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 5

Contents

YOUR DIGITAL RESOURCE

1 Whole Numbers and Operations

In this unit students will learn to:

- read numbers up to 1 000 000 (one million) in numerals and words
- write numbers up to 1 000 000 (one million) in numerals and words
- add numbers up to 6-digit numbers
- subtract numbers up to 6-digit numbers
- multiply numbers, up to 5-digit, by 10, 100, and 1000
- multiply numbers, up to 5-digit, by a number up to 3-digit numbers
- divide a number up to 5-digit numbers by 10, 100, and 1000
- divide numbers up to 5-digit numbers by a number up to 2-digit numbers
- solve real life situations involving operations of addition, subtraction, multiplication, and division
- identify and apply a pattern rule to determine missing elements for a given pattern
- identify the pattern rule of a given increasing and decreasing pattern and extend the pattern for the next three terms
- describe the pattern found in a given table or chart

MATH FLASH

You have already learnt to:

- read and write numbers in words and figures up to 6-digits. Example: 406 891
  Four hundred and six thousand, eight hundred and ninety-one
- identify place value of numbers up to 6-digits
- write numbers in expanded form
  Example: 326 094
  300 000 + 20 000 + 6000 + 000 + 90 + 4
- compare and order numbers
- add and subtract numbers up to 6-digits
- multiply and divide numbers
- recognise a given increasing and decreasing pattern by stating a pattern rule

KEY VOCABULARY

numeral, digit, less than, more than, predecessor, successor, multiplicand, multiplier, product, quotient, divider, divisor

Numbers

Now we will work with numbers up to 7 digits, like one million.

Let us consider the following place value chart.

Millions			Thousands			Ones			
HM	TM	M	HTh	TTh	Th	H	T	U	
			1	0	0	0	0	0	→ 6-digit number
		1	0	0	0	0	0	0	→ 7-digit number

From the above chart we conclude that as the number of digits increases the value of the number also increases. A 7-digit number is a million.

Now as an example consider a 7-digit number 2 489 652 and place it in the place value chart.

M	HTh	TTh	Th	H	T	U
2	4	8	9	6	5	2

This shows that a 7-digit number goes up to one million.

NOTE

Earlier, commas have been used to group the units, thousands, millions, billions. Now, in the International place value chart commas have been replaced by spaces.

Examples:

1. Write 2 952 602 in words.

Solution

First place the number in the place value chart.

M	HTh	TTh	Th	H	T	U
2	9	5	2	6	0	2

Now we can easily write the number in words as:

Two million, nine hundred and fifty-two thousand, six hundred and two.

2. Write the given number in figures:

Five million, nine hundred and nine thousand, four hundred and thirty-seven.

Solution:

Make a place value chart and write the number in it.

M	HTh	TTh	Th	H	T	U
5	9	0	9	4	3	7

Hence the required number is 5 909 437.

3. Write the value of the ringed digit in the number 9 8③2 416

Solution:

Place the number in the place value chart.

M	HTh	TTh	Th	H	T	U
9	8	③	2	4	1	6

The value of 3 is thirty thousand or 30 000.

4. Write the number 9 825 136 in expanded form.

Solution:

9 000 000 + 800 000 + 20 000 + 5000 + 100 + 30 + 6

QUICK REFERENCE

To find the place value of the ringed digit, write the digit as it is and replace all other digits on its right with zero.

Example: 71⑧356

↓↓↓↓

⑧000

The place value of the ringed digit is eight thousand.

5. The given number is written in expanded form, find the value.
6 000 000 + 000 000 + 20 000 + 1000 + 500 + 40 + 1

Solution:

The required value can be obtained by adding up all the numbers vertically. The required number is 6 021 541.

Comparing and ordering 7-digit numbers

Comparing numbers is the same as knowing which number is smaller and which number is the bigger. Let us take an example of two 6-digit numbers, 698 721 and 698 831.

To compare these numbers, follow the given steps.

1. Make a place value chart and write both the numbers in it.

HTh	TTh	Th	H	T	U
6	9	8	⑦	2	1
6	9	8	⑧	3	1

2. Now check the place value of each digit starting from the largest place – hundred thousand.
3. We see that the numbers in HTH, TTH and Th are equal, but in the hundred place, 8 hundred is greater than 7 hundred which makes 698 831 greater than 698 721.
4. Symbolically, it is denoted as 698 831 > 698 721.

REMEMBER

Symbol '>' indicates greater than

Symbol '<' indicates less than

The open side of the symbol indicates the greater number.

Now, let us compare two 7-digit numbers, 6 251 881 and 6 270 430.

Following the steps we write the numbers in the place values.

M	HTh	TTh	Th	H	T	U
6	2	⑤	1	8	8	1
6	2	⑦	0	4	3	0

Starting from the left we find that 70 thousand is greater than 50 thousand.

Therefore, 6 270 430 > 6 261 881
or 6 251 881 < 6 270 430

The closed end of the symbol indicates the smaller number.

Using the same strategy, we can order a sequence of numbers in their ascending or descending order.

Example:

Arrange the following numbers in ascending order.
2 345 801 ; 2 346 801 ; 2 341 801

Solution:

Arrange the given numbers as follows:

2	3	4	5	8	0	1
2	3	4	6	8	0	1
2	3	4	1	8	0	1

Starting from the left we see that digits in the thousand place differ from each other.

We know that 1000 < 5000 < 6000.

Therefore, the required ascending order is: 2 341 801, 2 345 801, 2 346 801

or 2 341 801 < 2 345 801 < 2 346 801

Example:

Arrange the following numbers in descending order.
3 921 016 ; 3 921 816 and 3 921 516

Solution:

Proceeding according to the steps given above we find that in the hundreds place we have digits 0, 8, and 5.
We know that 800 > 500 > 000.

Therefore, the required descending order is:
3 921 816 , 3 921 516 , 3 921 016
or 3 921 816 > 3 921 516 > 3 921 016

▶ Exercise 1a

1. Fill in the blanks.
   a. In the International system, one million is a 7 digit number.
   b. The place value of the ringed digit in ⑤ 299 287 is 5 million
   c. Complete the sequence.
      5 030 186; 5 030 286; 5 030 386 ; 5 030 486.

d. 835 500
+50 000
885 500

d. The number 50 000 more than 835 500 is 885500.
e. The place value of 3 in the number 1 314 110 is 300 thousand.

2. State whether the following are true or false.
a. As per the International place value chart, 6198457 is written as 6 198 457. (True)
b. The number 200 less than 2 698 210 is 2 698 200. (False) 200 less than 2698210 is 2698010.
c. The smallest 7-digit number is ten million. (False) Smallest 7-digit number is 1 million.
d. The value of the ringed digit in 8 (1)93 156 is one hundred thousand. (True)
e. In the International system, 4598260 is written as 459 8260. (False) 4598260 is written as 4 598 260.

3. Select the correct answer from the given options.
a. Three million, seven hundred thirty-five thousand, two hundred and five in figures is
(A) 3 735 205
B 3 035 205
C 3 735 025
D 3 735 250

b. The successor of 1943 777
A 1 943 776
B 2 943 776
(C) 1 943 778
D 2 943 777

c. Two million is a
A 5-digit number
B 6-digit number
(C) 7-digit number
D 8-digit number

d. Which of the given number matches with the expanded form?
6 000 000 + 56 000 + 700 + 20 + 5?
A 656 725
B 6 567 025
C 6 065 725
(D) 6 056 725

e. 9786120 written in the International system
A 97 86 120
(B) 9 786 120
C 978 612 0
D 97 86 120

4. Write the numbers in the figure, giving the spaces correctly according to International system.
a. One million, nine hundred thousand 1 900 000
b. Eight million 8 000 000
c. Seven million, fifty thousand, eight hundred, and six 7 050 806

5. a. 2 905 384 b. 7 031 700 c. 1 320 059
d. 4 301 637

5. Write the numbers in the figure, giving the spaces correctly.
   a. 2905384 b. 7031700 c. 1320059 d. 4301637
6. Write the following numbers in words.
   a. 4 000 000 b. 6 500 000 c. 2 149 000 d. 2 840 333
   e. 3 185 620 f. 5 401 626
7. Write the place value of the ringed digit.
   a. 4 1⑦9 623 b. ⑨ 900 605 c. 9 ⑤63 182 d. ⑧ 049 315
   e. 2 4⑨2 585 f. ⑤ 201 782
8. Write the following numbers in expanded form.
   a. 3 761 830 b. 403 075 c. 7 512 847 d. 701 010
9. Arrange the following numbers in descending order.
   a. 9 603 298; 9 630 928; 9 613 829
   b. 3 410 623; 3 416 053; 3 415 933
   c. 3 685 623; 3 685 632; 3 684 362
10. Write the predecessor of the following numbers.
    a. 9 999 000 b. 1 456 789 c. 4 300 100 d. 2 488 901

9 998 999 1 456 788 4 300 099 2 488 900

Addition and subtraction up to 6-digit numbers

Adding and subtracting very big numbers with 6 digits is simple, provided we are careful to write columns neatly and carefully, and work from the ones column first.

```
   1 1   1
 456 138
+ 505 952
 962 090
```

NOTE

When zero is added to a number, the number remains the same.

Example:
156 + 0 = 156

```
    1 15
 997 2̸0̸4
- 442 096
 555 168
```

NOTE

When zero is subtracted from a number, the number remains the same.

Example:
78 − 0 = 78

Unit 1 – Exercise 5a

6. a. Four million

b. Six million five hundred thousand

c. Two million one hundred and forty-nine thousand

d. Two million eight hundred and forty thousand three hundred and thirty-three

e. Three million one hundred and eighty-five thousand six hundred and twenty

f. Five million four hundred and one thousand six hundred and twenty-six

7. a. 70 thousand or 70 000 b. 9 million or 9000000

c. 500 thousand or 500 000 d. 8 million or 8000 000

e. 90 thousand or 90 000 f. 5 million or 5 000 000

8. a. 3 000 000 + 700 000 + 60 000 + 1000 + 800 + 30

b. 400 000 + 3000 + 70 + 5

c. 7000 000 + 500 000 + 10 000 + 2000 + 800 + 40 + 7

d. 700 000 + 1000 + 10

9. a. 9 630 928 ; 9 613 829 ; 9 603 298

b. 3 416 053 ; 3 415 933 ; 3 410 623

c. 3 685 632 ; 3 685 623 ; 3 684 362

1. a 6920110 − 6900000 = 0020110

6. ① 4952106 + 900000 = 5852106

c. 5874813 − 5774813 = 0100000

▶ Exercise 1b

d. ① ① 3421792 + 421792 = 3843584

1. Fill in the blanks.
   a. 6 920 110 is 20110 more than 6 900 000.
   b. Sum of 4 952 106 and 900 000 is 5 852 106.
   c. 5 874 813 is greater than 5 774 813 by 100 000.
   d. 3 421 792 and 421 792 together make 3 843 583.
   e. Difference of 5 610 823 and 9 610 072 is 3 999 240.

e. 9 610 072 − 5 610 832 = 3999 240

2. State whether the following are true or false.
   a. If one is added to the greatest 6-digit number it makes the smallest 7-digit number. (True)
   b. 500 000 subtracted from 6 500 000 equals 6 000 000. (True)
   c. 750 000 is the sum of 500 000 and 25 000. (False) 500000 + 25000 = 525000
   d. The difference of 3 500 720 and 2 500 720 is 1 500 000. (False) 3500720 − 2500720 = 1000000
   e. 9 216 477 is the sum of 8 120 595 and 1 095 882. (True)

3. Select the correct answer from the given options.
   a. The number which is 50 000 more than 1 253 129 is
      Ⓐ 1 203 129 Ⓑ 1 753 129
      Ⓒ 1 303 129 Ⓓ 1 258 129

① 1253129 + 50000 = 1303129

   b. The number which is 2000 less than 9 732 400 is
      Ⓐ 9 712 400 Ⓑ 9 730 400
      Ⓒ 9 532 400 Ⓓ 9 784 400

9732400 − 2000 = 9730400

   c. If 8 765 550 is reduced by 7 000 550, the result is equal to
      Ⓐ 1 065 000 Ⓑ 1 705 550
      Ⓒ 1 765 000 Ⓓ 8 000 000

8765550 − 7000550 = 1765000

   d. 7 824 729 + 324 216 is equal to
      Ⓐ 8 148 945 Ⓑ 8 148 935
      Ⓒ 7 148 945 Ⓓ 7 148 935

   e. If the smallest 6-digit number is subtracted from the greatest 7-digit number, the result is
      Ⓐ 9 889 989 Ⓑ 9 899 999
      Ⓒ 1 000 001 Ⓓ 1 000 000

9999999 − 100000 = 9899999

4. Add the given numbers.

a. 984 623 + 015 346 = 999969

b. 569 231 + 694 325 = 1 263 556

c. 407 156 + 592 843 = 999999

d. 468 571 + 865 149 = 1333720

e. 407 862 + 374 109 = 781971

f. 650 192 + 029 999 = 680191

g. 467 333 + 805 438 = 1272771

h. 836 117 + 562 431 = 1398548

i. 6 481 075 + 1 562 431 = 8043506

5. Write vertically and add.

a. 564 121 + 473 565

b. 655 132 + 2984 + 34 103

c. 630 499 + 38 324 + 5687

d. 39 862 + 410 364 + 300 145

e. 465 + 900 321 + 1092

f. 243 018 + 32 + 51 673

g. 465 321 + 7495 + 118 626

h. 444 910 + 333 333 + 8067

6. Write the number which is:

a. 5000 more than 245 624

b. 800 more than 695 382

c. 20 000 more than 462 834

d. 12 000 more than 695 148

e. 900 more than 624 540

f. 18 000 more than 146 371

7. Subtract the given numbers.

a. 496 953 − 205 343 = 291610

b. 647 329 − 538 142 = 109187

c. 875 648 − 232 537 = 643111

d. 900 823 − 436 172 = 464651

e. 864 932 − 418 725 = 446 207

f. 100 032 − 52 164 = 47868

g. 895 438 − 141 654 = 753784

h. 6 703 029 − 216 420 = 486609

i. 280 037 − 268 430 = 011607

Unit 1 - Exercise 1b

5. a
$$\begin{array}{r} {\scriptstyle 1}\,564\,121 \\ +\,473\,565 \\ \hline 1\,037\,686 \end{array}$$

b.
$$\begin{array}{r} {\scriptstyle 1\ 1\ 1}\ {\scriptstyle 1} \\ 65\,5\,132 \\ 2\,984 \\ +\,34\,103 \\ \hline 692\,249 \end{array}$$

c.
$$\begin{array}{r} {\scriptstyle 1\ 1}\ {\scriptstyle 2\ 2} \\ 630\,499 \\ 38\,324 \\ +\,5\,687 \\ \hline 674\,510 \end{array}$$

d.
$$\begin{array}{r} {\scriptstyle 1} \\ 39\,862 \\ 410\,364 \\ +\,300\,145 \\ \hline 750\,371 \end{array}$$

e.
$$\begin{array}{r} {\scriptstyle 1}\,465 \\ 900\,321 \\ +\,1\,092 \\ \hline 901\,878 \end{array}$$

f.
$$\begin{array}{r} 243\,018 \\ 32 \\ +\,51\,673 \\ \hline 294\,723 \end{array}$$

g.
$$\begin{array}{r} {\scriptstyle 2\ 1}\ {\scriptstyle 1\ 1} \\ 465\,321 \\ 7\,495 \\ +\,118\,626 \\ \hline 591\,442 \end{array}$$

h.
$$\begin{array}{r} {\scriptstyle 1\ 1\ 1}\ {\scriptstyle 1} \\ 444\,910 \\ 333\,333 \\ +\,8\,067 \\ \hline 786\,310 \end{array}$$

6. a
$$\begin{array}{r} {\scriptstyle 1} \\ 245\,624 \\ +\,5\,000 \\ \hline 250\,624 \end{array}$$

b.
$$\begin{array}{r} {\scriptstyle 1} \\ 695\,382 \\ +\,800 \\ \hline 696\,182 \end{array}$$

c.
$$\begin{array}{r} 462\,834 \\ +\,20\,000 \\ \hline 482\,834 \end{array}$$

d. $\overset{1}{6}95\ 148$

$+\ 12\ 000$

$707\ 148$

e. $62\overset{1}{4}\ 540$

$+\ 900$

$625\ 440$

f. $\overset{1}{1}46\ 371$

$+\ 18\ 000$

$164\ 371$

8. Solve these sums using the International system.
   a. Find the difference between the greatest 6-digit number and the greatest 5-digit number.
   b. From the smallest 6-digit number, subtract the greatest 5-digit number.

9. Write in vertical form and subtract.
   a. 831 569 – 629 293
   b. 600 360 – 38 745
   c. 4 000 351 – 25 689
   d. 600 381 – 417 298
   e. 100 000 – 45 692
   f. 234 629 – 165 117

10. Write the number which is:
   a. 2000 less than 840 328
   b. 700 less than 593 400
   c. 5000 less than 213 864
   d. 90 000 less than 194 523

11. Study the table carefully, then answer the given questions below:

Population of major cities of Pakistan according to the 2017 Census	
Islamabad	1 164 000
Multan	1 871 843
Faisalabad	3 203 846
Rawalpindi	2 098 231
Peshawar	1 970 042
Quetta	1 001 205

   a. How many more people live in Rawalpindi than in Islamabad?
   b. After Faisalabad, which city has the most people? How many people live in this city and Faisalabad combined?
   c. What is the total population of Multan and Rawalpindi?
   d. Which city has the lowest number of people? What is the difference in population between this city's and Faisalabad's?
   e. If the population of Peshawar is added to that of Quetta, how many people are there altogether?

Unit 1 – Exercise 1b

8. a greatest 6-digit number = 999 999
greatest 5-digit number − 99 999
900 000

b smallest 6-digit number = 100 000
greatest 5-digit number = − 99 999
00 001 = 1

9. a 831 469
− 629 293
202 276

b. 600 340
− 38 745
561 615

c 3400 3551
− 25 689
3974 662

d. 600 231
− 417 298
183 083

e 1000 9000
− 45 692
54 308

f. 1234 629
− 165 117
069 512

10 a. 8840 328
− 2000
838 328

b. 598400
− 700
597700

c 2913 864
− 5000
208 864

d 194 523
− 90 000
104 523

11. a. Rawalpindi = 2 098 231
Islamabad - 1 164 000
934231

934 231 more people live in Rawalpindi

b. Rawalpindi ; 2 098 231
Faisalabad : + 3 203 846
5 302 107

5302107 people live in Rawalpindi and Faisalabad.

c. Multan = 1 871 843
Rawalpindi = + 2 098 231
3 970 074

The total population of Multan and Rawalpindi was 3 970 074.

d. Faisalabad = 3 203 846
Quetta = - 1 001 205
2202 641

Quetta; the difference between population of Faisalabad and Quetta is 2 202 641.

e. Peshawar = 1970 042
Quetta = + 1001 205
2971 247

There are 2 971 247 people altogether.

Multiplication

In previous classes we have learnt to multiply numbers up to 4 digits by numbers up to 2 digits.

MATHEMA-TRICK

When a number is multiplied by 10, and 10 is added to the result, and then the sum is divided by 10, the result will always be the successor of the original number.

Multiplication of numbers up to 5 digits by 10, 100, and 1000

Let us see what happens when we multiply a 6-digit number by 10, 100, and 1000.

Consider a 5-digit number 46 512.
Make a table of multiplication as shown below.

Number	Millions			Thousands			Ones		
	HM	TM	M	HTh	TTh	Th	H	T	U
46512 × 10				4	6	5	1	2	0
46512 × 100			4	6	5	1	2	0	0
46512 × 1000		4	6	5	1	2	0	0	0

Notice that when we:

- multiply a number by **10**, we move that number one column to the left, and fill the blank with **one zero**.
- multiply a number by **100**, we move that number two columns to the left, and fill in **two zeros**.
- multiply by **1000**, we move the number three columns to the left, filling in **three zeros**.

