\frac{1}{100}$ g. 501.016 h. 16.106

i. 269.428 j. 7.642

8. Write these as decimal numbers.

a. $10\frac{1}{10}$ 10·1 b. $\frac{4}{10}$ 0·4 c. $15\frac{3}{10}$ 15·3 d. $\frac{46}{100}$ 0·46

e. $\frac{7}{100}$ 0·07 f. $\frac{16}{100}$ 0·16

9. Write these as fractions.

a. 2.7 $\frac{27}{10}$ b. 9.4 $\frac{94}{10}$ c. 11.4 $\frac{114}{10}$ d. 0.15 $\frac{15}{100}$

e. 0.067 $\frac{67}{1000}$ f. 0.10 $\frac{10}{100}$ g. 0.002 $\frac{2}{1000}$ h. 0.008 $\frac{8}{1000}$

10. Write as decimal numbers.

a. 18 tenths 1·8 b. 2 tenths 0·2

c. 3 tenths 5 hundredths 0·35 d. 0 tenths 9 hundredths 0·09

e. zero point one two eight 0·128 f. eleven point one six zero 11·160

g. 4 tenths 3 hundredths 7 thousandth 0·437

h. 0 tenths 0 hundredths 2 thousandths 0·002

11. Write the place value of the circled digits.

a. 6.5(6) hundredths b. 21.(2)01 tenths c. 188.1(6)3 d. (6)1.112

e. 130.(9)25 9 tenths

6 hundredths 6 tens

12. Convert these fractions into decimals.

a. $\frac{1}{4}$ 0·25 b. $\frac{3}{20}$ 0·15 c. $\frac{9}{25}$ 0·36 d. $\frac{2}{5}$ 0·4

e. $\frac{39}{500}$ 0·078 f. $\frac{41}{250}$ 0·164 g. $\frac{71}{250}$ 0·284 h. $\frac{103}{200}$ 0·515

13. Change these mixed numbers into decimal numbers.

a. $1\frac{3}{10}$ 1·3 b. $8\frac{1}{5}$ $\frac{41}{5}$ = 8·2 c. $6\frac{27}{100}$ 6·27 d. $10\frac{47}{50}$ $\frac{547}{50}$ = 10·94

e. $7\frac{43}{1000}$ 7·043 f. $7\frac{121}{200}$ 7·605 g. $2\frac{9}{1000}$ 2·009 h. $8\frac{27}{250}$ 8·10

14. Write these as mixed numbers in their lowest terms.

a. 2.624 b. 3.028 c. 5.010 d. 20.005

Estimation/Rounding off

Estimation is an approximate calculation of the value, number, or quantity, etc.

Rounding off is a kind of estimation. Rounding numbers makes them simpler and easier; although they are not accurate, they are close to their original values. We round off whole numbers to nearest 10, 100, 1000, and so on (powers of 10).

You have rounded off whole numbers to nearest 10 and 100 in previous class.

Rounding off a whole number to its nearest 1000

- Identify and underline the place value to be rounded off.
- If the number to the right is 0 to 4, we round it down.
- If the number to the right is 5-9, we round it up.

Example 1: Round off 3648 to the nearest 1000.

Solution:
Multiple of 1000 above 3648 is 4000.
Multiple of 1000 below 3648 is 3000.

The number at thousand place is 3. The number to the right is 6 which is greater than 5, therefore, the given number is rounded up to 4000.

3648 ≈ 4000

Rounding off a whole number on a number line

To round off a number on a number line, first we need to decide to which place value the number is being rounded. Then we create a number line depending upon the place value. Following the same method as done above, we mark the rounded value on the number line.

Example 2: Round off 4573 to nearest 1000.

Solution:
Multiple of 1000 above 4573 is 5000.
Multiple of 1000 below 4573 is 4000.

The number at hundred place is 5, therefore, the given number is rounded up to 5000.

4573 ≈ 5000

Mark point on number line for 4573.

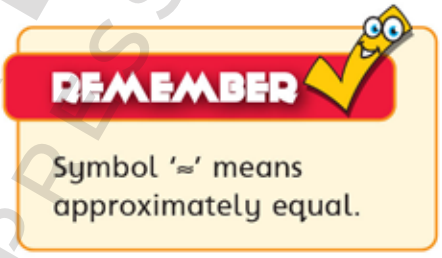
Locate 4573 on the number line. 4573 is away from 4000 and near to 5000. Mark 5000 on the number line as the rounded value.

Rounding off a decimal (with 1 or 2 decimal places) to the nearest whole number

Follow the simple steps given below to round off a decimal number.

a. If the tenth digit is less than 5, round the number down. Remove the decimal part of the number.

b. If the tenth digit is 5 or more, then round up the number. Add 1 to the number before decimal and remove the decimal part of the number.



Example 3: Round off 45.7 to nearest whole number

Solution:

Check the number on tenth place; 7 > 5.

Round up the number and remove decimal part.

45.7 ≈ 46

Now look at the number line.

45.7 is closer to 46, therefore, 45.7 ≈ 46

Example 4: Round off 534. 28 to the nearest whole number.

Solution: Check the number on tenth place is; 2 < 5.

Round the number down. Remove the decimal part of the number.

534.28 ≈ 534

▶ Exercise 4b

1. Fill in the blanks.
   a. Rounding 72 to the nearest tens equals 70.
   b. Rounding 5895 to the nearest thousands place equals to 6000.
   c. 243 is equal to 200 if rounded off to the nearest hundred place.
   d. 11.09 rounded off to the nearest whole number is equal to 11.
   e. 124.78 rounded off to the nearest whole number is equal to 125.
2. State whether the following are true or false.
   a. 5700 rounded off to the nearest 1000 is 6000. (True)
   b. 300.89 rounded off to the nearest whole number is 308. (False)301
   c. 9.56 and 10.21 rounded off to the nearest whole number have same value. (True)
   d. 13.95 rounded off to the nearest whole number is equal to 14.95 (False) 14
   e. 2349 rounded off to the nearest 1000 is equal to 2000. (True)
3. Select the correct answer from the given options.
   a. 705.21 rounded off to the nearest whole number is equal to
      Ⓐ 706 Ⓑ 705 Ⓒ 705.3 Ⓓ 715
   b. Rounding off a number means
      Ⓐ dividing a number by 10 Ⓑ estimating a number
      Ⓒ always adding 1 to the number Ⓓ reducing a number by 10
   c. 61.59 rounded off to the nearest whole number results in
      Ⓐ 61 Ⓑ 62 Ⓒ 61.6 Ⓓ 61.5
   d. Round off 1840 to the nearest 1000. The result will be
      Ⓐ 1800 Ⓑ 1900 Ⓒ 2000 Ⓓ 1000
   e. 3299 rounded off to the nearest thousand equals to
      Ⓐ 3000 Ⓑ 2299 Ⓒ 3200 Ⓓ 3300
4. Round off the following numbers to the nearest 1000.
   a. 3690 4000 b. 1245 1000 c. 2090 2000 d. 1005 1000 e. 9126 9000
5. Round off the following numbers to the nearest whole numbers.
   a. 95.96 96 b. 39.09 39 c. 0.93 1 d. 637. 48 637 e. 100.01 100

Decimals and four operations

Addition and subtraction of decimal numbers up to two decimal places

When we add and subtract numbers with decimals, we work in exactly the same way as with whole numbers, but we must remember to keep the decimal points in the same column.

Examples:

1. **Addition**

H	T	O	.	t
5	8	6	.	7
+ 1	9	5	.	8
7	8	2	.	5

2. **Addition**

H	T	O	.	t	h
4	5	8	.	7	2
+ 9	8	7	.	0	5
1	4	4	5	.	7	7

3. **Subtraction**

H	T	O	.	t
6	0	3	.	0
− 1	9	8	.	8
4	0	4	.	2

4. **Subtraction**

H	T	O	.	t	h
8	2	5	.	0	9
− 6	8	9	.	9	5
1	3	5	.	1	4

Multiplication and division of a decimal by 10, 100 and 1000

let us multiply a whole number 15 by 10.

T	O			H	T	O
1	5	.	0 × 10 =	1	5	0 . 0

We say that the decimal point moves **one place to the right**.

Similarly, when a whole number 9 is multiplied by 100, the result is:

H	T	O		H	T	O
9	.	0	× 100 =	9	0	0 . 0

We say that the decimal point moves **two places to the right**.

Now let us multiply a decimal number by 10, 100, and 1000.

12.4 × 10

Step 1 Write the decimal number as it is: 12.4

Step 2 Tag a zero at the end of the number: 12.40

Step 3 Move the decimal point one place to right: 12.40

∴ 12.4 × 10 = 124.0

12.4 × 100

Step 1 Write the decimal number as it is: 12.4

Step 2 Tag two zeros at the end of the number: 12.400

Step 3 Move the decimal point two places to right: 12.400

∴ 12.4 × 100 = 1240.0

12.4 × 1000

Step 1 Write the decimal number as it is: 12.4

Step 2 Tag three zeros at the end of the number: 12.4000

Step 3 Move the decimal point three places to right: 12.4000

∴ 12.4 × 1000 = 12400.0

We move the decimal point to the right as many places as there are zeros in the multiplier, that is 10, 100, and 1000.

Now let us divide a decimal number by 10 and 100.

T	O			T	O
2	0	. 0	÷ 10 =		2 . 0

We say that the decimal point moves one place to the left.

H	T	O		H	T	O
7	0	0 . 0	÷ 100 =		7	. 0

We say that the decimal point moves two places to the left.

H	T	O . t
7	0	0 . 0
	2	0 . 0

The columns to the left of the decimal point are: Ones (O), Tens (T), Hundreds (H), and so on.

The columns to the right of the decimal point are the tenths (s) and hundredth (h).

Examples:

1. 0.59 × 10
   0.59 × 10
   = 5.9

2. 4.65 × 100
   4.65 × 100
   = 465.0
   = 465

3. 0.84 × 1000
   0.84 × 1000
   = 840.00
   = 840

4. 6.7 ÷ 10
   6.7 ÷ 10
   = 0.67

5. 1.39 ÷ 100
   1.39 ÷ 100
   = 0.0139

6. 0.88 ÷ 100
   0.88 ÷ 100
   = 0.0088

Multiplying a decimal by a 1-digit and 2-digit number

It is simple to multiply with decimals, provided we write our columns neatly and remember to align the decimal point.

Example:

1.

	H	T	O	.	t
		7^{3}	8^{1}	.	3
×					4
	3	1	3	.	2

2.

	Th	H	T	O	.	t
			2	9	.	5
×						47
		2	0	6		5
	1	1	8	0		0
	1	3	8	6	.	5

Dividing a decimal by a 1-digit number

Dividing with decimals is easy too.

For dividing with decimals work like this.

1.

	H	T	O	.	t
		4	6	.	5
7	3	2	5	.	5
	−	2	8		
		4	5		
	−	4	2		
			3		5
		−	3		5
			0		0

2.

	H	T	O	.	t	h
		1	0	.	6	3
9	9	5	.	6	7	
	−	9				
		0	5			
	−	0	0			
			5		6	
		−	5		4	
					2	7
			−		2	7
					0	0

We see that the decimal point in the quotient is aligned with the decimal point in the dividend.

Exercise 4c

1. Fill in the blanks.
   a. The sum of 244.15 and 2.5 is 246.65.
   b. The difference between 913.01 and 810.05 is 102.96.
   c. 14.25 × 1000 = 14250.
   d. 41.86 × 4 = 167.44.
   e. 4.5 ÷ 5 = 0.9.

2. State whether the following are true or false.
   a. 12.45 + 6.7 = 19.15 (True)
   b. If 42.5 is subtracted from 100.72 then the result will be 58.72. (False)
   c. 210.15 × 10 = 2101.5. (True)
   d. 53.20 divided by 2 is 26.6. (True)
   e. The product of 1.25 and 4 is equal to 500.(False)

3. Select the correct answer from the given options.
   a. The difference between 450 and 4.5 is
      (A) 440.5 (B) 44.55 (C) 4455 (D) 445.5
   b. 253.6 × 20 is equal to
      (A) 507.2 (B) 50720 (C) 5072 (D) 407.22
   c. 91.6 × 100 is equal to
      (A) 9.16 (B) 9160 (C) 916 (D) 91600
   d. The total of 456.19 and 0.81 is
      (A) 456.00 (B) 45.600 (C) 4570.0 (D) 457
   e. 43.2 ÷ 8 is equal to
      (A) 0.54 (B) 540 (C) 54 (D) 5.4

4. Write vertically and add.
   a. 653.47 + 122.52 775.99
   b. 465.31 + 284.66 749.97
   c. 509.18 + 482.39 322.7
   d. 329.43 + 614.75 944.18
   e. 759.87 + 196.92 146.89
   f. 477.76 + 378.67 856.43
   g. 1269.31 + 1769.88 3039.19

5. Write vertically and subtract.

a. 985.64 − 139.55 846·09
b. 702.72 − 484.38 218·34
c. 521.81 − 199.11 322·7
d. 619.90 − 487.45 132·45
e. 602.32 − 455.43 146·89
f. 750.14 − 289.35 460·79
g. 808.41 − 662.79 145·62
h. 513.29 − 377.67 135·62
i. 1219.51 − 846.91 372·6

6. Multiply

a.
T	O	.	t
	3	8	3
×			5
1	9	1	5

b.
T	O	.	t
	8	4	9
×	3	2	
2	7	1	6

c.
T	O	.	t
	9	3	7
×			7
6	5	5	9

d.
T	O	.	t
	6	0	9
×	4	3	
2	6	1	8

7. Write vertically and solve.

a. 15.1 × 3 45·3
b. 29.5 × 7 206·5
c. 65.8 × 5 329

65·8 × 5 = 329·0

8. Divide the following.

a.
TO.t	
5	40.5

8·1

b.
TO.t	
8	81.6

10·2

c.
TO.t	
7	65.1

9·3

d.
TO.t	
3	96.3

32·1

9. Write in long division form and divide.

a. 18.9 ÷ 9 2·1
b. 11.4 ÷ 6 1·9
c. 97.5 ÷ 3 32·5
d. 20.3 ÷ 7 2·9

Decimals and money

In earlier classes, we learned that one rupee is made up of 100 paise.

We also know how the decimal point helps us to write sums of money easily and neatly.

For example, **Rs 56 and 25 paise** is written more neatly as:

We now understand that the numbers to the right of the point are **decimal numbers**.

25 paise is just another way of saying 'point two five', or $\frac{25}{100}$ of a rupee.

Rs 56.25 can be said as: fifty-six rupees and twenty-five paise.

We can write sums of money as decimals.

Examples:

a. Rs 75 and forty paise
Rs 75.40

b. Rs 120 and 5 paise
Rs 120.05

REMEMBER

5 paise is $\frac{5}{100}$ = 0.05 rupee

In Book 3, we learned how simple it is to add, subtract, multiply, and divide money, **provided we remember to place our decimal point correctly.**

Addition:

Rs 1420.95
+ Rs 3849.85
Rs 5270.80

Subtraction:

Rs 6051.15
− Rs 3789.35
Rs 2261.80

Multiplication:

Rs 175.75
× 23
52725
+351500
Rs 4042.25

Division:

Rs 197.10
5 | 985.50
− 5
48
− 45
35
− 35
0 5
− 0 5
0 0

In Class 3, we learned how to prepare bills like this:

Name: Aadil Ahmed			Date. 6.3.2019
Quantity	**Description**	**Cost of one**	**Total cost**
2	Cream cake	Rs 6.20	Rs 12.40
4	Wafer chips	Rs 5.30	Rs 21.20
10	Bubblegum	Rs 2.85	Rs 28.50
		Grand Total	Rs 62.10

▶ Real-life Story Sums

Solve the problems, writing complete statements.

1. Prepare bills for Aadil's shopping at these different shops.
   a. **Sports shop**: 1 pair of shorts at Rs 225 each; 12 table tennis balls at Rs 9.50 each; 5 sports caps at Rs 35.50 each.
   b. **Bookshop**: 7 comics at Rs 32.30 each; 2 'Famous Five' books at Rs 87.50 each; 3 books about magic at Rs 36.50 each; a new diary costing Rs 94.70.
   c. **Bakery**: 4 doughnuts at Rs 15.50 each; 2 chocolates at Rs 27.50 each; 6 chicken puffs at Rs 14.90 each.
2. Now prepare these bills.
   a. **Mrs Shahid**: 3 packets of typing paper at Rs 450 per packet; 2 books on electronics costing Rs 112.50 each; a new pen costing Rs 28.90.
   b. **Mr Aamir**: 5 packets of soap at Rs 26.50 each; 4 packets of biscuits at Rs 19.40 each; 3 cookery books costing Rs 13.50 each; 2 music CDs at Rs 41.50 each.
   c. **Mrs Khan**: 4 books on computers costing Rs 180.50 each; a new lamp for her room costing Rs 200.90; 6 tickets for a concert at Rs 115.00 each.
3. Use the unitary method to find the cost of:
   a. 4 notebooks, if 10 notebooks cost Rs 80.50.
   b. 3 kg of wheat, if 10 kg cost Rs 320.50.
   c. 6 tickets to the cricket match, if 8 tickets cost Rs 720.
   d. 5 tennis balls, if 3 tennis balls cost Rs 62.70.
4. A new TV costs Rs 24 065.90. Samina has only Rs 10 780.50 in her bank account. How much more money must she save before she can buy the TV?
5. Danish needs a Math book costing Rs 98.75, an English book costing Rs 67.50, an atlas costing Rs 125, and a new lunch box costing Rs 105.75. How much money will all this cost his parents?
6. A tiger eats 3.4 kg of meat per day, how much will it eat in 1 week?
7. The cost of 4 packets of sweets is Rs 480.60, what will be the cost of one packet?
8. A 92.5 m long rope is divided into 5 equal parts. How long will be each part?

Unit 4 - Exercise 4c

Real-life Story Sums.

1. a Shopping at Sport's shop:

1 Pair of shorts	= 1 x 225	= 225
12 tolde tennis balls	= 12 x 9·50	= 114
5 sports caps	= 5 x 35·50	= 117·5
		456·5

Total bill = Rs 456·5

b. Shopping at bookshop:

7 comics	= 7 x 32·30	= 226·1
2 'Famous Five' books	= 2 x 87·50	= 175
3 books about magic	= 3 x 36·50	= 109·5
1 new diary	= 1 x 94·70	= 94·70
		605·30

Total bill = Rs 605·30

c. Shopping at a bakery:

4 doughnuts	= 4 x 15·50	= 62
2 chocolates	= 2 x 27·50	= 55
6 chicken puff	= 6 x 14·90	= 89·4
		206·4

Total bill = Rs 206·4

2a Mrs Shamid: 3 packs of typing paper = 3 x 450 = 1350

2 packs of electronics = 2 x 112·50 = 225

1 pen = 1 x 28·90 = 28·90

1350 + 225 + 28·90 = Rs 1603·5

b. Mr. Amir = 5 packs of soup = $5 \times 26.50 = 132.5$

4 packs of biscuits = $4 \times 19.40 = 77.6$

3 cook books = $3 \times 13.50 = 445.5$

2 music CDs = $2 \times 41.50 = 83$

Total bill = $132.5 + 77.6 + 445.5 + 83$

= Rs 738.6

c. Mrs. Khan = 4 computer books = $4 \times 180.5 = 722$

1 lamp = $1 \times 200.90 = 200.9$

6 concert tickets = $6 \times 115 = 690$

Total bill = $722 + 200.9 + 690$

= Rs 1612.9

3. a. 10 notebooks costs = Rs 80.50

4 notebooks will cost = $\frac{80.50 \times 4}{10}$

= Rs 32.2

b. 10kg of wheat will cost = Rs 320.50

3kg of wheat will cost = Rs $\frac{320.50 \times 3}{10}$

= Rs 96.15

c. 8 tickets cost : Rs 720

6 tickets will cost : Rs $\frac{720 \times 6}{8}$

= Rs 540

d. 3 tennis balls cost : Rs 62·70

5 tennis balls will cost : $\frac{62 \cdot 70 \times 5}{3}$

= Rs 104·5

4. Rs 24065 · 90

− Rs 10780 · 50

Rs 13285 · 40

Samina needs Rs 13285.40 more to buy the TV.

5. Rs 98·75 + Rs 67·50 + Rs 125 + Rs 105·75

= Rs 471·25

Danish's parents will pay Rs 471·25

6. A tiger eats 3·4kg of meat in a day.

In a week (7 days), it will eat: 3·4 × 7

= 23·8kg

7. 4 packets of sweets cost: Rs 480·60

1 packet of sweets will cost = Rs $\frac{480 \cdot 60}{4}$

= Rs 120·15

8. $\frac{92 \cdot 5\,m}{5}$ = 18·5 m.

5 Measurements

YOUR DIGITAL RESOURCE

In this unit students will learn to:

- use standard metric units to measure the length of different objects.
- convert larger to smaller metric units (2-digits numbers with one decimal place)
  - kilometers into meters
  - meters into centimetres
  - centimetres into millimeters
- add and subtract measures of length in same units
- use standard metric units to measure the mass of different objects.
- convert larger to smaller metric units (2-digits numbers with one decimal place)
  - kilograms into grams
  - grams into milligrams
- add and subtract measures of mass in same units
- use standard metric units to measure the capacity of different containers.
- convert larger to smaller metric units (2-digit numbers with one decimal place) liters into millilitres
- add and subtract measure of capacity in same units
- solve real life situations involving conversion, addition and subtraction of measures of length, mass and capacity
- read and write the time using digital and analogue clocks on 12 -hour and 24-hour format.
- convert hours to minutes and minutes to seconds.
- convert years to months, months to days, and weeks to days.
- add and subtract measures of time without carrying and borrowing.
- solve simple real-life situations involving conversion, addition and subtraction of measures of time.

MATH FLASH

You have already learnt:

- to read, measure, and write standard units of length, mass/weight, and volume/capacity
- add and subtract measure of length in the same unit
- add and subtract measure of mass/weight involving the same units
- add and subtract units of measure of volume/ capacity involving the same units
- use a.m. and p.m. to record the time in analogue clock
- read and write time from analogue and digital clocks
- use a calendar to identify and write days and dates
- add and subtract units of time

KEY VOCABULARY

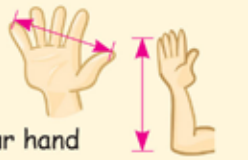
length, unit, kilometre, metre, centimetre, millimetre, weight, mass, kilogram, gram, volume, capacity, litre, millilitre, time, analogue clock, digital clock, hours, minutes, seconds, calendar, year, leap year, month, week, days

History of the metric system

1

Do you remember some of the different ways in which we can measure length?

2 We can use



3 Of course, the problem here is that people's hands, arms and feet are of different lengths.

For centuries, people tried to find a single or standard measure that would be the same everywhere.

4 Finally, in 1791, a new standard unit was agreed upon. It was not like any of the earlier units. It was to be:

one ten-millionth of a quarter of a circle on the earth, passing through Paris and through the North and South Poles

5 In 1789, a revolution took place in France.

The new government wanted to modernise the country and expand trade. But the existing units of measurement differed from province to province and even from town to town! How could modernisation possibly take place?

6 In 1793, a special name, metre, was given to this unit of length. Metre is a French word adapted from the Greek word metron, meaning measure.

But, of course, the metre was not very useful for measuring small lengths or long distances. So smaller and bigger units—all based on the metre—were introduced. These made use of the decimal system. The smaller units were tenths, hundredths, and thousandths of a metre, while the larger units were multiples of 10 (100, 1000, and so on).

The units for measuring weight and capacity were all based on the metre. In this way, the metric system came into being.

We can multiply our basic units of measurement to make a bigger unit (useful for measuring big lengths, weights, and capacities).

We may also divide our basic units to make smaller ones (useful for measuring small lengths, weights, and capacities).

But whether we multiply or divide our units, we always do so in multiples of 10.

This system of measurement based on multiples of 10 is called the metric system.

It is now used throughout the world.

Units of measurement

We use different units of measurement for length, weight, and capacity. These units of measurements are of different sizes. The small units are to measure small things and bigger units to measure big things.

Length

The standard units of length are: kilometre (km), metre (m), centimetre (cm), and millimetre (mm). For example, the length of a paper clip and a commonly used eraser is very small, therefore, we measure it in cm or mm. While a dining table, length of a piece of cloth or a carpet will be measured in metres. Similarly, longer lengths such as distance travelled by a car or a train will be measured in kilometres.

Examples:

- Length of the Mathematics book is 275 cm.
- Sana bought 5 m of cloth.
- Distance between Amir's house and school is 13 km.
- The length of a colour pencil is 15 cm 8 mm.
- Salma's height is 1 m 84 cm.
- A train travelled a distance of 300 km 750 m between two cities.

Mass

The standard units of mass are kilogram (kg) and gram (g). Heavy things are measured in bigger unit kilogram. For example, vegetables, rice, and flour will all be measured in kilogram.

While, lighter things such as spices, tea bags, and pastries are measured in the smaller unit, gram.

Examples:

- Fauzia's father bought 5 kg of apples.
- The Chef requires 75 g of spices and 1 kg 200 g of meat to prepare a dish.

Capacity

The standard units of capacity are litre (l) and millilitre (ml). Capacity is the amount of space a container can occupy. We measure liquids in litres and millilitres. For example:

- A water tank can hold 800 litres of water.
- The milk bottle has a capacity of 250 ml.
- There is 15 l 750 ml of water in the aquarium.

Conversion of units of measurement

We can always convert a bigger unit to a smaller unit and a smaller unit to a bigger unit by using a conversion factor.

Now, look carefully, at the conversion factors of units of length, mass, and capacity.

We have already seen how useful decimal points are when we work with money:
Rs 14 and 25 paise = Rs 14.25

We can also use decimal points to show measurement:
4 m and 58 cm = 4.58 m

In both cases, our decimal numbers have only **two decimal places**.

NOTE

Length
1 km = 1000 m
1 m = 100 cm
1cm = 10 mm

Weight
1 kg = 1000 g

Capacity
1 litre = 1000 ml

Mass

The standard units of mass are kilogram (kg) and gram (g). Heavy things are measured in bigger unit kilogram. For example, vegetables, rice, and flour will all be measured in kilogram.

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- The Chef requires 75 g of spices and 1 kg 200 g of meat to prepare a dish.

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NOTE

Length
1 km = 1000 m
1 m = 100 cm
1cm = 10 mm

Weight
1 kg = 1000 g

Capacity
1 litre = 1000 ml

This is because here we are dealing only with **hundredths**.
1 rupee = **100** paise
1 metre = **100** centimetres

But as we already know, our units of measurement—metres, grams, and millilitres—are sometimes grouped in **thousands.**
1000 m = 1 kilometre (km)
1000 g = 1 kilogram (kg)
1000 ml = 1 litre (l)

In such cases, we use decimal points to express our basic units (metres, grams, and millilitres) as **thousandths**. For example:
1842 m = 1.842 km
2021 g = 2.021 kg
5006 ml = 5.006 l

Similarly, we can also express a double unit as a single unit using the decimal point.
4 km 275 m = 4.275 km
2 kg 98 g = 2.098 kg
7 l 6 ml = 7.006 l

Note that our numbers are now written to three decimal places. This is because we are dealing with **thousandths**.

Conversion of units of length

Conversion of kilometres to metres

To convert larger units to smaller units, we always **multiply** the larger unit with the conversion factor.

For example, let us convert 3 km to m.

We already know that 1 km = 1000 m

$\therefore$ 3 km = 3 × 1000 = 3000 m

Conversion Table
1 km = 1000 m
$\frac{1}{2}$ km or 0.5 km = 500 m
$\frac{1}{4}$ km or 0.25 km = 250 m
$\frac{3}{4}$ km or 0.75 km = 750 m

Examples:

1. Write the following lengths in metres.
   a. 5 km = 5 × 1000 = 5000 m
   b. 21 km = 21 × 1000 = 21 000 m
   c. 407 km = 407 × 1000 = 407 000 m

Higher Order Thinking Skills

When we work with km and m, we use the decimal point to separate km from m, making our work neater and simpler. For example, 8 km 321 m can be written as 8.321 km. Here 321 m is just another way of saying 'point three two one' or $\frac{321}{1000}$ of a kilometre.

When we use a decimal point in measurement, we must be very careful to put the numbers in the correct decimal places.

Examples:

1. Convert m into km.
   a. 6418 m
   $\frac{6418}{1000}$ = 6.418 km [1 m = 1 ÷ 1000 km]
   b. 5036 m
   $\frac{5036}{1000}$ = 5.036 km
   c. 714 m
   $\frac{714}{1000}$ = 0.714 km
   d. 89 m
   $\frac{89}{1000}$ = 0.089 km
   e. 6 m
   $\frac{6}{1000}$ = 0.006 km

NOTE

The numbers are written to three decimal places, because we are dealing with thousandths.

2. Write the following lengths in kilometres.
   a. 4 km 275 m = 4.275 km
   b. 2 km 98 m = 2.098 km
   c. 7 km 6 m = 7.006 km

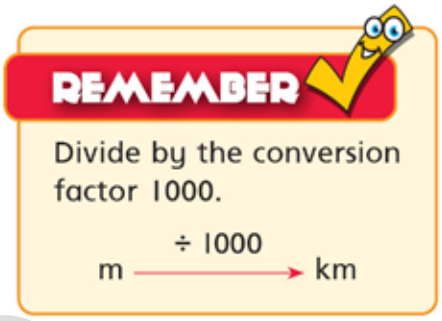
Conversion of metres to kilometres

To convert smaller units to larger units, we always **divide** the smaller unit by the conversion factor.

1000 m = 1 km

$\therefore$ 1m = 1 ÷ 1000 km

or 1 m = $\frac{1}{1000}$ = 0.001 km



Examples:

1. Convert m into km and m.
   a. 7395 m
      7000 m and 395 m
      $\therefore$ 7 km and 395 m.
   b. 8760 m
      8 km 760 m
   c. 4031 m
      4 km 31 m
   d. 8009 m
      8 km 9 m

2. Write the following lengths in metres.
   a. 9 km 421 m
      = (9 × 1000) m + 421 m
      = 9421 m
   b. 12 km 709 m
      = 12 000 m + 709 m [12 km × 1000 = 12 000 m]
      = 12 709 m

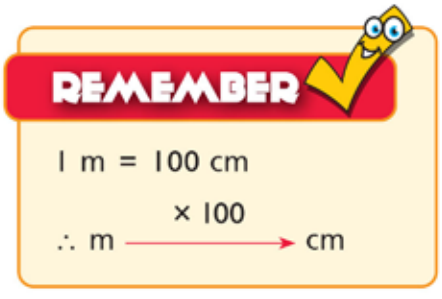
Conversion of metres to centimetres

Metre is a larger unit and centimetre is a smaller unit.