Examples

1. 89 850 × 10 = 898 500
2. 48 305 × 100 = 4 830 500
3. 20 590 × 1000 = 20 590 000

REMEMBER

To multiply a number with powers of 10, place zeros on the right and move the number towards the left.

HINT

When multiplying bigger numbers, always double check your calculations.

Multiplication of numbers up to 5 digits

Now we will multiply 5-digit numbers by a 2-digit and a 3-digit number.

Examples:

1. Multiply 32 615 (5-digit number) by 23 (2-digit number).

Solution:

We proceed in a similar way as we did in the previous class. Moreover, we will learn that each term in a multiplication sum has a special name.

32615 →	**multiplicand**
× 23 →	**multiplier**
97845 →	(32615 × 3)
+ 652300 →	(32615 × 20)
750145 →	**product**

NOTE

When a number is multiplied by 1 the result remains the same.

Example:
45 × 1 = 45

2. Multiply 21 083 (5-digit number) by 254 (3-digit number).

Solution:

21083 →	multiplicand
× 254 →	multiplier
84332 →	(21083 × 4)
1054150 →	(21083 × 50)
+ 4216600 →	(21083 × 200)
5355082 →	product

NOTE

When a number is multiplied by 0 the result is zero.

Example:
23 × 0 = 0

Division

Previously we have learnt division of 3-digit and 4-digit numbers by 1-digit and 2-digit numbers. Now we will perform division of 5-digit numbers.

Division of numbers up to 5 digits by 10, 100, and 1000

Let us see what happens when we divide a 5-digit number by 10, 100, and 1000.

Consider a 5-digit number 83 000.
Make a table of division as shown below.

Number	Thousands			Ones		
	HTh	TTh	Th	H	T	U
83000 ÷ 10			8	3	0	0
83000 ÷ 100				8	3	0
83000 ÷ 1000					8	3

Notice that when we:

- divide a number by **10**, we remove **one zero** and move the number one column to the right.
- divide a number by **100**, we remove **two zeros** and move the number two columns to the right.
- divide a number by **1000**, we remove **three zeros** and move the number three columns to the right.

Examples

1. 78 420 ÷ 10 = 7842
2. 95 600 ÷ 100 = 956
3. 41 000 ÷ 1000 = 41

To divide a number with powers of 10, remove zeros and move the number towards the right.

When dividing bigger numbers, it is easier to do the calculation without spaces.

Like multiplication, each term in a division sum also has a special name. Look at the following example.

Example:

Divide 437 by 12.

Solution:

```
                36   → quotient
divisor ← 12 ⟌437   → dividend
          −36↓
           77
          −72
            5   → remainder
```

× quotient
divisor ⟌ dividend
—
\+ remainder =

Dividing numbers up to 5 digits

We follow the same steps when we divide a 5-digit number with a 2-digit number.

Example:

48 375 ÷ 38

Solution:

- How many 38s in 48? Easy: 1
- How many 38s in 103? Our guess: 3
  38 × 3 = 114 ✗
  38 × 2 = 76 ✓
- How many 38s in 277? Our guess: 8
  38 × 8 = 304 ✗
  38 × 7 = 266 ✓
- How many 38s in 115? Our guess: 3
  38 × 3 = 114 ✓

Answer: 1273 Rem 1

```
   1273
38 ⟌48375
  −38↓
   103
  −76↓
    277
   −266↓
     115
    −114
       1 Rem
```

▶ Exercise 1c

1. Fill in the blanks.
   a. 20 856 × 1000 = 20 856 000
   b. 38 695 × 100 = 3 869 500
   c. 45 200 × 20 = 904 000
   d. If 52 695 is divided by 10, the remainder is 5.
   e. 58 800 ÷ 100 = 588. = 58800/100

2. State whether the following are true or false.
   a. 13 985 × 0 = 0 (True)
   b. 71 432 × 50 = 35 571 600 (False)
   c. 70 000 ÷ 1000 = 70 (True)
   d. (6000 ÷ 6) − (333 × 3) = 10 (False) (1000 − 999 = 1)
   e. Dividing two numbers always leaves a remainder. (False)

3. Select the correct answer from the given options.
   a. 10 000 ÷ 100 is equal to
      Ⓐ 10 Ⓑ 1000
      Ⓒ 1 000 000 Ⓓ 100
   b. The smallest 5-digit number multiplied by 10 gives. (10 000 × 10 = 100000)
      Ⓐ hundred thousand Ⓑ million
      Ⓒ thousand Ⓓ ten million
   c. Which of the following is an incorrect statement?
      Ⓐ 25 × 4 = 100 ✓ Ⓑ 800 ÷ 8 = 100 ✓
      Ⓒ 500 × 2 = 1000 ✓ Ⓓ 102 ÷ 2 = 50
   d. 5694 ÷ 13 =
      Ⓐ 428 Ⓑ 438
      Ⓒ 448 Ⓓ 408
   e. 69 825 × 24 =
      Ⓐ 16 850 Ⓑ 16 800
      Ⓒ 1 675 800 Ⓓ 1 675 000

4. Multiply the following numbers by 10.
   a. 10 532 = 105320 b. 93 500 = 935000 c. 83 601 = 836 010

5. Multiply the following numbers by 100.
   a. 45 018 = 4501800 b. 92 000 = 9 200 000 c. 64 132 = 6 413 200

6. Multiply the following numbers by 1000.

a. 61 850 = 61 850 000 b. 20 018 = 20 018 000 c. 32 112 = 32 112 000

7. Divide the following numbers by 10.

a. 47 080 = 4708 b. 38 200 = 3820 c. 94 210 = 9421

8. Divide the following numbers by 100.

a. 8400 = 84 b. 80 000 = 800 c. 32 700 = 327

9. Divide the following numbers by 1000.

a. 56 000 = 56 b. 92 000 = 92 c. 70 000 = 70

10. Solve the following sums.

a.
$$\begin{array}{r} 82165 \\ \times\ 253 \\ \hline 20\,787\,745 \end{array}$$

b.
$$\begin{array}{r} 91327 \\ \times\ 471 \\ \hline 43\,015\,017 \end{array}$$

c.
$$\begin{array}{r} 82016 \\ \times\ 584 \\ \hline 47\,897\,344 \end{array}$$

d.
$$\begin{array}{r} 12341 \\ \times\ 732 \\ \hline 9\,033\,612 \end{array}$$

11. Write vertically and multiply.

a. 91 200 × 39
b. 10 925 × 76
c. 58 912 × 131
d. 20 510 × 35
e. 38 705 × 211
f. 69 240 × 444

12. Perform the following divisions.

a. $24\overline{)43256}$
b. $18\overline{)62936}$
c. $33\overline{)34569}$
d. $48\overline{)65067}$
e. $65\overline{)86518}$
f. $19\overline{)72050}$

13. Solve the following.

a. 46 028 ÷ 38
b. 34 396 ÷ 64
c. 28 932 ÷ 55
d. 91 256 ÷ 45
e. 35 706 ÷ 13
f. 49 007 ÷ 28

Unit 1 - Exercise 1c

11a. 191 200 × 39

820 800

2736 00 ×

3556 800

b. 10 925 × 76

65550

76475 ×

830300

c. 58 912 × 131

58 912

1767 36 ×

5891 2 × ×

7717472

d. 20 510 × 35

102550

61530 ×

717850

e. 138 705 × 211

138 705

387 05 ×

77410 × ×

8166755

f. 69 240 × 444

276960

276960 ×

276960 × ×

30742560

12. a $24 \overline{)43256}$

1802

432

× 56

48

8

b. $18 \overline{)62936}$

3496

612

× 1736

162

× 116

108

8

c. $33\overline{)34569}$ → 1047

330

x 1569

132

x 249

231

18

d. $48\overline{)65067}$ → 1355

48

170

144

266

240

267

240

x 27

e. $65\overline{)86518}$ → 1331

65

215

195

201

195

68

65

x 3

f. $19\overline{)72050}$ → 3792

57

150

133

x 175

171

x 40

38

x 2

13a. $38\overline{)46028}$ → 1211

38

80

76

42

38

48

38

r: 10

b. $64\overline{)34369}$

537

320

236

192

449

448

x 1

c. $55\overline{)28932}$

526

275

143

110

332

330

x 2

d. $45\overline{)91256}$

2027

90

12

0

125

90

356

315

41

e. $13\overline{)35706}$

2746

26

97

91

60

52

86

78

8

f. $28\overline{)49007}$

1750

28

210

196

140

140

x 7

▶ Real-life Story Sums

Solve the problems, writing complete statements.

1. Jumbo Fancy Store wants to place an order for candles. If one box contains 44 candles, how many boxes must the shop order to get 14 300 candles?
2. The government wants to give aid to 382 homeless families. If each family gets Rs 40 960, how much will the project cost altogether?
3. School children raised Rs 40 575 during a sponsored marathon race. If it is shared equally between 15 families, how much will each family get, and how much will be left?
4. Superpop's potato chip factory employs 267 people. If each worker receives Rs 23 845 as wages every month, what is the total wage (i) for one month, (ii) for one year?
5. If a rocket travels a distance of 75 600 km in 120 hours, how many km does it travel in one hour?
6. During her trip, Sara knits a scarf at the rate of 4690 mm a day. If her trip lasts 8 days, how much of the scarf will she have knitted by the end of the trip?
7. If a project needs Rs 95 500 to be completed then how much money will be needed for 100 such projects?
8. A park can accommodate 50 000 people. How many people can be accommodated in 10 such parks?
9. If Rs 94 850 are donated to a welfare trust in one month, then how much will be deposited in 42 months.
10. A student pays Rs 12 300 annually to the school as lab charges. How much does he pay monthly?
11. If a person has 25 shops, each worth Rs 65 500, then what is the total cost of these shops?

Unit 1 – Real-life Story Sums

1.
$$
\begin{array}{r|l}
44 & 14300 \\
\hline
 & 325 \\
 & 132 \\
\hline
 & 110 \\
 & 88 \\
\hline
 & 220 \\
 & 220 \\
\hline
 & \times
\end{array}
$$

The shop must order 325 boxes to get 14300 candles.

2.
$$
\begin{array}{r}
40960 \\
\times\ 382 \\
\hline
81920 \\
327680\times \\
\hline
122880\times\times \\
\hline
15646720
\end{array}
$$

The project will cost Rs 15646720 altogether.

3.
$$
\begin{array}{r|l}
15 & 40575 \\
\hline
 & 2705 \\
 & 30 \\
\hline
 & 105 \\
 & 105 \\
\hline
 & \times 07 \\
 & 0 \\
\hline
 & 75 \\
 & 75 \\
\hline
 & \times
\end{array}
$$

Each family will get Rs 2705.

Nothing would be left.

4. i)
$$\begin{array}{r} {}^{1}5\ \ {}^{2}3\ \ {}^{1}3 \\ 2^{2}\ \ 5\ \ 3\ \ 5 \\ \hline 23\ 845 \\ \times\ 267 \\ \hline {}^{1}1{}^{1}6{}^{1}6\ 9\ 1\ 5 \\ {}^{1}1\ 4\ 3\ 0\ 7\ 0\ \times \\ 4\ 7\ 6\ 9\ 0\ \times\ \times \\ \hline 6\ 3\ 6\ 6\ 6\ 1\ 5 \end{array}$$

The total wage per month is Rs 6 366 615

ii)
$$\begin{array}{r} 6\ {}^{1}3\ {}^{1}6\ 6\ 6\ {}^{1}1\ 5 \\ \times\ 12 \\ \hline 1{}^{1}2\ 7\ 3\ 3\ 2\ 3\ 0 \\ 6\ 3\ 6\ 6\ 1\ 5\ \times \\ \hline 7\ 6\ 3\ 9\ 9\ 3\ 8\ 0 \end{array}$$

The total wage for a year is Rs 76 399 380.

5.
$$\begin{array}{r} 630 \\ 120\overline{)75600} \\ 720 \\ \hline \times\ 360 \\ 360 \\ \hline 0 \\ 0 \\ \hline \times \end{array}$$

The rocket travels 630 km in an hour.

6.
$$\begin{array}{r} {}^{5}4\ {}^{7}6\ 9\ 0 \\ \times\ 8 \\ \hline 3\ 7\ 5\ 2\ 0 \end{array}$$

She will knit 37520 mm of scraf by the end of her trip

7. $95500 \times 100 = 9550000$

Rs 9550000 will be needed for 100 projects

8. $50\,000 \times 10 = 500000$; 10 parks would acomodate 500000 people.

9. 94850 × 42

3 1 2
94850
× 42
1 1
189700
379400 ×
3983700

Rs 3 983 700 will be deposited in 42 months.

10. 12 | 12300 = 1025

12
× 3
0
30
24
× 60
60
x

A student will pay Rs 1025 monthly as late charges.

11. 65500 × 25

2 1 1 2
65500
× 25
327500
131000 ×
1637500

The total cost of 25 shops are Rs 1 637 500

Number Pattern

We have already studied number patterns in class 4. We learnt to recognise a number pattern and identify the rule applied. We also studied the increasing and decreasing number sequences.

In this unit, we will find the missing numbers by identifying the pattern rule in the given sequence. To find the missing numbers in a number pattern we proceed as follows.

1. First we decide if the given sequence is in ascending or descending order.
2. In ascending order sequence, the mathematical operations of addition and multiplication are used as pattern rules.
3. In descending order sequence, the mathematical operations of subtraction and division are used as pattern rules.

Examples:

1. Look at the following number pattern and find the missing numbers. State the rule also.
   3 , 9 , 27, _____ , 243 , _____.

Solution:

The given pattern is an ascending sequence as the number are getting bigger.

To identify the rule we consider the first number that is 3 and the next number is 9. Now to get 9 from 3, there are two possible ways.

3 + 6 = 9 and 3 × 3 = 9

This shows that whether we multiply 3 by 3 or we add 6 to 3, we get the next number 9.

Now, applying the above mentioned two possible ways to 9 to determine the next number in the sequence we see that,

9 + 6 = 15 and 3 × 9 = 27

Hence, adding 6 is not the correct rule. The correct rule is to multiply each number of sequence by 3 to get the next number.

$3 \times 3 = 9$

$9 \times 3 = 27$

$27 \times 3 = 81$

$81 \times 3 = 243$

$243 \times 3 = 729$

Hence, the rule is multiplying by 3.

The missing numbers in the sequence are 81 and 729.

2. Find the missing numbers in the following pattern. Also state the rule.
   126, 115, _____, 93, 82, _____, 60.

Solution:

The given pattern is in descending order. The mathematical operation we need to use, is subtraction or division. Since we can not find any common divisor to move from one number to next, division can not be a rule. To move from one number to the next, we subtract 11.

$126 - 11 = 115$

$115 - 11 = 104$

$104 - 11 = 93$

$93 - 11 = 82$

$82 - 11 = 71$

$71 - 11 = 60$

Hence, the rule is subtracting 11.

The missing numbers are 104 and 71.

3. Identify the pattern rule and extend the given sequence for the next three terms.

   384, 192, 96, 48

Solution:

The given pattern is in descending order. The mathematical operation we need to use are subtraction or division. Since we can not find any common difference to move from one number to next, subtraction can

not be a rule. To move from one number to the next, we divide each number by 2.

$384 \div 2 = 192$
$192 \div 2 = 96$
$96 \div 2 = 48$
$48 \div 2 = 24$
$24 \div 2 = 12$
$12 \div 2 = 6$

Hence, the rule is dividing by 2.

The next three terms of the sequence are 24, 12, and 6.

We can find patterns in tables and charts as well. One is given for you.

This is a page from a calendar. Can you find any pattern in these numbers?

M	T	W	T	F	S	S
	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			

1. If we move from top to bottom, we get next number by adding 7.
2. If we move from bottom to top we subtract 7 and get the next number.
3. If we move diagonally towards left the numbers have a difference of 8.

▶ Exercise 1d

1. Identify the pattern rule and complete the missing terms in the following number patterns.
   a. 94, 85, 76, 67, 58, 49, 40, 31. (subtract 9)
   b. 38, 45, 52, 59, 66, 73, 80. (add 7)
   c. 18, 27, 36, 45, 54, 63, 72, 81, 90. (add 9)
   d. 2889, 963, 321, 107. (divide by 3)
2. Use the following random numbers to make a pattern. (Multiple answers are accepted)
   a. 49, 37, 53, 41, 45, 57
   b. 32, 8, 128, 4, 64, 16
   c. 15, 10, 30, 35, 25, 20

a. Add 4:
37, 41, 45, 49, 53, 57

b. Multiply by 2:
4, 8, 16, 32, 64, 128

c. Subtract 5:
35, 30, 25, 20, 15, 10
or
Add 5:
5, 10, 15, 20, 25, 30, 35

3. a. Subtract 11; 44, 33, 22 b. Subtract 13; 261, 248, 235
c. Subtract 45; 730, 685, 640 d. Divide by 2; 28, 14, 7.

3. Identify the pattern rule and extend for the next three terms.
   a. 110, 99, 88, 77, 66,55
   b. 326, 313, 300, 287, 274
   c. 955, 910, 865, 820, 775
   d. 896, 448, 224, 112, 56

4. Look at the following number table and answer the questions.

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

   a. Write an increasing number pattern with diagonal numbers starting from 31. State the pattern rule. Add 11
   b. Find the last three numbers of the pattern given below.
   93, 84, 75, 66, 57, 48.
   c. Write a number pattern starting with 89 and ending in 23. State the rule also. Subtract 11; 78, 67, 56, 45, 34, 23
   d. Make a number pattern of your choice, applying the rule subtracting 10. 100, 90, 80, 70, 60, 50, 40, 30, 20, 10.

YOUR DIGITAL RESOURCE

2 Multiples and Factors

In this unit students will learn to:

- find HCF of
  - two numbers up to 2-digit numbers
  - three numbers up to 2-digit numbers using
  - prime factorisation method
  - division method
- find LCM of
  - two numbers up to 2-digit numbers
  - three numbers up to 2-digit numbers using
  - prime factorisation method
  - division method
- solve real life situations involving HCF and LCM

MATH FLASH

You have already learnt:

- the rules of divisibility of 2, 3, 5, 10
- to differentiate between prime and composite numbers
  Example:
  Prime numbers: 2, 3, 5, 7, 19
  Composite numbers: 10, 15, 38, 56
- to find factors and multiples
- to find common factors and highest common factor using Venn diagram and by prime factorisation method
- to find common multiples and lowest common multiple

KEY VOCABULARY

factor, common factor, highest common factor, multiple, least common multiple, divisible, divisibility rule

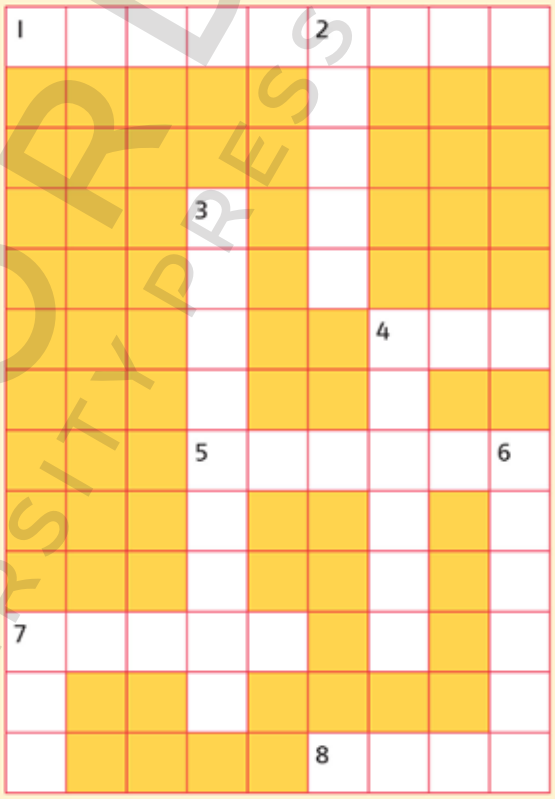
HCF and LCM

We know that the greatest number in the group of common factors of two or more numbers is known as the highest common factor, usually written as HCF.

We also know that the least number in the group of common multiples of two or more numbers is the lowest common multiple usually written as LCM.

ACTIVITY

The given crossword will help you review the factors and multiples.