Therefore, when we convert metres to centimetres we multiply by the conversion factor 100.

Examples:

1. Convert m to cm.
   a. 9 m = 9 × 100 = 900 cm
   b. 38 m = 38 × 100 = 3800 cm
   c. 246 m = 246 × 100 = 24 600 cm
   d. 6.12 m = 6.12 × 100 = 612 cm
   e. 7.03 m = 7.03 × 100 = 703 cm



2. Express in cm.

a. 9 m 12 cm
= (9 × 100) cm + 12 cm = (900 + 12) cm
= 912 cm

b. 36 m 25 cm
= 3600 cm + 25 cm [36 m × 100 = 3600 cm]
= 3625 cm

3. Write the following lengths in centimetres.

a. 8.69 m × 100 = 869 cm = 8 m 69 cm

b. 15.74 m × 100 = 1574 cm = 15 m 74 cm

c. 32.08 m × 100 = 3208 cm = 32 m 8 cm

REMEMBER

The numbers are written to two decimal places, because we are dealing with hundredths.

Higher Order Thinking Skills

Conversion of centimetres to metres

We know that:
1 metre (m) = 100 centimetres (cm)

or 100 cm = 1 m

$\therefore$ 1 cm = $\frac{1}{100}$ m = 0.01 m

When we work with m and cm, we use the decimal point to separate m from cm.

For example 39 m 74 cm can be written as 39.74 m.

74 cm is read as 'point seven four' or $\frac{74}{100}$ of a metre.

Examples:

1. Write the following lengths in m and cm.

a. 350 cm
= 300 cm + 50 cm
= 3 m 50 cm

NOTE

1 m = 100 cm;
3 m = 300 cm

2. Write the given lengths in metres.

a. 285 cm	b. 357 cm	c. 809 cm
$\frac{285}{100}$	$\frac{357}{100}$	$\frac{809}{100}$
= 2.85 m	= 3.57 m	= 8.09 m

NOTE

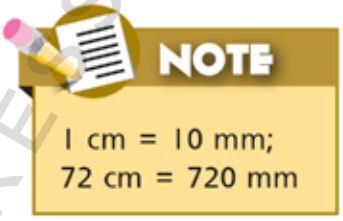
1 cm = 1 ÷ 100 m

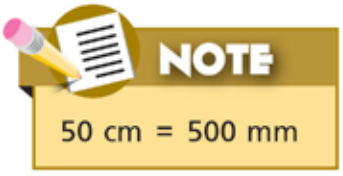
Conversion of centimetres to millimetres

When we convert cm to mm, we multiply by the conversion factor 10.

Examples:

1. Convert cm to mm.
   a. 5 cm = 5 × 10 = 50 mm
   b. 13 cm = 13 × 10 = 130 mm
   c. 76 cm = 76 × 10 = 760 mm
2. Write the lengths in mm.
   a. 9 cm 30 mm
      = (9 × 10) mm + 30 mm
      = (90 + 30) mm
      = 120 mm
   b. 72 cm 87 mm
      = (720 + 87) mm
      = 807 mm
   c. 50 cm 44 mm
      = 544 mm
3. Write the following lengths in mm.
   a. 7.5 cm × 10 = 75 mm = 7 cm 5 mm
   b. 10.9 cm × 10 = 109 mm = 10 cm 9 mm
   c. 13.2 cm × 10 = 132 mm = 13 cm 2 mm





Addition and subtraction of units of length

We can add or subtract similar units of length. That is kilometres are added to kilometres, metres to metres, and centimetres to centimetres.

Examples:

1. Add the following.
   a. 25 km 376 cm + 81 km 123 cm

	km	m
	25	376
+	81	123
	106	499

b. 98 km 205 m + 10 km 715 m

	km	m
	98	205
+	10	715
	108	920

c. 8 m 30 cm + 4 m 40 cm

	m	cm
	8	30
+	4	40
	12	70

d. 7 m 45 cm + 4 m 25 cm

	m	cm
	7	45
+	4	25
	11	70

e. 23 m 85 cm + 5 m 14 cm

	km	m
	23	85
+	5	14
	28	99

2. Subtract the following.

a.

	km	m
	56	482
−	11	350
	44	132

b.

	km	m
	26	$7\,^{7}84$
−	10	627
	16	157

c.

	m	cm
	25	78
−	16	35
	9	43

d.

	m	cm
	36	45
−	12	40
	24	05

▶ Exercise 5a

1. Fill in the blanks.
   a. 45 m in centimetres is equal to 4500 cm. 45 x 100 = 4500 cm
   b. 78 kilometres converted into metres will be 78000 m. 78 x 1000 = 78000
   c. The sum of 4 cm 20 mm and 6 cm 9 mm will be 129 mm. 10 cm x 10 = 100 + 29 = 129 mm
   d. The difference between 14 km 50 m and 14 km is equal to 50 m.
   e. 259 m converted to cm will be 25900 cm. 259 x 100 = 25900 cm

2. State whether the following are true or false.
   a. 5 km converted to m will be 500 000 m. (False) 5 x 1000 = 5000 m
   b. The height of the wall of a room can be measured in millimetre. (False) Height of the wall is measured in metres.
   c. Half kilometre is equal to 500 m. (True)
   d. 50 cm converted to mm will be 5000 mm. (False) 50 x 10 = 500 mm
   e. The distance between two countries is measured in kilometres. (True)

3. Select the correct answer from the given options.
   a. Convert 50 m to cm. 50 x 100 = 500 cm
      Ⓐ 50 cm Ⓑ 5000 cm
      Ⓒ 500 cm Ⓓ 5 cm
   b. Convert 18 cm to mm. 18 x 10 = 180 mm
      Ⓐ 18 mm Ⓑ 1800 mm
      Ⓒ 180 mm Ⓓ 18 000
   c. The correct unit to measure the height of a door is.
      Ⓐ metre Ⓑ centimetre
      Ⓒ kilometre Ⓓ millimetre
   d. 15 m 56 cm + 19 m 12 cm is equal to
      Ⓐ 34 m 68 cm Ⓑ 34 m 44 cm
      Ⓒ 34 m 108 cm Ⓓ 35 m 108 cm

      ① 15 m 56 cm
      + 19 m 12 cm
      34 m 68 cm
   e. 30 cm 15 mm − 9 cm 7 mm is equal to
      Ⓐ 21 cm 2 mm Ⓑ 20 cm 8 mm
      Ⓒ 39 cm 14 mm Ⓓ 21 cm 8 mm

      30 cm 15 mm
      − 9 cm 7 mm
      21 cm 8 mm

4. Convert into metres. 1 km = 1000 m

a. 39 km 39000 m b. 405 km 405000 m c. 45 km 415 m 45415 m

d. 4891 km 4891000 m e. 900 km 900000 m f. 130 km 119 m 130119 m

5. Convert into centimetres. 1 m = 100 cm

a. 42 m 4200 cm b. 815 m 81500 cm c. 12 m 80 cm 1280 cm

d. 673 m 67300 cm e. 93 m 9300 cm f. 35 m 42 cm 3542 cm

6. Convert into millimetres. 1 cm = 10 mm

a. 15 cm 150 mm b. 8 cm 80 mm c. 18 cm 5 mm 185 mm

d. 213 cm 2130 mm e. 71 cm 7 mm 717 mm f. 35 cm 12 mm 362 mm

7. Convert the following.

a. 400 km = 400 000 m b. 55 m = 5500 cm

c. 91 km = 91000 m d. 13 km 15 m = 13015 m

e. 4 m 29 cm = 429 cm f. 7 km 35 m = 735 m

8. Convert the following as required.

a. 3.56 km = 3560 m b. 2.5 cm = 25 mm

c. 90.4 m = 9040 cm d. 20.50 km = 20500 m

e. 1.78 m = 178 cm f. 1.40 cm = 14 mm

9. Add the following.

a. 35 km 150 m + 47 km 640 m b. 103 km 25 m + 14 km 75 m

c. 95 cm 3 mm + 12 cm 5 mm d. 63 cm 2 mm + 17 cm 5 mm

10. Subtract the following.

a. 45 km 130 m − 27 km 28 m b. 176 km 460 m − 92 km 359 m

c. 90 cm 8 mm − 14 cm 5 mm d. 405 m − 200 m

11. Write the suitable unit of length for the following measurements.

a. Height of your friend. m / cm

b. The thickness of the door. cm/mm

c. The height of a window. m

d. The thickness of a cardboard. mm

e. The distance between your house and your school. km

f. The thickness of your math book. mm/cm

Unit 5 — Exercise 5a

9. a. $^{1}35\text{ km }150\text{ m} + 47\text{ km }640\text{ m} = 82\text{ km }790\text{ m}$

b. $^{1}103\text{ km }25\text{ m} + 14\text{ km }75\text{ m} = 117\text{ km }100\text{ m}$

c. $95\text{ cm }3\text{ mm} + 12\text{ cm }5\text{ mm} = 107\text{ cm }8\text{ mm}$

d. $^{1}63\text{ cm }2\text{ mm} + 17\text{ cm }5\text{ mm} = 80\text{ cm }7\text{ mm}$

10. a. $^{3}\cancel{4}^{1_4}\cancel{8}\text{ km }^{10}\cancel{3}^{1}0\text{ m} - 27\text{ km }640\text{ m} = 18\text{ km }490\text{ m}$

b. $^{1}\cancel{1}76\text{ km }4\cancel{6}^{5}^{1}0\text{ m} - 92\text{ km }359\text{ m} = 84\text{ km }101\text{ m}$

c. $^{8}\cancel{9}^{1}0\text{ cm }8\text{ mm} - 14\text{ cm }5\text{ mm} = 76\text{ cm }3\text{ mm}$

d. $405\text{ m} - 200\text{ m} = 205\text{ m}$

▶ Real-life Story Sums

Solve the problems, writing complete statements.

1. Ahsan drove his car 20 km 15 m in the morning. In the evening he drove 30 km 150 m. How much distance did he cover?
2. Rashid is 1 m 56 cm tall. Tariq is 170 cm tall. Who is taller and by how much?
3. Asna's record in the long jump event was 3 m. Farah made a new record of 3 m 70 cm. How much longer did Farah jump?
4. Sara had a 40 cm long ribbon. She joined another piece of ribbon to make it 2 m 70 cm. What is the length of the other piece of ribbon?
5. A piece of carpet 3 m 30 cm long is cut from a bigger piece of carpet. The remaining part is 6 m 50 cm. What is the length of the bigger piece of carpet?

Mass

The unit of mass in the International system is the kilogram (kg). One kilogram is equal to 1000 grams. Gram is the smaller unit of measuring mass. One teaspoon of sugar weighs 4 grams, while the mass of a cricket bat is a little more than one kilogram.

Conversion of units of mass

Conversion of kilograms to grams

1 kilogram = 1000 grams

To convert kilograms to grams we multiply the number of kilograms by 1000.

Conversion of grams to kilograms

To convert grams to kilograms we divide number of grams by 1000.

Examples:

1. 17 kg = 17 × 1000 = 17000 g
2. 300 kg = 300 × 1000 = 300 000 g
3. $510\ g = \frac{510}{1000} = 0.510\ kg$
4. $20\ g = \frac{20}{1000} = 0.020\ kg$

Unit 5 – Exercise 5a

Real-life Story Sums

1. 20 km 15 m
+ 30 km 150 m
50 km 165 m

Ahsan covered a distance of 50 km 165 m.

2. Tariq = 170 cm = 1 m 70 cm
Rashid = − 1 m 56 cm
0 m 14 cm

Tariq is 14 cm taller than Rashid

3. Farah's record = 3 m 70 cm
Asma's record = − 3 m
0 m 70 cm

Farah jump was 70 cm longer.

4. 2 m 70 cm
− 40 cm
2 m 30 cm

The length of the other ribbon was 1 m 30 cm.

5. 6 m 50 cm
+ 3 m 30 cm
9 m 80 cm

The length of the bigger carpet was 9 m 80 cm.

Addition and subtraction of units of mass

Examples:

1. 17 kg 540 g + 23 kg 350 g

	kg	g
	17	540
+	23	350
	40	890

2. 35 kg 500 g + 15 kg 200 g

	kg	g
	^{1}35	500
+	15	200
	50	700

3. 90 kg 850 g − 75 kg 400 g

	kg	g
	90	850
−	75	400
	15	450

We must use appropriate units to measure the mass of different objects.

Examples:

- a sack of rice → kg
- a spoon → g
- a brick → kg
- a bag of mangoes → kg
- a small packet of tea → g

We can guess the appropriate units for different objects as given in the above list. However, there are even smaller units of that will be studied later. For example, milligram (mg) is another smaller unit.

1 g = 1000 mg

Exercise 5b

1. Fill in the blanks.
   a. 750 g = 750000 mg. 750g = 750 × 1000 = 750000 mg
   b. 569 kg 555 g = 569555 g. 569 kg = 569 × 1000 = 569000 g
   c. 215 g + 995 g = 1210 g.
   d. 1132 kg 905 g − 961 kg 800 g = 171 kg 105 g.
   e. 198 kg = 198000 g. 198 kg = 198 × 1000 = 198000 g

2. State whether the following are true or false.
   a. The sum of 1500 g and 2 kg is 3500 g. True
   b. 1000 grams are equal to 10 kilograms. False. 1000 g = 1 kg
   c. To convert kg into g, we multiply by 100. False. We multiply by 1000.
   d. The difference between 50 kg 750 g and 30 kg 250 g is 20 kg 500 g. True
   e. The appropriate unit of measurement for a big size of water melon in kilogram. True

3. Select the correct answer from the given options.
   a. 845 kg 45 g converted in grams is equal to:
      (A) 845000 g (B) 845045 g
      (C) 890 g (D) 84545 g

      845 kg = 845 × 1000
      = 845000 + 45
      = 845045 g

   b. 5699 g can be written as
      (A) 5699 kg (B) 56 kg
      (C) 5 kg 699 g (D) 569 kg 9 g

      5699 g → 5699 ÷ 1000
      = 5 kg 699 g

   c. 70 kg 365 g + 21 kg 200 g is equal to
      (A) 91 kg 565 g (B) 51 kg 165 g
      (C) 915 kg 65 g (D) 90 kg 565 g

      70 kg 365 g
      + 21 kg 200 g
      91 kg 565 g

   d. 12 kg 535 g − 8 kg 200 g is equal to
      (A) 4 kg 365 g (B) 4 kg 335 g
      (C) 3 kg 735 g (D) 4 kg 735 g

      12 kg 535 g
      − 8 kg 200 g
      4 kg 335 g

   e. The sum of 39 kg and 59 kg can be written as
      (A) 9800 g (B) 9 kg 800 g
      (C) 98000 kg (D) 98000 g

      39 kg + 59 kg
      = 98 kg
      = 98000 g

4. a. 375 kg → g
375 x 1000
= 375000

4. Express in terms of grams. 1kg = 1000g
a. 375 kg 375000g
b. 46 kg 46000g
c. 1005 kg 1005000g

5. Find the sum of:
a. 29 kg 544 g and 36 kg 350 g
b. 10 kg 200 g and 65 kg
c. 38 kg 440 g and 45 kg 220 g

6. Find the difference of:
a. 79 kg 600 g and 35 kg 215 g
b. 2 kg 910 g and 1 kg 145 g
c. 19 kg 470 g and 10 kg 120 g

7. a
14kg → g
14 x 1000
= 14000g
14000+750
= 14750g

7. Convert the following.
a. 14 kg 750 g into g 14750g
b. 32 kg 716 g into g 32716g
c. 350 kg into g 350000g
d. 105 kg 200 g into g 105200g
e. 10 kg 5 g into g 10005g

8. Convert the following into grams. 1kg = 1000g
a. 50 kg = 50000 g
b. 190 kg = 190000 g
c. 255 kg = 255000 g
d. 156 kg = 156000 g
e. 100 kg = 100000 g
f. 918 kg = 918000 g

9. Convert the following into milligrams. 1g = 1000mg
a. 580 g = 580000 mg
b. 150 gm = 150000 mg
c. 135 g = 135000 mg
d. 85 g = 85000 mg
e. 291 g = 291000 mg

10. Guess the appropriate unit of mass for the following objects.
a. a sack of wheat. kg
b. a carton of 50 apples. kg
c. a bar of soap. g
d. a big bunch of grapes. g/kg

Unit 5 – Exercise 5b

5. a. $\overset{1}{}$ 29kg 544g
+ 36kg 350g
65kg 894g

b. 10kg 200g
+ 65g
10kg 265g

c. $\overset{1}{}$ 38kg 440g
+ 45kg 220g
83kg 660g

6. a. 79kg $\overset{5}{6}\overset{1}{0}$0g
− 35kg 350g
44kg 250g

b. 2kg $\overset{8}{9}\overset{10}{}\overset{1}{}$ 0g
− 1kg 145g
1kg 765g

c. 19kg 470g
− 10kg 120g
9kg 350g

▶ Real-life Story Sums

Solve the problems, writing complete statements.

1. Dania weighs 67 kg 18 g. Ayesha weighs 62 kg 15 g. What is their total mass?
2. An airline allows 40 kg baggage to its passengers. Hassan's baggage weighs 47 kg. How much extra baggage does he have?
3. Saima bought 500 g of flour and 100 g of sugar to make a cake. What is the total mass of the ingredients.
4. Add the heaviest to the lightest of these masses.
   130 g; 22 g; 10 kg 41 g; 8 kg.
5. Sadia bought 1 kg of apples, 0.5 kg of plums, 0.75 kg of grapes, and 2.25 kg of tomatoes. What was the total mass in kg?

Capacity

Capacity is the maximum amount that something can contain. Volume is the amount of space that a liquid or object occupies, or that is enclosed within the container.

The units of capacity in the metric system are litre (l) and millilitre (ml).

1 litre = 1000 millilitres or
1 l = 1000 ml

We must use an appropriate unit of capacity depending on the size of the container or liquid. The unit should be neither too small nor too big.

Examples:

Milk in a container → litres
Water in a small pool → litres
Medicine → millilitres
Water in a glass → millilitres
A packet of juice → millilitres
A cup of tea → millilitres

Unit 5 – Exercise 5b

Real-life story sums

1. 67kg 18g
   + 62kg 15g

   129kg 33g

   Dania and Ayesha's total mass is 129kg 33g

2. 47kg
   − 40kg

   7kg

   Hassan has 7kg extra baggage.

3. 500g + 100g = 600g

   The total mass of the ingredients was 600g.

4. Heaviest mass = 10kg 41g
   Lightest mass = 22g
   ∴ 10kg 41g
   + 22g

   10kg 63g

5. 1kg + 0·5kg + 0·75kg + 2·25kg
   = 4·5kg

   The total mass of all the fruits was 4·5kg.

Conversion of units of capacity

Conversion of litres to millilitres

To convert litres to millilitres we multiply the number of litres by 1000.

Examples:

1. Convert litres to millilitres.

   a. 7 litres into millilitres.

   Solution:

   7 l = 7 × 1000 ml
   = 7000 ml

   b. 18 litres into millilitres.

   Solution:

   18 l = 18 × 1000 ml
   = 18 000 ml

   c. 139 litres into millilitres.

   Solution:

   139 l = 139 × 1000 ml
   = 139 000 ml

2. Convert litres and millilitres into millilitres.

   a. Convert 10 l 700 ml into ml.

   Solution:

   10 l 700 ml = 10 × 1000 + 700
   = 10 000 + 700
   = 10 700 ml

   b. Convert 85 l 230 ml into ml.

   Solution:

   85 l 230 ml = 85 000 ml + 230 ml [85 × 1000 = 85 000]
   = 85 230 ml

   c. Convert 66 l 96 ml into ml.

   Solution:

   66 l 96 ml = 66 000 ml + 96 ml
   = 66 096 ml

Higher Order Thinking Skills

Conversion of millilitres to litres

To convert millilitres to litres we divide millilitres by 1000.

Examples:

a. Convert 488 ml into litres.

Solution:

$488 \text{ ml} = \frac{488}{1000} = 0.488 \text{ l}$

b. Convert 5794 ml into litres.

Solution:

$5794 \text{ ml} = \frac{5794}{1000} = 5.794 \text{ l}$

Addition and subtraction of units of capacity

Examples:

1. 105 l 250 ml + 15 l

	l	ml
	105	250
+	15	000
	120	250

2. 16 l + 190 ml + 13 l 670 ml

	l	ml
	16	190
+	13	670
	29	860

3. 21 l 789 ml + 150 l 090 ml

	l	ml
	210	789
+	150	090
	360	879

4. 225 l 897 ml − 132 l 787 ml

	l	ml
	225	897
−	132	787
	93	110

5. 654 l 921 ml − 634 l 900 ml

	l	ml
	654	921
−	634	900
	20	021

6. 958 l 729 ml − 316 l 518 ml

	l	ml
	958	729
−	316	518
	642	211

▶ Exercise 5c

1. Fill in the blanks.
   a. There are _____ ml in 8 l.
   b. 1000 ml is equal to _____ l.
   c. Millilitre is a _____ unit than litre.
   d. 15 l 12 ml is same as _____ ml.
   e. 120 l 116 ml and 100 l 825 ml together equals to _____ l _____ ml.

2. State whether the following are true or false.
   a. To convert litres into millilitres we multiply the quantity of litre by 1000.(_____)
   b. 25 l is equal to 25 000 ml. (_____)
   c. The sum of 29 l and 35 l is 640 000 ml. (_____)
   d. The difference of 160 l 890 ml and 90 l 325 ml is 70 l 565 ml. (_____)
   e. 13 l 450 ml is equal to 1 345 000 ml. (_____)

3. Select the correct answer from the given options.
   a. 45 l is equal to:
      Ⓐ 450 000 ml Ⓑ 4500 ml
      Ⓒ 45 000 ml Ⓓ 450 ml
   b. 125 l 925 ml converted into ml will be
      Ⓐ 125 000 ml Ⓑ 125 925 ml
      Ⓒ 1 259 250 ml Ⓓ 925 125 ml
   c. The sum of 235 ml and 18 l 625 ml equals to
      Ⓐ 18 l 860 ml Ⓑ 19 l 800 ml
      Ⓒ 18 l 850 ml Ⓓ 18 l 190 ml
   d. 27 l 740 ml is 370 ml more than
      Ⓐ 343 ml Ⓑ 27 l 370 ml
      Ⓒ 26 l Ⓓ 26 l 630 ml
   e. The suitable unit for a dose of medicine is
      Ⓐ litre (l) Ⓑ kilogram (kg)
      Ⓒ millilitre (ml) Ⓓ gram (g)

4. Convert the litres into millilitres.
   a. 35 l b. 18 l 750 ml c. 129 l d. 25 l 15 ml

5. Convert the following into millilitres.
   a. 456 l b. 921 l
   c. 18 l d. 108 l
   e. 550 l

6. Add the following.
   a. 55 l 75 ml and 100 l 100 ml b. 92 l 183 ml and 110 l 280 ml
   c. 740 ml and 980 ml d. 42 l 800 ml and 150 ml

7. Subtract the following.
   a. 37 l 500 ml from 49 l 755 ml b. 44 l 220 ml from 50 l 640 ml
   c. 22 l 500 ml from 30 l 900 ml d. 1350 ml from 1700 ml

8. Think and write the suitable units for the following amounts of liquids.
   a. petrol from a gas station _____
   b. a glass of milk _____
   c. water in a water cooler _____
   d. a small bowl of soup _____
   e. water stored in a tank _____

▶ Real-life Story Sums

Solve the problems, writing complete statements.

1. A water tanker carried 12 000 l of water. It delivered 5000 l to a house. What quantity of water is left?
2. Sara bought 3 l of yellow paint and 2 l 550 ml of blue paint. How much paint did she buy altogether?
3. The milkman delivers 3 l 750 ml of milk to Mr Ahsan and 2 l 250 ml to Mr Aamir. Who is getting more milk and how much more?

Time

We have already learnt to read and write time from analogue and digital clocks.

The minute hand goes clockwise round the clock 24 times every day.

Each day is divided into halves:

12 hours for the morning and 12 hours for the afternoon-to-evening.

This can be confusing!

To make it clear which half of the day we mean, when we tell the time or make an appointment, we use the special letters as follows.

a.m. for **morning to afternoon** time. For example, Ahmed got up at *6:00 a.m.*

REMEMBER

The hour hand goes clockwise round the clock twice every day.

There are 24 hours in a day.
There are 60 minutes in an hour.

a.m. is short form for ***ante meridiem,*** two Latin words meaning 'before noon or midday'.

p.m. for **afternoon-to-evening** time. For example, Sara went to the market at 6:00 p.m.

p.m. is short form for ***post meridiem,*** Latin for 'after noon or midday'.

Internationally, **a.m.** is used for any time between 12:00 midnight and 12:00 noon, while **p.m.** is used for the time between 12:00 noon and 12:00 midnight.

The 12-hour clock

Now look at the following clocks.

The time on each analogue clock is written in words and in figures.

25 minutes past 2
2:25

15 minutes past 12
12:15

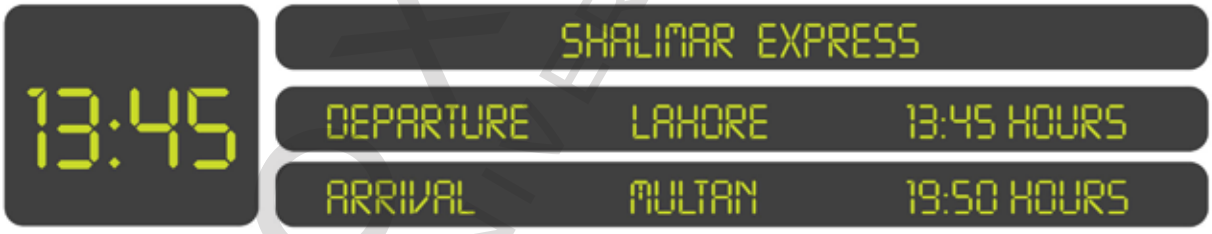
30 minutes past 3
3:30

Digital clocks show the time in digits.

12 minutes to 9
or
48 minutes past 8

The 24-hour clock

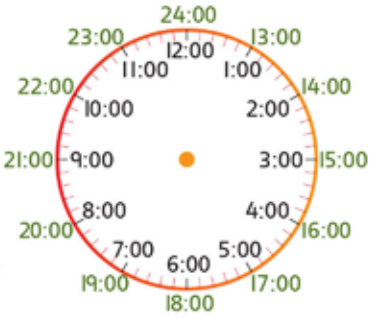
Have you ever seen the time shown like this or written like this?



These are 24-hour clock timings.

The 24-hour clock helps us to avoid confusing morning time (a.m.) with afternoon-and-evening time (p.m.).

We can imagine the 24-hour clock like this:



Here, the morning (a.m.) time is shown in black, while the afternoon-and-evening time (p.m.) is shown in green.

Now study this table:

12-hour clock	24-hour clock
Time	Time
12 midnight	24:00 hours or 00:00 hours
12:05 a.m.	00:05 hours
1:15 a.m.	01:15 hours
12 noon	12:00 hours
5:45 p.m.	17:45 hours

Hours, minutes, and seconds

Look at this clock. It has **3 hands**, not just two:

The third hand is usually long and thin. It moves much faster than the other two hands.

It moves in short, brisk jerks. Each jerk made by this hand marks the passing of **one second**.

The second is **the smallest unit of time**.

There are **60 seconds (sec)** in every **minute**.

Because the third hand measures seconds, we call it the **seconds hand**.

Seconds Hand

The seconds hand takes **60** little jumps or jerks to go clockwise around the clock face.

When **60** little jerks (seconds) are complete, a **minute** has passed. Think carefully. How many jerks will the seconds hand make in one **hour**?

1 h = 60 min

60 × 60 sec = **3600 seconds**

Addition and subtraction of units of time

Sometimes we need to **add** periods of time together. For example, let us find out how long Saima's journey back home takes if she travels 35 min by bus and then walks for 23 min.

35 min + 23 min = 58 min

We can write the sum vertically as

	min
	35
+	23
	58

Look at this subtraction sum involving time.

	h	min
	1	46
−		40
	1h	6 min

The calendar

A calendar is an organised chart presenting months, weeks and days of a year. We can check the specific month, day or week in a calendar.

January

Su	Mo	Tu	We	Th	Fr	Sa	
			1	2	3	4	1
5	6	7	8	9	10	11	2
12	13	14	15	16	17	18	3
19	20	21	22	23	24	25	4
26	27	28	29	30	31		5

February

Su	Mo	Tu	We	Th	Fr	Sa	
						1	
2	3	4	5	6	7	8	6
9	10	11	12	13	14	15	7
16	17	18	19	20	21	22	8
23	24	25	26	27	28		9

March

Su	Mo	Tu	We	Th	Fr	Sa	
						1	
2	3	4	5	6	7	8	10
9	10	11	12	13	14	15	11
16	17	18	19	20	21	22	12
23	24	25	26	27	28	29	13
30	31						

April

Su	Mo	Tu	We	Th	Fr	Sa	
		1	2	3	4	5	14
6	7	8	9	10	11	12	15
13	14	15	16	17	18	19	16
20	21	22	23	24	25	26	17
27	28	29	30				18

May

Su	Mo	Tu	We	Th	Fr	Sa	
				1	2	3	
4	5	6	7	8	9	10	19
11	12	13	14	15	16	17	20
18	19	20	21	22	23	24	21
25	26	27	28	29	30	31	22

June

Su	Mo	Tu	We	Th	Fr	Sa	
1	2	3	4	5	6	7	23
8	9	10	11	12	13	14	24
15	16	17	18	19	20	21	25
22	23	24	25	26	27	28	26
29	30						

July

Su	Mo	Tu	We	Th	Fr	Sa	
		1	2	3	4	5	27
6	7	8	9	10	11	12	28
13	14	15	16	17	18	19	29
20	21	22	23	24	25	26	30
27	28	29	30	31			31

August

Su	Mo	Tu	We	Th	Fr	Sa	
					1	2	
3	4	5	6	7	8	9	32
10	11	12	13	14	15	16	33
17	18	19	20	21	22	23	34
24	25	26	27	28	29	30	35
31							

September

Su	Mo	Tu	We	Th	Fr	Sa	
	1	2	3	4	5	6	36
7	8	9	10	11	12	13	37
14	15	16	17	18	19	20	38
21	22	23	24	25	26	27	39
28	29	30					40

October

Su	Mo	Tu	We	Th	Fr	Sa	
			1	2	3	4	40
5	6	7	8	9	10	11	41
12	13	14	15	16	17	18	42
19	20	21	22	23	24	25	43
26	27	28	29	30	31		44

November

Su	Mo	Tu	We	Th	Fr	Sa	
						1	
2	3	4	5	6	7	8	45
9	10	11	12	13	14	15	46
16	17	18	19	20	21	22	47
23	24	25	26	27	28	29	48
30							

December

Su	Mo	Tu	We	Th	Fr	Sa	
	1	2	3	4	5	6	49
7	8	9	10	11	12	13	50
14	15	16	17	18	19	20	51
21	22	23	24	25	26	27	52
28	29	30	31				

ACTIVITY

Example:

In the calendar given on the previous page, what date is the first Tuesday in October?

The date is 7 October.

Now look at the calendar carefully and answer the following questions.

a. The first Wednesday in May? _____

b. The first Monday in January? _____

c. The fourth Saturday of the year? _____

d. Two weeks after 14 June? _____

e. Two weeks after 21 November? _____

f. One week before 10 June? _____

g. Two weeks before 6 August? _____

h. 10 days before 18 April? _____

i. The first day of the new millennium? _____

DO YOU REMEMBER?

There are:

- 7 days in a week.
- 4 weeks in a month.
- 30 or 31 days in a month, except February, which has 28 days. It has 29 days in a leap year. A leap year comes after every four years.
- 12 months in a year
- 52 weeks in a year
- 365 days in a year, and 366 days in a leap year.

From the above information we can easily convert years to months, months to days and weeks to days.

Examples:

1. How many days are there in 5 weeks?

   Solution:

   1 week = 7 days
   5 weeks = 7 x 5 = 35 days

2. How many months are there in 15 years?

   Solution:

   1 year = 12 months
   15 years = 12 x 15 = 180 months

3. How many weeks are there in 5 years?

   Solution:

   1 year = 52 weeks
   5 years = 52 x 5 = 260 weeks

▶ Exercise 5d

1. Fill in the blanks.
   a. Quarter to seven in figures is written as _____.
   b. 7:45 p.m. in 24-hour clock will be _____.
   c. The time 10 minutes earlier than 4:15 is _____.
   d. Quarter past three as morning time is _____.
   e. Three o'clock as evening time is _____.
2. State whether the following are true or false.
   a. 4:15 p.m. in 24-hour clock will be 16:15. (_____)
   b. 6:25 hours in 12-hour clock will be 18:25 a.m. (_____)
   c. 4 h 35 min is equal to 275 minutes. (_____)
   d. 1 h 10 min 5 sec is equal to 4260 seconds. (_____)
   e. The sum of 13 h 45 min and 10 h 10 min is 23 h 55 min. (_____)

3. Select the correct answer from the given options.

a. 2 h 20 min are equal to:

Ⓐ 4800 sec Ⓑ 3600 sec Ⓒ 8400 sec Ⓓ 1200 sec

b. A carpenter started his work at 8:30 a.m. and worked till 1:30 pm. He worked for:

Ⓐ 5 hours Ⓑ 1 h 30 min Ⓒ 5 h 30 min Ⓓ 7 hours

c. 45 min 45 sec converted into seconds are:

Ⓐ 90 sec Ⓑ 2700 sec Ⓒ 4545 sec Ⓓ 2745 sec

d. 5 years 10 months are equal to

Ⓐ 50 months Ⓑ 70 months Ⓒ 125 months Ⓓ 160 months

e. 12 weeks 5 days converted into days are:

Ⓐ 84 days Ⓑ 47 days Ⓒ 89 days Ⓓ 60 days

4. Write the time in words and in figures.

a.  b.  c. 

d.  e.  f. 

5. What time do these digital clocks show?
Write your answer in words.

a. 

b. 

c. 

6. Write the time that is:

a. 6 minutes earlier than 9:30

b. $\frac{1}{2}$ hour later than 10:55

c. $\frac{1}{4}$ hour earlier than 7:30

d. 25 minutes earlier than 6:20

e. 30 minutes earlier than 3:12

f. $\frac{1}{2}$ hour earlier than 5:15

g. 11 minutes later than 12:59

7. What time will it be 3 hours after:

a. 6:15 a.m. b. 8:40 a.m. c. 10:10 a.m. d. 12 midnight

8. What time was 4 hours earlier than:

a. 7:30 a.m. b. 2:05 a.m. c. 10:20 p.m. d. 12 noon

9. Write the time as it would be on the 24-hour clock.
   a. 9:00 p.m.
   b. 12:02 a.m.
   c. 2:00 p.m.
   d. 8:23 p.m.
   e. 3:15 p.m.
   f. 11:05 p.m.

10. Write as 12-hour clock time, using a.m. and p.m.
   a. 05:20 hours
   b. 17:16 hours
   c. 00:00 hours
   d. 00:45 hours
   e. 12:00 hours

11. How many seconds are in
   a. 3 min 15 sec
   b. 21 min 30 sec
   c. 90 min 18 sec

12. How many seconds are in
   a. 4 hours
   b. 30 hours
   c. 12 hours
   d. 40 hours

13. Convert these into min.
   a. 1 h 15 min
   b. 2 h 5 min
   c. 1 h 44 min
   d. 2 h 20 min

14. Write vertically and solve.
   a. 58 min + 42 min
   b. 1 h 23 min + 30 min
   c. 4 h 16 min + 1 h 2 min

15. Write vertically and subtract.
   a. 1 h 54 min − 48 min
   b. 6 h 27 min − 1 h 12 min
   c. 34 min 53 sec − 20 min 30 sec
   d. 10 h 40 min − 6 h 35 min

16. Write vertically and solve.
   a. 44 sec + 28 sec
   b. 59 sec − 28 sec
   c. 1 min 15 sec + 35 sec
   d. 7 min 30 sec + 3 min 28 sec
   e. 8 min 40 sec − 2 min 25 sec

17. How many weeks are there in:
   a. 4 months
   b. 10 months

18. How many days are there in:
   a. 7 weeks
   b. 11 weeks

▶ Real-life Story Sums

Solve the problems, writing complete statements.

1. An airbus left Karachi at 18:40 hours and arrived at Peshawar after 2 hours 10 minutes. At what time did it arrive at Peshawar?
2. A train left Cantt Station in Karachi at 09:10 hours and reached Multan 15 hours later. What time was that?
3. Tahir is training to swim for the national championship.

   For 7 days, he kept a record of when he began each swimming practice and when he finished. Copy and complete the table to find out how long he practised each day.

Date	began swimming	finished swimming	time spent swimming
10.3.12	3:30 p.m.	5:00 p.m.	1 hr 30 min
11.3.12	5:00 p.m.	6:15 p.m.	
12.3.12	4:40 p.m.	6:20 p.m.	
13.3.12	5:40 p.m.	6:35 p.m.	
14.3.12	5:25 p.m.	6:42 p.m.	
15.3.12	10:00 a.m.	12:05 p.m.	
16.3.12	11:25 a.m.	12:40 p.m.	

4. Sahir took 1 h 20 min to do his English homework, 25 min to do his math homework, and 10 min to do his Urdu. How long did he take to complete all his homework?
5. Shaista went to sleep at 21:40 hours and got up at 06:30 hours.

   How long did she sleep?

YOUR DIGITAL RESOURCE

6 Perimeter and Area

In this unit students will learn to:

- find perimeter of a 2D figures on a square grid.
- recognise that perimeter is measured in units of length.
- find area of 2D figures on a square grid.
- recognise that area of a square is measured in meter square (m^2) and centimeter square (cm^2)

MATH FLASH

You have already learnt:

- to identify the perimeter of a square and a rectangle using a centimetre grid
- to identify the area of a square and a rectangle using centimetre grid
- calculate the area and perimeter of a square and a rectangle using a formula

KEY VOCABULARY

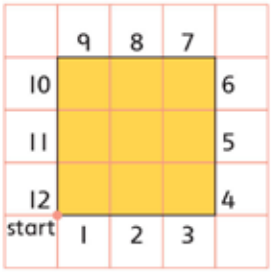
perimeter, area, square unit, composite shapes, square, rectangle, centimetre, grid

Perimeter

We have already learnt that **perimeter** is the boundary of a closed shape.

To find the perimeter we simply add all the sides of the boundary.

Look at the figure given below, drawn in a grid made of unit squares.



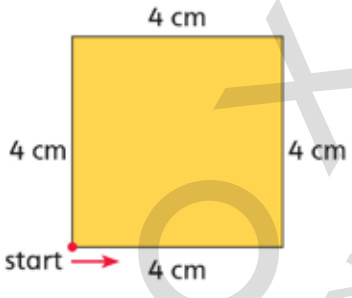
REMEMBER

Start from a point and add all sides clockwise or anti-clockwise till you reach the point from where you started.

Count the unit length along the boundary of the shape. The perimeter of the given shape is 12 units.

Let us now find the perimeter of a square and a rectangle.

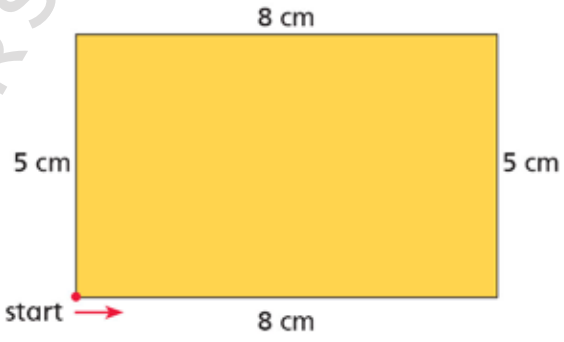
Here, the perimeter will be the sum of lengths of all sides.



Perimeter of square:

4 cm + 4 cm + 4 cm + 4 cm

= 16 cm



Perimeter of rectangle:

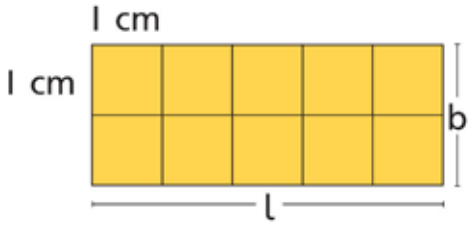
8 cm + 5 cm + 8 cm + 5 cm

= 26 cm

Now look at this rectangle. It is made up of 10 small squares with each side equal to 1 cm.

There are 2 rows of 5 squares each.

There is a simple way of finding the perimeter of a rectangle.



To find the perimeter we add length (l) and breadth (b) and multiply the sum by 2.

$l + b$ = 5 cm + 2 cm = 7 cm
$(l + b) \times 2$ = 7 cm × 2 = 14 cm

∴ The perimeter of the rectangle = 14 cm

Example:

The length of a rectangle is 10 cm and its breadth is 4 cm. Find its perimeter.

Solution:

$l + b$ = 10 cm + 4 cm = 14 cm
$(l + b) \times 2$ = 14 cm × 2 = 28 cm
∴ the perimeter of the rectangle is 28 cm.

We can find the length of a rectangle, if the perimeter and breadth of rectangle is given.

Example:

The perimeter of a rectangle is 82 cm and its breadth is 20 cm. What is the length of the rectangle?

Divide the perimeter by 2 to get the sum of length and breadth:

82 ÷ 2 = 41 cm
∴ $l + b$ = 41 cm
length = 41 cm − 20 cm
∴ l = 21 cm

Similarly, we can find the breadth of a rectangle if the perimeter and length of the rectangle is given.

Example:

The perimeter of a rectangle is 110 cm and its length is 35 cm. What is the breadth of the rectangle?

First, we divide the perimeter by 2 to get the sum of length and breadth:

$110 \div 2 = 55$ cm

$\therefore l + b = 55$ cm

breadth = 55 cm − 35 cm

$\therefore b = 20$ cm

Area

Look carefully at the given pair of shapes.

The smaller square covers less surface, while the bigger square covers more surface.

> The amount of surface a shape covers is called its **area**.

Examples:

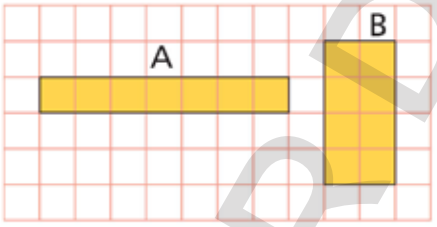
a.  more area  less area

b.  less area  more area

c.  less area  more area

Look at these shapes:

It is not easy to tell which shape has the greater area. Let us put the shapes on squared paper:



How many square does each shape cover?

Shape A covers 7 squares.

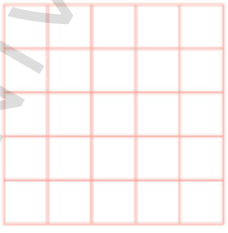
Shape B covers 8 squares.

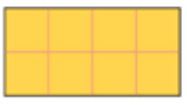
So, B has a larger area than A.

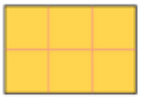
Comparison of areas

The best shape for measuring areas is the **square**.

You may have a notebook with squared paper on it, just like this

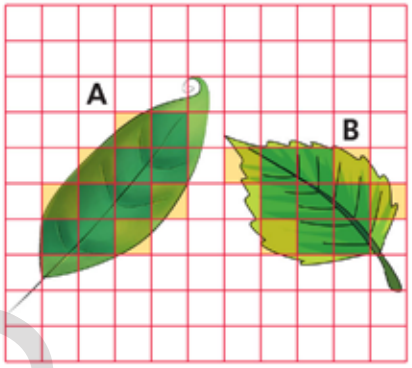


The area of this shape is 8 squares. 

The area of this shape is 6 squares. 

Higher Order Thinking Skills

Area of irregular shapes



Here, two leaves of different shapes and sizes have been placed on a grid of squares.

How can we measure the area of each leaf?

First, we count the number of whole squares each leaf covers.

Next, we look at the parts of squares that are covered.

If more than half of a square has been covered, we count it as a whole square. If less than half of a square has been covered, we do not count it.

By this method we estimate the areas of the two leaves:

Leaf A covers 7 whole squares and 6 squares cover more than half.

$\therefore$ Area of leaf A $\approx$ 13 squares.

$\approx$ stands for **approximately equal**.

Leaf B covers 7 whole squares and 4 squares cover more than half.

$\therefore$ Area of leaf B $\approx$ 11 squares.

So, the area of leaf A $\approx$ area of leaf B.

ACTIVITY

Ask your teacher for a large sheet of squared paper (graph paper).
Very carefully trace the outline of your hand on it.

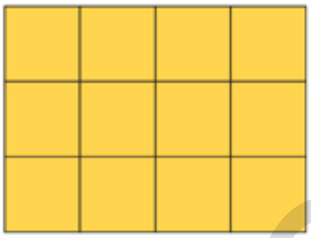
a. Estimate the area covered by your hand. Then, count the squares and find the actual area.

b. Now compare the outline of your hand with that of your classmate.

c. Whose hand has a larger area?

Units of area

Given below is a grid made up of small squares. With your ruler, find out how long each square's side is.



Each side is exactly 1 cm long.

The grid is made up of 12 small squares. 

Each square has an **area** of **1 square centimetre**.

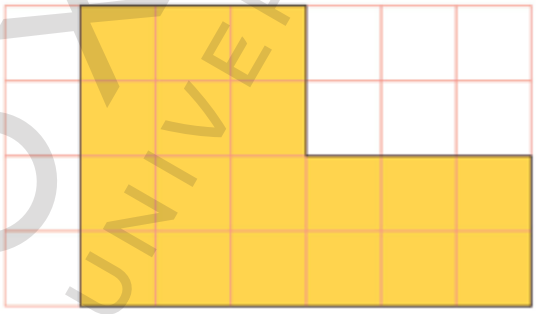
We say: 'One centimetre squared'.

We write: **1 cm²**

The little number '2', raised high to the right of 'cm', is a special symbol for the area, or number of **squares** covered.

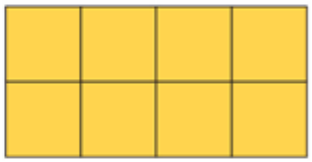
Example:

Write down the area of the given shape in cm².



Area of the given shape is 18 cm².

Look at this rectangle. It is made up of 8 small squares, each with an area of 1 cm^2.



Area = 8 cm^2

There are 2 rows of 4 squares each.

There is a very simple way of finding the area of a rectangle.

To find the area we multiply the length (l) of the rectangle by the breadth (b) (breadth is another word for width).

Here, $l \times b$ = 4 cm × 2 cm = 8 cm^2

$\therefore$ the area of the rectangle is 8 cm^2

We can find the length of a rectangle, if the area and the breadth of the rectangle is given.

Example:

The area of a rectangle is 96 cm^2 and its breadth is 8 cm.
What is the length of the rectangle?

Solution:

Area = $l \times b$
96 cm^2 = l cm × 8 cm
Length = 96 cm ÷ 8 cm
$\therefore$ Length = 12 cm

Similarly, we can find the breadth of a rectangle, if the area and length of the rectangle is given.

Example:

The area of a rectangle equals 150 cm^2 and its length is 10 cm.
What is the breadth of the rectangle?

Solution:

Area = $l \times b$
150 cm^2 = 10 cm × b cm
150 cm^2 ÷ 10 cm = b cm
$\therefore$ breadth = 15 cm

ACTIVITY

Ask your teacher for a metre ruler or a measuring tape. Then measure and work out:

a. The area of your desk.

b. The area of the board in your classroom.

c. The area of your classroom (to the nearest m^2).

Compare your answers with those of your friends.

Area and perimeter

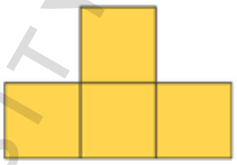
Shapes with the same area can have different perimeters.

Example:

Consider two shapes made up of four small squares with each side of 1 cm.

a. 

A

b. 

B

a. Area = 4 cm^2
Perimeter = 8 cm

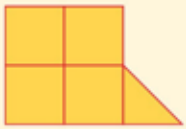
b. Area = 4 cm^2
Perimeter = 10 cm

We notice that although the areas of both these shapes are the same, that is 4 cm^2, the perimeters of these shapes are different.
Perimeter of shape A = 8 cm
Perimeter of shape B = 10 cm

▶ Exercise 6

1. Fill in the blanks.

   a. The area of a rectangle is square unit

   b. The area of  is 4 1/2 cm².

   c. The perimeter of a rectangle with length 2 cm and breadth 1 cm is 6 cm.

   c. $l + l + b + b$
   $2 + 2 + 1 + 1 = 6$

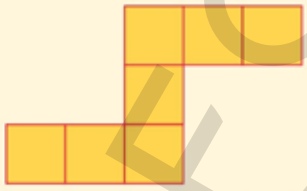
   d. The area of a rectangle with length 3 cm and breadth 4 cm is 12 cm².

   d. $l \times b$
   $3 \times 4 = 12$

   e. The perimeter of the shape  is 10 cm.

2. State whether the following are true or false.

   a. The amount of surface a shape covers is called its area. (True)

   b. The area of  is 9 cm (False)

   Area = 7 cm²

   c. The perimeter of a rectangle is equal to 2 (l + b) cm. (True)

   d. The area of a rectangle is 4 cm² and its length is 1 cm, then its breadth is 4 cm. (True)

   e. Two shapes having the same area, must have the same perimeters. (False)

   No, different perimeter.

3. Select the correct answer from the given options.

   a. If l = 5 cm, b = 4 cm then the perimeter of the rectangle is

   Ⓐ 20 cm Ⓑ 18 cm²

   Ⓒ 18 cm Ⓓ 9 cm

   $2(l + b)$ cm
   $2(5 + 9) = 18$ cm

   b. If the perimeter of a rectangle is 26 cm and its length is 7 cm, then its breadth will be

   Ⓐ 13 cm Ⓑ 19 cm²

   Ⓒ 33 cm Ⓓ 6 cm

c. The area of a room is 42 m^2 and its length is 7 m. Its breadth will be

area = l × b

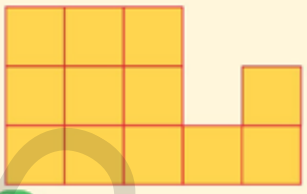
42 = 7 × b

b = 42/7

= 6 cm

(A) 6 m
(B) 6 m^2
(C) 284 m^2
(D) 49 m

d. The area of the given shape is

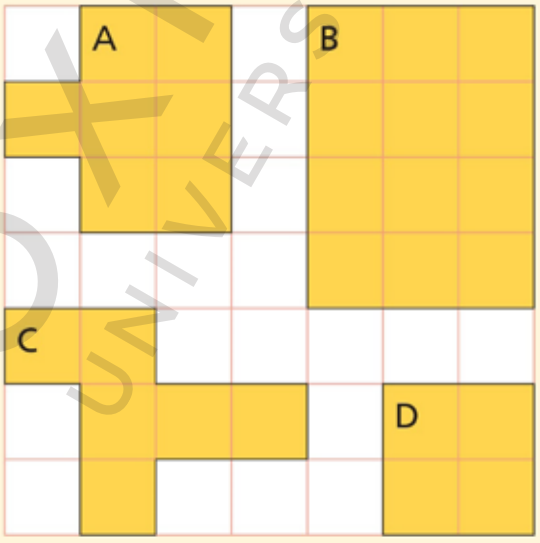


(A) 17 cm^2
(B) 12 cm^2
(C) 12 cm
(D) 17 cm

e. The area of a rectangle is 30 cm^2 and its length is 10 cm. Its breadth will be.

(A) 3 cm
(B) 15 cm
(C) 6 cm
(D) 3 cm^2

4. Look at these shapes carefully. Each shape is made up of small squares with each side equal to 1 cm.



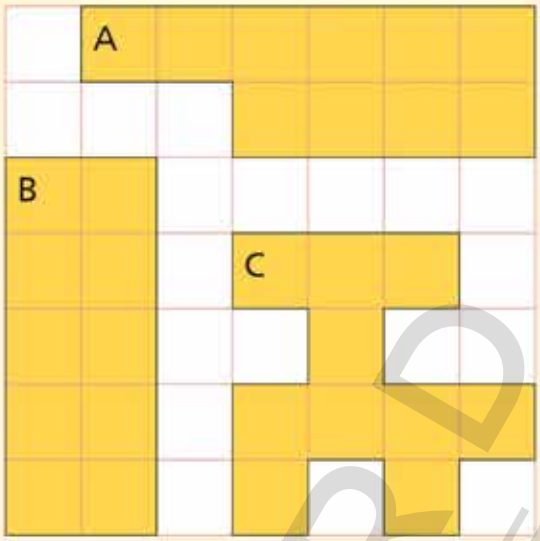
a. A = 12 cm
B = 14 cm
C = 14 cm
D = 8 cm

b. A = 7 cm^2
B = 12 cm^2
C = 6 cm^2
D = 4 cm^2

a. Find the perimeter of each shape in cm.
b. Write the area of each shape in cm^2.

5. Each of these shapes is made up of ten squares.

Hint = Count the edges of the coloured boxes



greatest perimeter = C

smallest perimeter = B

A = 16 cm
B = 14 cm
C = 22 cm

Calculate the perimeter of each shape and find the greatest and the smallest perimeters.

6. Complete the following table, by finding the length or the breadth of the rectangle.

6. a.

	Perimeter	*l*	*b*
a.	20 cm	6 cm	4 cm
b.	28 cm	9 cm	5 cm
c.	34 cm	12 cm	5 cm
d.	70 cm	20 cm	15 cm
e.	300 cm	100 cm	50 cm

$P = 2(l + b)$

$\frac{20}{2} = 6 + b$

$10 - 6 = 6$

$b = 4$ cm

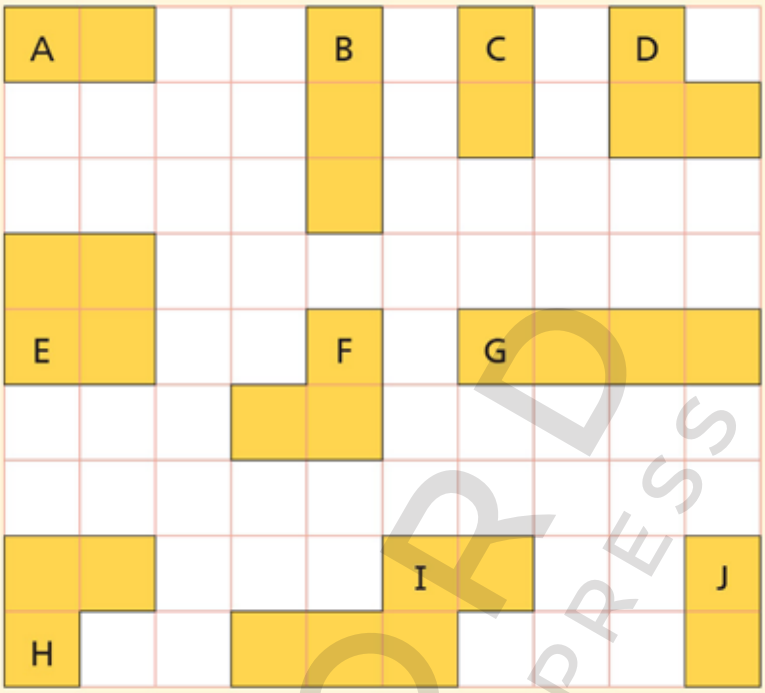
7. Tick the shape with the smaller area.

a.  

b.  

c.  

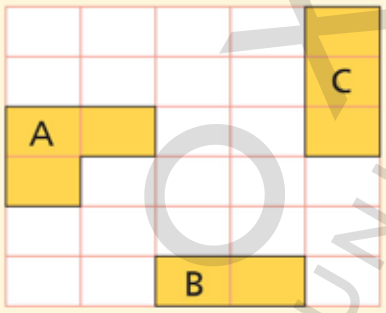
8. Look at the following shapes in the grid and answer the questions.



a. Which shapes have the same area as shape A? C and J
b. Which shapes have the same area as shape H? B, D and F
c. Which are the shapes with the largest area and the smallest area? A, C, J ↳ I

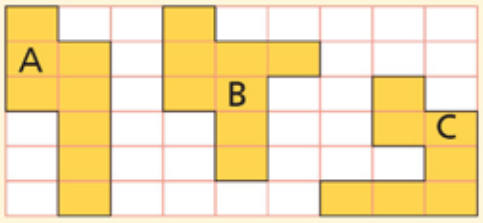
9. Which two shapes in each group have the same area?

a.



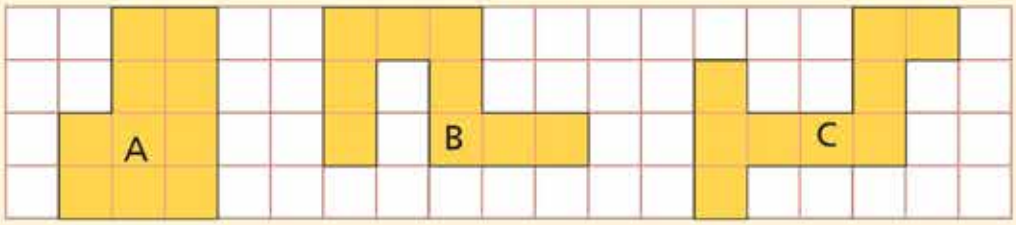
A and C

b.



A and B

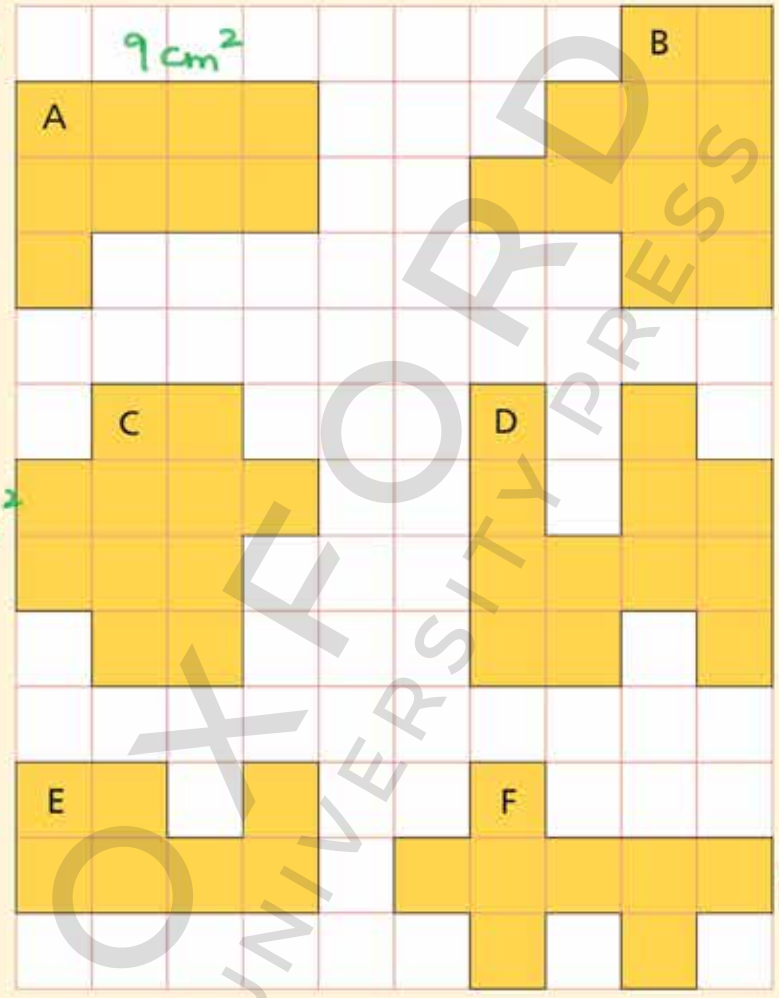
c.