Clues across:

1. 4, 6, 8, 10 and 12 are _____ of number 2.
4. All even numbers are multiples of this number.
5. Every number is a factor of _____.
7. The next prime number after five is _____.
8. The number eight has a total of _____ factors.

Clues down:

2. A number with only two different factors (itself and 1) is called a _____ number.
3. A multiple is a number which can be divided by another number without any _____.
4. The LCM of 4 and 6 is _____.
6. Number 1 is a _____ of every number.
7. 12, 18, 30, 48 are multiples of the number _____.

Rules of divisibility

There are certain rules in mathematics to find whether one whole number is divisible by another whole number leaving no remainder. It is a quick method to find factors of large numbers.

In New Countdown 4 we have studied the divisibility rules for 2, 3, 5, and 10. Let us go through the following exercise to review the previous learning.

1. Fill in the blanks.
   a. Any number with 0 in the _____ place is divisible by 5.
   b. An _____ number is always divisible by 2.
   c. A number whose digits add up to a multiple of 3 is divisible by _____.
   d. An example of a number which is divisible by 5 and 10 is _____.
2. Which of these numbers is divisible by 3?
   a. 149 b. 5481 c. 19 410
3. Which of these numbers is not divisible by 5?
   a. 16 495 b. 1 703 760 c. 704
4. Circle the numbers which are divisible by 10.
   a. 4960 b. 5010 c. 720 395

Divisibility rule for number 4

Now let us take the number 584 as an example.

Look at the tens and units digits: 5(84).

The number formed is 84.

Is 84 divisible by 4?

Yes, it is.

$84 \div 4 = 21$

Therefore, 584 is divisible by 4.

Let us check:

$$4 \overline{)584} = 146$$

-4

18

-16

24

-24

00

Hence 4 exactly divides 584 leaving no remainder.

We know that 200, 300, 500, ... are multiples of 4.

Therefore, if the last two digits of a number are zero, then the number is divisible by 4.

> A number is divisible by 4 if the number formed by the last two digits of the number is divisible by 4.

Divisibility rule for number 6

Let us take the number 918.

We first check if the number is even?

Yes. 918 in an even number, therefore, divisible by 2.

Next we check whether the sum of the digits is divisible by 3.

9 + 1 + 8 = 18

18 is divisible by 3. The number 918 is divisible by both 2 and 3. Hence, it is divisible by 6.

> A number is divisible by 6 if it is an even number and the sum of its digits is divisible by 3.

Let us divide 918 by 6 to check.

```
  153
6 | 918
  -6
  ---
   31
  -30
  ---
    18
   -18
  ---
    00
```

$918 \div 6 = 153$

Hence 6 exactly divides 918 leaving no remainder.

Divisibility rule for number 8

Remember 1000, 2000, 3000, and so on are multiples of 8. If the last three digits of a number are zero, then the number is divisible by 8.

If a number does not end with three zeros, then we check the divisibility as follows:

Let us take the number 6128 as an example and check whether it is divisible by 8 or not. Look at the digits in the hundreds, tens, and ones places: 6(128).

The number formed is 128.

Now, let us check if 128 is divisible by 8? 128 ÷ 8 = 16 shows that 128 is exactly divisible by 8. So, 6128 is divisible by 8.

> A number is divisible by 8, if the number formed by the last three digits is a multiple of 8, or there are zeros at its hundreds, tens, and ones places.

Let us divide 6128 by 8 to check.

```
  766
8 | 6128
  -56
   52
  -48
    48
   -48
    00
```

6128 ÷ 8 = 766 rem 0.

Hence 8 exactly divides 6128 leaving no remainder.

Rule of divisibility for number 9

If we think of multiples of 9, we notice that the sum of the digits of such numbers is always a multiple of 9 or exactly divisible by 9.

18 = 1 + 8 = 9; 63 = 6 + 3 = 9; 99 = 9 + 9 = 18

9, 9, and 18 are exactly divisible by 9.

Therefore, 18, 63, and 99 are divisible by 9.

Let us take a number 2358.

2 + 3 + 5 + 8 = 18 which is divisible by 9.

Hence, 2358 is divisible by 9.

If the digits of any number add up to a number which is exactly divisible by 9, then the original number is also divisible by 9.

$$
\begin{array}{r}
262 \\
9\overline{)2358} \\
-18 \\
\hline
55 \\
-54 \\
\hline
18 \\
-18 \\
\hline
00
\end{array}
$$

2358 ÷ 9 = 262 r 0.

Hence, 9 exactly divides 2358.

The following table gives the rules to test the divisibility of numbers by 2, 3, 4, 5, 6, 8, 9, and 10.

Divisible by	If
2	the digit in the unit's place of the number is 0, 2, 4, 6, or 8.
3	the sum of the digits of the number is divisible by 3.
4	the number formed by the last two digits of the number is a multiple of 4.
5	the number ends with either 0 or 5.
6	the number is divisible by 2 and the sum of the digits of the number is a multiple of 3.
8	the number formed by the last three digits is a multiple of 8.
9	the sum of the digits of the number is a multiple of 9.
10	the digit in the unit's place of the number is 0.

▶ Exercise 2a

1. Fill in the blanks.
   a. If a number is divisible by 2 and 3, then the number is divisible by _____.
   b. If the sum of the digits of a number can be divided by _____ with no remainder, the number is divisible by 9.
   c. 1038 is divisible by 2, 3, and _____.
   d. A number is divisible by _____, if its last three digits are divisible by 8 or are zeros.
   e. 450 is divisible by 2, 3, 5, _____ and _____.

2. State whether the following are true or false.
   a. If every digit of a number is divisible by 4, then the number is divisible by 4. (_____)
   b. 9482 is divisible by 9. (_____)
   c. 1920 is not divisible by 8. (_____)
   d. Sum of 210 and 315 is not divisible by 6. (_____)
   e. Product of 150 and 40 is divisible by 8. (_____)

3. Select the correct answer from the given options.
   a. 125 × 13 is divisible by
      Ⓐ 5 only Ⓑ 5 and 13 Ⓒ 5 and 9 Ⓓ 10
   b. All multiples of 6 are divisible by
      Ⓐ 2 and 6 Ⓑ 2 and 3 Ⓒ 2, 3, and 6 Ⓓ 6 only
   c. All the numbers ending with three zeros are divisible by
      Ⓐ 8 Ⓑ 4 only Ⓒ 6 and 8 Ⓓ 4, 5, and 10 only
   d. 444 is divisible by
      Ⓐ 4 only Ⓑ 2 and 4 Ⓒ 2, 3, and 4 Ⓓ 2, 3, 4, and 6
   e. A number which is divisible by 6 must be
      Ⓐ an even number Ⓑ an odd number
      Ⓒ a prime number Ⓓ ending with zero

4. Which of the following numbers are divisible by 4?
   a. 1996 b. 2000 c. 23 606

5. Which of the following numbers are divisible by 6? Apply the rule and show the working.
   a. 8622 b. 47 018 c. 1463 d. 39 582

6. Which of the following numbers are divisible by 3 but not divisible by 6? Show your working also.
   a. 4707 b. 801 c. 159 654

7. With the help of the rule of divisibility for 8, find out which of the following are divisible by 8?
   a. 4189 b. 117 000 c. 6408 d. 1 493 600

8. Check with the help of the rule of divisibility, which of the following are divisible by 9.
   a. 1873 b. 2457 c. 6083 d. 950 283

MINDBENDER

Rule of divisibility for number 11

The difference between the sums of the alternate digits of the number is 0 or a multiple of 11.

Example: Which of the given numbers is divisible by 11?

724614, 44340

MINDBENDER

Rule of divisibility for number 25

The number formed by the last two digits of the number is divisible by 25.

Example: Which of the given numbers is divisible by 25?

8760, 15625

Highest Common Factor (HCF)

Finding HCF of three numbers by prime factorisation

In Book 4 we learnt how to break down numbers into prime factors by simple division with prime numbers. This helps to find the HCF and LCM of larger numbers quickly and easily.

Let us find the prime factors of 72 using the division method.

72 is an even number, so we start dividing by the first prime number 2 then use other prime numbers.

2	72
2	36
2	18
3	9
3	3
	1

REMEMBER

1 is not a prime number.

The prime factors of 72 are $2 \times 2 \times 2 \times 3 \times 3 = 72$.

Now let us take three numbers 56, 14, and 63. Break them down into their prime factors.

2	56
2	28
2	14
7	7
	1

2	14
7	7
	1

3	63
3	21
7	7
	1

$56 = 2 \times 2 \times 2 \times 7$

$14 = 2 \times 7$

$63 = 3 \times 3 \times 7$

REMEMBER

HCF of two or more 2-digit numbers can be found using a Venn diagram.

The HCF is the product of the factors common to all the three numbers. The common factor in all the given examples is 7 only.

Therefore, HCF of 56, 14, and 63 is 7.

Let us take another example with three numbers 70, 98, and 154.

2	70
5	35
7	7
	1

2	98
7	49
7	7
	1

2	154
7	77
11	11
	1

$70 = 2 \times 5 \times 7$

$98 = 2 \times 7 \times 7$

$154 = 2 \times 7 \times 11$

The common factors are 2 and 7.

$\therefore$ HCF of 70, 98, and 154 $= 2 \times 7 = 14$.

Finding HCF of three numbers by division method

We can find the HCF of two or more numbers using division method. This method can be used to find the HCF of larger numbers.

Example:

Find HCF of 51 and 85 by division method.

First make the bigger number the dividend and the smaller number the divisor. Then divide as follows:

```
      1
51 ) 85
   - 51
    34 remainder
```

Next change this remainder into a divisor and previous divisor into a dividend.

```
      1
34 ) 51
   - 34
    17 remainder
```

a. HCF

2	64, 48, 60
2	32, 24, 30
	16, 12, 15
	(2×2)

HCF = 4

b.

3	63, 18, 72
3	21, 6, 24
	7, 2, 8
	(3×3)

HCF: 9

c.

2	26, 96, 12
	13, 48, 6
	(2)

HCF: 2

d.

1	27, 30, 46
	27, 30, 46
	(1)

HCF: 1

5. a. 40, 60, 220

40: 1, 2, 4, 5, 8, 10, 20, 40

60: 1, 2, 3, 4, 5, 6, 10, 12, 15, 20, 30, 60

220: 1, 2, 4, 5, 10, 11, 20, 22, 44, 55, 110, 220

HCF: 20

b. 90, 210, 126

90: 1, 2, 3, 5, 6, 9, 10, 15, 18, 30, 45, 90

210: 1, 2, 3, 5, 6, 7, 10, 14, 15, 21, 30, 35, 42, 70...

126: 1, 2, 3, 6, 7, 9, 14, 18, 21, 42, 63, 126

HCF: 6

c. 150, 525, 375

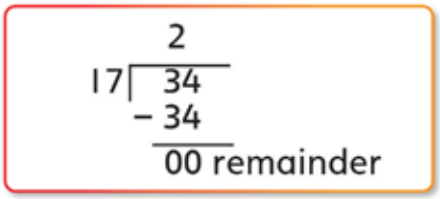
150: 1, 2, 3, 5, 6, 10, 15, 25, 30, 50, 75, 150

525: 1, 3, 5, 7, 15, 21, 25, 35, 75, 105, 175, 525

375: 1, 3, 5, 15, 25, 75, 125, 375

HCF: 75

Next, applying the same rule, the remainder becomes the divisor and the previous divisor becomes the dividend.



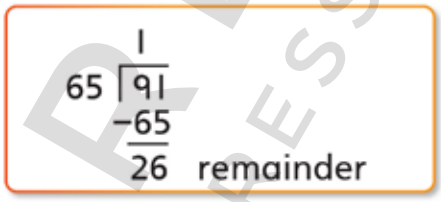
Now, we have no remainder.

So, the HCF of 51 and 85 = 17.

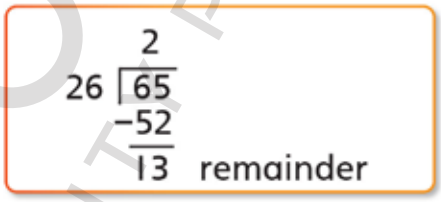
We can apply the same division method to find the HCF of three two-digit numbers.

Let us take 91, 65, and 39.

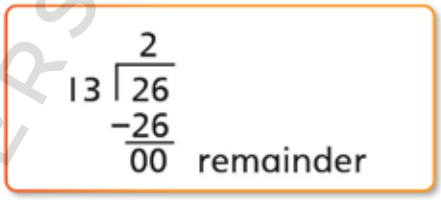
Take 91 as dividend and 65 as divisor.



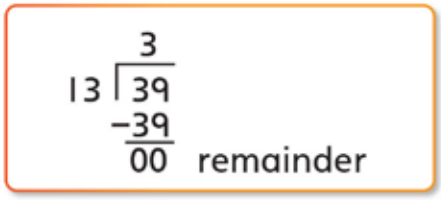
Now 26 becomes the divisor and 65 becomes the dividend.



Now again take 13 as the divisor and 26 as the dividend.



Now we take 13 and 39, where 13 is the divisor and 39 is the dividend.



Remainder is zero.

Therefore, HCF of 91, 65, and 39 = 13.

6a.

3	39, 93, 54
	13, 31, 18
	=3

b.

2	48, 56, 68
2	24, 28, 34
	12, 14, 17

$2 \times 2 = 4$

c.

2	72, 96, 36
2	36, 48, 18
3	18, 24, 9
	9, 8, 3

$2 \times 2 \times 3 = 12$

d.

2	40, 52, 76
2	20, 26, 38
	10, 13, 19

$2 \times 2 = 4$

e.

7	35, 42, 77
	5, 6, 11
	=7

7.

2	84, 27, 35
2	42, 27, 35
3	21, 27, 35
3	7, 9, 35
3	7, 3, 35
7	7, 1, 35
5	1, 1, 5
	1, 1, 1

$2^2 \times 3^3 \times 7 \times 5$

$= 3150$

b.

2	14, 15, 28
2	7, 15, 14
3	7, 15, 7
5	7, 5, 7
7	7, 1, 7
	1, 1, 1

$2^2 \times 3 \times 5 \times 7 = 420$

8. a.

2	18, 36, 40
2	9, 18, 20
2	9, 9, 10
5	9, 9, 5
9	9, 9, 1
	1, 1, 1

$2^3 \times 5 \times 9$

$= 360$

b.

2	12, 26, 16
2	6, 13, 8
2	3, 13, 4
2	3, 13, 2
3	3, 13, 1
13	1, 13, 1
	1, 1, 1

$2^2 \times 2^2 \times 3 \times 13$

$= 624$

c.

3	39, 81, 65
3	13, 27, 65
3	13, 9, 65
3	13, 3, 65
13	13, 1, 65
5	1, 1, 5
	1, 1, 1

$3^2 \times 3^2 \times 5 \times 13$

$= 5625$

Lowest Common Multiple (LCM)

Finding LCM by prime factorisation

To find the lowest common multiple (LCM) by prime factorisation, we should first find out the prime factors of the given numbers. Multiply the common prime factors with uncommon prime factors. The product is called LCM.

Example:

Find the LCM of 12, 18, and 27.

Solution:

2	12
2	6
3	3
	1

2	18
3	9
3	3
	1

3	27
3	9
3	3
	1

$12 = \boxed{2} \times 2 \times \boxed{3}$

$18 = \boxed{2} \times \boxed{3} \times \boxed{3}$

$27 = \boxed{3} \times \boxed{3} \times 3$

$\therefore$ LCM $= 2 \times 2 \times 3 \times 3 \times 3 = 108.$

The LCM of the given numbers is the product of all the prime factors including the common factors used only once.

Finding LCM by division method

To find lowest common multiple (LCM) by using division method, we follow the steps given below.

Step 1 Write the given numbers horizontally separating them with commas.

Step 2 Divide them by a prime number which divides all the numbers or at least one number completely and put the quotient under the number in the next row.

Step 3 We continue dividing until all the numbers are completely divided.

Step 4 Multiply all prime factors. The product is the lowest common multiple of the given numbers.

Example:

Find the LCM of 42, 18, and 12

Solution:

2	42 , 18 , 12
2	21 , 9 , 6
3	21 , 9 , 3
3	7 , 3 , 1
7	7 , 1 , 1
	1 , 1 , 1

LCM = 2 × 2 × 3 × 3 × 7 = 252

Hence, the LCM of 42, 18, and 12 is 252.

DO YOU KNOW?

The product of two numbers is equal to the product of their HCF and LCM.

▶ Exercise 2b

1. Fill in the blanks.
   a. HCF of 7 and 11 is _____.
   b. The LCM is always _____ than HCF.
   c. HCF stands for _____.
   d. The LCM of two prime numbers is _____ of the numbers.
   e. The LCM of 9 and 24 is _____.

2. State whether the following are true or false.
   a. The prime factors of 125 are 5, 5, and 5. (_____)
   b. The product of HCF and LCM of any two numbers is equal to the product of those numbers. (_____)
   c. The HCF of 15 and 35 is 35. (_____)
   d. The LCM of 17 and 19 in 17 × 19. (_____)
   e. LCM stands for largest common multiple. (_____)

3. Select the correct answer from the given options.
   a. The prime factors of 195 are
      Ⓐ 3 and 5 Ⓑ 6 and 13 Ⓒ 3, 5, and 13 Ⓓ 15 and 13
   b. HCF of 75 and 45 is
      Ⓐ 15 Ⓑ 5 Ⓒ 75 Ⓓ 45
   c. LCM of 3, 5, and 7 is
      Ⓐ 15 Ⓑ 21 Ⓒ 35 Ⓓ 105
   d. LCM of two prime numbers is
      Ⓐ product of the numbers Ⓑ sum of the numbers
      Ⓒ one of the two numbers Ⓓ equal to the HCF of the numbers
   e. HCF of 28, 49, and 70 is
      Ⓐ 21 Ⓑ 70 Ⓒ 7 Ⓓ 49

4. Find the HCF by prime factorisation method.
   a. 64, 48, 60 b. 63, 18, 72
   c. 26, 96, 12 d. 27, 30, 46

5. Find the HCF for each group of prime factors.
   a. 2 × 2 × 2 × 5; 2 × 2 × 3 × 5; 2 × 2 × 5 × 11
   b. 2 × 3 × 3 × 5; 2 × 3 × 5 × 7; 2 × 3 × 3 × 7
   c. 2 × 3 × 5 × 5; 3 × 5 × 5 × 7; 3 × 5 × 5 × 5

6. Using division method find the HCF of the following numbers.
   a. 39, 93, 54
   b. 48, 56, 68
   c. 72, 96, 36
   d. 40, 52, 76
   e. 35, 42, 77
7. Find the LCM of the following using prime factorisation method.
   a. 84, 27, 35
   b. 14, 15, 28
8. Find the LCM of the following using division method.
   a. 18, 36, 40
   b. 12, 26, 16
   c. 39, 81, 65

▶ Real-life Story Sums

1. There are some pieces of wood 18 m, 30 m and 12 m long. The carpenter wants to make them equal sizes. What size should he cut them to avoid wasting wood?
2. Sara does her laundry every 9 days. Areeba does hers every 12 days, while Neha does it every 6. If they all do laundry today, after how many days will they do it together again?
3. Ayesha has three pieces of cloth. One is 70 cm wide, and the other two are 84 cm and 98 cm wide. She wants to cut them into strips of equal size, as wide as possible. How wide should she cut the strips?