B an

10. Write the area of these shapes in square centimetre.

hint: count the number of coloured squares to find the area of each shape



9 cm²

11 cm²

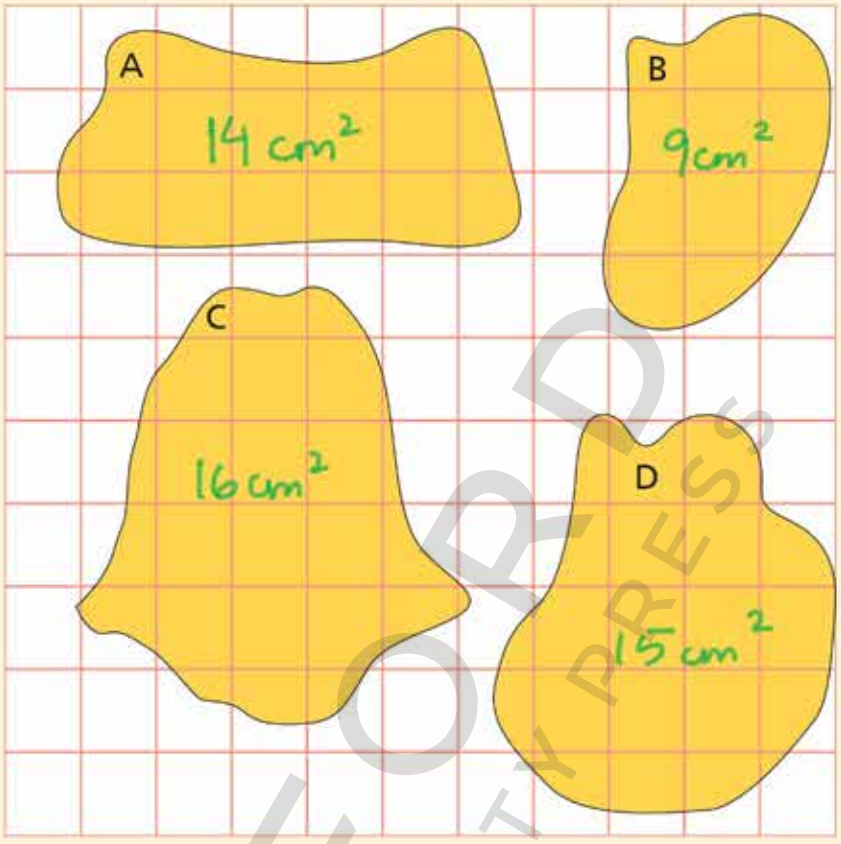
11 cm²

12 cm²

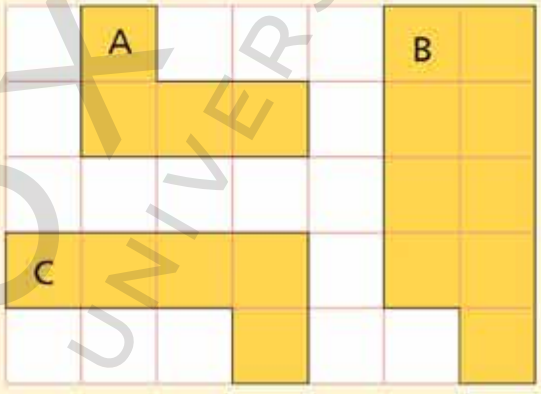
7 cm²

8 cm²

11. Estimate the approximate areas of these shapes (in squares).



12. Write down the area, in cm², of each shape.



A = 4 cm²
B = 9cm²
C = 5cm²

13. Draw the shapes of the following area on centimetre squared paper.

a. 8 cm² b. 9 cm² c. 7 cm² d. 1 cm²

eter Product Area Perim

Q 13 Exercise 6,

a b.

14. Copy and complete this table.

Rectangle		
l	b	area
a. 20 cm	50 cm	100 cm²
b. 24 cm	3 cm	72 cm²
c. 9 cm	4 cm	36 cm²
d. 9 cm	6 cm	54 cm²
e. 12 cm	10 cm	120 cm²

a. area = $l \times b$

$100 = 20 \times b$

$\frac{100}{20} = b$

$b = 50\text{cm}^2$

b. area = $l \times b$

$= 24 \times 3$

$= 72\text{cm}^2$

15. Find out the area of each of the following carpets.

a.

$l \times b$

$4 \times 6 = 24\text{cm}^2$

b.

$l \times b$

7×3

$= 21\text{cm}^2$

c.

$l \times b$

4×3

$= 12\text{cm}^2$

Which carpet has the largest area? Carpet a

16. Saleem wants to build a house. This is the plan of his house.

What is the total area of Saleem's house?
[Hint: kitchen = 2 m × 3 m = 6 m²]

hint = find the area of all the rooms and add them together

bedroom = $l \times b = 2 \times 4 = 8$

bathroom = $l \times l = 2 \times 2 = 4$

living room = $l \times b = 3 \times 5 = 15$

play room = $2 \times 3 = 6$

store = $2 \times 2 = 4$

kitchen = 6

total area =

$8 + 4 + 15 + 6 + 4 + 6$

$= 43\text{cm}^2$

17. Find the area and perimeter of each of the following rectangles.

a. l = 4 cm, b = 3 cm

b. l = 7 cm, b = 4 cm

c. l = 5 cm, b = 1 cm

d. l = 8 cm, b = 2 cm

18. Complete the following table.

Rectangle			
length	breadth	area	perimeter
a. 4 cm	5 cm	20 cm^2	18 cm
b. 10 cm	2 cm	20 cm^2	24 cm
c. 9 cm	7 cm	63 cm^2	32cm
d. 8 cm	7 cm	56cm^2	30cm
e. 11 cm	4 cm	44cm^2	30cm

▶ Real-life Story Sums

Solve.

1. The perimeter of a field is 300 m and its length is 100 m. Find its breadth and area?
2. A rectangle is 15 cm long and 7 cm wide. What is its area and perimeter?
3. Mr Kamal has a beautiful lawn in his garden. Its area is 54 m^2 and its breadth is 6 m. What is its length?
4. A swimming pool is 10 m long and covers an area of 60 m^2. What is its breadth?
5. Saeed's bed is 2 m long and 1 m wide. How much area of the room does it occupy? If Saeed walks around it once, what distance does he cover?
6. The walls around a playground measure 410 m. If one wall along the length of the playground is 80 m long, what is the length of the wall along its breadth? What is the area of the playground?

Unit 6 – Exercise 6

Q17a Perimeter = $2(l+b)$
$= 2(4+3)$
$= 2(7)$
$= 14\text{cm}$

Area = $l \times b$
$= 4 \times 3$
$= 12\text{cm}^2$

b. perimeter = $2(l+b)$
$= 2(7+4)$
$= 2(11)$
$= 22\text{cm}$

Area = $l \times b$
$= 7 \times 4$
$= 28\text{ cm}^2$

c perimeter = $2(l+b)$
$= 2(5+1)$
$= 2(6)$
$= 12\text{cm}$

Area = $l \times b$
$= 5 \times 1$
$= 5\text{ cm}^2$

d perimeter = $2(l+b)$
$= 2(8+2)$
$= 2(10)$
$= 20\text{cm}$

area = $l \times b$
$= 8 \times 2$
$= 16\text{cm}^2$

Unit 6 – Exercise 6

Real-life story sums

1. perimeter $= \frac{300}{2}$

$l + b = 150$

$100 + b = 150$

$b = 150 - 100$

$b = 50\,m$

area $= l \times b$

$= 100 \times 50$

$= 5000\,m^2$

2. area $= l \times b$

$= 15 \times 7$

$= 105\,cm^2$

perimeter $= 2(l + b)$

$= 2(15 + 7)$

$= 2(22)$

$= 44\,cm$

3. area $= l \times b$

$54 = l \times 6$

$l = \frac{54}{6}$

$l = 9\,m$

4. area $= l \times b$

$60 = 10 \times b$

$b = \frac{60}{10}$

$b = 6\,m$

5. area $= l \times b$

$= 2 \times 1$

$= 2\,m^2$

perimeter $= 2(l + b)$

$= 2(2 + 1)$

$= 6\,m$

6. $410 \div 2 = 205$

$205 = 80 + b$

$b = 205 - 80$

$b = 125\,m$

area $= l \times b = 80 \times 125 = 10000\,m^2$

YOUR DIGITAL RESOURCE

7 Geometry

In this unit students will learn to:

- recognise and identify parallel and non-parallel lines.
- recognise an angle formed by intersection of two rays.
- measure angles in degree (°) by using protractor.
- draw an angle of given measurement and use the symbol (∠) to represent it.
- differentiate acute, obtuse and right angles.
- measure angles using protractor where
  - upper scale of protractor reads the measure of angle from left to right.
  - lower scale of protractor reads the measure of angle from right to left.
- identify right angles in 2D shapes
- describe radius, diameter and circumference of a circle.
- recognise lines of symmetry in two-dimensional (2D) shapes.
- complete a symmetrical figure with respect to a given line of symmetry on square grid/dot pattern.
- compare and sort 3D objects (cubes, cuboids, pyramids, cylinder, cone, sphere)

MATH FLASH

You have already learnt:

- about 2D and 3D shapes and their properties
- about triangles, quadrilaterals, and polygons
- about points, lines, and line segments
- about parallel lines and non-parallel lines
- reflective symmetry in 2D shapes

KEY VOCABULARY

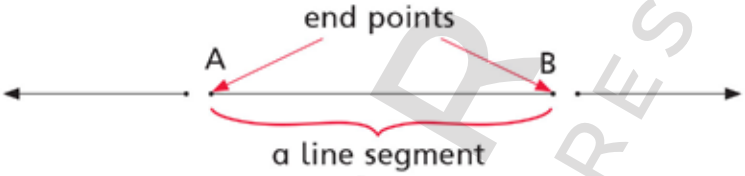
divider, pair of compasses, protractor, set square, straight, curved, horizontal, vertical, parallel, non-parallel, angle, vertex, degree, acute, obtuse, right angle, circle, centre, radius, diameter, circumference, quadrilateral, symmetry

Looking at lines

A line is a set of points, placed together. For example straight, zigzag, wavy, curved, and spiral lines can be made by placing these points in a special way.

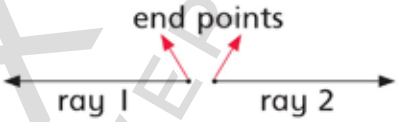
A straight line goes on and on, without changing direction. To show this, arrowheads are sometimes drawn at each end of the line.

If a straight line is cut at two points, then the part of the line between the cuts is called a line segment. A line segment has two end points.



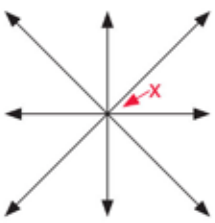
A line segment is the shortest distance between any two points.

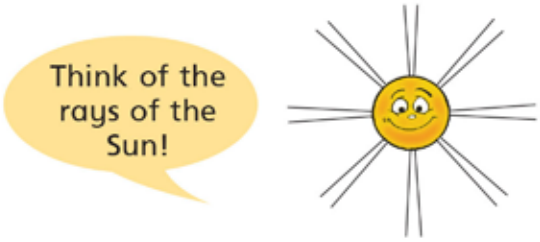
If a straight line is cut at only one point (dividing it into two parts), then each part is called a ray. The point on each ray nearest to the cut is called the end point of the ray:



A ray has one end point only, and goes on and on, in the direction of the arrow.

Here are many rays, all with the same end point X





Drawing a line segment

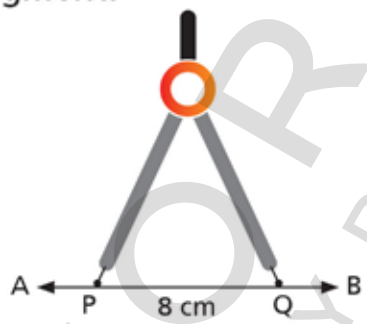
Now, let us draw a line segment of 8 cm using a ruler and a divider.

Step 1 Draw a line $\overleftrightarrow{AB}$ of any length with the help of a ruler.

Step 2 Open the two ends of the divider and measure 8 cm on the ruler.

Step 3 With the same opening that is 8 cm mark two points P and Q on $\overleftrightarrow{AB}$.

PQ is the required line segment.



Measuring straight and curved lines

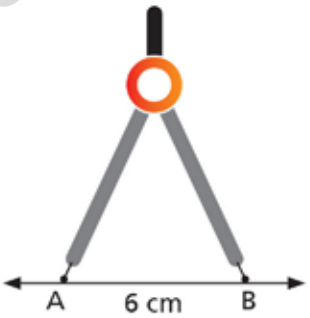
Measuring a straight line

We can measure the length of a given line with the help of a divider and a ruler.

Step 1 Select the length of the line by adjusting the two ends of the divider on end points of the line.

Step 2 Put the divider's ends on the ruler to read the length of the line.

The line $\overline{AB}$ is 6 cm.



Measuring curved lines using a thread

We can draw a curved line and measure its length using a thread.

Step 1 Draw a curved line on a sheet of paper, naming end points as A and B.

Step 2 Take a thread of appropriate length.

Step 3 Tie a knot at one end of the thread.

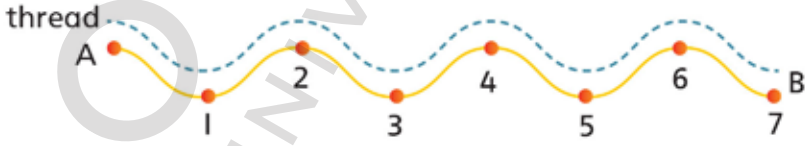
Step 4 Place the knot at A and measure a small length which is almost straight.

Step 5 Placing your thumb on the other end of the measured part, measure the next part. Mark each point as 1, 2, 3, ...

Step 6 Repeat the above steps till the end of the line. Make a knot at the end of the thread.

Step 7 Now straighten the thread and measure the length between the two knots using a scale.

The measured length of thread is the length of the curved line.

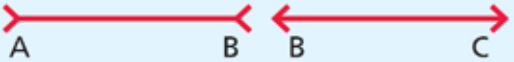


CHALLENGE

Which are further apart, A and B or C and D?

CHALLENGE

Without measuring can you tell which is longer, line AB or BC?

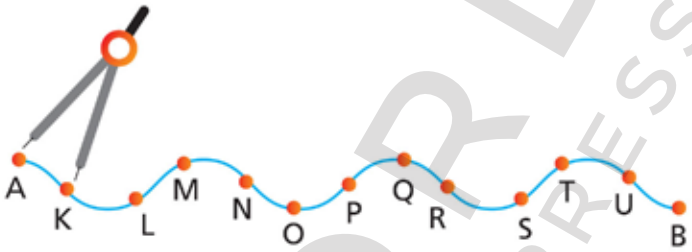


Measuring curved lines using a divider and a ruler

Step 1 Draw a curved line $\overline{AB}$.

Step 2 Open the divider's ends to a suitable length, say 2 cm.

Step 3 Put one end of the divider at A. Mark the other end of the divider on the line as K.



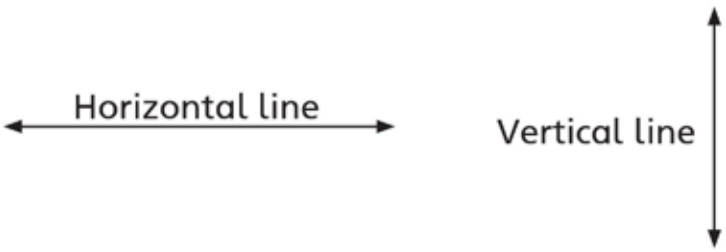
Step 4 Keep on measuring in the same way, putting the divider's ends at K, L, M and so on, till B.

Step 5 Measure the length of the line by adding line segments $\overline{AK}$, $\overline{KL}$, $\overline{LM}$ and so on till $\overline{UB}$ taking each length equal to 2 cm.

This will be the length of the curved line.

Horizontal and vertical lines

In geometry, a horizontal line is the one which runs from left to right. A vertical line is the one which runs up and down the surface.



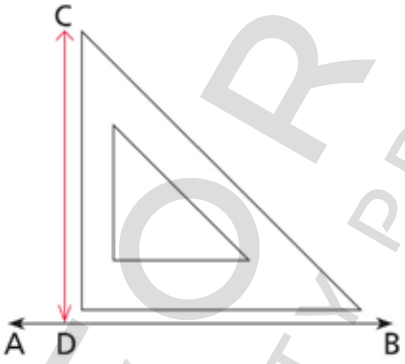
Drawing a vertical line on a given horizontal line using a set square

A set square can be used to draw a vertical line.

Step 1 Draw a horizontal line $\overleftrightarrow{AB}$ with the help of a ruler.

Step 2 Set an edge of the set square on the horizontal line.

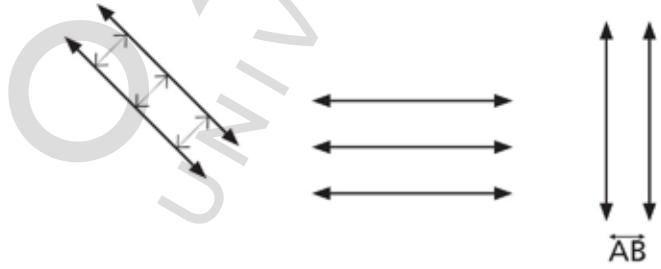
Step 3 Draw a line $\overline{CD}$ as shown in the figure.
$\overline{CD}$ is a vertical line.



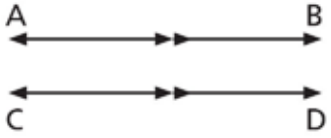
Parallel and non-parallel lines

Parallel lines

Parallel lines are lines which do not meet. Two lines in a plane that do not intersect or touch each other are called parallel lines. The distance between two parallel lines remains the same.



All the above three sets of lines are parallel lines. Parallel lines are always equidistant from each other and are denoted by the symbol ∥.



$\overleftrightarrow{AB} \parallel \overleftrightarrow{CD}$, read as $\overleftrightarrow{AB}$ is parallel to $\overleftrightarrow{CD}$.

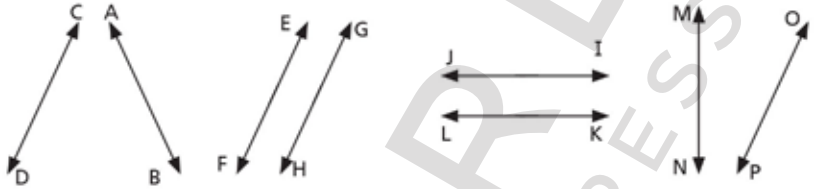
Non-parallel lines

If two or more lines intersect each other or meet at a point, they are called non-parallel lines. Non-parallel lines converge to a point.

$\overleftrightarrow{AB}$ and $\overleftrightarrow{CD}$ are non-parallel lines. When they are extended in the same direction they meet each other at K or we say they intersect each other at K.

Example:

Identify the parallel and non-parallel lines.



Solution:

$\overleftrightarrow{AB}$ and $\overleftrightarrow{CD}$, $\overleftrightarrow{MN}$ and $\overleftrightarrow{OP}$ are non-parallel lines.
$\overleftrightarrow{EF}$ and $\overleftrightarrow{GH}$, $\overleftrightarrow{IJ}$ and $\overleftrightarrow{KL}$ are parallel lines.

Drawing parallel lines

Draw a parallel line to a given straight line using a set square

Let $\overleftrightarrow{AB}$ be a straight line drawn with the help of a ruler.
To draw a line ‖ to $\overleftrightarrow{AB}$ using a set square follow the given steps.

Step 1 Draw a line $\overleftrightarrow{AB}$ of any suitable length.

Step 2 Set the set square and ruler as described on page 160.

Step 3 Keeping the ruler on its place, slide the set square upward as shown in figure 2.

Step 4 Draw a line $\overleftrightarrow{CD}$ holding the set square a few centimetres above $\overleftrightarrow{AB}$. Be careful not to move the ruler from its position.

Step 5 Remove the set square and the ruler.

$\overleftrightarrow{AB} \parallel \overleftrightarrow{CD}$

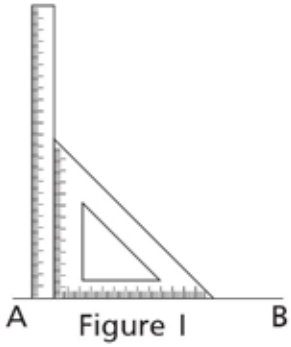


Figure 1

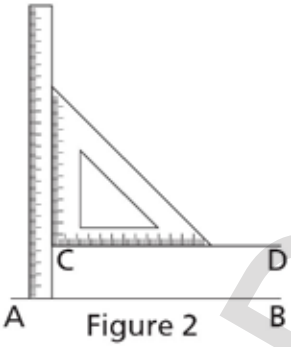


Figure 2

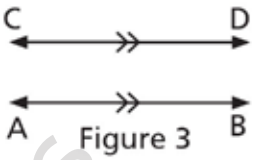


Figure 3

Draw a line which passes through a given point and is parallel to a given line using a set square

Let $\overleftrightarrow{AB}$ be a given line and P a point above the line.

Now, to draw a line $\parallel$ to $\overleftrightarrow{AB}$ and passing through P, follow the given steps.

Step 1 Adjust the ruler and set square against $\overleftrightarrow{AB}$ as shown below in figure 1.

Step 2 Slide the set square upward keeping the ruler fixed, until the straight edge of set square touches the point P as shown below in figure 2.

Step 3 Draw a line along the edge of the set square passing through P and name it $\overleftrightarrow{QR}$.

$\overleftrightarrow{QR}$ is the required line.

$\overleftrightarrow{QR} \parallel \overleftrightarrow{AB}$; $\overleftrightarrow{QR}$ is passing through P as shown in figure 3.

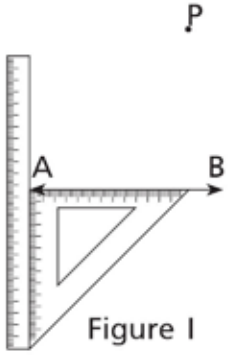


Figure 1

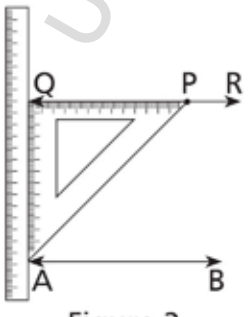


Figure 2

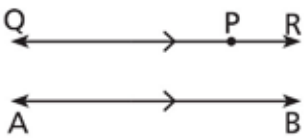
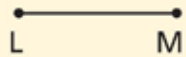
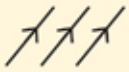


Figure 3

$\overleftrightarrow{AB} \parallel \overleftrightarrow{QR}$

▶ Exercise 7a

1. Fill in the blanks.
   a.  is a line segment.

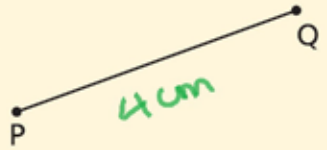
   b.  are parallel lines.
   c. A line is a set of points.
   d. The distance between two parallel lines remains constant.
   e.  These lines intersect each other.

2. State whether the following are true or false.
   a. A line segment is a straight path which has two end points. (True)
   b. A line is a straight path which has one fixed end point. (False) A line has no fixed end point.
   c. A vertical line goes from left to right. (False) goes up to down
   d. Horizontal lines go up and down. (False) goes left to right.
   e. If two or more lines are parallel, they will never meet. (true)

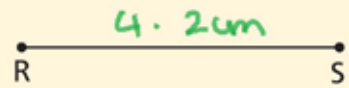
3. Select the correct answer from the given options.
   a. ∥ is the symbol for
      (A) vertical lines
      (B) parallel lines
      (C) non-parallel lines
      (D) horizontal lines
   b. A line segment is the _____ distance between two points.
      (A) shortest
      (B) longest
      (C) curved
      (D) indefinite
   c. The given line  is

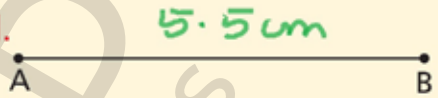
      (A) 4 cm long
      (B) 7 cm long
      (C) 3.9 cm long
      (D) 4.5 cm long
   d. Two or more parallel lines
      (A) always meet at a point
      (B) are perpendicular to each other
      (C) never meet each other
      (D) are always equal in size
   e. All line segments have
      (A) one end point
      (B) two end points
      (C) no end point
      (D) three end points

4. Measure the length of the following line segments with the help of a ruler and divider.

a. 

b. 

c. 

d. 

5. Draw line segments of the following lengths using a ruler and divider.

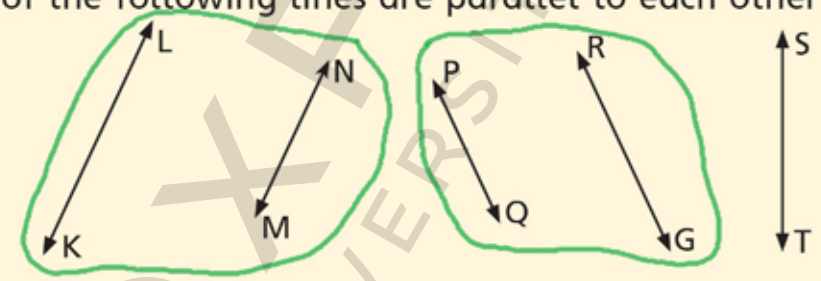
hint = make horizontal or vertical lines

a. 4 cm b. 8 cm c. 10 cm
d. 6 cm e. 9 cm f. 7 cm

6. a. Draw a vertical line of 5 cm. — line will go up to down
b. Draw a horizontal line of 7 cm. — line will go left to right.

7. Which of the following lines are parallel to each other?

KL // MN
PQ // RG



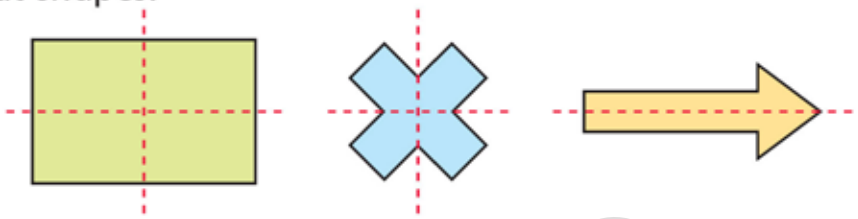
8. Draw $\overline{AB}$ = 5 cm. Take a point P above $\overline{AB}$. Draw a line $\overline{PQ} \parallel \overline{AB}$ passing through P.

9. Take $\overline{XY}$ = 12 cm and $\overline{KL}$ = 12 cm.

Draw $\overline{XY} \parallel \overline{KL}$ using a set square.

Symmetry

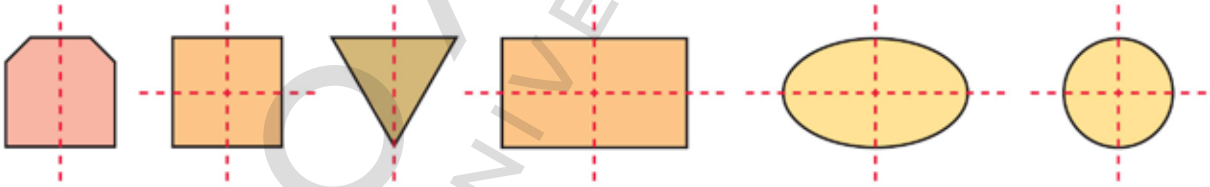
In previous class you have studied reflective symmetry in two dimensional shapes.



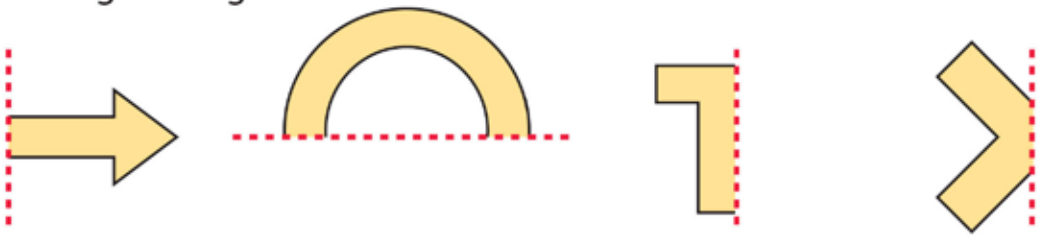
The dotted lines divide the figures in two identical halves. It means one half is reflection of other half. The dotted lines are known as lines of symmetry.

In our surroundings lots of objects are symmetrical. Few have been shown in the above illustrations.

Symmetry in 2 dimensional geometrical shapes



Now look at the following shapes. Draw same shapes on the other side of line of symmetry.



▶ Exercise 7b

1. Does the dotted line on each letter represent a line of symmetry?

a. B yes b. D yes c. U yes

d. V yes e. W no f. H yes

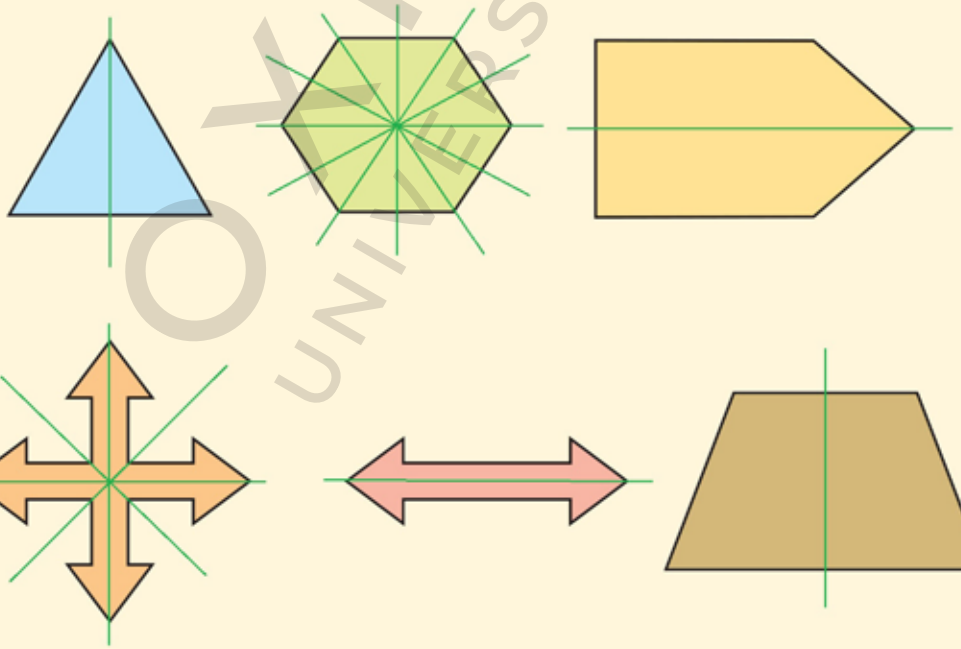
g. Z no h. Y no i. M yes

2. Draw the line of symmetry in the following pictures.

no line of symmetry

no line of symmetry

3. Draw all possible lines of symmetry for the following geometrical shapes.



Angles

Sara has a beautiful fan.

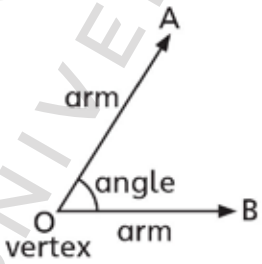
Let us see what happens as she slowly opens her fan.

As Sara **turns** one arm of the fan, the gap between the two arms of the fan increases.

We use a special word to describe the amount of turn between two arms, or two rays that have a common end point. That special word is **angle**.

We can say that an angle is the amount of space between two intersecting lines or rays meeting at a common point. The two rays are called the **sides** or arms of the angle and the point where they meet is called the **vertex**.

Now look at the given figure.



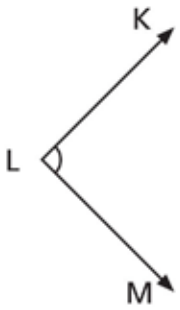
Here,

$\overrightarrow{OA}$ and $\overrightarrow{OB}$ are the **arms** of the angle and O is the **vertex**.

The angle is denoted as $\angle AOB$.

The unit for measuring angles is called **degree** and is denoted by (°).

Examples:

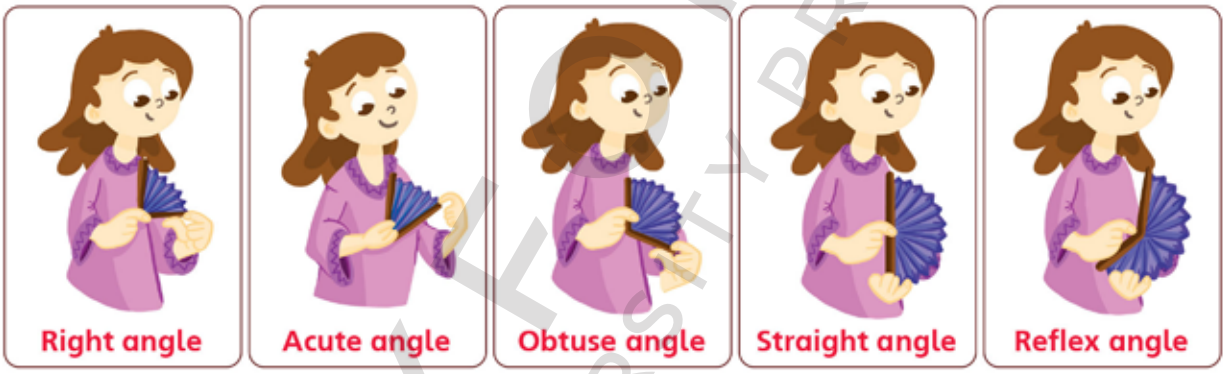


In ∠KLM, the arms of the angles are $\overrightarrow{LK}$, and $\overrightarrow{LM}$, and L is the vertex.

In ∠PQR, the arms of the angle are $\overrightarrow{QP}$ and $\overrightarrow{QR}$, and Q is the vertex.

Types of angles

There are several different types of angles. Here, Sara uses her fan to show these:

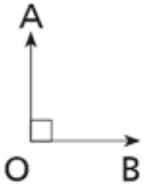


Cut two strips of card and fasten them with a paper fastener or paper clip at one end.

You can colour them differently.

Turn **one** of the strips to make a **right angle**:

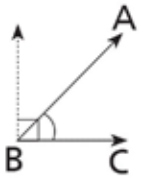
A right angle



Angle AOB is a right angle.

Now make an angle **smaller** than a right angle by turning your strip back a little. You have now made an **acute angle**.

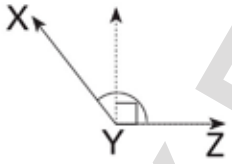
An acute angle



∠ABC is an acute angle.

Now turn your strip beyond a right angle but not as far as a straight angle. This is called an **obtuse angle**.

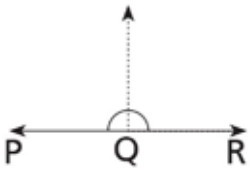
An obtuse angle



∠XYZ is an obtuse angle.

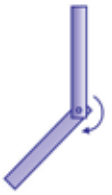
Now turn your strip beyond an obtuse angle to make a straight line. This is called a **straight angle**.

A straight angle

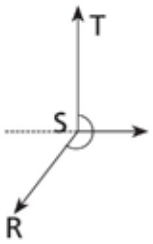


∠PQR is a straight angle.

Lastly, turn your strip even further, beyond a straight angle. You have made a **reflex angle**.



A reflex angle



∠RST is a reflex angle.

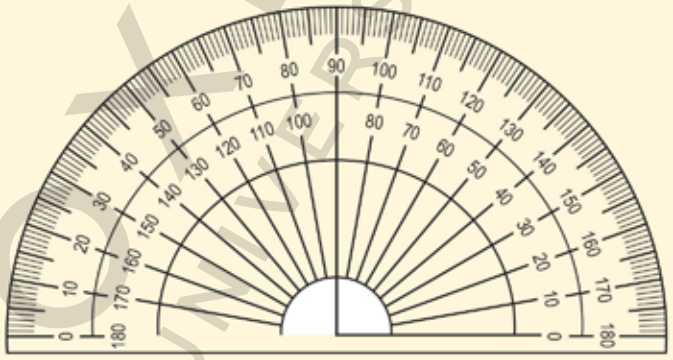
Measuring angles

ACTIVITY

Do you have this in your pencil box?

It is a special instrument called **the protractor.**

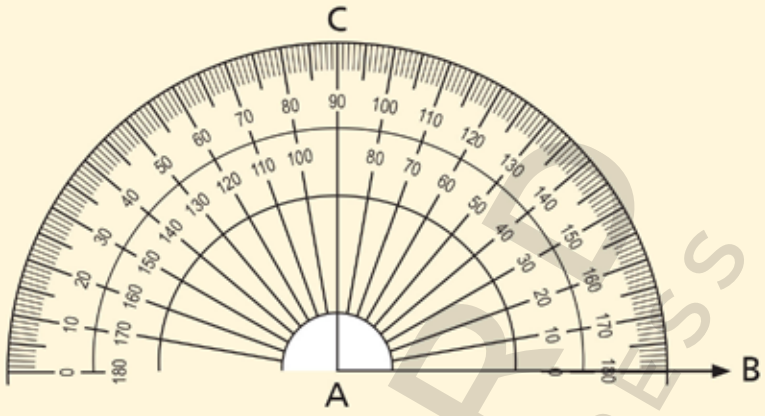
Just as we use a ruler to measure length, we use the protractor to measure **angles.**



a. What is the shape of the protractor?
b. Starting at the **left** of the protractor, what is the very first number marked?
c. Going round the edge of the protractor, what is the next number marked?
d. Which number is found exactly halfway round the protractor?
e. Which is the very last number marked at the right-hand side of the protractor?

Draw a base line 6 cm long and label it AB. Now place your protractor so that the middle of its bottom line is exactly on A.

Find the **90** mark on the protractor and mark it **C**. Remove the protractor. Join C to A. What angle have you drawn?



The unit for measuring angles is the **degree**.

Two strips of card can be used to make angles. Turn one strip beyond the straight angle to form a reflex angle.

Now continue turning the strip until it joins the other one again.

You have made a **complete turn**. The shape drawn by the tip of the strip after a complete turn is a **circle**.

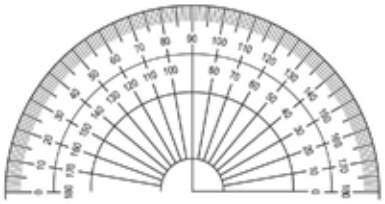
To measure angles, we therefore, divide circles (complete turns) into equal parts called **degrees.**

The number of degrees in a complete turn is **360.**

The special symbol for 'degree' is a '°' written to the right of the number, and high up. So, 360 degrees is written as 360°.

Using the protractor

Let us look again at the half-circle protractor.



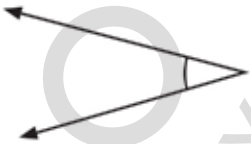
We see that there are two rows of numbers marked on its edge.

The row on the top starts at 0° at the far left of the protractor and ends at 180° at the far right.

The other, lower row, goes in the opposite direction.

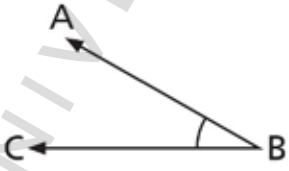
Example:

1. Look at the angle you want to measure.

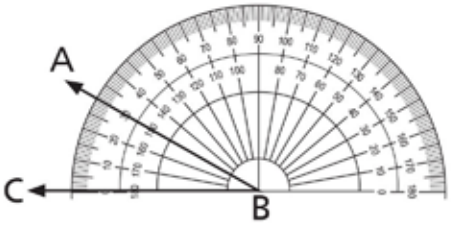


Is it an acute, obtuse, or a right angle?

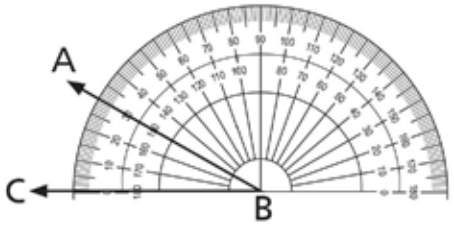
Label the angle as ABC.



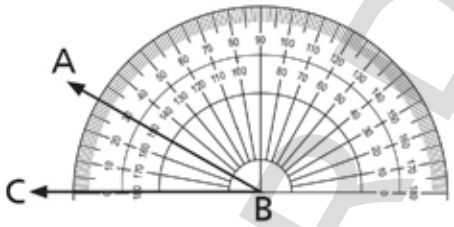
2. Place the centre point of the protractor on the vertex of the angle (B).



3. Put the 0 mark along the arm BC.

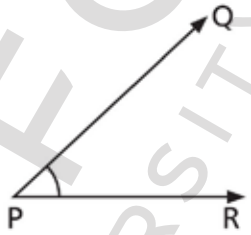


4. Now look very carefully, at what number in the top row of markings, the $\overrightarrow{AB}$ arm of the angle crosses the protractor.



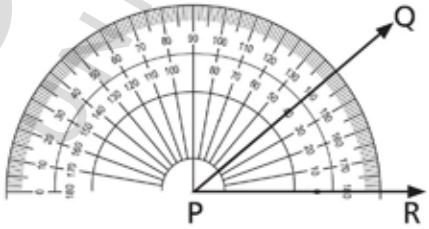
Since the $\overrightarrow{AB}$ arm crosses at the number 30, so $\angle ABC = 30°$.

We understood how to measure an acute angle opening to the left. But look at this angle:



It is an acute angle, but this time it opens to the right.

We follow the same steps, but this time we need to use the **lower row** of numbers to find the point where arm $\overrightarrow{PQ}$ crosses the protractor:

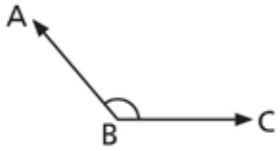


PQ crosses at the 40° mark.

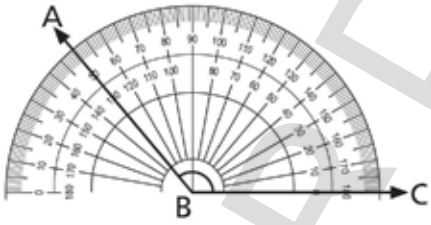
$\therefore \quad \angle QPR = 40°$

If you wish, you can take the upper row of numbers by placing the protractor along $\overrightarrow{PQ}$.

It is easy to measure obtuse angles, following the same steps as before.



Since our angle is obtuse, we know it must be more than 90°.
This helps us decide which row of markings we should use.

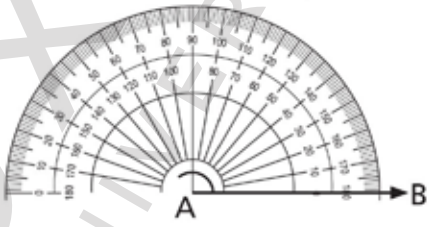


Here, we use the lower row of markings, and measure from $\overrightarrow{BC}$ to $\overrightarrow{AB}$.
$\angle ABC = 130°$

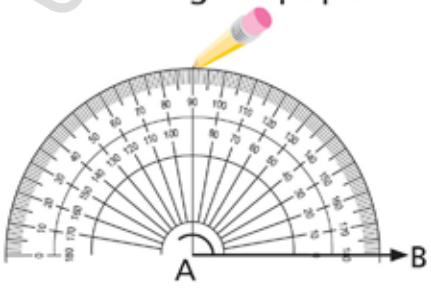
Drawing a right angle using a protractor

To draw an angle of 90°, first draw a ray AB about 6 cm long.

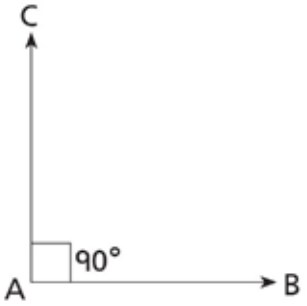
Place the centre of the protractor at the point A.



Now find the 90° mark by moving up your protractor away from B.
Carefully mark this point as C on your paper.



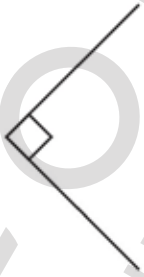
Now, remove the protractor. Join this mark to A, making a vertex.



Write 90° inside your angle.

We already know that if two sides of an angle can be used to form a square, that angle is a right angle.

When we mark a right angle, we use a **special square symbol.**



Whenever you see this symbol, you know that the angle is a right angle.

a right angle **an acute angle**

Nearly all buildings form a right angle with the ground:

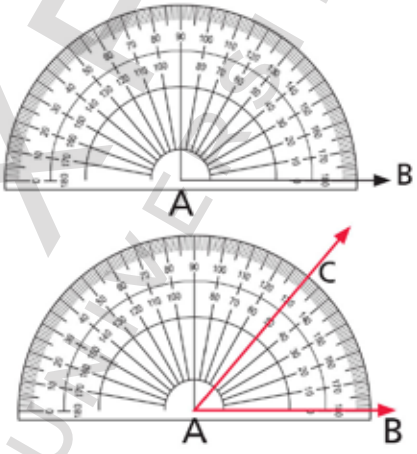
An exception is the famous Leaning Tower of Pisa, in Italy.
The Leaning Tower is leaning and still standing.

Drawing angles

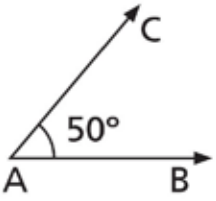
Drawing acute and obtuse angles using a protractor

To draw an acute angle, first draw a ray $\overrightarrow{AB}$ about 6 cm long.

We know that an acute angle is smaller than 90°. Let us take an angle of 50°. Place the centre of the protractor at point A. Now find the 50° mark by moving along the marks away from B. Carefully, mark this point as C on the paper.



Remove the protractor. Join C to A. A is the vertex.



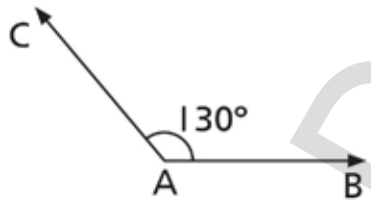
∠CAB or ∠BAC is equal to 50° and it is an acute angle.

To draw an obtuse angle we follow the same steps as above.

We know that the obtuse angle is greater than 90°.

Let us draw an angle of 130°.

Following the same steps as above, we start measuring the angle from B, moving upward along the protractor we reach 130° and mark it as C. We join A to C. ∠BAC or ∠CAB is the required obtuse angle.



Draw an angle equal in measure to a given angle using a protractor

Step 1 Let ∠PQR be the given angle.

Step 2 Measure ∠PQR with the protractor.

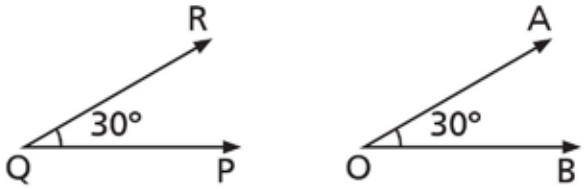
Step 3 Now draw a ray $\overrightarrow{OB}$ of suitable length.

Step 4 Put the protractor on $\overrightarrow{OB}$ with its centre at O.

Step 5 Starting from B, read the degrees on the protractor until you reach the reading equal to the magnitude of ∠PQR.

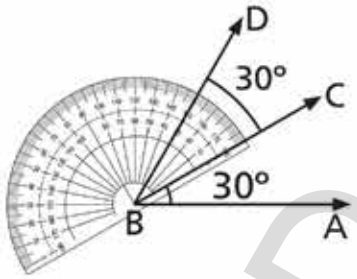
Mark this reading as point A.

Join A to O. ∠AOB = ∠PQR = 30°



Draw an angle twice the measure to a given angle

Step 1 Draw ∠ABC = 30° using a protractor.



Step 2 Take BC as the base line. Put the protractor on BC, such that B is on the centre of the protractor.

Step 3 Mark 30° on the protractor and name it as D.

Step 4 Join B and D.

Step 5 Measure ∠ABD.

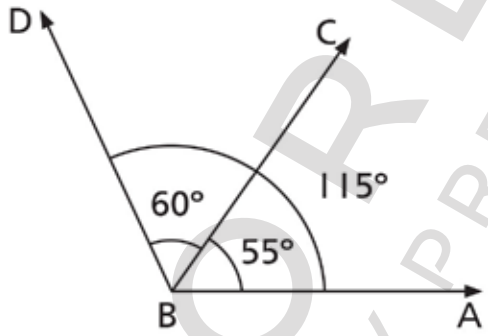
∠ABD = 60° which is twice of ∠ABC.

Draw an angle equal in measure to the sum of two given angles using a protractor

Consider two angles: ∠ABC = 55° and ∠CBD = 60°

Step 1 Make an angle ∠ABC = 55° using a protractor.

Step 2 Taking B as the centre of the protractor and $\overrightarrow{BC}$ as the base line of the protractor, make another angle of 60°. ∠CBD = 60°.



Step 3 Measure angle ABD.
∠ABD = 115°

Hence, ∠ABC + ∠CBD = ∠ABD
55° + 60° = 115°

Hence, ∠ABD is equal to the sum of ∠ABC and ∠CBD.

Exercise 7c

1. Fill in the blanks.
   a. In ∠MNO, N is the vertex of the angle.
   b. A right angle is equal to 90 degrees.
   c. An angle less than a right angle is called an acute angle.
   d. An angle greater than 90° but less than 180° is called an obtuse angle.
   e. The protractor is a device to measure or draw an angle.

2. State whether the following are true or false.
   a. An angle of 80° is a right angle. (False) right angle = 90°
   b. In ∠PQR, PQ and QR are the arms of the angle. (True)
   c. A protractor has two scales, upper scale and lower scale. (True)
   d. An angle of 130° is an acute angle. (False) acute angle = >90°
   e. A protractor has a semi-circular shape. (True)

3. Select the correct answer from the given options.
   a. The angles made by the sides of a square are
      (A) 180° (B) 90°
      (C) 100° (D) 0°
   b. If ∠PQR = 80° and ∠XYZ = 40° then ∠PQR + ∠XYZ is
      (A) an acute angle (B) a right angle
      (C) a straight angle (D) an obtuse angle
   c. ∠LMN is

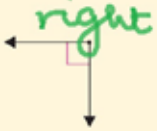
      (A) an acute angle (B) a straight angle
      (C) an obtuse angle (D) a right angle
   d. An obtuse angle is
      (A) greater than 180° (B) equal to 90°
      (C) greater than 90° (D) less than 90°
   e. ∠MON is

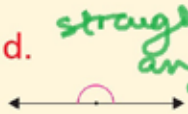
      (A) a right angle (B) an acute angle
      (C) a straight angle (D) an obtuse angle

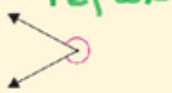
4. Name the following angles.

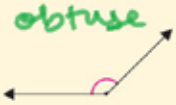
a. acute 

b. right 

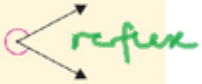
c. right 

d. straight angle 

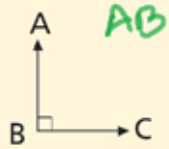
e. reflex 

f. obtuse 

g. acute 

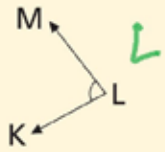
h. reflex 

5. Name the arms of these angles.

a. AB and BC 

b. WX and XY 

6. Name the vertex of these angles.

a. L 

b. T 

7. Draw the following angles and label them.

a. ∠EFG (vertex F)
b. ∠JKL (vertex K)
c. ∠STU (vertex T)
d. ∠MNO (vertex N)

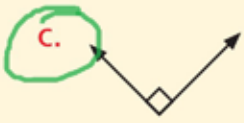
8. Draw the following angles matching the names.

a. ∠PQR (acute angle)
b. ∠ABC (reflex angle)
c. ∠DEF (obtuse angle)
d. ∠WXY (right angle)
e. ∠RST (reflex angle)
f. ∠LMN (right angle)

9. Tick the right angles.

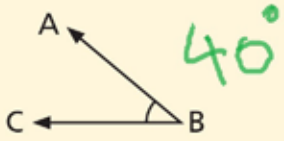
a. 

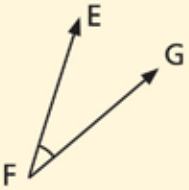
b. 

c. 

d. 

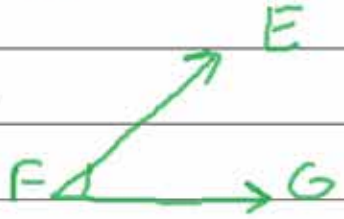
10. Measure these angles with the help of a protractor.

a. 40° 

b. 30° 

Unit 7 – Exercise 7b

7. a.

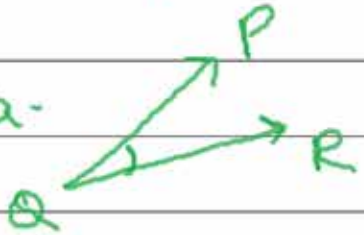


b.

c.

d.

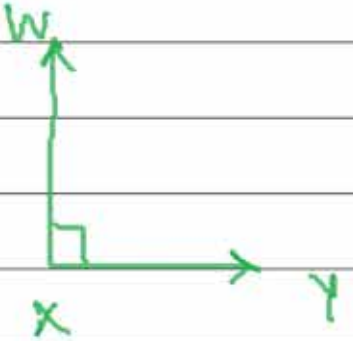
8. a.



b.

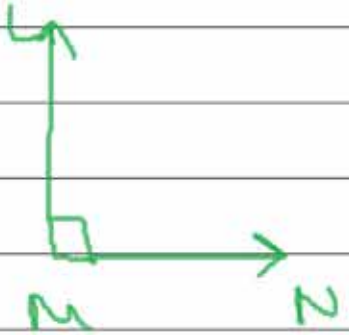
c.

d.

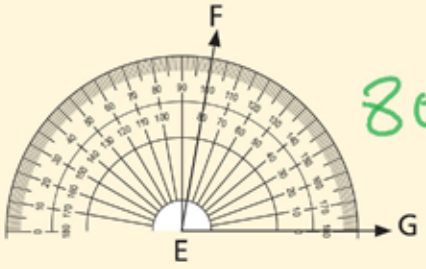


e.

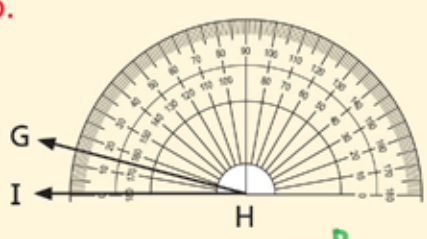
f.



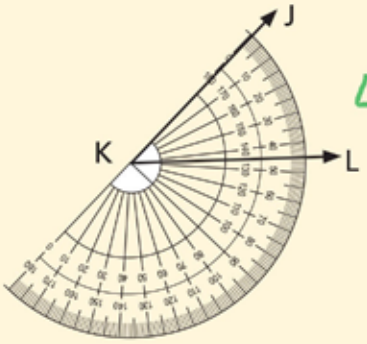
11. Look at the protractors and write down the angles they show.

a. 

80°

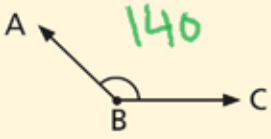
b. 

15°

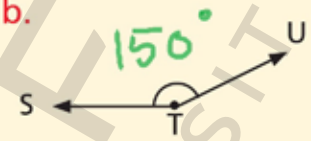
c. 

45°

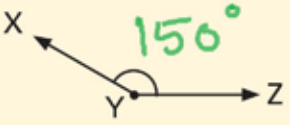
12. Measure the following obtuse angles.

a. 

140°

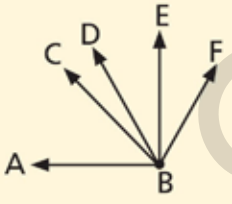
b. 

150°

c. 

150°

13. Measure the angles shown below and complete the table.



∠ ABC	=	45 °
∠ ABD	=	60 °
∠ ABE	=	90 °
∠ ABF	=	120 °
∠ CBE	=	45 °
∠ DBF	=	60 °

14. Draw these angles using a protractor.

a. 30°	b. 65°	c. 50°	d. 125°
e. 70°	f. 10°	g. 90°	h. 75°
i. 110°	j. 155°	k. 45°	l. 170°
m. 130°	n. 105°	o. 25°	p. 180°

Circle

A complete turn has 360°.

The shape made by one complete turn is the shape of a circle.

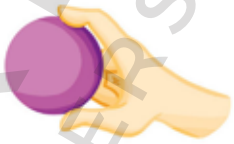
Look at Sara's fan, now fully opened to make a circle.

If we measure each fold of her fan, from the centre to the edge,
we find that the length stays the same.

A circle is the path of a moving point which is always at the same distance from a fixed point.

Let's now find out more about circles and their special features.

Using a small plate, or the base of a tumbler or a bottle, draw a circle on a piece of paper and cut it out. Run your finger round its edge. Stick a string along it.

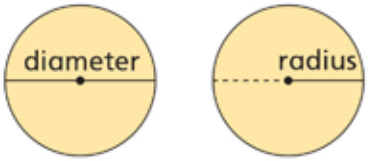


This edge is called the circumference of the circle.

Now fold your circle in half.

Each half of the circle is called **a semicircle**. Semi is another word for a half.

Open up your circle and draw a coloured line along the fold.



This line which joins two points on the circumference and passes through the centre of the circle is called the **diameter**.

The line from the centre joining any point on the circumference is called the **radius**.

$$\text{Diameter} = 2 \times \text{Radius}$$

Fold your circle back in half along the diameter fold. Then fold your semicircle in half.

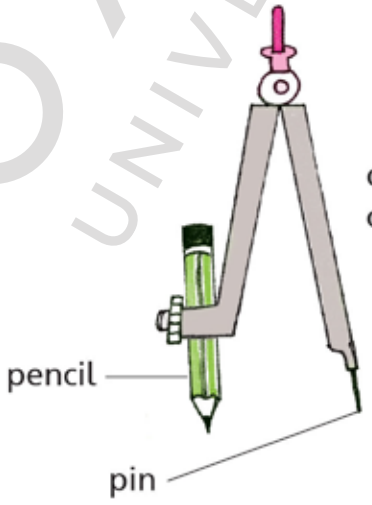
quadrant

You have made a **quadrant**, or a quarter of a circle. Open your circle again. You will now find a new fold. Draw a line along it in a different colour. Mark a dot where the two folds cross each other.

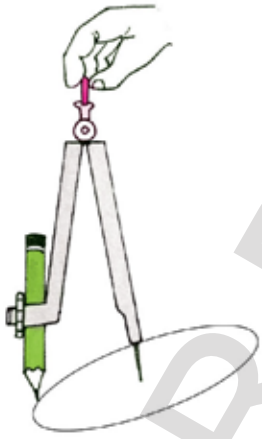
This point marks the **centre** of the circle:

To make an accurate circle, collect these items.

- a sheet of paper
- a pencil
- pair of compasses



Place the pin or the pivot of the pair of compasses in the middle of the paper. Extend the pencil arm about 3 cm away from the pivot. Then carefully, move the pencil arm round the pivot. It makes a perfect circle.

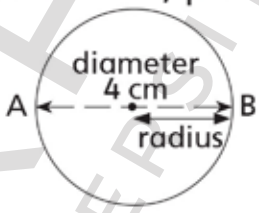


Examples:

1. Measure the diameter of the given circle. Find its radius also.

Solution:

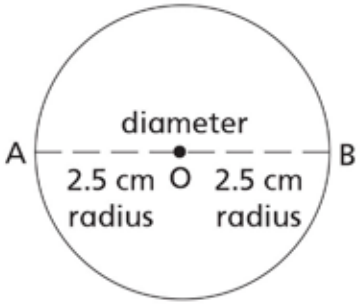
Measure the diameter of the circle with a scale by drawing a line from one end of the circle to the other end, passing through the centre.



$\overline{AB}$ is the diameter of the circle; $\overline{AB}$ = 4 cm
Diameter of the given circle = 4 cm
Radius = half of diameter = 4 ÷ 2 = 2 cm.

2. In the given circle draw the diameter, mark the centre and find the length of the diameter and radius.

   Diameter $\overline{AB}$ = 5 cm
   Radius = 5 ÷ 2 = 2.5 cm



▶ Exercise 7d

1. Fill in the blanks.
   a. If a circle has a diameter of 9.64 cm, its radius will be 4.82 cm.
   b. If the radius of a circle equals 5.8 m, its diameter is 11.6 m.
   c. A quarter circle is also known as a quadrant.
   d. The diameter of a circle is a straight line passing through the centre joining two points on the circumference.
   e. Each half of a circle is called a semicircle.

2. State whether the following are true or false.
   a. The radius of a circle whose diameter is 6 cm, will be 12 cm. (False) $r = 9/2 = 6/2 = 3$ cm
   b. The centre of the circle lies on its circumference. (False)
   c. The outer boundary of a circle is called the circumference. (True)
   d. The radius of a circle is half of its diameter. (True)
   e. The line stretching across the circle passing through its centre is called the radius. (False) It is the diameter

3. Select the correct answer from the given options.
   a. The line from the centre to the circumference of a circle is its
      Ⓐ centre Ⓑ diameter Ⓒ radius Ⓓ circumference
   b. One-fourth part of a circle is called a
      Ⓐ quadrant Ⓑ fixed point Ⓒ semicircle Ⓓ triangle
   c. A complete turn of 360° makes a
      Ⓐ radius Ⓑ circle Ⓒ diameter Ⓓ semicircle
   d. The diameter of a circle with radius 16 cm will be
      Ⓐ 48 cm Ⓑ 8 cm Ⓒ 64 cm Ⓓ 32 cm
   e. The circumference of a circle is
      Ⓐ its outer boundary
      Ⓑ a line joining two points on the boundary
      Ⓒ the distance of the centre and a point on the boundary
      Ⓓ double its diameter

4. Measure the diameter of each circle.

a. 1.1 cm

b. 

c. 

d. 