YOUR DIGITAL RESOURCE

3 Fractions

In this unit students will learn to:

- add and subtract two or three fractions with different denominators
- multiply a fraction by a 1-digit numbers and demonstrate with the help of diagram
- multiply two or three fractions involving proper, improper fractions, and mixed numbers
- solve real life situations involving multiplication of fractions
- divide a fraction by another fraction involving proper, improper fraction, and mixed numbers
- solve real life situations involving division of fractions

MATH FLASH

You have already learnt:

- about proper, improper, and mixed fractions
  Example: $\frac{3}{4}, \frac{8}{11}, \frac{6}{4}, \frac{9}{5}, \frac{10}{7}, 2\frac{1}{6}, 7\frac{11}{13}, 9\frac{2}{11}$
- about like and unlike fractions
  Example: $\frac{1}{3}, \frac{2}{3}, \frac{7}{3}, \frac{8}{3}, \frac{3}{5}, \frac{7}{9}, \frac{11}{14}, \frac{8}{13}$
- $\frac{1}{2} = \frac{2}{4} = \frac{3}{6} = \frac{5}{10}$ are equivalent fractions
- to add and subtract fractions
- a fraction can be reduced to its lowest term
- a fraction can be multiplied and divided
- to verify commutative and associative property of addition and multiplication

KEY VOCABULARY

fraction, numerator, denominator, like fractions, unlike fractions, equivalent, common fraction, lowest form, lowest term, simplify

Now we will deal with addition, subtraction, multiplication, and division of different types of fractions.

Addition and subtraction of two or more fractions

Do you remember that a fraction is in its lowest term, when 1 is the only common factor between the numerator and the denominator?

Examples:

1. Reduce $\frac{28}{40}$ to the lowest term.

Solution:

$\frac{28 \div 2}{40 \div 2} = \frac{14 \div 2}{20 \div 2} = \frac{7}{10}$

or we can divide directly by 4.

$\frac{28 \div 4}{40 \div 4} = \frac{7}{10}$

Hence, 1 is the only common factor of 7 and 10.

Therefore, $\frac{28}{40}$ in its lowest term is $\frac{7}{10}$.

2. $4\frac{2}{5} + 7\frac{1}{10}$

$= (4 + 7) + (\frac{2}{5} + \frac{1}{10})$

$= 11 + (\frac{2 \times 2}{5 \times 2} + \frac{1}{10})$

$= 11 + (\frac{4 + 1}{10}) = 11 + (\frac{5}{10})$

$= 11 + (\frac{\overset{1}{\cancel{5}}}{\underset{2}{\cancel{10}}})$

$= 11 + \frac{1}{2}$

$= 11\frac{1}{2}$

REMEMBER

Do not forget to:

- make the denominators same
- reduce to the lowest term
- convert an improper fraction to a mixed fraction

3. $7\frac{4}{8} - 3\frac{1}{8}$

$= (7 - 3) + (\frac{4}{8} - \frac{1}{8})$

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

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

4. $3\frac{1}{5} - 2\frac{2}{15}$

$= (3 - 2) + (\frac{1}{5} - \frac{2}{15})$

$= 1 + (\frac{1 \times 3}{5 \times 3} - \frac{2}{15})$

$= 1 + (\frac{3}{15} - \frac{2}{15})$

$= 1 + \frac{1}{15}$

$= 1\frac{1}{15}$

We can add and subtract more than two fractions with different denominators in the same way.

Example:

1. $3\frac{3}{7} + 5\frac{3}{4} + 7\frac{1}{28}$

Solution:

$= (3 + 5 + 7) + (\frac{3}{7} + \frac{3}{4} + \frac{1}{28})$

$= 15 + (\frac{3 \times 4}{7 \times 4} + \frac{3 \times 7}{4 \times 7} + \frac{1}{28})$

$= 15 + (\frac{12}{28} + \frac{21}{28} + \frac{1}{28})$

$= 15 + (\frac{\overset{17}{\cancel{34}}}{\underset{14}{\cancel{28}}})$

$= 15 + (\frac{17}{14})$

$= 15 + (1\frac{3}{14})$

$= 16\frac{3}{14}$

2. $6\frac{2}{5} - 3\frac{4}{15} - 2\frac{1}{30}$

Solution:

$= (6 - 3 - 2) + (\frac{2}{5} - \frac{4}{15} - \frac{1}{30})$

$= 1 + (\frac{2 \times 6}{5 \times 6} - \frac{4 \times 2}{15 \times 2} - \frac{1}{30})$

$= 1 + (\frac{12}{30} - \frac{8}{30} - \frac{1}{30})$

$= 1 + (\frac{\overset{1}{\cancel{3}}}{\underset{10}{\cancel{30}}})$

$= 1 + \frac{1}{10}$

$= 1\frac{1}{10}$

1. a. $\frac{3\times4}{3\times5} + \frac{5\times5}{3\times5} = \frac{12}{15} + \frac{25}{15} = \frac{37}{15} = 2\frac{7}{15}$

d. $\frac{2\times20}{3\times20} + \frac{3\times15}{4\times15} + \frac{1\times12}{5\times12}$

$= \frac{40}{60} + \frac{45}{60} + \frac{12}{60}$

$= \frac{97}{60} = 1\frac{37}{60}$

▶ Exercise 3a

1. Fill in the blanks.

a. $\frac{4}{5} + \frac{5}{3} =$ $2\frac{7}{15}$

b. $\frac{8}{11} - \frac{3}{22} =$ $\frac{13}{22}$

c. $\frac{6}{5} +$ $\frac{9}{10}$ $= \frac{21}{10}$

d. $\frac{2}{3} + \frac{3}{4} + \frac{1}{5} =$ $1\frac{37}{60}$

e. $\frac{3}{5} - \frac{6}{15} - \frac{1}{10} =$ $\frac{1}{10}$

e. $\frac{3\times6}{5\times6} - \frac{6\times2}{15\times2} - \frac{1\times3}{10\times3} = \frac{18}{30} - \frac{12}{30} - \frac{3}{30} = \frac{3}{30} = \frac{1}{10}$

2. State whether the following statements are true or false.

a. $3\frac{1}{6} + 4\frac{1}{3} = \frac{15}{2}$ (True)

b. $\frac{8}{13} - \frac{4}{39} = \frac{20}{39}$ (True)

c. $\frac{12}{17} - \frac{3}{51} = \frac{9}{17}$ (False) $\frac{11}{17}$

d. $\frac{1}{2} + \frac{1}{3} + \frac{1}{4} = \frac{13}{12}$ (True)

e. $\frac{3}{7} - \frac{3}{14} - \frac{2}{21} = \frac{5}{21}$ (False) $\frac{5}{42}$

3. Select the correct answer from the given options.

a. $\frac{3}{13} + \frac{9}{91}$ is equal to

Ⓐ $\frac{12}{19}$ Ⓑ $\frac{12}{13}$ Ⓒ $\frac{30}{13}$ Ⓓ $\frac{30}{91}$

b. $\frac{26}{57} - \frac{4}{19}$

Ⓐ $\frac{14}{19}$ Ⓑ $\frac{22}{19}$ Ⓒ $\frac{14}{57}$ Ⓓ $\frac{22}{57}$

c. $\frac{8}{15} + \frac{7}{5} + \frac{1}{30}$ is equal to

Ⓐ $\frac{16}{30}$ Ⓑ $\frac{59}{30}$ Ⓒ $\frac{16}{5}$ Ⓓ $\frac{29}{15}$

d. $2\frac{1}{3} - 1\frac{4}{5} - \frac{2}{15}$ is equal to

Ⓐ $\frac{6}{15}$ Ⓑ $\frac{6}{5}$ Ⓒ $\frac{6}{45}$ Ⓓ 0

e. $2\frac{1}{3} - 1\frac{1}{10} - \frac{1}{6}$ expressed in simplest form is

Ⓐ $1\frac{12}{30}$ Ⓑ $\frac{16}{15}$ Ⓒ $\frac{30}{32}$ Ⓓ $\frac{3}{10}$

Unit 3 Ex 3a

Q4) a) $\frac{1}{5} + \frac{3}{20}$

$\frac{4+3}{20} = \frac{7}{20}$

b) $\frac{5}{13} + \frac{7}{26}$

$\frac{10+7}{26} = \frac{17}{26}$

c) $2\frac{3}{7} + 4\frac{4}{21}$

$\frac{17}{7} + \frac{88}{21} = \frac{51+88}{21}$

$= \frac{139}{21}, 6\frac{13}{21}$

d) $10\frac{1}{6} + 8\frac{5}{36}$

$\frac{61}{6} + \frac{293}{36}$

$\frac{366+293}{36} = \frac{659}{36} = 18\frac{11}{36}$

e) $\frac{4}{5} + \frac{6}{7} + \frac{1}{2}$

$\frac{18+60+36}{70} = \frac{114}{70} = 1\frac{22}{35}$

f) $9\frac{1}{10} + 3\frac{1}{5} + 4\frac{1}{15}$

$\frac{91}{10} + \frac{16}{5} + \frac{61}{15}$

$\frac{273+96+122}{30} = \frac{491}{30} = 16\frac{11}{30}$

g) $12\frac{1}{2} + 9\frac{5}{6} + 11\frac{7}{9}$

$\frac{25}{2} + \frac{59}{6} + \frac{106}{9}$

$\frac{34+62+108}{18} = \frac{204}{18} = 11\frac{3}{9}$

h) $4\frac{5}{8} + 2\frac{3}{16} + 7\frac{3}{4}$

$\frac{37}{8} + \frac{33}{16} + \frac{31}{4}$

$\frac{74+33+124}{16} = \frac{231}{16} = 14\frac{7}{16}$

Q5a) $\frac{3}{8} - \frac{1}{6}$

$\frac{9-4}{24} = \frac{5}{24}$

b) $\frac{5}{11} - \frac{1}{3}$

$\frac{15-11}{33} = \frac{4}{33}$

c) $\frac{6}{7} - \frac{4}{5}$

$\frac{30-28}{35} = \frac{2}{35}$

d) $\frac{9}{20} - \frac{1}{4}$

$\frac{9-5}{20} = \frac{4}{20}$

e) $\frac{8}{7} - \frac{1}{8} - \frac{3}{4}$

$\frac{64-7-42}{56} = \frac{15}{56}$

f) $\frac{15}{6} - \frac{1}{4} - \frac{1}{2}$

$\frac{30-3-6}{12} = \frac{21}{12}$

g) $8\frac{4}{7} - 3\frac{2}{5} - 1\frac{1}{10}$

$\frac{60}{7} - \frac{17}{5} - \frac{11}{10}$

$\frac{600-238-77}{70} = \frac{285}{70}$

$= 4\frac{1}{14}$

h) $6\frac{25}{27} - 4\frac{4}{9} - 1\frac{1}{3}$

$\frac{187}{27} - \frac{45}{9} - \frac{4}{3}$

$\frac{187-135-36}{27} = \frac{16}{27}$

4. Add the following.

a. $\frac{1}{5} + \frac{3}{20}$ b. $\frac{5}{13} + \frac{7}{26}$ c. $2\frac{3}{7} + 4\frac{4}{21}$

d. $10\frac{1}{6} + 8\frac{5}{36}$ e. $\frac{4}{5} + \frac{6}{7} + \frac{1}{2}$ f. $9\frac{1}{10} + 3\frac{1}{5} + 4\frac{1}{15}$

g. $12\frac{1}{2} + 9\frac{5}{6} + 11\frac{7}{9}$ h. $4\frac{5}{8} + 2\frac{1}{16} + 7\frac{3}{4}$

5. Subtract the following.

a. $\frac{3}{8} - \frac{1}{6}$ b. $\frac{5}{11} - \frac{1}{3}$ c. $\frac{6}{7} - \frac{4}{5}$

d. $\frac{9}{20} - \frac{1}{4}$ e. $\frac{8}{7} - \frac{1}{8} - \frac{3}{4}$ f. $\frac{15}{16} - \frac{1}{4} - \frac{1}{2}$

g. $8\frac{4}{7} - 3\frac{2}{5} - 1\frac{1}{10}$ h. $6\frac{25}{27} - 4\frac{4}{9} - 1\frac{1}{3}$

▶ Real-life Story Sums

1. Rashid walked $\frac{3}{4}$ kilometres and then took a rest.
   Then he walked $\frac{1}{2}$ kilometres more. How far did he walk altogether?
2. Hiba used $\frac{3}{4}$ cup of sugar, $1\frac{1}{2}$ cups of flour and $\frac{1}{8}$ cup of dry fruit for making a cake. How many cups of all the ingredients in total were used?
3. For the school gala, a group of students made $10\frac{3}{4}$ litres of lemonade. At the end of the program, they had $1\frac{1}{4}$ litres left over. How many litres of lemonade were used?
4. $\frac{1}{10}$ of the candies in a bag are red and $\frac{1}{5}$ are orange.
   What fraction of candies are red and orange?
5. Sami shared a chocolate bar. He ate $\frac{3}{5}$ and Kiran ate $\frac{2}{15}$.
   How much of the chocolate bar did they eat altogether?

Ex 3a - Real-Life Story Sums

Q1) $\frac{3}{4} + \frac{1}{2}$

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

Q2) $\frac{3}{4} + 1\frac{1}{2} + \frac{1}{8}$

$\frac{3}{4} + \frac{3}{2} + \frac{1}{8}$

$\frac{12+24+2}{16} = \frac{38}{8} = \frac{19}{8} = 2\frac{3}{8}$ cups

Q3) $10\frac{3}{4} - 1\frac{1}{4}$

$\frac{43}{4} - \frac{5}{4}$

$\frac{43-5}{4}$

$= \frac{38}{4} = \frac{19}{2} = 9\frac{1}{2}$ litres

Q4) $\frac{1}{10} + \frac{1}{5}$

$\frac{1+2}{10} = \frac{3}{10}$

Q5) $\frac{3}{5} + \frac{2}{25}$

$\frac{9+2}{25} = \frac{11}{25}$

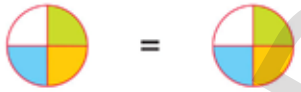
Multiplication of fractions

Multiplication of a fraction by a whole number

With the help of diagrams it becomes easy to understand multiplication of a fraction by a whole number.

Let us take three ⊕s or $3 \times \frac{1}{4}$.

We can solve this by repeated addition, thus: $3 \times \frac{1}{4}$ or three quarters



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

We write $3 \times \frac{1}{4} = \frac{3}{1} \times \frac{1}{4} = \frac{3}{4}$.

Example: Work out $2 \times \frac{1}{3}$, using repeated addition and with a diagram.

Solution: $2 \times \frac{1}{3}$ expressed in a diagram:

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

Let us take three $\frac{2}{5}$s or $3 \times \frac{2}{5}$.

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

Did you spot the short cut? Instead of adding, we can solve our sum very quickly by **multiplying the numerator by the whole number:**

Let us take three $\frac{2}{5}$s.

$\frac{2}{5} + \frac{2}{5} + \frac{2}{5} = \frac{6}{5}$

Or $3 \times \frac{2}{5} = \frac{3 \times 2}{5} = \frac{6}{5} = 1\frac{1}{5}$

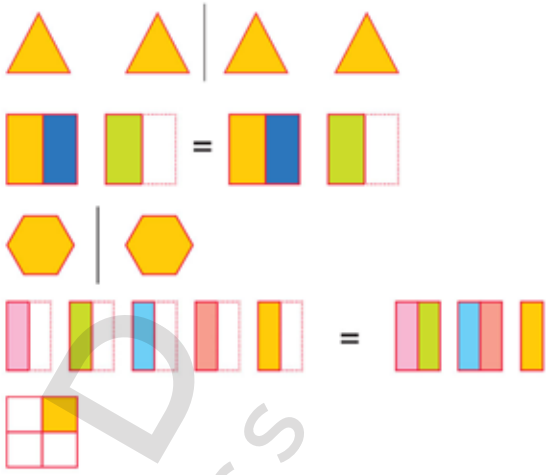
Now take two $\frac{3}{7}$s.

$\frac{3}{7} + \frac{3}{7} = \frac{6}{7}$

Or $2 \times \frac{3}{7} = \frac{2 \times 3}{7} = \frac{6}{7}$

Examples:

1. $\frac{1}{2}$ of $4 = \frac{1}{2} \times 4 = 2$
2. Three halves $3 \times \frac{1}{2} = \frac{3}{2} = 1\frac{1}{2}$
3. $\frac{1}{2}$ of $2 = \frac{1}{2} \times 2 = 1$
4. Five halves $5 \times \frac{1}{2} = \frac{5}{2} = 2\frac{1}{2}$
5. $\frac{1}{2}$ of $\frac{1}{2} = \frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$



Multiplication of a fraction by a fraction

What is the difference between $\frac{1}{2} \times \frac{1}{3}$ (half of a third) and $\frac{1}{3} \times \frac{1}{2}$ (a third of a half?

$\frac{1}{2} \times \frac{1}{3}$

$= \frac{1}{6}$

$\frac{1}{3} \times \frac{1}{2}$

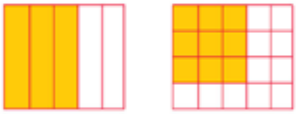
$= \frac{1}{6}$

Both are the same, therefore,
$\frac{1}{2} \times \frac{1}{3} = \frac{1}{3} \times \frac{1}{2} = \frac{1}{6}$

Examples:

1. $\frac{3}{4} \times \frac{3}{5}$

We can show it in diagram form:



$\frac{3}{5}$ $\frac{3}{4}$ of $\frac{3}{5} = \frac{3}{4} \times \frac{3}{5} = \frac{9}{20}$

We think of the multiplication as **three-quarters** of $\frac{3}{5}$, using the same pattern as before.

2. $\frac{2}{5} \times \frac{3}{5}$

$\frac{3}{5}$ $\quad \frac{2}{5}$ of $\frac{3}{5} = \frac{2}{5} \times \frac{3}{5} = \frac{6}{25}$

3. $\frac{5}{6} \times \frac{3}{4}$

$\frac{3}{4}$ $\quad \frac{5}{6}$ of $\frac{3}{4} = \frac{5}{6} \times \frac{3}{4} = \frac{15}{24}$

Do you notice a pattern?
Yes, once again we can multiply to find the product.

For example, $\frac{7}{8} \times \frac{4}{5} = \frac{7 \times 4}{8 \times 5} = \frac{28}{40}$

It is easy to solve multiplication sums containing mixed numbers, once we remember that we must change each mixed number into an improper fraction first.

We have a useful short cut which we can use for multiplying fractions.

For example, we want to find the product of $4\frac{2}{5} \times 3\frac{3}{4}$.

We will first change mixed numbers into improper fractions:

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

$\frac{22}{5} \times \frac{15}{4} = \frac{22 \times 15}{5 \times 4}$

It's bothersome to multiply 22 by 15.

So, we look for a short cut. We notice that:

$\frac{\overset{\div 2}{\textcircled{22}} \times 15}{5 \times \underset{\div 2}{\textcircled{4}}}$ numerator of the 1st and the denominator of the 2nd fraction have common factors

$\frac{11 \times \overset{\div 5}{\textcircled{15}}}{\underset{\div 5}{\textcircled{5}} \times 2}$ numerator of the 2nd and the denominator of the 1st fraction have common factors

$= \frac{11 \times 3}{1 \times 2} = \frac{33}{2} = 16\frac{1}{2}$

Examples:

1. $1\frac{3}{4} \times 2$

$= \frac{7}{4} \times 2$

$= \frac{14}{4} = \frac{7}{2} = 3\frac{1}{2}$

2. $2\frac{1}{5} \times 1\frac{5}{6}$

$= \frac{11}{5} \times \frac{11}{6} = \frac{11 \times 11}{5 \times 6}$

$= \frac{121}{30} = 4\frac{1}{30}$

Multiplication of two or more fractions involving brackets

Look at the multiplication of 3 whole numbers.

$2 \times 3 \times 5$

$= (2 \times 3) \times 5 = 6 \times 5 = 30$

$= 2 \times (3 \times 5) = 2 \times 15 = 30$

$= (2 \times 5) \times 3 = 10 \times 3 = 30$

The same rule can be applied to fractions.