5. Calculate the radius of each circle in Question 4.

6. Using your ruler and pair of compasses, draw circles with these radii.
   a. 4 cm b. 7 cm c. 3.3 cm
   d. 5 cm e. 4.5 cm f. 4.1 cm

7. Without using a ruler, state the diameter of each of the circles you have drawn in Question 6.

5. a. 0.55 cm
b. 1.1 cm
c. 1.15 cm
d. 1 cm

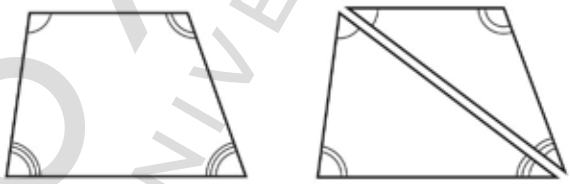
7. a. 8 cm b. 14 cm c. 6.6 cm
d. 10 cm e. 9 cm f. 8.2 cm

Higher Order Thinking Skills

Quadrilaterals

Any polygon with four sides is known as a quadrilateral. There are many special kinds of quadrilaterals. For example, a square, a rectangle, a parallelogram, a trapezium, and a rhombus, etc.

Consider a quadrilateral and break it up into 2 triangles as shown.

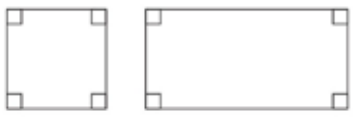


The angles of each triangle add up to 180°.

The angles of both the triangles will add up to: 180° + 180° = 360°.

It is easy to add together the angles of squares and rectangles:

Each angle = **90°**



So the sum of the angles = 90° × 4 = 360°

At this stage we will learn to construct squares and rectangles using a protractor, set square and ruler.

Using the protractor or set square carefully, we can now draw squares and rectangles.

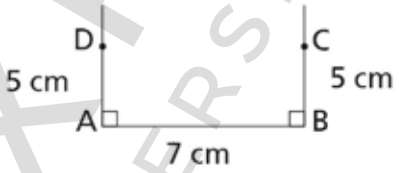
Draw a rectangle with sides 7 cm and 5 cm.

Steps of construction:

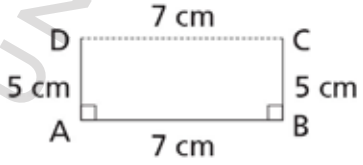
Step 1 Draw a line segment $\overline{AB}$ = 7 cm.

Step 2 Use a protractor or a set square to draw right angles at A and B.

Step 3 On the lines at right angles to AB, mark two points C and D of length 5 cm.



Step 4 Join C and D to form the rectangle ABCD.



With the same procedure we can draw a square. The length of all sides will be equal in the square.

Higher Order Thinking Skills

▶ Exercise 7e

1. Fill in the blanks.
   a. A four sided figure is called a quadrilateral.
   b. A rhombus and trapezium are special types of quadrilaterals.
   c. The angle between the sides of a square is 90°.
   d. The opposite sides of a rectangle are equal and parallel.
   e.  is a quadrilateral.

2. State whether the following are true or false.
   a. A triangle is a quadrilateral. (False) A triangle has 3 sides
   b. There are four vertices in a quadrilateral. (True)
   c. A circle is a special type of a quadrilateral. (False) Circle has no sides.
   d. The angle between the sides of a rectangle is 180°. (False)
   e. The sum of angles of a quadrilateral is 360°. (True)

   Angle b/w sides = 90°

3. Select the correct answer from the given options.
   a. A circle cannot be a quadrilateral because it has
      Ⓐ 3 sides Ⓑ no sides Ⓒ 4 sides Ⓓ 2 sides
   b. In a four-sided shape, if opposite sides are equal and the sides make an angle of 90°, then the shape is a
      Ⓐ triangle Ⓑ rhombus Ⓒ rectangle Ⓓ half circle
   c. If all the four sides of a quadrilateral are equal making an angle of 90° with each other, the quadrilateral is a
      Ⓐ triangle Ⓑ rectangle Ⓒ pentagon Ⓓ square
   d. The sum of the angles of a quadrilateral is
      Ⓐ 90° Ⓑ 360° Ⓒ 180° Ⓓ 100°
   e. If two angles of a quadrilateral sum up to 170°, then the other two angles can be
      Ⓐ 110° and 80° Ⓑ 95° and 70°
      Ⓒ 100° and 70° Ⓓ 100° and 80°

4. Draw a rectangle with the following sides using a protractor.
   a. 10 cm and 6.2 cm b. 9.5 cm and 4.8 cm

5. Draw squares, using a set square, with the given sides.
   a. 5 cm b. 5.7 cm

Data Handling

YOUR DIGITAL RESOURCE

In this unit students will learn to:

- read simple bar graphs given in horizontal and vertical form.
- interpret real life situations using data presented in bar graphs.
- read line graph.
- interpret real life situations using data presented in line graphs.
- read Pie Chart.
- interpret real life situations using data presented in Pie Chart.

MATH FLASH

You have already learnt:

- that information can be represented through pictures
- to read and interpret a picture graph

Favourite fruit of students	
Fruit	Number of students
Mango	5
Pomegranate	4
Strawberry	7

Key: 1 = 2 | 1 = 2 | 1 = 2

- that information can be represented by drawing bars
- to read and interpret a bar graph

KEY VOCABULARY

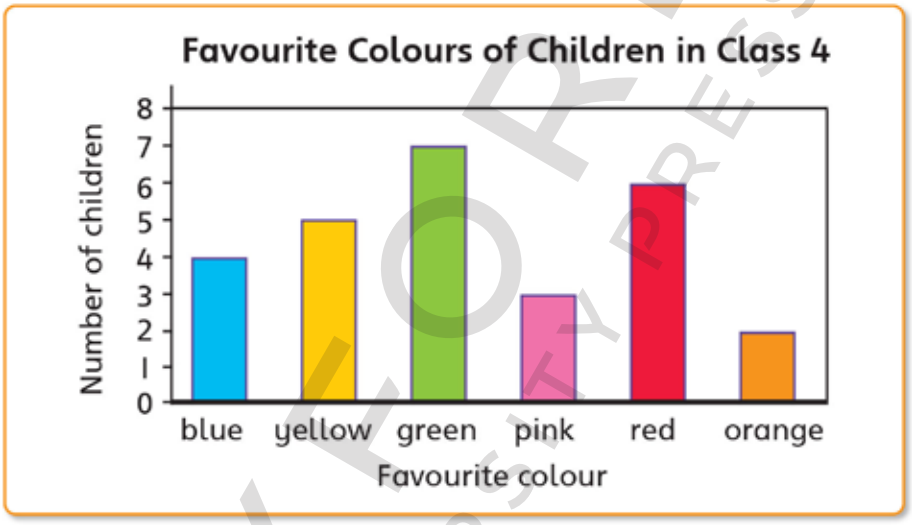
graph, picture graph, bar graph, line graph, interpret, horizontal bar graph, vertical bar graph, pie chart

Bar graph

A bar graph or bar chart is a graphical presentation of data using bars of different heights or lengths. Bar graphs can be drawn vertically or horizontally.

Example:

1. In a survey, children of Class 4 were asked about their favourite colour. The information was then represented in a vertical bar graph.



Now, answer these questions.

a. How many children liked red? _____

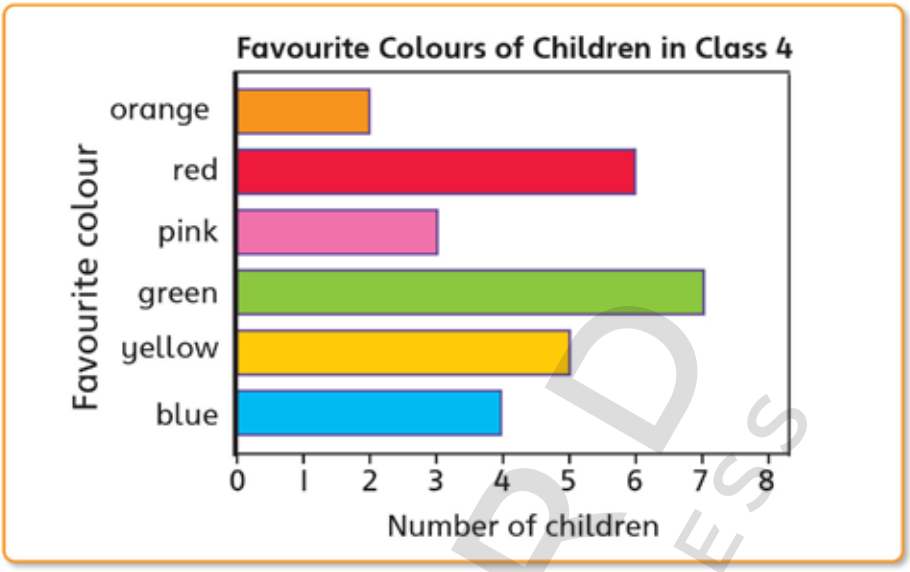
b. Which colour is least liked? _____

c. How many children liked green? _____

d. Which colour is the most liked? _____

e. How many children are there in total? _____

The same graph can be represented horizontally as shown below.

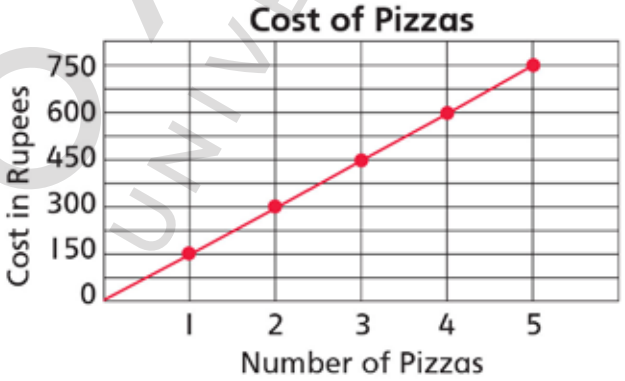


So far, we have used column graphs to show quite small amounts or quantities. But graphs are often used to show relationships between **large** quantities (of people, money, etc). This is done by making one **unit** or **step** of the column graph stand for a certain quantity like 2, 5, 10, 50, 100, 1000, etc. of the concerned object.

Line graph

Another very useful graph is the **line graph.** It is particularly useful when we want to measure something which is gradually **changing.**

Study this line graph and answer the questions.



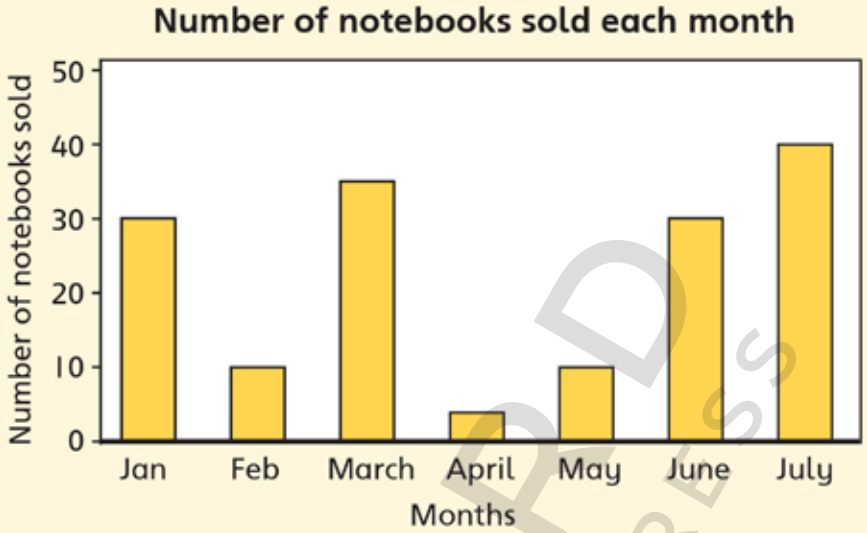
a. What is the cost of 3 Pizzas? _____

b. How many Pizzas can be bought for Rs 600? _____

c. How much money will be spent to buy 10 Pizzas? _____

▶ Exercise 8a

1. Answer the following questions based on the given bar graph.



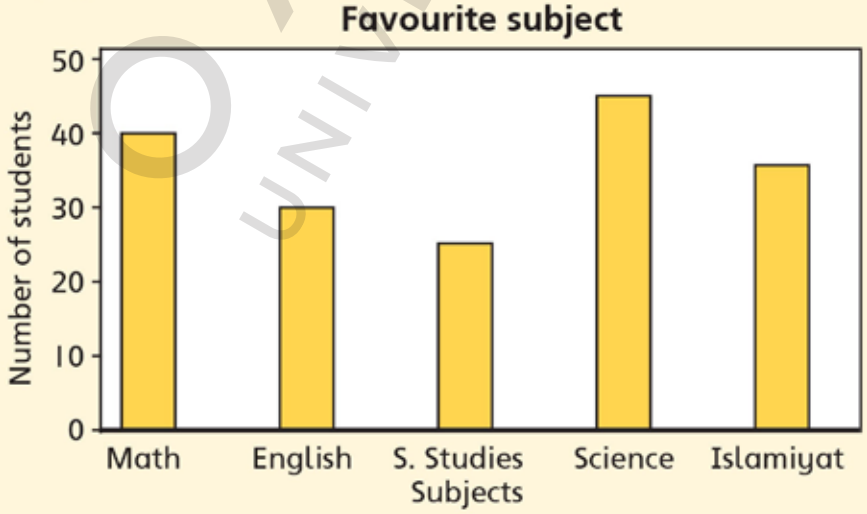
a. How many notebooks were sold in February? 10 notebooks

b. Which two months have equal sales? February and May

c. How many more notebooks were sold in March than January?
5 notebooks. March = 35, Jan = 30. 35 - 30 = 5

d. In which month were the highest number of notebooks sold?
July

2. The given graph shows the record of favourite subjects of a group of students in a school. Look at the bar graph and answer the following questions.



a. Which subject is liked most? Science

b. How many students like Social Studies? 25

c. Which is the second most liked subject? Maths

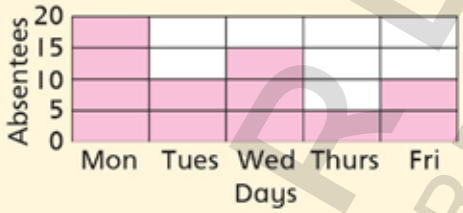
d. Which subject is liked by 30 students? English

e. How many more students like Science than English? 15 students.

Science = 45
English = 30
45 - 30 = 15

3. The given column graph shows the number of absent children during a week from school.

Children Absent from School



Study the graph and answer the questions.

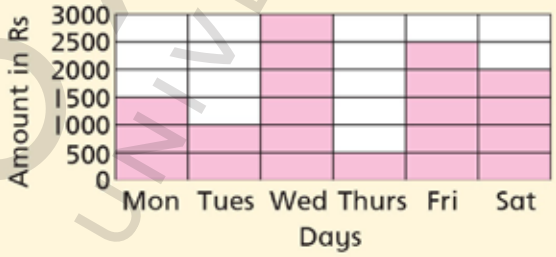
a. How many children were absent from school on Friday? 10 students.

b. How many more children were absent on Monday than on Wednesday? 5 children. Monday = 20, Wednesday = 15
20 - 15 = 5

c. How many children were not in school on Tuesday and Wednesday? 25 children
Tuesday = 10, Wednesday = 15
15 + 10 = 25

4. Study the graph and answer the questions.

Money Collected for Homeless Families



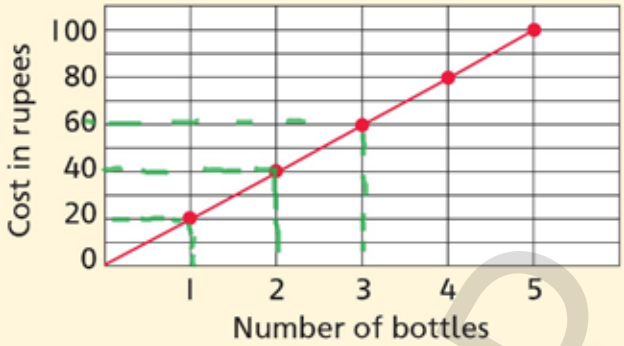
a. How much money was collected on Wednesday? Rs 3000

b. How much more money was collected on Friday than on Tuesday? Rs 1500 more. Friday = Rs 2500, Tuesday = Rs 1000
2500 - 1000 = 1500

c. On which day was the most money collected? Wednesday

5. Study the graph, then answer the questions that follow.

Cost of Litre Bottles of Lemon Squash



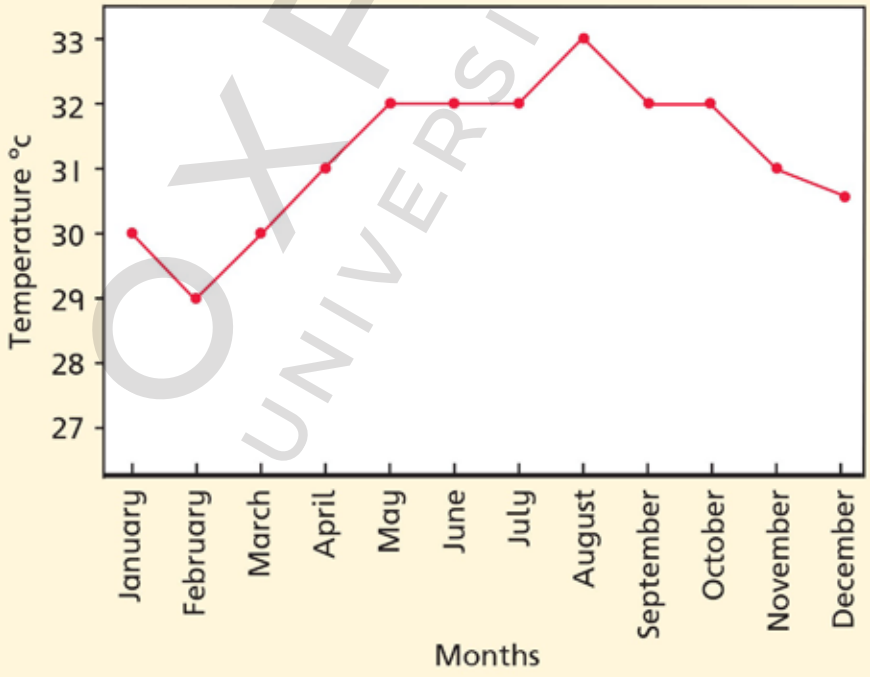
a. What is the cost of 3 l of lemon squash? Rs 60

b. If you have two Rs 20 notes, can you buy 4 l of lemon squash? No. (You can only buy 2 l of juice)

c. How much change will you get from Rs 100 when you buy 1 l of lemon squash? Rs 80. 100 - 20 = Rs 80

6. Look at the given line graph and answer the questions.

Temperature from January to December



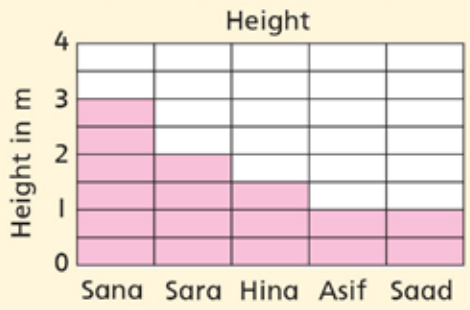
a. In which month is the temperature the highest? August

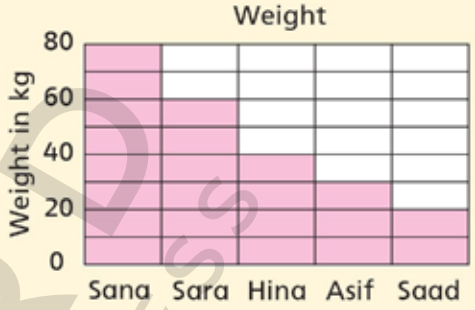
b. Which months have the same temperature? May, June, July, September, October.

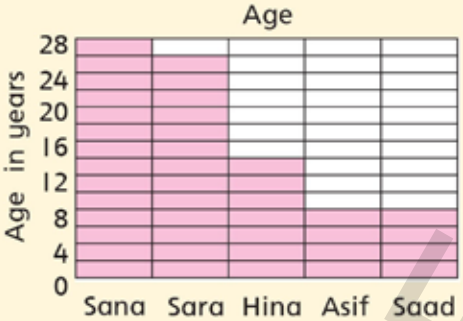
c. In which month is the temperature the lowest? Feburary

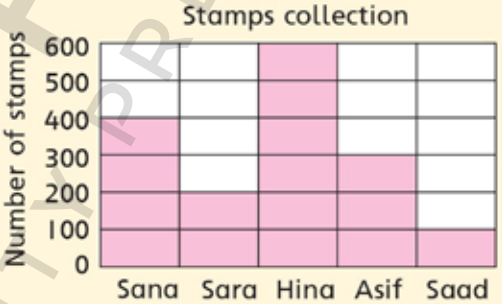
d. Which months have a temperature higher than 32 °C? August

7. These column graphs tell us a lot about a group of cousins: Sana, Sara, Hina, Asif, and Saad.









Study the graphs and answer these questions. Sara = 2m. Saad = 1m; 2-1 = 1

a. What is the difference in the heights of Saad and Sara? 1m

b. How much older is Hina than Asif? 6 years Hina = 14yrs. Asif = 8yrs 14-8 = 6

c. How much lighter is Hina than Sana? 40 kg Hina = 40kg. Sana = 80 kg 80 - 40 = 40

d. Which of the member of the group cannot walk through a 2 m high door without bending? Sana

e. How many stamps do Hina, Asif, and Saad have altogether? 1000 stamps. 600 + 300 + 100 = 1000

f. If Sana gives $\frac{1}{4}$ of her stamp collection to Saad, how many stamps will Saad now have? 200 $400 \times \frac{1}{4} = 100 + 100 = 200$

g. If Hina and Asif lie end to end, how far will they stretch? 2.5 m 1.5 m + 1m = 2.5 m

h. If Asif and Saad climb together onto same scales, what weight will be shown? 50kg 30kg + 20 kg = 50kg

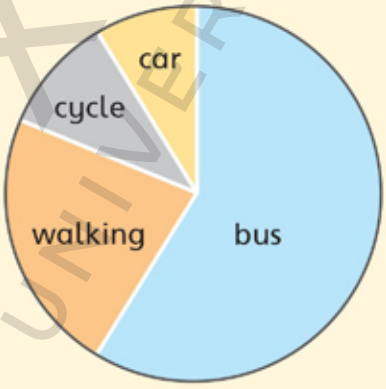
Pie charts

Pie charts are specific types of data presentation where the data is represented in the form of a circle. A **pie chart** (or a circle **chart**) is a circular graph, which is divided into slices to represent different numerical values of data. The entire diagram looks like a **pie** and its components resemble slices cut from a **pie**. Each slice can represent a different category. A good example of a **pie chart** can be seen below. Following is the sale data of a bakery.

1. Which item sold the most in the bakery? Croissant
2. How many cookies were sold? 20
3. Did the bakery sell fewer croissant or banana bread? No
4. Is the sales of brownies more than the sales of cupcakes? No
5. What is the total quantity of cookies and cupcakes sold? 36

Exercise 8b

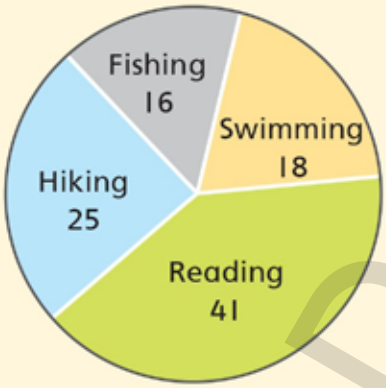
1. Look at the pie chart given below and answer the questions.



a. Which method is used by most of the students? Bus
b. Which two methods are equally used by the students? Cycle and Car
c. Which method is greater, bus, or walking? Bus

2. Look at the pie chart and answer the questions given below.

Favourite Activities



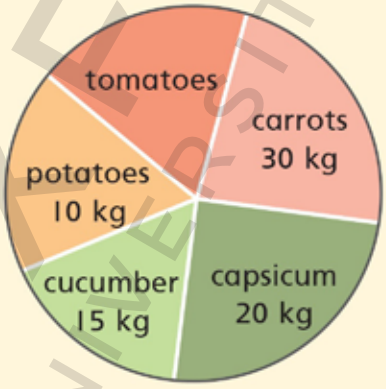
a. How many people like hiking? 25 people

b. Do more people like reading or fishing or swimming? Reading

c. What is the total number of people who like hiking and swimming? 25 + 18 = 43 people

d. What is the total number of people doing these activities? 25 + 16 + 18 + 41 = 100 people.

3. Following is the pie chart of daily usage of vegetables in a restaurant.



Answer the questions given below.

a. Which two vegetables make equal mass as carrots? Potatoes and Capsicum

b. What is the difference in usage between carrots and cucumber? 30 - 15 = 15kg

c. If the total mass of the vegetables is 100 kg, then what is the mass of tomatoes?

Potatoes + Tomatoes + Carrots + Capsicum + Cucumber = 100

10 + T + 30 + 20 + 15 = 100

75 + T = 100

T = 100 - 75

Tomatoes = 25kg

Numbers

WORKSHEET 1

1. Place these numbers in International system, then write their names.
   a. 47203
   b. 657031
   c. 80614
   d. 920037

2. Write symbols (>, <, =) in the blanks.
   a. 2.48 ____ 2.444
   b. 6.312 *kl* ____ 6312 *l*
   c. 0.001 ____ 0.010
   d. 904 600 ____ 9046 × 10
   e. $12\frac{4}{5}$ ____ $12\frac{3}{4}$

3. Write the numbers preceding the following.
   a. 890 000
   b. 100 000
   c. 151 600
   d. 8490

4. Give the value of the underlined digit.
   a. 69 <u>3</u>84
   b. 20.<u>6</u>43
   c. 6.9<u>8</u>1
   d. <u>1</u>64 932

5. Underline the biggest number in each group.
   a. 606; six hundred and sixty; 650; 65.603
   b. 0.103; 0.113; zero point one two six; 0.109
   c. 2.4 kg; 2389 g; $2\frac{1}{2}$ kg; 2398 g

6. Write in expanded form.
   a. 206 942
   b. 695 081
   c. 27 648
   d. 873 008
   e. 100 905
   f. 730 851

7. Write vertically and solve.
   a. 59 643 + 2819 + 61 732
   b. 4.916 + 8.243 + 16.878
   c. 103 201 − 79 875
   d. 6.032 − 1.589

8. Fill in the blanks.
   a. 620.432 − ____ = 41.968
   b. 10.045 − ____ = 3.621
   c. 59.405 − ____ = 18.737
   d. 23.106 − ____ = 15.429

9. Multiply each number (i) by 10; (ii) by 100; (iii) by 1000.
   a. Rs 18
   b. 215 m
   c. 409
   d. 380

10. Write vertically and multiply.
    a. 493 × 16
    b. 5093 × 66
    c. 837 × 210
    d. 42.66 × 30
    e. 509 × 28
    f. 218.09 × 20
    g. 8.691 × 7
    h. 162.31 × 25

Numbers

1. Work these out in your head, then write the answers in your notebook.
   a. 18 × 20
   b. 64 + 82
   c. 91 − 59
   d. 511 ÷ 10
   e. 831 × 500
   f. 6200 ÷ 1000
   g. 146 + 23 + 40
   h. 524 + 48 − 62

2. Solve the following sums.
   a. 32 069 − 18 478
   b. 8243 ÷ 49
   c. 384 × 72
   d. 48 162 + 530 694
   e. 62 432 + 30 149 + 6828
   f. 645 × 49
   g. 5031 ÷ 64
   h. 140 300 − 89 699

3. Solve the following real-life story sums.
   a. The Shahid family keeps aside Rs 1550 every month for charity. How much does the family donate to charity annually?
   b. There are 3821 children in junior school, 2798 children in middle school, and 2462 in senior school. What is the total strength of the school?
   c. 36 children went on a field trip. The total expenses were Rs 4860. How much did the trip cost each child?
   d. Out of 2069 people working in a shoe factory, 1387 were women. How many men worked in the factory?
   e. An orphanage needs Rs 89 000 to buy a second-hand car. It has collected only Rs 57 697 so far. How much money is still needed?
   f. Tasty Bakery made 10 000 brownies for a party. 2750 brownies had walnuts and the rest were plain. How many plain brownies were there?
   g. 13 490 people attended the Trade Fair on Friday; 15 750 on Saturday; and 20 700 on Sunday. How many people attended the Fair altogether?

Numbers

1. Write the number with correct spacing.
   a. eighteen thousand and forty-seven
   b. three million, two hundred thousand, eight hundred and sixty-four

2. Write in expanded form.
   a. 27 029 b. 509 624

3. Fill in the blanks.
   a. 62 824, ____, ____, 63 124, 63 224
   b. 178 699, 179 699, ____, ____

4. Underline the smallest number.
   a. 864 509, 864 905, 864 950
   b. 719 024, 718 240, 781 004

5. Write vertically and solve.
   a. 48 168 + 15 777 + 137 692
   b. 460 421 − 279 653

6. Multiply by 100 and place in International number system.
   a. 279 b. 1507 c. 731

7. Divide by 100.
   a. 516 b. 6318
   c. 147 038 d. 972
   e. 23 049 f. 962 704

8. Convert kg into g.
   a. 49 kg b. 14 kg
   c. 68 kg d. 501 kg
   e. 164 kg f. 9 kg

9. Convert *ml* into *l* and *ml*.
   a. 7000 *ml* b. 31 112 *ml*
   c. 6240 *ml* d. 395 041 *ml*
   e. 29 600 *ml* f. 29 500 *ml*

10. Write vertically and multiply.
    a. 862 × 58 b. 1473 × 60
    c. 495 × 63 d. 957 × 700

11. Use the long division method.
    a. 138 ÷ 18 b. 290 ÷ 40
    c. 7329 ÷ 84 d. 5061 ÷ 38

12. Solve these real-life story sums, with complete statements.
    a. A crossword book contains 540 puzzles. If Sara solves 12 puzzles every day, how many days will it take her to complete the book?
    b. If Adil can cycle 15 km (15 000 m) in one hour. How far can he cycle in 12 minutes?
    c. Rida went to school at 7:20 a.m. and returned $6\frac{1}{2}$ h later. At what time did she reach home?

Numbers

WORKSHEET 4

Number World

Each question is followed by four answers, only one of which is correct. Choose the correct answer and circle it.