$\frac{1}{2} \times \frac{1}{3} \times \frac{1}{5}$

$= (\frac{1}{2} \times \frac{1}{3}) \times \frac{1}{5} = \frac{1}{6} \times \frac{1}{5} = \frac{1}{30}$

$= \frac{1}{2} \times (\frac{1}{3} \times \frac{1}{5}) = \frac{1}{2} \times \frac{1}{15} = \frac{1}{30}$

$= (\frac{1}{2} \times \frac{1}{5}) \times \frac{1}{3} = \frac{1}{10} \times \frac{1}{3} = \frac{1}{30}$

Some more examples:

1. $(2\frac{1}{3} \times 6\frac{3}{7}) \times \frac{4}{25}$

$(\frac{\cancel{7}}{\cancel{3}} \times \frac{\overset{15}{\cancel{45}}}{\cancel{7}}) \times \frac{4}{25}$

$\overset{3}{\cancel{15}} \times \frac{4}{\underset{5}{\cancel{25}}} = \frac{12}{5} = 2\frac{2}{5}$

2. $\frac{1}{9} \times (\frac{6}{7} \times 5\frac{1}{4})$

$= \frac{1}{9} \times (\frac{\overset{3}{\cancel{6}}}{\cancel{7}} \times \frac{\overset{3}{\cancel{21}}}{\underset{2}{\cancel{4}}})$

$= \frac{1}{\cancel{9}} \times \frac{\cancel{9}}{2}$

$= \frac{1}{2}$

▶ Exercise 3b

1. Fill in the blanks.

   a. $\frac{1}{3}$ of 12 = 4

   b. $\frac{3}{5} \times \frac{15}{9}$ = 1

   c. $\frac{4}{7} \times \frac{14}{8} \times \frac{2}{5}$ = 2/5

   d. $\frac{7}{9} \times (\frac{2}{7} + \frac{3}{14})$ = 7/18

   e. $(\frac{2}{3} \times \frac{1}{5}) + (\frac{2}{3} \times \frac{4}{5})$ = 2/3

2. State whether the following statements are true or false.

   a. $\frac{1}{2}$ of $\frac{1}{4}$ is $\frac{1}{6}$. (False)

   b.  = $\frac{1}{2}$ (True)

   c. $\frac{144}{81} \times \frac{81}{144} \times \frac{4}{9} = \frac{4}{9}$ (True)

   d. Half of a third is $\frac{1}{5}$. (False)

   e. Five thirds make $\frac{5}{3}$. (True)

3. Select the correct answer from the given options.

   a. Three times one-ninth is

   Ⓐ 27 Ⓑ $\frac{1}{3}$ Ⓒ $\frac{1}{27}$ Ⓓ 3

   b. Product of $\frac{13}{5}$, $\frac{5}{9}$, and $\frac{3}{65}$ is $\frac{13}{5} \times \frac{5}{9} \times \frac{3}{65} = \frac{13}{195} = \frac{1}{15}$

   Ⓐ $\frac{1}{15}$ Ⓑ $\frac{3}{15}$ Ⓒ $\frac{5}{15}$ Ⓓ $\frac{1}{45}$

   c. Express the product of $\frac{5}{6} \times \frac{7}{10} \times \frac{12}{35}$ in the lowest term $\frac{1}{5}$

   Ⓐ $\frac{2}{10}$ Ⓑ $\frac{12}{60}$ Ⓒ $\frac{1}{5}$ Ⓓ $\frac{30}{150}$

   d. $3\frac{4}{7} \times 3\frac{3}{15} \times \frac{7}{12}$ $= \frac{25}{7} \times \frac{48}{15} \times \frac{7}{12} = \frac{20}{3} = 6\frac{2}{3}$

   Ⓐ 6 Ⓑ $\frac{20}{21}$ Ⓒ $1\frac{1}{3}$ Ⓓ $6\frac{2}{3}$

   e. $\frac{7}{5} \times 10$ is equal to

   Ⓐ $\frac{7}{2}$ Ⓑ 14 Ⓒ 70 Ⓓ $\frac{7}{50}$

Ex 3b

Q1a) $\frac{1}{\cancel{2}_{2}} \times \frac{\cancel{4}^{4}}{\cancel{12}_{3}} = 4$ b) $\frac{\cancel{3}^{1}}{\cancel{5}_{1}} \times \frac{\cancel{15}^{3}}{\cancel{9}_{3}} = \frac{3}{3} = 1$ c) $\frac{\cancel{14}^{2}}{\cancel{7}_{1}} \times \frac{\cancel{14}^{1}}{\cancel{28}_{2}} \times \frac{\cancel{2}^{1}}{\cancel{5}_{1}} = \frac{2}{5}$

d) $\frac{7}{9} \times \left(\frac{2}{7} + \frac{3}{14}\right)$ e) $\left(\frac{2}{3} \times \frac{1}{5}\right) + \left(\frac{2}{3} \times \frac{4}{5}\right)$

$\frac{7}{9} \times \left(\frac{4+3}{14}\right) = \frac{\cancel{7}^{1}}{9} \times \frac{7}{\cancel{14}_{2}}$ $\frac{2}{15} + \frac{8}{15} = \frac{2+8}{15} = \frac{\cancel{10}^{2}}{\cancel{15}_{3}} = \frac{2}{3}$

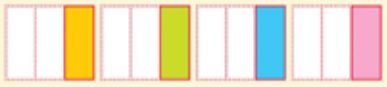
$= \frac{7}{18}$

4. Work out these, using repeated addition with the help of the diagrams.

a. $5 \times \frac{1}{2}$  $5 \times \frac{1}{2} = \frac{5}{2} = 2\frac{1}{2}$

b. $4 \times \frac{1}{4}$  $4 \times \frac{1}{4} = \frac{4}{4} = 1$

c. $3 \times \frac{1}{5}$  $3 \times \frac{1}{5} = \frac{3}{5}$

d. $4 \times \frac{1}{3}$  $4 \times \frac{1}{3} = \frac{4}{3} = 1\frac{1}{3}$

5. Solve the following.

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

e. $5 \times \frac{1}{6}$ f. $6 \times \frac{1}{2}$

6. Solve the following. Reduce to the lowest term.

a. $\frac{2}{3} \times 6$ b. $\frac{3}{4} \times 8$ c. $\frac{10}{2} \times 2$ d. $4 \times \frac{7}{8}$

e. $\frac{4}{9} \times 3$ f. $7 \times \frac{2}{7}$

7. Complete the following.

a. $\frac{1}{2} \times 4 =$ b. $3 \times \frac{1}{2} =$

c. $\frac{1}{2} \times 2 =$ d. $5 \times \frac{1}{2} =$

e. $\frac{1}{2} \times \frac{1}{2} =$

8. Draw pairs of diagrams to show these fractions.

a. $\frac{1}{5}$ of $\frac{1}{2}$
$\frac{1}{2}$ of $\frac{1}{5}$

b. $\frac{1}{2}$ of $\frac{1}{3}$
$\frac{1}{3}$ of $\frac{1}{2}$

c. $\frac{3}{4}$ of $\frac{1}{2}$
$\frac{1}{2}$ of $\frac{3}{4}$

d. $\frac{1}{2}$ of $\frac{2}{3}$
$\frac{2}{3}$ of $\frac{1}{2}$

Ex 3b

Q5a) $\frac{2}{3} \times 4 = \frac{8}{3}$ b) $7 \times \frac{2}{5} = \frac{14}{5}$ c) $\frac{3}{4} \times 3 = \frac{9}{4}$ d) $\frac{1}{3} \times 7 = \frac{7}{3}$ e) $5 \times \frac{1}{6} = \frac{5}{6}$ f) $\overset{3}{\cancel{6}} \times \frac{1}{\cancel{2}} = 3$

Q6a) $\frac{\cancel{2}^{1}}{\cancel{3}_{1}} \times \frac{\cancel{2}^{1}}{\cancel{4}_{2}}$ $2 \times 2 = 4$ b) $\frac{3}{\cancel{4}_{2}} \times \frac{\cancel{8}^{2}}{1}$ $3 \times 2 = 6$ c) $\frac{10}{\cancel{2}_{1}} \times \cancel{2}^{1} = 10$ d) $\frac{\cancel{4}^{2} \times 7}{\cancel{8}_{2}} = \frac{7}{2}$ e) $\frac{4}{\cancel{4}_{3}} \times \frac{\cancel{8}^{2}}{1} = \frac{4}{3}$

f) $\frac{\cancel{7}^{1} \times 2}{\cancel{7}_{1}} = 2$

Q7a) $\frac{1}{\cancel{2}_{1}} \times \frac{\cancel{4}^{2}}{1} = 2$ b) $3 \times \frac{1}{2} = \frac{3}{2}$ c) $\frac{1}{\cancel{2}_{1}} \times \cancel{2}^{1} = 1$ d) $5 \times \frac{1}{2} = \frac{5}{2}$ e) $\frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$

9. Write statements to match these diagrams.

a. 

b. 

10. Draw diagrams to match these multiplications, and write the product of each.

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

11. Find the products, and represent through diagrams.

a. $\frac{1}{5} \times \frac{2}{3}$ b. $\frac{1}{6} \times \frac{4}{5}$ c. $\frac{1}{3} \times \frac{3}{5}$ d. $\frac{1}{8} \times \frac{2}{3}$

12. Find the products.

a. $\frac{1}{9} \times \frac{2}{3}$ b. $\frac{1}{5} \times \frac{7}{8}$ c. $\frac{1}{8} \times \frac{5}{6}$ d. $\frac{3}{4} \times \frac{5}{12}$

e. $\frac{1}{11} \times \frac{3}{4}$ f. $\frac{1}{5} \times \frac{7}{8}$

13. Solve these multiplications.

a. $\frac{1}{12} \times \frac{4}{7}$ b. $\frac{1}{5} \times \frac{4}{7}$ c. $\frac{1}{10} \times \frac{5}{9}$ d. $\frac{1}{9} \times \frac{9}{11}$

e. $\frac{1}{6} \times \frac{9}{10}$ f. $\frac{1}{6} \times \frac{7}{11}$ g. $\frac{1}{14} \times \frac{3}{4}$ h. $\frac{1}{12} \times \frac{5}{9}$

14. Draw diagrams to show these multiplications, then write each product.

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

e. $\frac{3}{5} \times \frac{2}{3}$ f. $\frac{3}{4} \times \frac{3}{4}$

15. Write multiplication sums to match these statements.

a. Two-fifths of $\frac{5}{6}$ b. Three-eighths of $\frac{5}{6}$

16. Find the products of the given fractions.

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

e. $\frac{2}{3} \times \frac{4}{5}$ f. $\frac{3}{4} \times \frac{1}{6}$

Q10a) $\frac{1}{2} \times \frac{3}{4} = \frac{3}{8}$ b) $\frac{1}{4} \times \frac{2}{5} = \frac{\cancel{2}^{1}}{\cancel{10}_{10}} = \frac{1}{10}$ c) $\frac{1}{3} \times \frac{1}{4} = \frac{1}{12}$ d) $\frac{\cancel{2}^{1}}{3} \times \frac{1}{\cancel{2}_{1}4} = \frac{1}{6}$

Q11a) $\frac{1}{5} \times \frac{2}{3} = \frac{2}{15}$ b) $\frac{1}{6} \times \frac{4}{5} = \frac{\cancel{4}2}{\cancel{30}^{15}} = \frac{2}{15}$ c) $\frac{1}{\cancel{8}} \times \frac{\cancel{8}}{5} = \frac{1}{5}$ d) $\frac{1}{\cancel{8}_{4}} \times \frac{\cancel{8}}{3} = \frac{1}{12}$

Q12a) $\frac{1}{9} \times \frac{2}{3} = \frac{2}{27}$ b) $\frac{1}{5} \times \frac{4}{7} = \frac{4}{35}$ c) $\frac{1}{8} \times \frac{5}{6} = \frac{5}{48}$ d) $\frac{\cancel{8}^{2}}{4} \times \frac{5}{4\cancel{12}} = \frac{5}{16}$

e) $\frac{1}{11} \times \frac{3}{4} = \frac{3}{44}$ f) $\frac{1}{6} \times \frac{7}{11} = \frac{7}{66}$ g) $\frac{1}{14} \times \frac{3}{4} = \frac{3}{56}$ h) $\frac{1}{12} \times \frac{5}{9} = \frac{5}{38}$

Q13a) $\frac{1}{\cancel{12}_{3}} \times \frac{\cancel{4}}{7} = \frac{1}{21}$ b) $\frac{1}{5} \times \frac{4}{7} = \frac{4}{35}$ c) $\frac{1}{\cancel{10}_{2}} \times \frac{\cancel{5}^{1}}{9} = \frac{1}{18}$ d) $\frac{1}{10} \times \frac{5}{9} = \frac{\cancel{8}^{1}}{\cancel{90}_{18}} = \frac{1}{18}$

e) $\frac{1}{\cancel{9}_{1}} \times \frac{\cancel{9}}{11} = \frac{1}{11}$ f) $\frac{1}{6} \times \frac{9}{10} = \frac{\cancel{9}^{3}}{\cancel{60}_{20}} = \frac{3}{20}$ g) $\frac{1}{6} \times \frac{7}{\cancel{11}} = \frac{7}{66}$ h) $\frac{1}{14} \times \frac{3}{4} = \frac{3}{56}$

i) $\frac{1}{12} \times \frac{5}{9} = \frac{5}{108}$

Q15a) $\frac{2}{5} \times \frac{5}{6}$ b) $\frac{3}{8} \times \frac{5}{6}$

Q16a) $\frac{1}{3} \times \frac{1}{2} = \frac{1}{6}$ b) $\frac{5}{\cancel{6}_{3}} \times \frac{\cancel{2}}{3} = \frac{5}{9}$ c) $\frac{\cancel{3}}{4} \times \frac{2}{\cancel{3}_{1}}$ d) $\frac{\cancel{11}}{5} \times \frac{3}{\cancel{4}} = \frac{3}{5}$ e) $\frac{2}{3} \times \frac{4}{5} = \frac{8}{15}$

f) $\frac{\cancel{2}^{1}}{4} \times \frac{1}{\cancel{2}6} = \frac{1}{8}$

17. Find the products of the following fractions

a. $\frac{6}{7} \times \frac{2}{3}$ b. $\frac{3}{4} \times \frac{7}{8}$ c. $\frac{7}{10} \times \frac{5}{9}$ d. $\frac{8}{9} \times \frac{27}{8}$

e. $\frac{5}{6} \times \frac{2}{3}$ f. $\frac{7}{10} \times \frac{2}{3}$ g. $\frac{4}{5} \times \frac{3}{4}$ h. $\frac{6}{7} \times \frac{3}{10}$

18. Solve these multiplications making sure each product is in its lowest term.

a. $2\frac{2}{5} \times 3$ b. $4\frac{1}{2} \times \frac{7}{8}$ c. $1\frac{5}{8} \times 2\frac{1}{4}$

d. $4\frac{1}{8} \times 2\frac{1}{3} \times 4$ e. $3\frac{1}{9} \times \frac{1}{3} \times \frac{1}{6}$ f. $2\frac{1}{10} \times 1\frac{3}{8} \times 3\frac{1}{11}$

g. $\frac{1}{4} \times \frac{2}{3} \times \frac{6}{7}$ h. $3\frac{3}{5} \times 1\frac{1}{2} \times \frac{5}{9}$ i. $5\frac{1}{3} \times 1\frac{5}{6} \times \frac{3}{5}$

▶ Real-life Story Sums

1. Ayesha's grandmother buys $\frac{3}{4}$ m of lace for her handkerchief. She uses only $\frac{2}{3}$ m of the lace. What length of lace is left behind?
2. If the geography textbook for class 5 is $\frac{4}{5}$ cm thick, how high will a pile of 9 such textbooks be?
3. If there are $9\frac{1}{5}$ kg of mangoes in a carton, what will be the weight of 15 such cartons?
4. If Ali covers $\frac{1}{2}$ km, 9 times a day, how much distance does he cover in a day?
5. The race track in a stadium is $1\frac{7}{8}$ km long. If Adil manages to run around it $4\frac{1}{3}$ times, how many km has he run?
6. In a farm, $\frac{2}{3}$ is used for growing vegetables. Potatoes are grown on $\frac{1}{4}$ of this portion. What fraction of the total farm area is used to grow potatoes?

Q17a) $\frac{2}{7} \times \frac{2}{8} = \frac{4}{7}$ b) $\frac{3}{4} \times \frac{7}{8} = \frac{21}{32}$ c) $\frac{7}{10} \times \frac{5}{9} = \frac{35}{90}$ d) $\frac{1}{8} \times \frac{27}{8} = \frac{27}{9}$

e) $\frac{5}{8} \times \frac{2}{3} = \frac{5}{9}$ f) $\frac{7}{10} \times \frac{2}{3} = \frac{7}{15}$ g) $\frac{1}{5} \times \frac{3}{4} = \frac{3}{5}$ h) $\frac{3}{7} \times \frac{2}{10} = \frac{9}{35}$

Q18a) $2\frac{2}{5} \times 3$ b) $4\frac{1}{2} \times \frac{7}{8}$ c) $1\frac{5}{8} \times 2\frac{1}{4}$

$\frac{12}{5} \times 3 = \frac{36}{5}$ $\frac{9}{2} \times \frac{7}{8} = \frac{63}{16}$ $\frac{13}{8} \times \frac{9}{4} = \frac{117}{32} = 3\frac{21}{32}$

$= 7\frac{1}{5}$ $= 3\frac{15}{16}$

d) $4\frac{3}{8} \times 2\frac{2}{3} \times 4$ e) $3\frac{1}{9} \times \frac{1}{3} \times \frac{1}{6}$ f) $2\frac{1}{10} \times 1\frac{3}{8} \times 3\frac{1}{11}$

$\frac{11}{8} \times \frac{7}{8} \times 4 = \frac{77}{2} = 38\frac{1}{2}$ $\frac{14}{9} \times \frac{1}{3} \times \frac{1}{6} = \frac{14}{81}$ $\frac{21}{10} \times \frac{11}{8} \times \frac{17}{11} = \frac{357}{40}$

$= 8\frac{37}{40}$

g) $\frac{1}{4} \times \frac{2}{3} \times \frac{6}{7} = \frac{1 \times 3}{3 \times 7}$ h) $3\frac{3}{5} \times 1\frac{1}{2} \times \frac{5}{9}$ i) $5\frac{1}{3} \times 1\frac{5}{6} \times \frac{3}{5}$

$= \frac{3}{21} = \frac{1}{7}$ $\frac{18}{5} \times \frac{5}{2} \times \frac{5}{9} = \frac{6}{2} = 3$ $\frac{16}{3} \times \frac{11}{6} \times \frac{3}{5} = \frac{88}{15} = 5\frac{13}{15}$

Real-life story sums

1) $\frac{3}{4} - \frac{2}{3}$ 2) $\frac{4}{5} \times 9 = \frac{36}{5}$ cm 3) $9\frac{2}{5} \times 15$

$\frac{9-8}{12} = \frac{1}{12}$ m $\frac{46}{5} \times 15 = 138$ kg

4) $\frac{1}{2} \times 9 = \frac{9}{2} = 4\frac{1}{2}$ km 5) $1\frac{7}{8} \times 4\frac{1}{3}$ 6) $\frac{2}{3} - \frac{1}{4}$

$\frac{15}{8} \times \frac{13}{3} = \frac{65}{8} = 8\frac{1}{8}$ km $\frac{8-3}{12} = \frac{5}{12}$

$\frac{5}{12} - \frac{1}{4}$ (Portion for Potatoes)

$\frac{5-3}{12} = \frac{2}{12} = \frac{1}{6}$

Division of fractions

When we want an answer to 21 ÷ 3, we ask ourselves, 'how many sets of three can be made from a set of 21', or, more simply, 'how many threes make 21?' This is far too easy for you. If we remember the basic rule of division, we shall find division with fractions simple and fun to do.

Division sum	Words we say	Quotient
72 ÷ 9	How many nines make 72?	8
2500 ÷ 50	How many fifties make 2500?	
324 ÷ 4	How many fours make 324?	
391 ÷ 17	How many seventeens make 391?	

Reciprocal

When the product of two fractions is equal to 1, then each fraction is the reciprocal of the other. To find the reciprocal of a fraction, we simply interchange the numerator and the denominator.