1. What is the value of 8 in the numeral 18 964?

   a. 800 c. 80 000
   b. 8000 d. 8

2. How many hundreds are there in 60 000?

   a. 60 c. 600
   b. 6000 d. 60 000

3. 500 000 is the same as

   a. 5 thousand
   b. 50 thousand
   c. 500 thousand
   d. 5000 thousand

4. How many thousands are there in one hundred thousand?

   a. 100 c. 10
   b. 1000 d. 10 000

5. The product of 8000 and 8 is

   a. 640
   b. 64 000
   c. 8000
   d. 6400

6. The greatest 6-digit numeral that can be formed with the digits 8, 0, 4, 1, 5, and 6 is

   a. 651 480 c. 865 410
   b. 864 510 d. 846 510

7. On adding 400 to 69 600, we get

   a. 70 100 c. 71 000
   b. 7000 d. 70 000

8. In the product of 345 and 6, which digit is in the thousands place?

   a. 2 c. 7
   b. 0 d. 5

9. Divide the sum of 231 and 378 by 7. The answer is

   a. 21 c. 33
   b. 54 d. 87

10. Ten thousand less than one hundred thousand is

    a. 90 000 c. 95 000
    b. 9000 d. 900

Numbers

WORKSHEET 5

Brain-Stretching

Work out these problems.

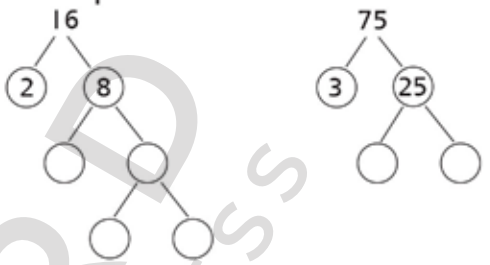
1. 29 months is _____ years and _____ months.
2. How many days are there in 15 weeks? _____
3. $2\frac{1}{4}$ m = _____ cm.
4. The only even prime number is _____.
5. $\frac{1}{4}$ of a day = _____ hours.
6. The LCM of 8 and 12 is _____.
7. 1080 ÷ 9 = _____.
8. Which of these is divisible by 9: 8109 or 3440?
9. $8\frac{1}{2} - 7\frac{1}{4}$ = _____.
10. 2000 *ml* = _____ *l*.
11. The prime number after 19 is _____.
12. 4 minutes = _____ seconds.
13. $\frac{2}{6}$ is the same as $\frac{4}{?}$.
14. Is 8 a multiple of 24?
15. 1 more than 70 099 is _____.

WORKSHEET 6

Numbers

Time to Look Back!

1. How quickly can you solve these?
   a. 2400 more than 39 640 = _____.
   b. 16 more than double of 14 = _____.
   c. $\frac{2}{3}$ of a day = _____ hours
   d. 0.695 = _____ (expressed as a fraction)
   e. 8 h 15 mins = _____ mins.
2. Write the successor of:
   a. 849 209 b. 949 900
   c. 140 599
3. Write the predecessors of:
   a. 909 090 b. 310 000
   c. 500 490
4. Circle the multiples of 12.
   24 74 1200 460 98
5. Circle the multiples of 8.
   16 24 39 4960 9608
6. Circle all the factors of 18.
   3 6 2 7 11 9 1
7. Circle all the factors of 63.
   9 2 3 7 1 6
8. State whether True or False.
   a. No number can have 0 as a factor. (___)
   b. 11 and 13 are prime numbers. (___)
   c. The only even prime number is 2. (___)
   d. The smallest factor that a number can have is 1. (___)
9. Complete these factor trees.



Problem Solving is Fun

10. The cost of one ticket to a Rock Concert is Rs 750. A group of 35 people wish to go. What would the total cost of the tickets be?
11. 4800 books were arranged on 20 shelves. Each shelf contained an equal number of books. How many books were arranged on each shelf?
12. What is the cost of 32 fans, if one fan costs Rs 1350?
13. The population of a town was 796 514 in 2009. It decreased by 125 600 the following year. What was the population in 2010?
14. I can pack 72 puzzle boxes in one carton. How many cartons do I need to pack 1800 puzzle boxes?

Numbers

Ready, Set, Go!

Each section should take you one minute to solve.

1. Change each improper fraction to a whole number or a mixed number.

   a. $\frac{6}{5}$ = ☐

   b. $\frac{108}{7}$ = ☐

   c. $\frac{14}{3}$ = ☐

   d. $\frac{19}{6}$ = ☐

   e. $\frac{27}{6}$ = ☐

   f. $\frac{9}{2}$ = ☐

   g. $\frac{12}{4}$ = ☐

   h. $\frac{28}{5}$ = ☐

2. Tables are fun. Work these out quickly.

   a. 8 × 11 = _____

   b. 7 × 7 = _____

   c. 5 × 9 = _____

   d. 9 × 8 = _____

   e. 14 × 2 = _____

   f. 40 × 4 = _____

   g. 20 × 6 = _____

   h. 60 × 100 = _____

   i. 10 × 12 = _____

   j. 70 × 70 = _____

   k. 19 × 1 = _____

   l. 100 × 10 = _____

3. Find the quotient. Be quick, but sure.

   a. 16 ÷ 2 = _____

   b. 150 ÷ 5 = _____

   c. 18 ÷ 1 = _____

   d. 200 ÷ 20 = _____

   e. 90 ÷ 3 = _____

   f. 1000 ÷ 10 = _____

   g. 70 ÷ 7 = _____

   h. 108 ÷ 12 = _____

   i. 40 ÷ 5 = _____

   j. 240 ÷ 12 = _____

Higher Order Thinking Skills
HCF and LCM

WORKSHEET 8

1. Write down the factors of each number, then find the HCF of each pair.
   a. 9 and 15
   b. 12 and 30
   c. 7 and 21
   d. 25 and 20
2. Draw a Venn diagram to show the common multiples of 5 and 4 less than 40. What is the LCM?
3. Find the LCM by listing the first 10 multiples of each number.
   a. 2, 4, and 5
   b. 8, 6, and 12
   c. 2, 3, and 4
   d. 5, 4, and 10
4. Write the factors of these numbers.
   a. 22
   b. 48
   c. 63
   d. 32
   e. 39
   f. 56
5. Write the common factors and HCF of these pairs of numbers.
   a. 20, 32
   b. 56, 28
   c. 12, 72
   d. 84, 24
6. Find the common factors and HCF of these.
   a. 8, 20, and 32
   b. 28, 21, and 35
   c. 15, 18, and 24
   d. 16, 20, and 40
   e. 10, 12, and 22
   f. 27, 36, and 45
7. Circle the pairs of numbers that are co-prime.
   a. 2 and 7
   b. 2 and 12
   c. 17 and 4
   d. 7 and 11
8. Tick (✓) the prime numbers only.
   a. 51
   b. 630
   c. 37
   d. 19
   e. 162
   f. 5005
   g. 101
   h. 41
   i. 217
9. True or false? Explain your answer in your notebook.
   a. Composite numbers have only two factors.
   b. The HCF of 12 and 20 is 2.
   c. 5 is a factor of 100 000.
   d. 15 is not a factor of 3000.
   e. The LCM of 4 and 12 is 48.
   f. The LCM of 6 and 10 is 30.
   g. 51 is not a prime number.
   h. 9 is not a factor of 1620.
10. Use the division method to show the prime factors of these.
    a. 240
    b. 603
    c. 715
11. Find the LCM and HCF using the division method.
    a. 36 and 42
    b. 15 and 40

Higher Order Thinking Skills
HCF and LCM

WORKSHEET 9

1. Write the LCM of each pair.
   a. 7 and 8 c. 4 and 6
   b. 12 and 10 d. 3 and 7
2. Write down all the factors of these numbers.
   a. 24 b. 19 c. 84
3. Write the common factors and HCF of these pairs of numbers.
   a. 12, 28 b. 27, 45
4. Tick (✓) the pairs that are co-prime numbers.
   a. 5 and 9 c. 3 and 18
   b. 2 and 7 d. 16 and 42
5. Fill in the blanks.
   a. Numbers which have only two different factors are called ____ numbers.
   b. The factors of 5 are ____ and ____, so 5 is a ____ number.
   c. The factors of 10 are ____, ____, ____ and ____, so 10 is a ____ number.
   d. Number 1 is not a ____ number because it does not have two different factors.
6. Draw factor tree to show the prime factors of these.
   a. 28 b. 70 c. 108
7. Use the division method to show the prime factors of these.
   a. 963 b. 1025 c. 142
8. Find the prime factors and then the LCM of these number pairs, using the division method.
   a. 36 and 48 b. 56 and 21
9. Find the HCF and LCM of these pairs of numbers.
   a. 60 and 48 b. 15 and 75
10. Solve these real-life story sums.
    a. Two big bells start to ring together at 05:00 hrs. 1 rings every 15 sec and the other every 12 sec. How often will they ring together?
    b. Maria bought 3 cakes of the same size. Half of one cake was left and one-third of the other. How much cake was left over altogether?

Fractions

WORKSHEET 10

1. What fraction of a day is 6 hours? ____
2. What fraction of a week is 4 days? ____
3. What fraction of an hour is 15 minutes? ____
4. Reduce the fractions to their lowest terms.
   a. $\frac{64}{70}$ b. $\frac{36}{180}$ c. $\frac{15}{60}$
5. Fill in the blanks.
   a. $\frac{4}{5} = \frac{}{20}$ b. $\frac{8}{12} = \frac{24}{}$
   c. $\frac{72}{11} = \square\frac{6}{11}$
6. Feroze bought $\frac{5}{6}$ l of milk. He drank $\frac{1}{2}$ l and his brother drank $\frac{1}{6}$ l. He had ____ l of milk left.
7. Maha ate $\frac{1}{5}$ of a cake. Her sister ate $\frac{3}{10}$ and her brother ate $\frac{2}{5}$ of the same cake. What fraction of the cake did they eat altogether?
   a. $\frac{3}{5}$ b. $\frac{1}{10}$
   c. $\frac{9}{10}$ d. $\frac{2}{5}$
8. Put the correct sign $<$, $>$, or $=$.
   a. $\frac{8}{12} \square \frac{4}{6}$
   b. $\frac{9}{15} \square \frac{2}{6}$
   c. $\frac{14}{20} \square \frac{4}{15}$
   d. $\frac{3}{8} \square \frac{9}{12}$
9. Write $>$, $<$, or $=$.
   a. $\frac{3}{5} \square \frac{5}{8}$ c. $\frac{16}{24} \square \frac{2}{3}$
   b. $\frac{7}{8} \square \frac{17}{20}$ d. $\frac{100}{6} \square 16\frac{2}{3}$
10. Reduce to the lowest terms, and change into mixed numbers.
    a. $\frac{56}{18}$ b. $\frac{110}{20}$ c. $\frac{75}{15}$
11. Add or subtract.
    a. $9\frac{2}{3} - 3\frac{4}{5}$ b. $8\frac{1}{4} - 2\frac{5}{6}$
    c. $4\frac{5}{8} + 6\frac{1}{12}$ d. $7\frac{3}{4} + 10\frac{8}{9}$

Fractions

WORKSHEET 11

1. Complete the equivalent fractions.
   a. $\frac{3}{5} = \frac{\_\_}{10}$ b. $\frac{6}{7} = \frac{\_\_}{35}$
   c. $\frac{3}{4} = \frac{\_\_}{12}$ d. $\frac{5}{6} = \frac{\_\_}{42}$
   e. $\frac{7}{8} = \frac{\_\_}{24}$ f. $\frac{10}{11} = \frac{\_\_}{33}$

2. Reduce these to their lowest terms.
   a. $\frac{24}{36}$ c. $\frac{26}{39}$ e. $\frac{18}{56}$
   b. $\frac{24}{30}$ d. $\frac{120}{150}$ f. $\frac{36}{96}$

3. Write the fraction that is:
   a. Equivalent to $\frac{5}{6}$ and has a denominator of 30.
   b. Equivalent to $\frac{7}{10}$ and has a numerator of 35.
   c. Equivalent to $\frac{48}{72}$ but is written in its lowest terms.

4. Change these whole numbers into improper fractions.
   a. 6 into sevenths
   b. 7 into thirds
   c. 4 into tenths
   d. 10 into quarters

5. Write these as mixed numbers.
   a. $\frac{17}{3}$ b. $\frac{48}{11}$ c. $\frac{22}{5}$

6. Write these as improper fractions.
   a. $3\frac{2}{3}$ b. $5\frac{5}{6}$ c. $1\frac{9}{10}$
   d. $2\frac{4}{5}$ e. $8\frac{1}{9}$ f. $7\frac{3}{4}$
   g. $4\frac{4}{7}$ h. $9\frac{5}{8}$ i. $9\frac{3}{7}$

7. Reduce these to their lowest terms, then change into mixed numbers.
   a. $\frac{24}{10}$ b. $\frac{28}{20}$ c. $\frac{120}{100}$
   d. $\frac{15}{9}$ e. $\frac{36}{21}$ f. $\frac{96}{36}$

8. Solve these, writing your answers in the form of mixed numbers.
   a. 55 ÷ 9 b. 50 ÷ 12
   c. 62 ÷ 10 d. 29 ÷ 7

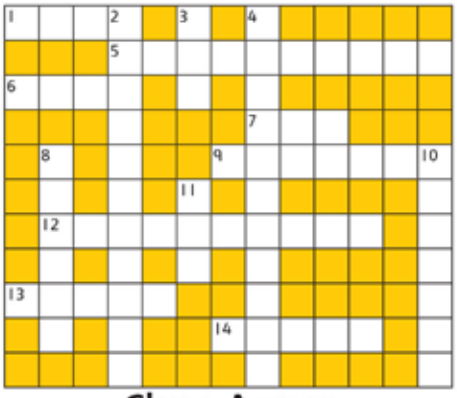
9. Rewrite these so that they have a common denominator.
   a. $\frac{2}{5}$ and $\frac{17}{20}$ b. $\frac{3}{4}$ and $\frac{3}{5}$
   c. $\frac{3}{8}$ and $\frac{5}{24}$ d. $\frac{27}{36}$ and $\frac{5}{18}$

10. Add or subtract.
    a. $3\frac{1}{4} + 12\frac{4}{5}$ b. $12\frac{1}{3} - 6\frac{2}{5}$
    c. $10\frac{3}{8} + 1\frac{3}{4}$ d. $8\frac{3}{10} - 1\frac{4}{15}$

Decimals

WORKSHEET 12

1. Complete the decimal crossword.



Clues Across

1. When we multiply a number by 10, the digits of the number jump one place to the _____.
5. I am the name for the second place of decimals.
6. If I come at the end of a (decimal) number, do not count me as a decimal place.
7. I am another name for 'decimal point'.
9. I am 'tenth' in Latin.
12. There are 100 of me in a metre.
13. $\frac{4}{100} = \frac{\_\_\_\_}{1000}$
14. 0.052 equals zero ____ zero five two.

Clues Down

2. I am the name of the column 3 places to the right of the decimal point.
3. I am the number of decimal places in 6.90.
4. 3.159 is the _____ of 3.160.
8. For a fraction to be converted into a decimal fraction, its denominator must be a _____ of 10, 100, or 1000.
10. 7000 paise = _____ rupees.
11. I am the number in the tenths column of 111.695.

2. Write (T) for true and (F) for false?

a. 21.7 < 21.66 (__)
b. The 6 in 23.569 stands for six tenths. (__)
c. 0.004 < 0.04 (__)
d. $\frac{1}{8}$ is the same as 0.125. (__)
e. 0.07 can be written as $\frac{7}{1000}$. (__)
f. The decimal value of $\frac{1}{5}$ is 0.2. (__)
g. 3.74 > 3.7 (__)
h. 52.10 is the same as 52.1. (__)

Decimals

WORKSHEET 13

1. Look carefully at this number:

   4143.629

   Write the digit in each of the following places.

   a. hundreds place
   b. thousandths place
   c. ones place
   d. tenths place
   e. thousands place
   f. tens place
   g. hundredths place

2. Write these as decimals.

   a. $\frac{3}{1000}$ c. $\frac{69}{1000}$ e. $\frac{72}{100}$

   b. $\frac{9}{10}$ d. $\frac{8}{100}$ f. $\frac{501}{1000}$

3. Copy and write symbols (<, >, or =) in the blanks.

   a. $\frac{20}{100}$ _____ $\frac{20}{10}$
   b. 200 g _____ 0.2 kg
   c. 0.5 _____ 0.05
   d. 1.65 *kl* _____ 170 *l*
   e. 1.19 _____ 1.90
   f. 48 cm _____ 4.85 m

4. Write these as fractions or mixed numbers.

   a. 0.35
   b. 10.09
   c. 0.6
   d. 0.93
   e. 0.003
   f. 20.105

5. Add or subtract:

   a. 24.09 + 10.13
   b. 35.06 − 8.79
   c. 416.45 + 2.08
   d. 19.165 − 9.786
   e. 1.09 + 0.999
   f. 5.031 − 2.875

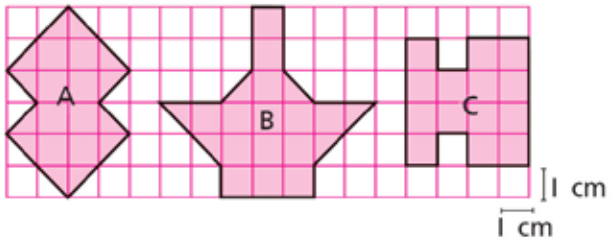
6. Express the following as decimal numbers.

   a. 5946 p = Rs _____
   b. 4 mm = _____ m
   c. 8 cm = _____ m
   d. 15 gm = _____ kg
   e. 102 m = _____ km
   f. 24 p = Rs _____
   g. 16 *l* = _____ *ml*
   h. 129 g = _____ kg
   i. 890 p = Rs _____
   j. 13 *ml* = _____ *l*

7. Multiply or divide.

   a. Rs 49.75 × 12
   b. 4.968 km ÷ 8
   c. 0.773 g × 18
   d. 16.231 *l* × 5
   e. 14.697 *kl* ÷ 9
   f. 2.076 kg ÷ 6
   g. 1.013 kg × 10
   h. 2.6 cm × 100

Area and Perimeter



Study the figures given above carefully. Now answer these questions by ticking the correct option.

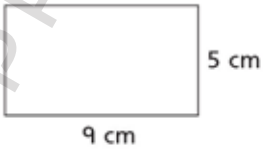
1. The area of figure A is
   a. 14 cm^2
   b. 20 cm^2
   c. 16 cm^2
   d. 18 cm^2

2. The area of figure B is bigger than the area of figure C by
   a. 3 cm^2
   b. 17 cm^2
   c. 14 cm^2
   d. 31 cm^2

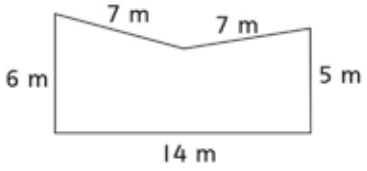
3. The total area of the three figures is
   a. 45 cm^2
   b. 55 cm^2
   c. 25 cm^2
   d. 35 cm^2

4. The perimeter of figure C is
   a. 18 cm
   b. 22 cm
   c. 20 cm
   d. 24 cm

5. The area of the rectangle given below is
   a. 26 cm^2
   b. 36 cm^2
   c. 45 cm^2
   d. 32 cm^2



6. Find the perimeter of the given figure.



7. The length of a rectangular field is 95 m and its breadth is 38 m. Ahad ran round the field 3 times.
   a. Find the perimeter of the field.
   b. How far did Ahad run?

Geometry

WORKSHEET 15

Each question is followed by four answers, only one of which is correct. Choose the correct answer and encircle it.

1. A square has _____ angles.
   a. 1
   b. 2
   c. 3
   d. 4

2. The sum of the angles of a triangle adds up to _____.
   a. 60°
   b. 75°
   c. 120°
   d. 180°

3. A ray has _____ end point(s).
   a. 0
   b. 1
   c. 2
   d. numerous

4. The isosceles triangle has _____ equal angles.
   a. 0
   b. 2
   c. 1
   d. 3

5. A pentagon has _____ angles.
   a. 6
   b. 5
   c. 3
   d. 7

6. Study the figure and answer the questions.

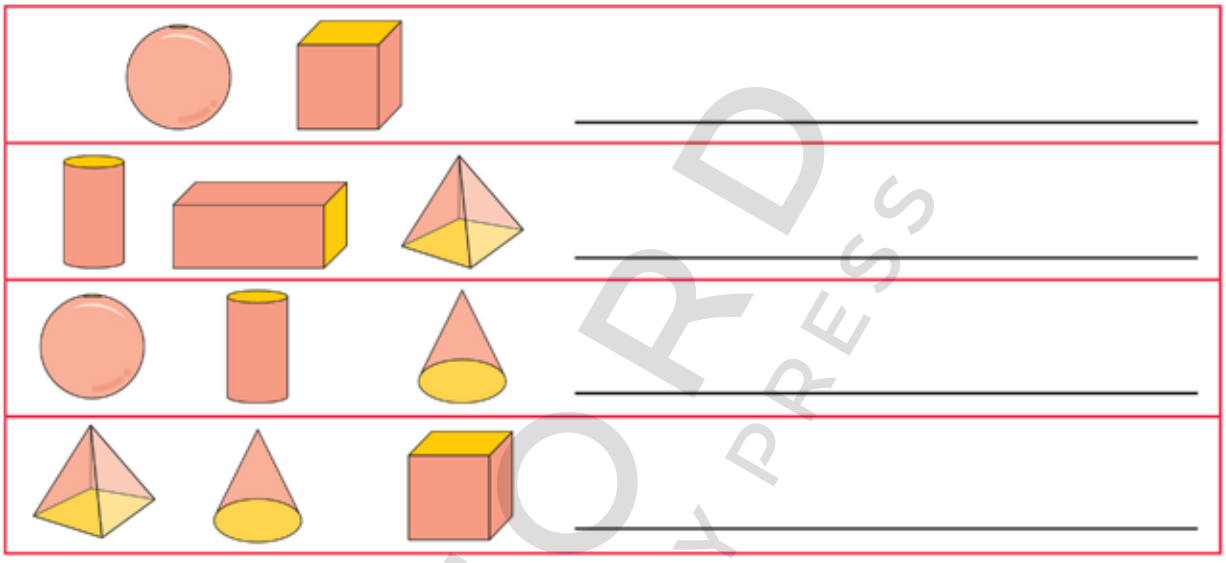
   a. This is a _____ sided figure.
   b. It has _____ right angles.
   c. It has _____ vertices.
   d. It has _____ angles which are greater than a right angle.
   e. It has _____ angles which are less than 90°.

WORKSHEET 16

3D Shapes

1. Compare and write the common features of the given pairs of 3D shapes.

Helping words: vertices, edges, curved surface, flat surface, or none



2. Sort and draw the given shapes in the circles.

without vertices

with straight edges

with curved edges

MATH LAB ACTIVITY 1

Objective: Children create clues to crossword puzzles.

Materials required: Blank rectangular crossword grids made out of paper or cardboard.

Steps:

i 1	4	ii 4		iii 1	0	0	0
9		0		2			
iv 9	4	5		v 1	4	4	vi 4
9			vii 3	6			2
	viii 1	7	4	5		ix 9	5

1. The teacher draws a blank grid on the board, like the one shown above.
2. Then s/he writes the numbers 144 and 1999 in the grid, starting from the square labelled (i). S/he gives clues to these numbers as under:

Across	Down
(i) Square of 12	(i) 1 less than 2000

3. Then s/he distributes the blank cardboard/paper grids among the children, and completes the grid on the board with numbers as shown.
4. First, the children merely fill in all the numbers in the blank grid.
5. Then they learn to create clues:

   For 1000, the clue can be: "Smallest four-digit number", or "4 × 250", or "500 + 500" depending upon the level of the child. For 945, the clue can be "950 − 5", or "10.5 × 90", or simply "1000 − 55".
6. One of the ways to write all the clues to the above grid is given below:

Across		Down	
(i)	Square of 12	(i)	1 less than 2000
(iii)	Smallest 4 digit number	(ii)	81 × 5
(iv)	10 000 − 9055	(iii)	Square of 11
(v)	Square of 38	(v)	89 + 76
(viii)	8574 − 6829	(vi)	850 × 0.5
(ix)	19 × 5	(vii)	0.17 × 200

MATH LAB ACTIVITY 2

Objective: Children learn to find a special pattern in day-to-day occurrences like time and date.

Materials required: A blank paper, pencil, and rubber.

Steps:

1. The teacher writes the following time and date on the board:
   Time: **03:04:05** and Date: **06/07/08**
2. S/he explains that this string of numbers represents the time : 5 seconds past 4 minutes past 3 hours, on the 6th of July, 2008. S/he tells the children that such a time that contains consecutive strings of numbers is a rare occurrence.
3. The teacher calls a student and helps him/her to write another time that can be written in the same way like 01:02:03 and 04/05/06. The student is then asked to explain to the class the time that these strings of numbers stand for.
4. The teacher asks the entire class to write down every possible time in this millennium (i.e. from year 2000 to 3000) that will have such interesting strings of numbers.
5. Once the students have finished writing, the teacher writes the following on the board explaining to them that this list shows all such possible instances in this millennium. She then asks the children to cross-check their response with the list.

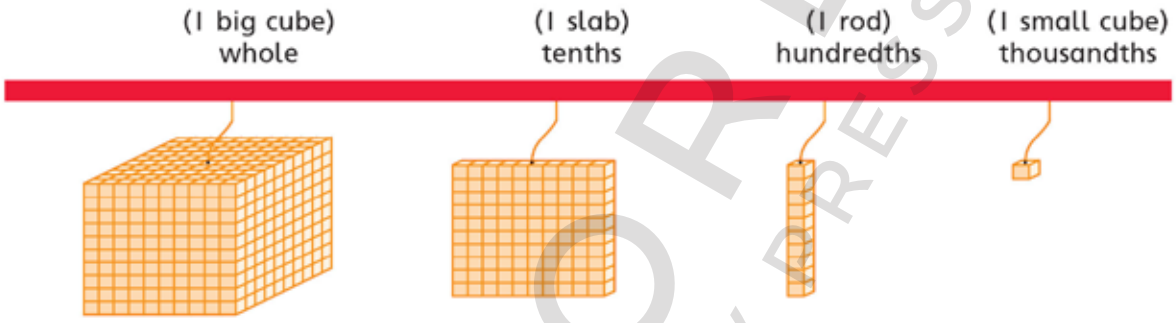
Time		Date	
0:01:02		03/04/05	
01:02:03		04/05/06	
02:03:04		05/06/07	
03:04:05	3 sec past 4 min past 5 hrs	06/07/08	
04:05:06		07/08/09	
05:06:07		08/09/10	
06:07:08		09/10/11	
07:08:09		10/11/12	
08:09:10		11/12/13	11 December, 2013

MATH LAB ACTIVITY 3

Objective: Children learn the role of decimal point.

Materials required:

- 1 big cube (1 whole) and some hooks,
- 10 slabs (10 slabs fit together to make 1 whole cube.)
- 10 small rods (10 rods fit together to make 1 slab.)
- 10 small cubes (10 small cubes fit together to make 1 rod.)
  (It is useful to have 1000 cubes, 100 rods, and 10 slabs.)



Steps:

1. The teacher hangs the big cube below the word 'Whole' and explains that this is the place for ones.
2. Then the teacher calls a student and asks him/her to put the 10 slabs together.
3. The student is then asked to place them next to the big cube. The teacher explains to the class that 1 big cube = 10 slabs and hence 1 slab is one-tenth of the cube. Simultaneously, s/he points to the position for tenths.
4. Another student shows that 10 rods fit together to make one slab.
5. The teacher then explains '10 rods are equal to 1 slab and 10 slabs equal 1 big cube. So, 100 rods equal 1 big cube or 1 rod = one-hundredth of a big cube, i.e. the whole.'
6. Similarly, children learn that there are 1000 small cubes in a big cube. They realise that, therefore, 1 small cube is one-thousandth of the big cube.

MATH LAB ACTIVITY 4

Objective: Children learn the use of grids for quick multiplication.

Materials required: Mini square grids for all children, pencil, eraser.

×	2	4	6	8
3		12		
5				40
7	14			
9				

×	5	7	9	11
6	30			
8				
10		70		
12				

×	5	6	7	8
5				
6	30			
7				
8				

×	2	8	9	11
3				
7				
9				
11				

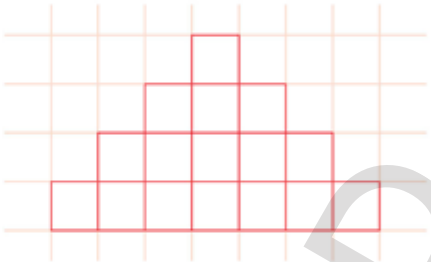
Steps:

1. The teacher gives mini squares to each child.
2. S/he draws a grid on the board, with the numbers to be multiplied written along the top horizontal row and the left vertical row.
3. The teacher calls a student to the board and helps him/her to write the product of 2 numbers in the correct square, as shown above.
4. More children come to the board and fill in the rest of numbers.
5. Then the children complete each of their mini squares as quickly as possible.

MATH LAB ACTIVITY 5

Objective: Children learn to identify prime numbers.

Materials required: Several sheets of squared paper with pyramids drawn on them as shown below:



Steps:

1. The teacher draws an empty pyramid on the board like the one shown above. S/he then calls a student and asks him/her to fill up the pyramid, starting with the number 11 and moving up to 26 as shown below:

			11			
		12	13	14		
	15	16	17	18	19	
20	21	22	23	24	25	26

2. Then another student is called and asked to encircle the prime numbers in the above pyramid. The student encircles the numbers 11, 13, 17, 19, and 23.
3. One more student is asked to fill up the pyramid on the board further till about 8 to 10 rows. Thereafter two students come and encircle the prime numbers in this extended pyramid.
4. The teacher asks the students to observe that most of the prime numbers lie in the central column although they do appear elsewhere also.
5. Now the children draw pyramids starting with the numbers 1, 3, 5, 7, etc. on the sheets distributed to them, and make the same observation.
6. The teacher then asks the students to make pyramids starting with the number 47 and find out how far they can go before they fill an even number in the central column.

			47				
		48	49	50			
	51	52	53	54	55		
56	57	58	59	60	61	62	and so on.

7. They will be surprised to find that this happens only after they cross 1400.

Answers

Exercise 1a

1. a. hundred thousands b. 200 459
c. 725 895 d. 8 001 000 e. 317 000
2. a. False b. False c. True d. True e. True
3. a. C b. A c. D d. B e. A
4. a. Six hundred and seventy two thousand, and seventy two.
b. Five hundred and nine thousand, four hundred and fifty three
c. Three hundred thousand, eight hundred and one
d. Seven hundred and ninety thousands
e. Two hundred and fifty thousand, six hundred and eighty five
f. Eight hundred and fifty four thousand, seven hundred and ninety two
g. One hundred and one thousand, one hundred and eleven
h. Nine hundred and seventy thousand, four hundred and twenty
5. a. 206 366 b. 155 604 c. 906 352
d. 725 120 e. 142 111 f. 600 009
g. 800 904 h. 93 442
6. a. 211 thousand 5 hundreds 8 tens 9 ones
b. 364 thousands 7 hundreds 1 tens 1 ones
c. 972 thousand 0 hundred 4 tens 5 ones
d. 656 thousands 9 hundred 0 tens 2 ones
e. 340 thousands 2 hundred 6 tens 5 ones
7. a. 9 thousands b. 4 hundreds
c. 0 hundreds d. 8 thousands e. 7 tens
f. 7 thousands g. 80 thousands
8. b. 300000 + 10000 + 8000+ 200 + 40 + 8
c. 600000 + 20000 + 7000+ 000 + 50 + 1 d. 900000 + 0 + 4000 + 800 + 70 + 0 e. 500000 + 30000 + 0000 + 600 + 10 + 2
9. a. 271 551 b. 830429 c. 909999
d. 743056 e. 182 103 f. 394260
10. a. < b. > c. > d. < e. > f. >
g. < h. > i. > j. >
11. a. 33 199, 34769, 34829, 34932
b. 62629, 64999, 65090, 65099
c. 25 499, 25 500, 25 509, 25 599
d. 90 145, 90 159, 90 194, 90 195
12. a. 38149, 34 819, 28 944, 28 491
b. 44 001, 43961, 43892, 43 691
c. 38 492, 34 688, 27 486, 26 568
d. 29 901, 29 190, 29 109, 29 091

Exercise 1b

1. a. 16 905 b. 6900 c. 100 090 d. 250
e. 39 310
2. a. True b. False c. True d. True e. False
3. a. B b. C c. D d. C e. A
4. a. 78 863 b. 123 395 c. 98 343
d. 610 70
5. a. 25 200 b. 21 000 c. 61 000
d. 51 360
6. a. 65 214 b. 7328 c. 35 325
d. 25 248
7. a. 23 889 b. 15 368 c. 1027
d. 13 918 e. 62 475
8. a. 46 852 b. 49 900 c. 30 410
d. 80 900
9. a. 85 120 b. 83 820 c. 50 040
d. 8510

Real-life Story Sums

1. 180560 2. Mrs Abid, 2266
3. 57780 books 4. Rs 11 434 5. 1
6. Rs 25 000 7. Rs 836 780

Exercise 1c

1. a. Multiplicand b. multiplier
c. divisor d. 84 e. zero
2. a. False b. True c. True d. False
e. False
3. a. C b. B c. C d. D e. A
4. a. 155156 b. 623931 c. 765090
5. a. 176778 b. 160180 c. 254076
d. 196553
6. a. 250647 b. 177995
7. a. 144 r 10 b. 40 r 24 c. 209 r 6
d. 55 r 12 e. 130 r 39 f. 53 r 17
g. 159 r 7 h. 108 r 32 i. 57 r 26
j. 91 r 41 k. 66 r b37 l. 137 r 23
8. a. 23 r 8 b. 65 r 52 c. 129 r 30
d. 433 r 12 e. 37 r 4 f. 880 r 1
9. a. 100 b. 650 c. 400 d. 300 e. 120 f. 700

Real-life Story Sums

1. 90000 ml 2. 118150 ml 3. 80640 min
4. 176 bags 5. 62 pieces 6. 13 boxes
7. Rs 1935 8. 45 hours 9. Rs. 905

Exercise 1d

1. a. Rule: Add 2; 4, 6, 8, 10, 12, 14
b. Rule: Add 3; 6, 9, 12, 15, 18, 21
c. Rule: Subtract 5; 25, 20, 15, 10, 5, 0
d. Rule: Multiple of 11 or add 11
11, 22, 33, 44, 55, 66
e. Rule: Multiple of 10 or add 10
10, 20, 30, 40, 50, 60
2. a. 31, 41 Rule: Add 5
b. 12, 24 Rule: Add 4
c. 55, 40 Rule: Subtract 5
d. 21, 12, 9 Rule: Subtract 3
e. 18, 36, 54 Rule: Add 9

Exercise 1e

1. 33, 40, 47. 54, 61, 68
2. 90, 80, 70, 60, 50, 40
3. 7, 70, 700, 7000, 70000, 700000
4. 96, 48, 24, 12, 6, 3
5. 20, 35, 50, 65, 80, 95

Exercise 1f

1. 47, 55; Increasing number pattern
2. 8, 2, 1; Decreasing number pattern
3. 20, 40; Increasing number pattern
4. 22, 33, 55; Increasing number pattern
5. 54, 38; Decreasing number pattern
6. 9, 3; Decreasing number pattern

Exercise 2a

1. a. 5 b. 2 and 3 c. 2, 5, and 10 d. 3 e. 2
2. a. True b. True c. False d. True e. False
3. a. B b. D c. A d. B e. A
4. a. 200 b. 126 e. 134 f. 2032
5. a. 624 b. 2358 d. 3612
6. a. 2900 c. 4085 d. 840050
7. b. 81080 c. 10000 e. 52010 h. 8760
8. 1872 divisible by 2 and 3; 53250 is divisible by 2, 3, 5, and 10; 673655 is divisible by 5 only; 2971 is divisible by none of them; 4720 is divisible by 2, 5, and 10

Exercise 2b

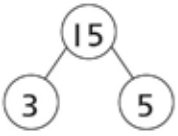
1. a. two b. two c. 1 d. composite e. 2
2. a. False b. False c. True d. True e. False.
3. a. C b. B c. D d. A e. A
4. a. composite b. prime c. composite
d. composite e. composite f. composite
g. prime h. prime i. prime j. prime
k. composite l. prime m. composite
n. composite o. composite p. composite
q. composite r. prime s. composite t. prime
5. a. 3 and 5 c. 4 and 9 d. 14 and 25
e. 36 and 49 f. 72 and 55

Exercise 2c

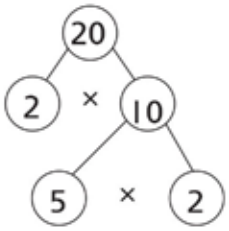
1. a. one b. 1, 2, 3, and 6 c. 2 d. 20 e. prime
2. a. False b. True c. True d. True e. False
3. a. C b. A c. B d. A e. B
4. a. 1, 3, and 9 b. 1 and 11
c. 1, 2, 3, 6, 9, 18 d. 1, 3, 7, 21
e. 1, 2, 3, 4, 6, 8, 12, 24 f. 1, 5, 7, 35
5 a. Yes b. No c. Yes d. No e. Yes
6. a. 1, 5, 25 b. 1, 2, 3, 4, 6, 9, 12, 18, 36

c. 1, 2, 3, 6, 9, 18, 27, 54 d. 1, 2, 4, 8, 16, 32
e. 1, 3, 5, 9, 15, 45 f. 1, 2, 5, 10, 25, 50

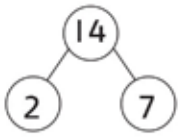
Exercise 2d

1. a. 30 b. 41 c. two d. 2 and 5
e. composite
2. a. True b. False c. True d. True e. False
3. a. D b. B c. C d. A e. D
4. a. 

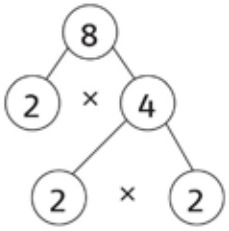
3 × 5

b. 

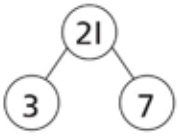
2 × 2 × 5

c. 

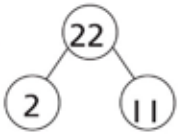
2 × 7

d. 

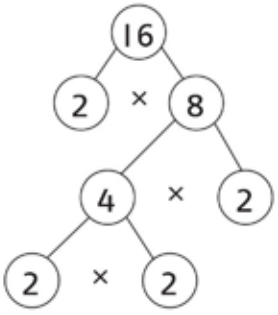
2 × 2 × 2

e. 

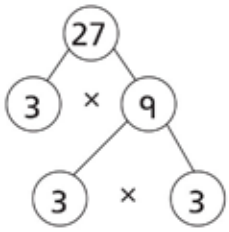
3 × 7

f. 

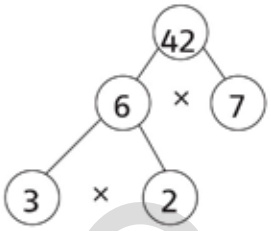
2 × 11

g. 

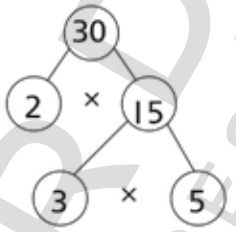
2 × 2 × 2 × 2

h. 

3 × 3 × 3

i. 

3 × 2 × 7

j. 

2 × 3 × 5

6. a. 2, 2, 3, and 7 b. 3, 3, and 13
c. 3, 3, and 37 d. 2, 3, 3, and 7
e. 2, 2, 2, 5, and 13 f. 3, 3, and 11

Exercise 2e

1. a. 1 b. 4 c. 2, 4 and 8 d. 2 e. 6
2. a. False b. False c. False d. True e. False
3. a. A b. B c. B d. D e. A
4. a. Factors of 10 = 1, 2, 5, 10
Factors of 18 = 1, 2, 3, 6, 9, 18

b. Factors of 12 = 1, 2, 3, 4, 6, 12
Factors of 1 = 1

c. Factors of 25 = 1, 5, 25
Factors of 15 = 1, 3, 5, 15

d. Factors of 16 = 1, 2, 4, 8, 16
Factors of 20 = 1, 2, 4, 5, 10, 20

e. Factors of 10 = 1, 2, 5, 10
Factors of 32 = 1, 2, 4, 8, 16, 32

f. Factors of 14 = 1, 2, 7, 14
Factors of 21 = 1, 3, 7, 21

5. a. 1, 2, 4, and 8 b. 1 and 5
c. 1, 2, 3, and 6 d. 1, 2, 7, and 14
e. 1, 2, 4, and 8 f. 1, 2, and 4
6. a. 1 and 3 b. 1 and 5 c. 1 and 2
d. 1 and 3 e. 1, 2, and 4 f. 1 and 7
7. a. $2 \times 3 \times 5$ b. $2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 5$
c. $3 \times 3 \times 5$ d. 5×11
8. c. 5 and 9 d. 2 and 17

Real-life Story Sums

1. 20 students 2. 15 metres 3. 16
4. 5 litres 5. 6

Exercise 2f

1. a. 60 b. 4 and 9 c. 30, 60, 90
d. 9, 18, and 27 e. 10, 20, 30, and 40
2. a. True b. False c. True d. True e. False
3. a. D b. B c. D d. C e. D
4. a. 72, 144, 216 b. 48, 96, 144
c. 60, 120, 180 d. 100, 200, 300
e. 96, 192, 288 f. 54, 108, 162
g. 48, 96, 144 h. 150, 300, 450
i. 96, 192, 288 j. 360, 720, 1080
k. 200, 400, 600 l. 44, 88, 132

Real-life Story Sums

1. 180 children 2. 60 sec or 1 min
3. 90 days 4. 576

Exercise 3a

1. a. like b. unlike c. equivalent
d. smaller e. ascending
2. a. False b. True c. False d. True e. True
3. a. C b. B c. C d. D e. C
4. a. $\frac{3}{12}, \frac{5}{12}$ b. $\frac{9}{20}, \frac{16}{20}$ c. $\frac{1}{15}, \frac{6}{15}$ d. $\frac{91}{100}, \frac{89}{100}$
5. a. like b. like c. unlike d. like
e. unlike f. unlike
6. a. $\frac{2}{4}$ and $\frac{1}{4}$ b. $\frac{9}{15}$ and $\frac{7}{15}$
c. $\frac{4}{6}$ and $\frac{5}{6}$ d. $\frac{1}{18}$ and $\frac{3}{18}$
e. $\frac{6}{20}$ and $\frac{15}{20}$ f. $\frac{4}{14}$ and $\frac{5}{14}$
g. $\frac{5}{20}$ and $\frac{8}{20}$ h. $\frac{9}{12}$ and $\frac{10}{12}$
7. a. < b. < c. > d. < e. > f. > g. < h. <
8. a. $\frac{9}{20}$ $\frac{7}{10}$ $\frac{4}{5}$ b. $\frac{4}{9}$ $\frac{13}{18}$ $\frac{5}{6}$
c. $\frac{3}{9}$ $\frac{2}{3}$ $\frac{5}{6}$ d. $\frac{5}{8}$ $\frac{11}{16}$ $\frac{3}{4}$
e. $\frac{3}{8}$ $\frac{3}{4}$ $\frac{5}{6}$ f. $\frac{1}{4}$ $\frac{3}{10}$ $\frac{7}{20}$
g. $\frac{8}{21}$ $\frac{4}{7}$ $\frac{2}{3}$ h. $\frac{3}{8}$ $\frac{5}{12}$ $\frac{11}{24}$

Exercise 3b

1. a. unit b. whole, proper c. greater
d. proper e. mixed
2. a. True b. True c. False d. True e. False
3. a. B b. A c. A d. D e. A
4. a. $1\frac{2}{6}$ b. $1\frac{3}{4}$ c. $2\frac{3}{8}$
5. a. $\frac{7}{4}$ b. $\frac{13}{6}$ c. $\frac{12}{5}$
6. a. $\frac{13}{4}$ b. $\frac{23}{10}$ c. $\frac{31}{8}$ d. $\frac{17}{12}$ e. $\frac{21}{4}$
f. $\frac{22}{8}$ g. $\frac{26}{7}$ h. $\frac{70}{11}$
7. a. $4\frac{1}{2}$ b. $3\frac{3}{4}$ c. $5\frac{5}{8}$ d. $2\frac{1}{3}$ e. $7\frac{1}{7}$
f. $3\frac{3}{11}$ g. $1\frac{3}{5}$ h. $2\frac{2}{10}$ i. $7\frac{6}{8}$ j. $1\frac{5}{7}$ k. $3\frac{6}{8}$ l. $5\frac{5}{6}$

Exercise 3c

1. a. 1 b. 1 c. $4\frac{2}{5}$ d. $\frac{5}{22}$ e. $7\frac{1}{2}$
2. a. False b. True c. False d. False e. True
3. a. A b. B c. A d. C e. C
4. a. 1 b. $\frac{11}{15}$ c. 1 d. $\frac{12}{10}$ e. $\frac{10}{22}$
5. a. $7\frac{4}{5}$ b. $5\frac{1}{2}$ c. $7\frac{2}{3}$ d. $11\frac{4}{5}$ e. $5\frac{4}{5}$
f. 11 g. $3\frac{3}{4}$ h. 10
6. a. $\frac{1}{2}$ b. $\frac{1}{2}$ c. $\frac{1}{3}$ d. $\frac{10}{13}$
7. a. 2 b. $5\frac{2}{3}$ c. 4 d. $2\frac{1}{3}$ e. $5\frac{4}{5}$
f. $5\frac{1}{3}$ g. $1\frac{1}{3}$ h. $2\frac{1}{5}$ i. $4\frac{1}{5}$ j. $2\frac{2}{3}$ k. $2\frac{1}{5}$
l. $2\frac{1}{2}$ m. $3\frac{1}{11}$ n. $6\frac{1}{3}$ o. $2\frac{2}{3}$
8. a. $4\frac{1}{14}$ b. $4\frac{13}{20}$ c. $5\frac{7}{8}$ d. $3\frac{7}{10}$ e. $2\frac{4}{9}$ f. $5\frac{13}{20}$

Real-life Story Sums

1. $4\frac{1}{2}$ km 2. $2\frac{4}{5}$ m 3. $19\frac{1}{2}$ m
4. $6\frac{1}{2}$ kg 5. $11\frac{4}{5}$ m

Exercise 3d

1. a. $\frac{10}{9}$ b. $\frac{5}{18}$ c. 2 d. $\frac{5}{7}$ e. $\frac{1}{2}$
2. a. True b. False c. False d. True e. False
3. a. C b. B c. A d. B e. A
4. a. 25 b. $9\frac{1}{3}$ c. $10\frac{1}{2}$ d. $4\frac{1}{4}$
5. a. $\frac{1}{8}$ b. $\frac{8}{35}$ c. $\frac{1}{15}$ d. $\frac{1}{10}$ e. $\frac{2}{3}$
6. a. $15\frac{3}{4}$ b. $15\frac{5}{8}$ c. 30 d. $12\frac{1}{2}$ e. $12\frac{4}{9}$
7. a. 54 b. 600 c. 91 d. 5
8. a. $\frac{1}{27}$ b. $\frac{1}{24}$ c. $\frac{1}{56}$ d. $\frac{1}{10}$
9. a. $\frac{1}{3}$ b. $\frac{4}{7}$
10. a. $\frac{1}{6}$ b. 10

Real-life Story Sums

1. $3\frac{1}{3}$ km 2. $\frac{1}{12}$ of cake 3. $17\frac{1}{2}$ pages
4. $22\frac{1}{2}$ m of cloth 5. $2\frac{3}{5}$ *l*

Exercise 4a

1. a. 0.01 b. $\frac{51}{100}$ c. 0.5 d. thousandths e. $\frac{75}{100}$
2. a. False b. False c. True d. False e. True
3. a. B b. B c. D d. A e. A
4. a. 1.7, $1\frac{7}{10}$ b. $2\frac{1}{10}$, 2.1 c. $1\frac{4}{10}$, 1.4
d. $\frac{5}{10}$, 0.5 e. $2\frac{5}{10}$, 2.5
5. a. $\frac{4}{100}$, 0.04 b. $\frac{19}{100}$, 0.19 c. $\frac{7}{100}$, 0.07
d. $\frac{3}{100}$, 0.03 e. $\frac{21}{100}$, 0.21 f. $\frac{33}{100}$, 0.33
8. a. 10.1 b. 0.4 c. 15.3 d. 0.46
e. 0.07 f. 0.16
9. a. $\frac{27}{10}$ b. $\frac{94}{10}$ c. $\frac{114}{10}$ d. $\frac{15}{100}$ e. $\frac{67}{1000}$
f. $\frac{10}{100}$ g. $\frac{2}{1000}$ h. $\frac{8}{1000}$
10. a. 1.8 b. 0.2 c. 0.35 d. 0.09
e. 0.128 f. 11.160 g. 0.437 h. 0.002
11. a. 6 hundredths b. 2 tenths
c. 6 hundredths d. 6 tens e. 9 tenths
12. a. 0.25 b. 0.15 c. 0.36 d. 0.4
e. 0.078 f. 0.164 g. 0.284 h. 0.515
13. a. 1.3 b. 8.2 c. 6.27 d. 10.94
e. 7.043 f. 7.605 g. 2.009 h. 8.108
14. a. $2\frac{78}{125}$ b. $3\frac{7}{250}$ c. $5\frac{1}{100}$ d. $20\frac{1}{200}$

Exercise 4b

1. a. 70 b. 6000 c. hundred d. 11 e. 125
2. a. True b. False c. True d. False e. True
3. a. B b. B c. B d. C e. A
4. a. 4000 b. 1000 c. 2000 d. 1000 e. 9000
5. a. 96 b. 39 c. 1 d. 637 e. 100

Exercise 4c

1. a. 246.65 b. 102.96 c. 14250 d. 167.44
e. 0.9
2. a. True b. False c. True d. True e. False
3. a. D b. C c. B d. D e. D
4. a. 775.99 b. 749.97 c. 991.57
d. 944.18 e. 956.79 f. 856.43 g. 3039.19
5. a. 846.09 b. 218.34 c. 322.7
d. 132.45 e. 146.89 f. 460.79
g. 145.62 h. 135.62 i. 372.6
6. a. 191.5 b. 2716.8 c. 655.9 d. 2618.7
7. a. 45.3 b. 206.5 c. 329
8. a. 8.1 b. 10.2 c. 9.3 d. 32.1
9. a. 2.1 b. 1.9 c. 32.5 d. 2.9

Real-life Story Sums

1. a. Sports Shop: Shorts Rs 450,
Table Tennis Balls Rs 114,
Sports Cap Rs 177.5, Total Rs 741.75
b. Book Shop: Comics Rs 226.1
Famous Five Books Rs 175
Magic Books Rs 109.5
New Diary Rs 94.70, Total Rs 605.3
c. Bakery: Doughnut Rs 62,
Chocolates Rs 55, Chicken Puffs Rs 89.4,
Total Rs 206.4
2. a. Mrs Shahid: Typing Paper Rs 1350,
Electronics Rs 225, New Pen Rs 28.90,
Total Rs 1603.9
b. Mr Amir: Soap Rs 132.5, Biscuits Rs 77.60,
Cookery Book Rs 40.50, CDS Rs 83,
Total Rs 333.6

c. Mrs Khan: Books on computer Rs 722, Lamp Rs 200.90, Tickets Rs 690, Total Rs 1612.90
3. a. Rs 32.2 b. Rs 96.15 c. Rs 540 d. Rs 104.5
4. Rs 13 285.40 5. Rs 397 6. 23.8 kg
7. Rs 120.15 8. 18.5 m

Exercise 5a

1. a. 4500 b. 78000 c. 129 mm d. 50 m
e. 25900 cm
2. a. False b. False c. True d. False e. True.
3. a. B b. C c. A d. A e. D
4. a. 39 000 m b. 405 000 m c. 45 415 m
d. 4 891 000 m e. 900 000 m f. 130 119 m
5. a. 4200cm b. 81 500 cm c. 1280 cm
d. 67 300 cm e. 9300 cm f. 3542 cm
6. a. 150 mm b. 80 mm c. 185 mm
d. 2130 mm e. 717 mm f. 362 mm
7. a. 400 000 m b. 5500 cm c. 91 000 m
d. 13 015 m e. 429 cm f. 7035 m
8. a. 3560 m b. 25 mm c. 9040 cm
d. 20 500 m e. 178 cm f. 14 mm
9. a. 82 km 790 m b. 117 km 100 m
c. 107 cm 8 mm d. 80 cm 7 mm
10. a. 18 km 102m b. 84 km 101 m
c. 76cm 3 mm d. 205 m
11. a. m/cm b. mm/cm c. m d. mm
e. km f. mm/cm

Real-life Story Sums

1. 50 km 165 m 2. Tariq is taller by 14 cm
3. 70 cm 4. 2 m 30 cm 5. 9 m 80 cm

Exercise 5b

1. a. 750 000 mg b. 569 555 g
c. 1210 g d. 171 kg 105 g e. 198 000 g
2. a. True b. False c. False d. True e. True
3. a. B b. C c. A d. B e. D
4. a. 375 000 g b. 46 000 g
c. 1 005 000 g
5. a. 65 kg 894 g b. 75 kg 200 g
c. 83 kg 660 g
6. a. 44 kg 385 g b. 1 kg 765 g
c. 9 kg 350 g
7. a. 14 750 g b. 32 716 g c. 350 000 g
d. 105 200 g e. 10 005 g
8. a. 50 000 g b. 190 000 g c. 255 000 g
d. 156 000 g e. 100 000 g f. 918 000 g
9. a. 580 000 mg b. 150 000 mg
c. 135 000 mg d. 85 000 mg e. 291 000 mg
10. a. kg b. kg c. g d. g/ kg

Real-life Story Sums

1. 129 kg 33 g 2. 7 kg 3. 600 g
4. 10 kg 63 g 5. 4.5 kg

Exercise 5c

1. a. 8000 ml b. 1 c. Smaller
d. 15012 ml e. 220 l 941 ml
2. a. True b. True c. False d. True e. False
3. a. C b. B c. A d. B e. C
4. a. 35 000 ml b. 18 750 ml
c. 129 000 ml d. 25 015 ml
5. a. 456 000 ml b. 921 000 ml c. 18 000 ml
d. 108 000 ml e. 550 000 ml
6. a. 155 l 175ml b. 202 l 463 ml
c. 1 l 720 ml d. 42 l 950 ml
7. a. 12 l 255 ml b. 6 l 420 ml
c. 8 l 400 ml d. 350 ml
8. a. litres b. ml c. ml/l d. ml e. l

Real-life Story Sums

1. 7000 l 2. 5 l 550 ml
3. Mr Ahsan 1l 500 ml more milk

Exercise 5d

1. a. 6:45 b. 19:45 hours c. 4:05
d. 3:15 am e. 3:00 p.m. or 15 hours
2. a. True b. False c. True d. False
e. True
3. a. C b. A c. D d. B e. C
4. a. 25 min to 2, 2:35
b. quarter to 4, 3:45 c. 10 min to 7, 6:50
d. 8 min to 5, 4:52 e. 24 min past 1, 1:24
f. half past 1, 1:30
5. a. 17 min past 1 b. 20 mins to 5
c. 22 min to 10

6. a. 9:24 b. 11:25 c. 7:15 d. 5:55
e. 2:42 f. 4:45 g. 1:10
7. a. 9:15 a.m. b. 11:40 a.m.
c. 1:10 p.m. d. 3:00 a.m.
8. a. 3:30 a.m. b. 10:05 p.m.
c. 6:20 p.m. d. 8:00 a.m.
9. a. 21:00 b. 00:02 c. 14:00
d. 20:23 hours e. 15:15 f. 23:05
10. a. 05:20 a.m. b. 5:16 p.m.
c. 12:00 midnight d. 12:45 a.m.
e. 12:00 noon
11. a. 195 sec b. 1290 sec c. 5418 sec
12. a. 14 400 sec b. 108 000 sec
c. 43 200 sec d. 144 000 sec
13. a. 75 min b. 125 min c. 104 min
d. 140 min
14. a. 100 min / 1 hr 40 min b. 1 hr 50 min
c. 5 h 18 min
15. a. 1 hr 6 min b. 5 h 15 min
c. 14 min 23 sec d. 4 hr 5 min
16. a. 72 sec b. 31 sec c. 1 min 50 sec
d. 10 min 58 sec e. 6 min 15 sec
17. a. 16 weeks b. 40 weeks
18. a. 49 days b. 77 days

Real-life Story Sums

1. 20:50 hours 2. 00 : 10 hours
3. 1 hr 15 min, 1 hr 40 min,
55 min, 1 hr 17 min, 2 hr 5 min, 1 hr 15 min
4. 1 hr 55 min 5. 8 hrs 50 min

Exercise 6

1. a. square unit b. $4\frac{1}{2}$ c. 6 cm
d. 12 cm^2 e. 10 cm
2. a. True b. False c. True d. True e. False
3. a. C b. D c. A d. B e. A
4. a. Perimeter b. Area
A: a. 12 cm b. 7 cm^2, B: a. 14 cm b. 12 cm^2,
C: a. 14 cm b. 6 cm^2, D: a. 8 cm b. 4 cm^2.
5. Shape A: 16 cm, Shape B: 14 cm,
Shape C: 22 cm, Shape C has the greatest perimeter and shape B has the smallest perimeter.
6. a. b = 4 cm b. l = 9 cm c. b = 5 cm
d. l = 20 cm e. b = 50 cm
8. a. C and J b. B, D and F c. A, C, and J have the smallest, I has the largest area.
9. a. A and C b. A and B c. B and C
10. A: 9 cm^2, B: 11 cm^2, C: 11 cm^2,
D: 12 cm^2, E: 7 cm^2, F: 8 cm^2
11. A: 14 cm^2, B: 9 cm^2, C: 16 cm^2, D: 15 cm^2
12. A: 4 cm^2, B: 9 cm^2, C: 5 cm^2
14. a. b = 5 cm b. Area = 72 cm^2
c. b = 4 cm d. l = 9 cm e. l = 12 cm
15. a. 24 m^2 b. 21 m^2 c. 12 m^2
Carpet a has the largest area.
16. Area of the house is 43 m^2
17.

	Area	Perimeter
a.	12 cm^2	14 cm
b.	28 cm^2	22 cm
c.	5 cm^2	12 cm
d.	16 cm^2	20 cm

18.

	Area	Perimeter
a.	20 cm^2	18 cm
b.	20 cm^2	24 cm
c.	63 cm^2	32 cm
d.	56 cm^2	30 cm
e.	44 cm^2	30 cm

Real-life Story Sums

1. b = 50 m, Area = 5000 m^2
2. Area = 105 cm^2, Perimeter = 44 cm
3. l = 9 cm 4. b = 6 m
5. Area of the bed = 2 m^2,
Perimeter = 6 m
6. b = 125 m, Area = 10 000 m^2

Exercise 7a

1. a. line segment b. parallel
c. points d. constant
e. Intersect
2. a. True b. False c. False d. False
e. True 3. a. B b. A c. D d. C e. B
4. a. 4 cm. b. 2.5 cm c. 4.2 cm
d. 5.5 cm
7. $\overline{KL}$ // $\overline{MN}$, $\overline{PQ}$ // $\overline{RG}$

Exercise 7b

1. a. Yes b. Yes c. Yes d. Yes e. No
f. Yes g. No h. No i. Yes

Exercise 7c

1. a. vertex b. 90° c. acute d. obtuse
e. draw or measure
2. a. False b. True c. True d. False
e. True
3. a. B b. D c. A d. C e. D
4. a. acute angle b. right angle
c. right angle d. straight angle
e. reflex angle f. obtuse angle
g. acute angle h. reflex angle
5. a. AB and BC b. WX and XY
6. a. L b. T 9. c and d 10. a. 40° b. 30°
11. a. 80° b. 15° c. 45°
12. a. 140° b. 150° c. 150°
13. ∠ABC = 45°; ∠ABD = 60°; ∠ABE = 90°; ∠CBF = 70°; ∠CBE = 45°: ∠DBF = 60°

Exercise 7d

1. a. 4.82 cm b. 11.6 m c. quadrant
d. centre e. semi circle
2. a. False b. False c. True d. True
e. False
3. a. C b. A c. B d. D e. A
4. a. 1.1 cm b. 2.2 cm c. 2.3 cm d. 2 cm
5. a. 0.55 cm b. 1.1 cm c. 1.15 cm d. 1 cm

Exercise 7e

1. a. four b. quadrilaterals c. 90°
d. parallel and equal e. quadrilateral
2. a. False b. True c. False d. False
e. True 3. a. B b. C c. D d. B e. A

Exercise 8a

1. a. 10 notebooks b. February and May
c. 5 more notebooks d. July
2. a. Science b. 25 students c. Math
d. English e. 15 more students
3. a. 10 children b. 5 more children
c. 10 children on Tuesday, 15 children on Wednesday
4. a. Rs. 3000 b. Rs 1500 more
c. On Wednesday
5. a. Rs 60 b. No c. Rs 80
6. a. August b. May, June, July, September and October c. February
d. August only
7. a. 1 m b. 8 years c. 40 kg d. Sana
e. 1000 stamps f. 200 stamps g. 2.5 m
h. 50 kg

Exercise 8b

1. a. Bus b. Cycle and car c. Bus
2. a. 25 b. Reading c. 43 d. 100
3. a. Potato and capsicum b. 15 kg
c. 25 kg