Examples:

Find the reciprocal of the given fractions.

a. $\frac{5}{9}$

$\frac{5}{9} \times \frac{9}{5}$

$= 1$

$\therefore$ reciprocal of $\frac{5}{9}$ is $\frac{9}{5}$.

b. $\frac{1}{12}$

$\frac{1}{12} \times \frac{12}{1}$

$= 1$

$\therefore$ reciprocal of $\frac{1}{12}$ is 12.

c. $2\frac{2}{3}$

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

$= 1$

$\therefore$ reciprocal of $\frac{8}{3}$ is $\frac{3}{8}$.

d. $1\frac{5}{8}$

$\frac{13}{8} \times \frac{8}{13}$

$= 1$

$\therefore$ reciprocal of $\frac{13}{8}$ is $\frac{8}{13}$.

REMEMBER

Rules for Division of Fractions

Step 1: First fraction is kept as it is.
Step 2: Take the reciprocal of the second fraction and change the division (÷) sign to the multiplication (×) sign.
Step 3: Multiply the numerators.
Step 4: Multiply the denominators.
Step 5: Simplify by cancellation if needed.

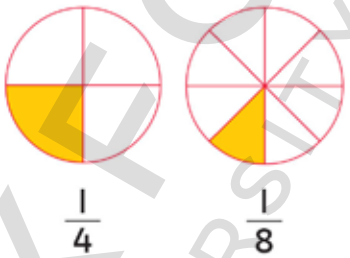
Division of a fraction by a whole number

Step 1 Take the reciprocal of the whole number.
Step 2 Multiply the numerators of the fractions.
Step 3 Multiply the denominators of the fractions.
Step 4 Simplify the fraction to the lowest term if necessary.

Example:

$\frac{1}{4} \div 2$

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



IMPORTANT

Division by a fraction is the same as multiplication by its reciprocal.

Division of a whole number by a fraction

Using words to help us, we can easily solve this division.

$1 \div \frac{1}{4}$

We ask ourselves: **how many quarters make one whole?**

The answer is easy: 4 quarters make 1 whole.

$1 \div \frac{1}{4} = 4$

is the same as $\frac{1}{1} \times \frac{4}{1} = \frac{1 \times 4}{1 \times 1} = \frac{4}{1} = 4$

4 quarters make 1 whole

Now let us try this:

$2 \div \frac{1}{3}$

We ask ourselves: **how many thirds are needed to make two wholes?**

Again, the answer is easy: 6 thirds make 2 wholes.

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

Similarly, $\frac{2}{1} \times \frac{3}{1} = \frac{2 \times 3}{1 \times 1} = \frac{6}{1} = 6$

What happens when we divide a fraction by 1?

Example:

$\frac{5}{6} \div 1$

We follow our rule: $\frac{5}{6} \div \frac{1}{1} = \frac{5}{6} \times \frac{1}{1}$

$= \frac{5 \times 1}{6 \times 1} = \frac{5}{6}$

We get the same fraction we started with.

REMEMBER

When we divide any number by 1, the answer is the number itself.

What happens when we divide a fraction by itself?

Example:

$\frac{4}{11} \div \frac{4}{11} = \frac{4}{11} \times \frac{11}{4}$

$= \frac{4 \times 11}{11 \times 4} = \frac{\cancel{44}}{\cancel{44}} = \frac{1}{1}$

Our answer is 1.

REMEMBER

When we divide a number by the same number, the answer will be 1.

What happens when the dividend is zero?

Example:

$0 \div \frac{3}{4} = \frac{0 \times 4}{1 \times 3} = \frac{0}{3} = 0$

REMEMBER

The result of 0 divided by any number is always 0.

Division of a fraction by a fraction

Examples:

1. $4\frac{2}{9} \div 2\frac{4}{9}$

Solution:

Convert the mixed fraction into improper fractions:

$\frac{38}{9} \div \frac{22}{9}$

$= \frac{38}{9} \times \frac{9}{22} = \frac{\overset{19}{\cancel{38}} \times \overset{1}{\cancel{9}}}{\underset{1}{\cancel{9}} \times \underset{11}{\cancel{22}}} = \frac{19}{11} = 1\frac{8}{11}$

2. Divide $\frac{3}{13}$ by 6

Solution:

$\frac{3}{13} \div 6$

$= \frac{3}{13} \times \frac{1}{6} = \frac{\overset{1}{\cancel{3}} \times 1}{13 \times \underset{2}{\cancel{6}}} = \frac{1}{26}$

3. $\frac{49}{65} \div \frac{14}{25}$

Solution:

$= \frac{49}{65} \times \frac{25}{14} = \frac{\overset{7}{\cancel{49}} \times \overset{5}{\cancel{25}}}{\underset{13}{\cancel{65}} \times \underset{2}{\cancel{14}}} = \frac{35}{26} = 1\frac{9}{26}$

4. $\frac{48}{39} \div \frac{18}{15}$

Solution:

$\frac{48}{39} \times \frac{15}{18} = \frac{\overset{8}{\cancel{48}} \times \overset{5}{\cancel{15}}}{\underset{13}{\cancel{39}} \times \underset{3}{\cancel{18}}} = \frac{40}{39} = 1\frac{1}{39}$

5. Adil has read $\frac{1}{8}$ of a book in 6 days. How much of the book did he read in one day?

Solution:

In 6 days, he reads $\frac{1}{8}$ of the book.

In one day he reads $\frac{1}{8} \div 6 = \frac{1}{8} \times \frac{1}{6} = \frac{1}{48}$ of the book.

6. A tailor requires $1\frac{2}{3}$ m of fabric to make a dress, how many dresses can be made from 20 m of fabric?

Solution:

$1\frac{2}{3}$ m is used to make 1 dress.

20 m will be used to make $20 \div 1\frac{2}{3}$ dresses.

$20 \div 1\frac{2}{3} = \frac{20}{1} \div \frac{5}{3} = \frac{20}{1} \times \frac{3}{5} = \frac{\overset{4}{\cancel{20}} \times 3}{1 \times \cancel{5}} = 12$ dresses.

▶ Exercise 3c

1. Fill in the blanks.

   a. $\frac{7}{2} \div \frac{5}{2} =$ $\frac{7}{5} = 1\frac{2}{5}$

   b. $\frac{3}{5} \div \frac{1}{7} =$ $\frac{21}{5} = 4\frac{1}{5}$

   c. $1\frac{1}{2} \div 1\frac{1}{2} =$ 1

   d. $\frac{10}{7} \div 5 =$ $\frac{2}{7}$

   e. 3 $\div 9 = \frac{1}{3}$

2. State whether the following are true or false.

   a. When dividing two fractions, the second fraction is inverted (True)

   b. $\frac{1}{2} \div 5$ is same as $5 \div \frac{1}{2}$ (False)

   c. $1\frac{1}{2} \div \frac{1}{2} = 3$ (True)

   d. $\frac{5}{8} \div 1 = \frac{8}{5}$ (False)

   e. $\frac{3}{7} \div 5 = \frac{3}{35}$ (True)

3. Select the correct answer from the given options.

   a. $1\frac{3}{5} \div 3\frac{4}{5}$ is equal to

   (A) $\frac{8}{19}$ (B) $\frac{1}{2}$ (C) $\frac{3}{4}$ (D) $\frac{16}{23}$

   b. $11 \div 4\frac{2}{5}$ is equal to

   (A) $\frac{2}{5}$ (B) $\frac{5}{2}$ (C) $\frac{242}{5}$ (D) 110

   c. $4\frac{3}{7} \div 8\frac{6}{7}$ is equal to

   (A) 2 (B) 1250 (C) $\frac{1}{2}$ (D) $2\frac{2}{7}$

   d. $15 \div \frac{25}{35}$ is the same as

   (A) $\frac{1}{21}$ (B) $\frac{7}{75}$ (C) $\frac{75}{7}$ (D) 21

   e. $\frac{1}{3} \div \frac{1}{9}$ is the same as

   (A) 3 (B) $\frac{1}{27}$ (C) $\frac{1}{3}$ (D) 27

Exercise 3c

Q1a) $\frac{7}{2} \div \frac{5}{2}$

$\frac{7}{2_1} \times \frac{2}{5} = \frac{7}{5} = 1\frac{2}{5}$

b) $\frac{3}{5} \div \frac{1}{7}$

$\frac{3}{5} \times 7 = \frac{21}{5} = 4\frac{1}{5}$

c) $1\frac{1}{2} \div 1\frac{1}{2}$

$\frac{3}{2} \div \frac{3}{2} = \frac{3^1}{2_1} \times \frac{2^1}{3_1}$

$= 1$

d) $\frac{10}{7} \div 5$

$\frac{2}{7} \frac{10}{1} \times \frac{1}{5_1} = \frac{2}{7}$

e) $\frac{x}{9} \div 9 = \frac{1}{3}$

$\frac{x}{9} \times \frac{1}{3}$ Suppose x

$3x = 9$

$x = \frac{9^3}{3_1} = 3 \quad x = 3$

Q3a) $1\frac{3}{5} \div 3\frac{4}{5}$

$\frac{8}{5} \div \frac{19}{5}$

$= \frac{8}{5_1} \times \frac{5^1}{19} = \frac{8}{19}$

b) $11 \div 4\frac{2}{5}$

$11 \div \frac{22}{5} = \frac{1}{2}\frac{1}{22} \times \frac{5}{2} = \frac{5}{2} = 2\frac{1}{2}$

c) $4\frac{3}{7} \div 8\frac{1}{2}$

$\frac{31}{7} \div \frac{62}{7}$

$\frac{31}{1} \times \frac{1}{62} = \frac{31}{62}$

$= \frac{1}{2}$

d) $15 \div \frac{35}{35}$

$\frac{3}{15} \times \frac{7}{35_1} = 21$

e) $\frac{1}{3} \div \frac{1}{9}$

$\frac{1}{3_1} \times 9^3 = 3$

4. Divide the following:

a. $\frac{1}{6} \div 5$ b. $\frac{1}{4} \div 7$ c. $\frac{3}{7} \div 9$ d. $\frac{5}{8} \div 8$

e. $1 \div \frac{1}{8}$ f. $3 \div \frac{1}{3}$ g. $3 \div \frac{3}{4}$ h. $24 \div \frac{4}{5}$

i. $\frac{1}{2} \div \frac{1}{3}$ j. $\frac{1}{4} \div \frac{1}{2}$ k. $\frac{3}{4} \div \frac{3}{2}$ l. $\frac{7}{3} \div \frac{14}{15}$

5. Copy and complete this table, thinking very carefully.

	Sum	In words	Quotient
	$2 \div \frac{1}{3}$	How many thirds make 2 wholes?	Hint: Use reciprocal of the fraction $2 \times 3 = 6$ wholes
a.	$3 \div \frac{1}{7}$	How many sevenths make 3 wholes	21
b.	$9 \div \frac{1}{10}$	How many tenths make 9 wholes	90
c.	$12 \div \frac{1}{11}$	How many elevenths make 12 wholes	132
d.	$14 \div \frac{1}{12}$	How many twelfths make 14 wholes	168

6. Write division sums to match these diagrams.

a.  b. 

c.  d. 

Q4a) $\frac{1}{6} \div 5$ (b) $\frac{1}{4} \div 7$ (c) $\frac{3}{7} \div 9$ (d) $\frac{5}{8} \div 8$

$\frac{1}{6} \times \frac{1}{5} = \frac{1}{30}$ $\frac{1}{4} \times \frac{1}{7} = \frac{1}{28}$ $\frac{\cancel{3}^{1}}{7} \times \frac{1}{\cancel{9}^{3}} = \frac{1}{21}$ $\frac{5}{8} \times \frac{1}{8} = \frac{5}{64}$

(e) $1 \div \frac{1}{8}$ (f) $3 \div \frac{1}{3}$ (g) $3 \div \frac{3}{4}$ (h) $24 \div \frac{4}{5}$ (i) $\frac{1}{2} \div \frac{1}{3}$

$1 \times 8 = 8$ $3 \times 3 = 9$ $\frac{\cancel{3}^{1}}{\cancel{3}_{1}} \times \frac{4}{\cancel{3}} = 4$ $\frac{\cancel{24}^{6}}{\cancel{4}} \times \frac{5}{\cancel{4}} = 30$ $\frac{1}{2} \times 3 = \frac{3}{2} = 1\frac{1}{2}$

(j) $\frac{1}{4} \div \frac{1}{2}$ (k) $\frac{3}{4} \div \frac{3}{2}$ (l) $\frac{7}{3} \div \frac{14}{15}$

$\frac{1}{\cancel{4}_{2}} \times \frac{\cancel{2}}{1} = \frac{1}{2}$ $\frac{\cancel{3}}{\cancel{4}_{2}} \times \frac{\cancel{2}}{\cancel{3}} = \frac{1}{2}$ $\frac{\cancel{7}}{\cancel{7}} \times \frac{\cancel{15}^{5}}{\cancel{14}_{2}} = \frac{5}{2} = 2\frac{1}{2}$

7. Divide the following fractions:

a. $1\frac{2}{5} \div \frac{4}{5}$ b. $\frac{15}{42} \div 5$ c. $\frac{37}{25} \div \frac{1}{75}$ d. $84 \div \frac{21}{16}$

e. $12\frac{3}{5} \div 4\frac{3}{8}$ f. $14 \div \frac{1}{13}$ g. $100 \div \frac{1}{10}$ h. $8\frac{3}{5} \div 6$

i. $\frac{3}{5} \div 4$ j. $10\frac{1}{2} \div 5$ k. $16 \div 4\frac{3}{4}$ l. $4\frac{9}{10} \div 2\frac{1}{2}$

m. $3\frac{5}{6} \div 1\frac{1}{6}$ n. $8\frac{1}{4} \div 3\frac{5}{8}$

▶ Real-life Story Sums

1. If 4 children ate $\frac{8}{9}$ of a bowl of ice cream, then how much ice cream of the bowl did each child have?
2. A pile of Math textbooks on a table is exactly $14\frac{2}{5}$ cm high. If each book is $1\frac{1}{5}$ cm thick, how many books make up the pile?
3. Maham has 36 chocolates. She gives $\frac{4}{9}$ of them to her best friend, Laila, then shares the rest between herself and 4 other friends. How many chocolates does Maham get?
4. A piece of ribbon is $5\frac{3}{5}$ m long. If it is cut into 14 equal pieces, how long will each piece be?
5. A cupcake takes just $\frac{1}{4}$ of an hour to bake. How many cup cakes can be baked in $1\frac{1}{2}$ hours?

Q7a) $1\frac{2}{5} \div \frac{4}{5}$

$\frac{7}{5} \times \frac{8}{4} = \frac{7}{4} = 1\frac{3}{4}$

b) $\frac{15}{42} \div 5$

$\frac{15}{42} \times \frac{1}{5} = \frac{1}{14}$

c) $\frac{37}{25} \div \frac{1}{75}$

$\frac{37}{25} \times 3 = 111$

d) $84 \div \frac{21}{16}$

$\frac{84}{21} \times 16 = 64$

e) $12\frac{3}{5} \div 4\frac{3}{8}$

$\frac{63}{5} \div \frac{35}{8}$

$\frac{63}{5} \times \frac{8}{35} = \frac{72}{25} = 2\frac{22}{25}$

f) $14 \div \frac{1}{13}$

$14 \times 13 = 182$

g) $100 \div \frac{1}{10}$

$100 \times 10 = 1000$

g) $100 \div \frac{1}{10}$

$100 \times 10 = 1000$

h) $8\frac{3}{5} \div 6$

$\frac{43}{5} \times \frac{1}{6} = \frac{43}{30} = 1\frac{13}{30}$

i) $\frac{3}{5} \div 4$

$\frac{3}{5} \times \frac{1}{4} = \frac{3}{20}$

j) $10\frac{1}{2} \div 5$

$\frac{21}{2} \times \frac{1}{5} = \frac{21}{10} = 2\frac{1}{10}$

k) $16 \div 4\frac{3}{4}$

$16 \div \frac{19}{4}$

$16 \times \frac{4}{19} = \frac{64}{19}$

l) $4\frac{9}{10} \div 2\frac{1}{2}$

$\frac{49}{10} \div \frac{5}{2}$

$\frac{49}{5} \times \frac{2}{5} = \frac{49}{25} = 1\frac{24}{25}$

m) $3\frac{5}{6} \div 1\frac{1}{6}$

$\frac{23}{6} \div \frac{7}{6}$

$\frac{23}{6} \times \frac{6}{7} = \frac{23}{7}$

n) $8\frac{1}{4} \div 3\frac{5}{8}$

$\frac{33}{4} \div \frac{29}{8}$

$\frac{33}{4} \times \frac{8}{29} = \frac{66}{29} = 2\frac{8}{29}$

Real-life story sums

1) $\frac{8}{9} \div 4$

$\frac{8}{9} \times \frac{1}{4} = \frac{2}{9}$ bowl of ice cream

2) $14\frac{2}{5} \div 1\frac{2}{5}$

$\frac{72}{5} \div \frac{6}{5} = \frac{12}{72} \times \frac{1}{6} = 12$ books

3) $\frac{4}{9} \times 36$

$= 4 \times 4 = 16$

Total chocolates = 36

$36 - 16 = 20$

Divide among Mariam and 4 friends =

$\frac{20}{5} = 4$ chocolates

4) $5\frac{3}{5} \div 14$

$\frac{28}{5} \div 14$

$\frac{28}{5} \times \frac{1}{14} = \frac{2}{5}$ m

5) $\frac{3}{2} = 1.5$ hrs

$\frac{1}{4} = 0.25$ hrs

$\frac{1.5}{0.25} = 6$ cupcakes

4 Decimals and Percentages

YOUR DIGITAL RESOURCE

In this unit students will learn to:

- compare numbers up to 3-digits with 2 decimal places using signs <, >, or =
- arrange numbers up to 3-digit numbers with 2 decimal places in ascending and descending order
- add and subtract 4-digit numbers up to 3-decimal places
- multiply a 3-digit number up to 2 decimal places by 10, 100, and 1000
- multiply a 3-digit number up to 2 decimal places by a whole number up to 2-digit
- multiply a 3-digit number up to 2 decimal places by a 3-digit number up to 2 decimal places
- divide a 3-digit number up to 2 decimal places by 10, 100, and 1000
- divide a 3-digit numbers up to 2 decimal places by a whole number up to 2-digit
- divide a 3-digit number up to 2 decimal places by a 2-digit number up to 1 decimal place
- convert fractions to decimals using division
- solve real life situations involving division of 3-digit numbers up to 2 decimal places
- round off a 4-digit number up to 3-decimal places to the nearest tenth or hundredth
- estimate sum or difference of the numbers (up to 4 digits)
- recognise percentage as a special kind of fraction
- convert percentage to fraction and to decimal number and vice versa
- solve real life situations involving percentages

MATH FLASH

You have already learnt:

- a decimal is a fraction with denominator 10 or power of 10. Example: $\frac{2}{10} = 0.2$; $\frac{13}{100} = 0.13$
- identify the place value of a digit in decimals
  Example: 78.42
  $\frac{4}{10}$ or four-tenths ← ↳ $\frac{2}{100}$ or two-hundredths
- convert a fraction into a decimal if the denominator is 10 or power of 10 or is not a power of 10. Example: $\frac{1}{2} = 0.5$; $\frac{3}{4} = 0.75$
- convert decimals to fractions
- add and subtract decimal numbers
- multiply decimals by a 2-digit number
- divide decimals by 1-digit number
- round off a number to nearest 1000

KEY VOCABULARY

common fraction, decimal fraction, place value, tenth, hundredth, thousandth, rounding off, rounding up, rounding down, percentage

Decimals

Do you remember the links between common fractions and decimal fractions.

LET US RECALL

Do you remember the links between common fractions and decimal fractions.

1. Complete the table:

$\frac{1}{100}$	$\frac{2}{10}$		$\frac{3}{1000}$		$\frac{19}{1000}$	$\frac{245}{1000}$		$\frac{7}{10}$		$\frac{14}{100}$
0.01		0.47		0.8			0.69		0.732	

2. Convert the common fractions into decimals.

   a. $3\frac{1}{2}$ b. $\frac{1}{10}$ c. $2\frac{1}{10}$

3. Change into common fractions.

   a. 10.01 b. 18.05 c. 35.75

4. Write as decimals.

   a. $2\frac{5}{1000}$ b. $8\frac{9}{100}$ c. $200\frac{9}{10}$

5. Write the place value of the circled digit.

   a. 9(3).061 b. 492.0(3)2 c. 25.17(4)

6. Write the following fractions as decimals by changing denominators into multiple of 10.

   a. $3\frac{4}{25}$ b. $8\frac{7}{200}$ c. $14\frac{65}{500}$

7. Fill in <, >, or =.

   a. $\frac{8}{100} \square \frac{8}{10}$ b. $\frac{10}{1000} \square \frac{1}{100}$

   c. 0.004 ☐ 0.040 d. 1.75 ☐ $1\frac{75}{100}$

Comparing and ordering decimals

Comparing decimals

Nadeem and Aslam had a race.
Nadeem reached the finish line in 55.08 seconds.

Aslam reached the finish line in 55.2 seconds.
Who won the race?
In order to find out who took less time, we need to compare.

First convert into like decimals.

55.08 ☐ 55.2

↓ ↓

55.08 ☐ 55.20

Here both have 2 decimal places.

Now compare as we do for whole numbers.

5508 < 5520

Thus 55.08 < 55.2
Therefore, Nadeem won the race as he reached the finish line in less time.

REMEMBER

Do not compare decimals by counting the number of digits.

Example: 4.238 is not greater than 4.56

NOTE

Two or more decimal fractions are called like decimals if they have equal number of decimal places.

To compare decimals, first convert them to like decimals.

Example:

Compare and write <, >, =.

a.	b.	c.
90.09 ☐ 90.9	16.54 ☐ 15.54	854.32 ☐ 854.32
90.09 < 90.9	16.54 > 15.54	854.32 = 854.32

Ordering Decimals

A shopkeeper weighed four items in his grocery store. He recorded their weight as shown. Rewrite these weights in descending order. That is place the heaviest first.

Wheat	65.28 kg
Rice	65.8 kg
Sugar	61.9 kg
Chickpeas	64.07 kg

In order to put them in descending order, convert them to like decimals of two places.

6. a. 5·03, 5·06, 5·36, 5·6

b. 11·40, 11·60, 110·64, 114·4

c. 14·2, 14·27, 27·14, 27·4

d. 130·45, 130·5, 131·45, 132·45

e. 3·48, 3·8, 5·05, 5·2

7. a.
$$\begin{array}{r} {}^{9} \\ 3\cancel{3}{}^{9}2.48 \\ -\ 208.24 \\ \hline = 94.24 \end{array}$$

b.
$$\begin{array}{r} {}^{1} \\ 619.052 \\ +\ 341.006 \\ \hline = 960.058 \end{array}$$

c.
$$\begin{array}{r} {}^{10}{}^{15} \\ \cancel{1}\cancel{5}6.135 \\ -\ 89.74 \\ \hline = 26.61 \end{array}$$

d.
$$\begin{array}{r} {}^{1} \\ 860.241 \\ +\ 564.237 \\ \hline = 1424.478 \end{array}$$

e.
$$\begin{array}{r} {}^{1}{}^{1} \\ 482.11 \\ +\ 653.938 \\ \hline = 1136.048 \end{array}$$

f.
$$\begin{array}{r} {}^{1}{}^{1} \\ 3.19 \\ 27.974 \\ +\ 8.8 \\ \hline = 39.964 \end{array}$$

g.
$$\begin{array}{r} {}^{8} \\ 4\cancel{9}.134 \\ -\ 8.7 \\ \hline = 40.64 \end{array}$$

h.
$$\begin{array}{r} {}^{2}{}^{11}{}^{10}{}^{10} \\ 7\cancel{3}7.\cancel{1}\cancel{0}0 \\ -\ 28.932 \\ \hline = 703.178 \end{array}$$

Wheat	Rice	Sugar	Chickpeas
65.28	65.8	61.9	64.07
↓	↓	↓	↓
65.28	65.80	61.90	64.07
↓	↓	↓	↓
6528	6580	6190	6407

Rewrite as whole numbers

Now we can easily arrange them in descending order.

$$6580 > 6528 > 6407 > 6190$$

Therefore,

Rice	65.8 kg
Wheat	65.28 kg
Chickpeas	64.07 kg
Sugar	61.9 kg

or 65.8, 65.28, 64.07, 61.9 are in descending order.

Example 1:

Rewrite in ascending order: 251.44, 251.04, 251.4

Solution:

Step 1: Convert to like decimals: 251.44, 251.04, 251.40

Step 2: Write in ascending order: 251.44, 251.40, 251.04

Addition and subtraction of decimals

Remember how we set out decimal fractions in a place value table.

	H	T	O	.	t	h	th
42.3 =		4	2	.	3		
118.61 =	1	1	8	.	6	1	
4.993 =			4	.	9	9	3

The first number, 42.3, has only 1 digit, 3, to the right of the decimal point. It has only **1 decimal place (dp)**. We can also write it as $42\frac{3}{10}$.

The second number, 118.61, has 2 digits to the right of the decimal point. It has **2 decimal places**. We can also write it as $118\frac{61}{100}$.

The last number, 4.993, has 3 digits, to the right of the decimal point. Therefore, it has **3 decimal places**. We can also write it as $4\frac{993}{1000}$.

When we work with decimals, it is very important to write our sums neatly, with the decimal point and the columns properly aligned. Each number above has a different number of decimal place. Such numbers are called **unlike decimals**.

We can easily transform them into **like decimals** with three decimal places each:

H	T	O	.	t	h	th
	4	2	.	3	0	0
1	1	8	.	6	1	0
		4	.	9	9	3

All three numbers are now like decimals.

If two numbers have same number of decimal places they can be easily added or subtracted by writing each digit under the other.

Examples:

9.803	Rs 56.19
+ 15.434	− Rs 23.48
25.237	Rs 32.71

If the decimal places are different then first we need to convert the decimals into like decimals and then arrange them vertically.

Example:

Add 41.24, 31.5, and 36.124.

Solution:

41.240
31.500
+ 36.124
108.864

Example:
Subtract 25.145 from 619.7.

Solution:

Change the decimals into like fractions first.

$$\begin{array}{r} 619.700 \\ -\ 25.145 \\ \hline 594.555 \end{array}$$

REMEMBER

When we add or subtract unlike decimal numbers we need to convert them into like decimals.

▶ Exercise 4a

1. Fill in the blanks.
   a. 167.9 + 7.29 = _____.
   b. 856.001 − 55.9 = _____.
   c. 31.9 + 52.09 + 49.009 = _____.
   d. 7846.119 is taken away from 9000 the result is _____.
   e. 132.5 and 632.005 altogether make _____.
2. State whether the following are true or false.
   a. In a set of decimal numbers, if each number has a different decimal place, then the numbers cannot be added. (_____)
   b. Like decimal numbers have the same number of decimal places. (_____)
   c. The number 81.008 has one decimal place. (_____)
   d. To add or subtract decimal numbers, unlike decimals should be converted into like decimals. (_____)
   e. The number 34.80 has two decimal places. (_____)
3. Select the correct answer from the given options.
   a. 7.29 + 18.105 is equal to
      Ⓐ 91.005 Ⓑ 18.834 Ⓒ 25.395 Ⓓ 1.8834
   b. 46.37 − 9.7 is equal to
      Ⓐ 36.67 Ⓑ 36.60 Ⓒ 43.47 Ⓓ 51.37
   c. The number 18.009 has
      Ⓐ one decimal places Ⓑ three decimal places
      Ⓒ two decimal places Ⓓ five decimal places

d. If 1 is added to 9.99 the result is

Ⓐ 10.09 Ⓑ 10.99 Ⓒ 19.99 Ⓓ 10.00

e. If 1.989 is subtracted from 2, we get

Ⓐ 1.987 Ⓑ 0.980 Ⓒ 1.989 Ⓓ 0.011

4. Compare and write < or >.

a. 3.03 ☐ 3.33 b. 50.05 ☐ 50.4

c. 78.13 ☐ 78.03 d. 49.09 ☐ 48.09

5. Rewrite in descending order.

a. 8.04, 8.05, 17.3, 17.56 b. 19.4, 11.94, 19.46, 11.95

c. 541.56, 154.56, 542.56, 542.6 d. 18.413, 18.143, 18.341, 18.431

6. Rewrite in ascending order.

a. 5.06, 5.6, 5.03, 5.36 b. 110.64, 11.60, 11.40, 114.4

c. 14.27, 27.14, 14.2, 27.4 d. 132.45, 130.5, 130.45, 131.45

e. 3.48, 5.2, 3.8, 5.02

7. Solve the following.

a. 302.48 − 208.24 b. 619.052 + 341.006

c. 116.35 − 89.74 d. 860.241 + 564.237

e. 482.11 + 653.938 f. 3.19 + 27.974 + 8.8

g. 49.34 − 8.7 h. 732.11 − 28.932

▶ Real-life Story Sums

1. Azam has Rs 1401.65. He received Rs 2314.10 more from his father. How much money does he have now?
2. Nina travelled 142.613 km by bus, and 25.15 km by train. How much distance did she travel altogether?
3. Mum made 4.5 l of lemonade to serve at a party. In the end she was left with 0.821 l of lemonade. How much lemonade was drunk at the party?
4. Ali bought a basketball for Rs 132.50, Ahad bought a bat for Rs 715.75, and Bilal bought a football for Rs 829.62. How much did they spend altogether?
5. The height of Pir Channasi mountain in Muzaffarabad is 2.9 km, while the height of Ganga Choti in discrict Bagh is 3.675 km. How much Ganga Choti is higher than Pir Channasi?

Multiplication of decimals

Multiplying a decimal by 10, 100, and 1000

We know that when a whole number is multiplied by 10, the number moves one column to the left in the place value table. The decimal point moves one column to the right.

$$37 \times 10 = 370$$

H	T	O	.	t
	3	7	.	0

$\times 10 =$

H	T	O	.	t
3	7	0	.	0

What happens when we multiply a decimal number by 10?

$$3.7 \times 10 = ?$$

$$3.7 \times 10 = 3\frac{7}{10} \times 10 = \frac{37}{\cancel{10}} \times \frac{\cancel{10}}{1} = 37$$

$3.7 \times 10 = 37$

When we multiply a decimal number by 10, we apply the same rule as for whole numbers: the number moves one column to the left or the decimal point moves one column to the right.

Let us see what happens when we multiply a decimal number by 100:

Example:

3.7×100

Solution:

$$3.7 \times 100 = 3\frac{7}{10} \times 100$$

$$\frac{37}{\cancel{10}} \times \frac{\cancel{100}}{1} = \frac{370}{1}$$

$3.7 \times 100 = 370$

Our number has now moved 2 columns to the left:

H	T	O	.	t	h
		3	.	7	0

$\times 100 =$

H	T	O	.	t	h
3	7	0	.	0	0

We can guess what will happen when we multiply by 1000.

Example: 3.7 × 1000

Solution:

$$3.7 \times 1000 = 3\frac{7}{10} \times \frac{1000}{1}$$

$$\frac{37}{\cancel{10}_{1}} \times \frac{\cancel{1000}^{100}}{1} = 3700$$

3.7 × 1000 = 3700

Our number has now moved 3 columns to the left:

H	T	O	.	t	h	th
		3	.	7	0	0

× 1000 =

Th	H	T	O	.	t	h	th
3	7	0	0	.	0	0	0

Multiply a decimal with a whole number

When a decimal number is multiplied by a whole number, the placement of the decimal point has to be considered carefully. The number of decimal places in the product depends on the number of decimal places in the multiplicand.

- If the multiplicand has 1 decimal place, then the product should also have 1 decimal place.
- Count the number of digits after the decimal point in the multiplicand.
- Place the decimal point after the same number of digits counting from right to left in the product.

Example:

3.8 × 4

Solution:

3.8 → 1 decimal place

× 4

15.2 → 1 decimal place

Example:

5.17 × 17

Solution:

5.17 → 2 decimal places

× 17

87.89 → 2 decimal places

Example:

3.53 × 26

Solution:

3.53 → 2 decimal places
× 26
2118
+7060
91.78 → 2 decimal places

Example:

4.62 × 18

Solution:

4.62 → 2 decimal places
× 18
3696
+4620
83.16 → 2 decimal places

Multiplying a decimal by tenths and hundredths

Two different methods can be adopted to multiply a decimal by tenths, hundredths, and thousandths.

To multiply a decimal number with any number of decimal places by a decimal number with one decimal place, follow two methods.

Method 1

Step 1: Proceed to multiply the numbers as whole numbers without considering the decimal points.

Step 2: Count the total decimal places in the multiplicand and multiplier.

Step 3: Place the decimal point accordingly in the product, counting from the right.

Example:

3.58 × 2.5

Solution:

3.58 → 2 decimal places in the multiplicand
× 2.5 → 1 decimal places in the multiplier
1790
+ 7160
8.950 → 3 decimal places in the product

The same method is followed if a decimal number is multiplied by hundredths.

Example:

5.17 × 4.16

Solution:

5.17 → 2 decimal places (multiplicand)

× 4.16 → 2 decimal places (multiplier)

3102

5170

206800

21.5072 → 4 decimal places (product)

Multiplication of decimal numbers can also be done by first changing the decimal fraction into a common fraction.

Method 2

Step 1: Change the decimal fraction into a common fraction.

Step 2: Multiply the numerators and the denominators.

Step 3: Convert the fraction to a decimal number by placing the decimal point depending on the numbers of zeros in the denominator.

Example:

3.81 × 2.34

Solution:

$3.81 \times 2.34 = \frac{381}{100} \times \frac{234}{100}$ → common fraction

$= \frac{381 \times 234}{10000}$

$= \frac{89154}{10000}$ → 4 zeros in the denominator

= 8.9154 → 4 decimal places

3.81 × 2.34 = 8.9154

The answer will have 4 decimal places.

HINT

Count the total number of decimals (in the multiplicand and multiplier), then place the decimal point in the product counting (the same number of places) from right to left.

Similarly, we can multiply a decimal number with one decimal place by a decimal with three decimal places.

Example:

1.65 × 7.8

Solution:

1.65	→	2 decimal places
× 7.8	→	1 decimal place
12.870	→	3 decimal places

Example:

1.72 × 3.6

Solution:

$$1.72 \times 3.6 = \frac{172}{100} \times 3\frac{6}{10}$$

$$= \frac{172}{100} \times \frac{36}{10}$$

$$= \frac{172 \times 36}{1000} = \frac{6192}{1000} = 6.192$$

Division of decimals

Divide decimals by 10, 100, and 1000

Let us consider a number 48 000 and divide it by 10, 100, and 1000.

We have learnt that:

- when divided by 10, the number 48 000 will move one column to the right and lose one of its zeros, becoming 4800.
- when divided by 100, it will move two columns to the right, losing two of its zeros to become 480.
- when divided by 1000, it will move three columns to the right, losing three zeros to become 48.

We apply the same rule when we divide a decimal number by 10 or its multiples.

If divided by **10**, our number moves **one column** to the right. 8.3 ÷ 10 = 0.83

If divided by **100**, our number moves **two columns** to the right. 8.3 ÷ 100 = 0.083

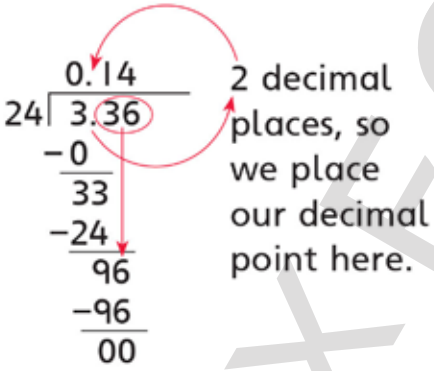
If divided by **1000**, our number moves **three columns** to the right. 8.3 ÷ 1000 = 0.0083

REMEMBER

Count the zeros in the divisor, then shift the dividend the same number of columns to the right.

Dividing a decimal by a whole number

When we divide a decimal fraction by a whole number, the quotient may or may not have the same number of decimal places as the dividend.



HINT

Before bringing down the digit after the decimal point, put a decimal point in the quotient.

Dividing a decimal by a decimal by converting decimals to fractions

It is easy to divide a decimal number by a whole number. For example we can easily divide 25.5 by 5, to get an answer 5.1.

But it is not so simple to divide a decimal number by tenths and hundredths. In such cases we need to change the decimal fraction into common fraction (as done for multiplication) and then divide.

Example:
Divide 6.48 by 1.6

Solution:

$6.48 \div 1.6$

$= \frac{648}{100} \div \frac{16}{10}$ (change into common fractions)

$= \frac{\overset{81}{\cancel{648}}}{\underset{50}{\cancel{100}}} \times \frac{\overset{5}{\cancel{10}}}{\underset{2}{\cancel{16}}}$ (take the reciprocal)

$= \frac{405}{100}$

$= 4.05$

Dividing a decimal by a decimal by using division

To divide a decimal number by a decimal number we can follow any of the two methods given below.

Method 1

1. If the divisor is a decimal number, then convert it to a whole number by multiplying it by 10 or 100 depending on the decimal places.
2. Multiply the dividend by the same number. Remember the dividend may become a whole number, or remain a decimal number, depending on the digits after the decimal.
3. Divide as usual.
4. Put the decimal point before bringing down the digit after the decimal point.

Example: 5.25 ÷ 2.5

$\frac{5.25}{2.5}$ → 1 decimal place, therefore, multiply the numerator and denominator by 10

$\frac{5.25 \times 10}{2.5 \times 10}$

$\frac{52.5}{25}$ → the denominator has become a whole number

Now we can easily divide 52.5 by a whole number 25.

$$\begin{array}{r} 2.1 \\ 25\overline{)52.5} \\ -50\downarrow \\ \hline 25 \\ -25 \\ \hline 0 \end{array}$$

Hence, 5.25 ÷ 2.5 = 2.1

Method 2: We can also divide a decimal number by a decimal number, by changing both the divisor and the dividend into whole numbers.

Example: 0.72 ÷ 0.6

Solution: Multiply both the numerator and the denominator by 100.

$$\frac{0.72}{0.6} \times \frac{100}{100} = \frac{72}{60} = \frac{12}{10} = 1.2$$

0.72 ÷ 0.6 = 1.2

Using division to change fractions into decimals

Adil and three of his friends want to share 3 cakes equally. How much will each boy get?

3 cakes shared by 4 people = 3 ÷ 4

Remember 3.0 is same as 3.00.

$$\begin{array}{r} 0.75 \\ 4\overline{)3.00} \\ -28 \\ \hline 20 \\ -20 \\ \hline 0 \end{array}$$

Therefore, $3 \div 4 = \frac{3}{4} = 0.75$.

Rounding off decimals

Rounding off means making an estimate but maintaining its value close to the original figure. We can round off numbers to the nearest 10 or 100.

To round off a whole number to its nearest 10, we look at the ones digit. If it is less than 5, we round it down and if it is equal to 5 or greater than 5, we round it up.

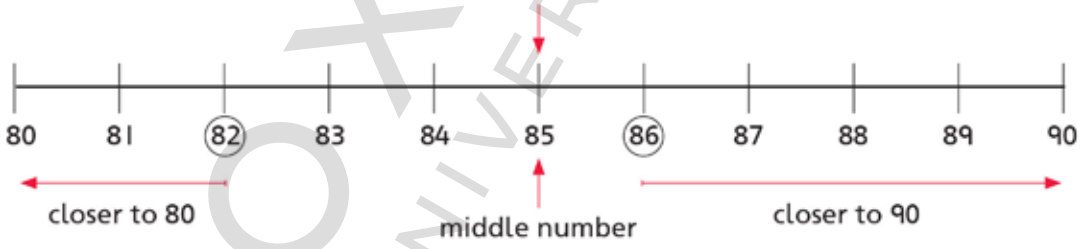
Example:
Round off 82 to the nearest 10.

Solution:
Check the ones digit. 2 < 5
82 rounded off to the nearest 10 is 80.

Example:
Round off 86 to the nearest 10.

Solution:
Check the ones digit. 6 > 5
86 rounded off to the nearest 10 is 90.

We can also express this on a number line.



In the same way we can round off decimal numbers to the nearest tenth, hundredth, and thousandth.

For example 8.762 rounded off to the nearest hundredth will be 8.76, and will be 8.8 when the same number is rounded off to the nearest tenth.

Steps for rounding off a decimal number

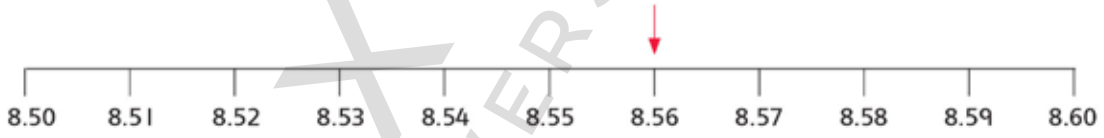
Step 1 Decide which digit to keep. So if we are rounding to the nearest tenth, we will keep the tenth digit.

Step 2 Leave this digit unchanged, if the next digit is less than 5. This is called rounding down. For example 4.123 rounded off to nearest hundredth will be 4.12, because the thousandth digit, 3 is less than 5.

Step 3 If the next digit is greater than 5 or equal to 5, the digit we are keeping will increase by 1 and all the digits after it will be dropped.
For example: 6.578 rounded off to nearest hundredth will be 6.58 as the thousandth digit 8 is greater than 5. This is called rounding up.

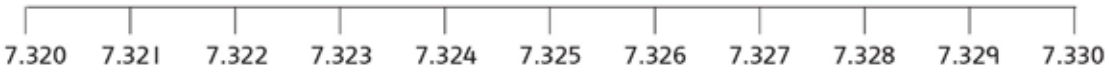
Rounding off the decimal numbers can be understood through a number line also.

If we want to round off 8.56 to the nearest tenth (or to 1 decimal place), we draw a number line to work it out:



Looking carefully at the number line, we notice that 8.56 is closer to 8.6 than it is to 8.5. Rounded off to one decimal place, 8.56 therefore, becomes 8.6.

To round off 7.322 with 3 decimal places to a number with 2 decimal places, remember the rule that if the number in the thousandths column is less than 5, the number should be rounded downwards. Therefore, 7.322 rounded off to 2 decimal places will be 7.32.



Similarly, to round off 7.326 to 2 decimal places remember the rule that halfway numbers are rounded upwards. So 5, 6, 7, 8, or 9 in the thousandths column means that the number should be rounded upwards.

Therefore, 7.326 rounded off to 2 decimal places will be 7.33.

Estimation

Estimation means to find an answer that is close to the exact answer but is not necessarily exact. You can estimate sums (the answers to addition problems), and differences (the answers to subtraction problems).

While estimating a sum or a difference we round the numbers, by changing them to the nearest power of ten, hundred, thousand, etc. We have already learnt the rounding rules of numbers.

1. If the number being rounded is less than 5, we round down.
2. If the number being rounded is 5 or greater, we round up.

Let us consider the following examples.

Examples:

1. Estimate the sum of 3689 and 2508.

Solution:

First, we round the numbers to the nearest hundred.
3689 rounds up to 3700.
2508 rounds down to 2500.

Now we find the sum.
3700 + 2500 = 6200

Hence, the approximated sum is 6200.
Actual sum is 3689 + 2508 = 6197
Actual sum is quite close to estimated sum.

2. Estimate the difference of 5496 and 5187.

Solution:

Rounding the numbers to the nearest hundred, we get
5496 rounds up to 5500

5187 rounds up to 5200

Now, we find the difference.
5500 − 5200 = 300

Hence the estimated difference is 300.
Actual difference is 5496 − 5187 = 309 which is close to the estimated difference.

When estimating, keep in mind:
1. The estimation must be reasonable.
2. The estimated value must be close to the exact answer.

▶ Exercise 4b

1. Fill in the blanks.
   a. $15\frac{3}{1000}$ converted into a decimal fraction will be _____.
   b. 0.06 × 1000 = _____
   c. 4.56 ÷ _____ = 0.0456
   d. $\frac{1}{4}$ expressed as a decimal fraction is _____.
   e. 0.12 × _____ = 12

2. State whether the following are true or false.
   a. 5.08 rounding off to 1 decimal place will be 5.9. (_____)
   b. The quotient of 68.5 ÷ 10 to the nearest whole number will be 69. (_____)
   c. $7\frac{1}{10}$ as a decimal fraction is 7.01. (_____)
   d. To change 0.81 into a whole number, we multiply the number by 100. (_____)
   e. The product of 145.49 and 81.53 has 4 decimal places. (_____)

3. Select the correct answer from the given options.
   a. The place value of 6 in 2.65 is
      Ⓐ tenth Ⓑ hundredth Ⓒ thousandth Ⓓ hundred
   b. 422.56 ÷ 1000 is equal to
      Ⓐ 4225.6 Ⓑ 4.2256 Ⓒ 42256 Ⓓ 0.42256

c. $\frac{169}{100}$ as a decimal fraction will be

Ⓐ 1.69 Ⓑ 16.9 Ⓒ 0.169 Ⓓ 1690

d. When 8.5 is divided by 5, the result will be

Ⓐ 17 Ⓑ 1.7 Ⓒ 0.17 Ⓓ 0.017

e. 

On the given number line, the shaded part rounded off to the nearest whole number is

Ⓐ 3 Ⓑ 3.12 Ⓒ 4 Ⓓ 3.2

4. Find the product of the following.

a. 2.41 × 3 b. 7.90 × 23 c. 10.5 × 62 d. 4.67 × 5
e. 5.63 × 17 f. 3.18 × 9 g. 9.56 × 84 h. 9.98 × 15

5. Solve the following sums.

a. 13.6 ÷ 4 b. 4.56 ÷ 6 c. 1.35 ÷ 15 d. 1.44 ÷ 12
e. 3.92 ÷ 28 f. 7.13 ÷ 23 g. 9.66 ÷ 21 h. 742.07 ÷ 7

6. Multiply the following decimals by 10 and 100.

a. 59.67 b. 29.81 c. 6.48 d. 7.32

7. Perform the division on the following sums.

a. 703.18 ÷ 10 b. 56.51 ÷ 100 c. 216.24 ÷ 10 d. 416.94 ÷ 100
e. 18.3 ÷ 100 f. 24.83 ÷ 100 g. 34.11 ÷ 1000 h. 4.55 ÷ 1000

8. Complete the following statements.

a. 3.65 ÷ _____ = 0.365 b. 4.8 ÷ _____ = 0.048
c. 1.92 ÷ _____ = 0.192 d. 8.74 ÷ _____ = 0.0874

9. Multiply the following decimal numbers.

a. 6.61 × 0.75 b. 7.15 × 1.92 c. 0.49 × 0.37 d. 16.4 × 3.82
e. 1.35 × 1.62 f. 3.78 × 2.48 g. 9.08 × 3.55 h. 1.23 × 0.43

10. Work out the following divisions.

a. 2.87 ÷ 0.7 b. 5.25 ÷ 2.5 c. 6.72 ÷ 3.2 d. 9.5 ÷ 1.9

11. Work out the following sums by the direct division method.
    a. 9.6 ÷ 0.48
    b. 6.95 ÷ 2.5
    c. 6.42 ÷ 1.2
    d. 8.14 ÷ 2.2

12. Change into decimal fractions.
    a. $\frac{1}{4}$ b. $\frac{3}{50}$ c. $\frac{7}{8}$ d. $\frac{11}{20}$ e. $\frac{2}{5}$ f. $\frac{13}{25}$

13. Round off to 1 decimal place.
    a. 7.15 b. 8.38 c. 9.91 d. 6.07

14. Round off to 2 decimal places.
    a. 6.137 b. 14.109 c. 2.495 d. 148.008

15. Estimate the following sums and differences to the nearest thousand.
    a. 3870 + 5420 b. 7541 − 6820 c. 3278 − 1863
    d. 4986 + 3762 e. 9009 + 1999 f. 8349 − 7334

▶ Real-life Story Sums

1. Asad has a strip of wood 60.95 cm long. He needs small pieces of wood 2.65 cm long to make a model house. How many pieces can he cut out of the strip?
2. Hina has a piece of ribbon 7.50 cm long. For her school project, she needs few strips of ribbon 1.5 cm long. How many pieces can she get from her piece?
3. Azfar spent Rs 75.75 for buying 15 pens. How much did he pay for each pen?
4. If a bag of rice weighs 7.75 kg, what will be the mass of such 35 bags?
5. A carpenter earns Rs 80.50 per hour. How much will he earn in 7.5 hours?
6. A storekeeper has 27.36 kg of rice. If he puts it into 9 sacks, how much rice will each sack contain?
7. Rida has Rs 5946 in her wallet. She wants to buy two dresses costing Rs 2565 and Rs 2750. Estimate the total cost of both dresses. Can she buy both?

Percentages

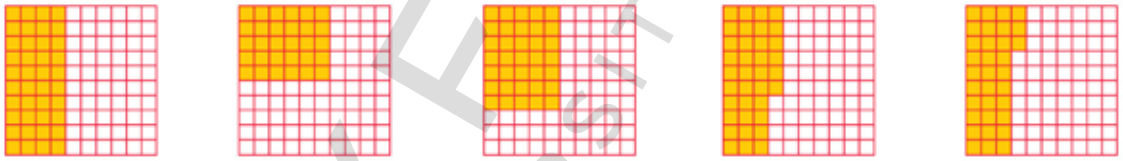
Sadiq is working on his math homework. He is looking carefully at 5 squares divided into different fractions. What part of the square is coloured in each case?

A $\frac{2}{5}$ B ___ C ___ D ___ E ___

Next, Sadiq wants to arrange the squares in ascending order, according to the fraction coloured.

Sadiq finds this difficult. How can he compare **unlike fractions**: that is, fractions with different denominators?

This can be done by drawing smaller squares, so that they all have the same number of small squares (i.e., the same denominator). 100, as a common denominator, is a good choice, so Sadiq divides his squares, keeping the same area of each square coloured:



A B C D E

$\frac{2}{5} = \frac{40}{100}$ ___ = ___ ___ = ___ ___ = ___ ___ = ___

Fill in the boxes by counting the shaded squares.

Sadiq now finds it easy to arrange his squares in **ascending order** according to their coloured area.

Can you also rank the squares in ascending order?

Write your sequence here: _____, _____, _____, _____, _____.

Here are Sadiq's results in the form of a table:

Name of square	Fraction coloured	=	Fraction coloured
A	$\frac{2 \times 20}{5 \times 20}$	=	$\frac{40}{100}$
C	$\frac{7 \times 5}{20 \times 5}$	=	$\frac{35}{100}$
D	$\frac{18 \times 2}{50 \times 2}$	=	$\frac{36}{100}$

In each case, the fraction on the left has been changed into an equivalent fraction with the denominator 100.

The word **percentage** is based on the Latin word 'centum'.

A percentage is a special kind of a fraction. It always has 100 as a denominator.

% is a symbol used for percentage, which means 'per cent' or 'upon 100'.

Examples:

$\frac{44}{100}$ = 44 per cent
= 44%

$\frac{53}{100}$ = 53 per cent
= 53%

$6\% = \frac{6}{100}$

$18\% = \frac{18}{100}$

Convert percentage to fraction and fraction to percentage

Percentages can easily be changed into fractions. We know that percentage is a special kind of fraction with 100 as the denominator.

∴ 2% can be written as $\frac{2}{100}$, and 35% can be written as $\frac{35}{100}$.

We notice that $\frac{2}{100}$ and $\frac{35}{100}$ are fractional numbers.

We can also express percentages into fractions in their lowest term.

$65\% = \frac{65}{100} = \frac{13}{20}$

$180\% = \frac{180}{100} = \frac{9}{5} = 1\frac{4}{5}$

$500\% = \frac{500}{100} = \frac{5}{1} = 5$

$24\% = \frac{\overset{6}{\cancel{24}}}{\underset{25}{\cancel{100}}} = \frac{6}{25}$

It is easy to write $\frac{87}{100}$ as 87%, but sometimes the fraction does not have 100 in the denominator. For example $\frac{8}{20}$.
In such cases we make the denominator equal to 100.

Examples:

1. $\frac{9}{2}$

$\frac{9 \times 50}{2 \times 50} = \frac{450}{100} = 450\%$

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

$\frac{3 \times 25}{4 \times 25} = \frac{75}{100} = 75\%$

3. $\frac{7}{20}$

$\frac{7 \times 5}{20 \times 5} = \frac{35}{100} = 35\%$

4. $\frac{3}{25}$

$\frac{3 \times 4}{25 \times 4} = \frac{12}{100} = 12\%$

5. $\frac{16}{10}$

$\frac{16 \times 10}{10 \times 10} = \frac{160}{100} = 160\%$

6. $3\frac{1}{5}$

$\frac{16}{5} = \frac{16 \times 20}{5 \times 20} = \frac{320}{100} = 320\%$

In all the given examples the denominator was a factor of 100, therefore, it was easy to multiply the numerator and the denominator by the same number, to have 100 in the denominator. In cases where the denominator is not a factor of 100, we first convert the denominator into a multiple of 100 and then convert it to a percentage.

Example:

Convert $\frac{1}{8}$ into a percentage.

$\frac{1}{8} = \frac{1 \times 25}{8 \times 25} = \frac{25}{200}$

$= \frac{25}{2 \times 100}$

$= \frac{25}{2} \times \frac{1}{100}$

$= \frac{25}{2}\%$

$= 12\frac{1}{2}\%$

Convert percentage to decimal and decimal to percentage

To change a percentage into a decimal first convert it into a common fraction then express it as a decimal.

Examples:

1. $75\% = \frac{75}{100} = 0.75$
2. $160\% = \frac{160}{100} = 1.6$
3. $300\% = \frac{300}{100} = 3.0$
4. $57\% = \frac{57}{100} = 0.57$

To change a decimal into a percentage first remove the decimal point by converting it to a common fraction with denominator 100.

Examples:

1. $6.79 = 6.79 \times \frac{100}{100} = \frac{679}{100} = 679\%$
2. $0.05 = 0.05 \times \frac{100}{100} = \frac{5}{100} = 5\%$
3. $1.25 = 1.25 \times \frac{100}{100} = \frac{125}{100} = 125\%$
4. $4.18 = 4.18 \times \frac{100}{100} = \frac{418}{100} = 418\%$

Using percentages

Percentages are useful in understanding and comparing information quickly and easily. Turn back to page 80. As soon as Sadiq changed all his squares into **hundredths** and showed his coloured areas as **percentages**, it was easy for him to compare and rank them.

Now look at this newspaper clipping.

> MULTAN, 30 September, A census by students has found that 11 out of 25 people living in Central Lane are office workers. In Sunset Street, 24 out of 40 residents are office workers.

It is not easy for us to compare the information given here. We are not sure which of the two streets has the higher fraction of office workers. But if we turn the information into percentages, it will become easy to compare:

Central Lane	Sunset Street
$\frac{11}{\cancel{25}} \times \frac{\cancel{100}^{4}}{100}$	$\frac{24}{40} \times \frac{100}{100}$
$= \frac{44}{1}\%$	$= \frac{2400}{40}\%$
$= 44\%$	$= 60\%$

We can, therefore, rewrite the newspaper article to make it clear.

> MULTAN, 30 September, A census by students has found that 44% of people living in Central Lane are office workers. In Sunset Street, 60% are office workers.

▶ Exercise 4c

1. Fill in the blanks.
   a. Percentage is a special fraction with denominator _____.
   b. 3.52 expressed as a percentage is equal to _____.
   c. 80% expressed in its lowest form of fraction is _____.
   d. 12% of Rs 900 is equal to Rs _____.
   e. 38% expressed as a fraction is _____.

2. State whether the following are true or false.
   a. 138% as a decimal is equal to 1.38. (_____)
   b. 10% of Rs 9000 is Rs 900. (_____)
   c. Saleem got 8 out of 10 marks in Math. The percentage of his marks is 8%. (_____)
   d. Dania solved 10 questions out of 20 in an exercise. She solved 5% of the exercise. (_____)
   e. 45 tickets were sold out of 100 tickets for a stage show. The percentage of sold ticket is 45%. (_____)

3. Select the correct answer from the given options.
   a. $\frac{7}{20}$ as a percentage is
      Ⓐ 7% Ⓑ 20% Ⓒ 49% Ⓓ 35%
   b. Percentage means
      Ⓐ per thousand Ⓑ per hundred
      Ⓒ per ten Ⓓ per hundredth
   c. 8 out of 32 is same as
      Ⓐ 5% Ⓑ 20% Ⓒ 10% Ⓓ 25%
   d. 75% is same as
      Ⓐ $\frac{1}{4}$ Ⓑ $\frac{1}{2}$ Ⓒ $\frac{1}{5}$ Ⓓ $\frac{3}{4}$
   e. The word percentage comes from
      Ⓐ an English word Ⓑ a French word
      Ⓒ a Latin word Ⓓ a German word

4. Change these fractions into equivalent fractions with denominator 100.
   a. $\frac{7}{10}$ b. $\frac{9}{10}$ c. $\frac{4}{5}$ d. $\frac{1}{5}$
   e. $\frac{11}{25}$ f. $\frac{21}{25}$

5. Express these as fractions of 100, rounding off to 2 decimal places where necessary.
   a. $\frac{4}{7}$ of 100 b. $\frac{11}{14}$ of 100 c. $\frac{3}{16}$ of 100 d. $\frac{2}{19}$ of 100

6. Write each fraction as a percentage.

a. $\frac{7}{10}$ b. $\frac{1}{4}$ c. $\frac{3}{8}$ d. $\frac{19}{100}$

e. $\frac{9}{10}$ f. $\frac{1}{6}$

7. Write each fraction as a percentage, using the special symbol.

a. $\frac{9}{10}$ b. $\frac{99}{100}$ c. $\frac{30}{50}$ d. $\frac{8}{10}$

e. $\frac{3}{5}$ f. $\frac{8}{25}$

8. Write each percentage as a fraction, reducing it to its lowest term where possible.

a. 30% b. 45% c. 89% d. 24%

e. 32% f. 100%

9. Change these fractions into percentages, rounding off your answers to 2 decimal places where necessary.

a. $\frac{2}{7}$ of 100 b. $\frac{5}{14}$ of 100 c. $\frac{5}{9}$ of 100 d. $\frac{6}{13}$ of 100

e. $\frac{3}{13}$ of 100 f. $\frac{2}{15}$ of 100

10. Change these mixed numbers into percentages.

a. $4\frac{1}{4}$ b. $6\frac{7}{20}$ c. $6\frac{3}{50}$ d. $1\frac{3}{5}$

e. $3\frac{4}{5}$ f. $8\frac{7}{10}$

11. Change these into percentages.

a. 6 b. 17 c. 58 d. 9

e. 23 f. 79

12. Change these into percentages.

a. 0.23 b. 7.39 c. 7.01 d. 4.69

e. 3.9 f. 3.00

13. Change these percentages into fractions, mixed numbers or whole numbers, reducing where you can.

a. 75% b. 300% c. 21% d. 38%

e. 135% f. 800%

14. Change these percentages into decimal numbers.

a. 35% b. 118% c. 98% d. 140%

e. 6% f. 163%

15. Change these decimal numbers into percentages.

a. 0.39 b. 0.6 c. 1.0 d. 0.04

e. 0.55 f. 1.52

16. Copy and complete the table.

%	Fraction with denominator 100	Decimal	Fraction in lowest terms
50%	$\frac{50}{100}$	0.50 or 0.5	$\frac{1}{2}$
10%			
1%			
75%			

▶ Real-life Story Sums

1. In a department store, the following items are reduced for a sale:

Look at the board and work out the special price of:

a. the thermos flask
b. the plastic bucket
c. the 'Klik it' camera
d. the toothpaste

2. Mrs Shah earns Rs 8500 every month working as a computer operator. If her boss gives her a 10% increase in salary, then how much will she earn every month? And how much will she earn in one year?

3. Mr Mansoor earns a sum of Rs 35 000 per month. He spends 75% of his salary. How much money does he save?

4. Rewrite these stories, changing fractions into percentages.
   a. On 14 January, 24 out of 48 cows on Saleem's farm are ill. On Hassan's farm, 36 out of 120 cows have a similar illness.
   b. On 27 March, 240 out of 500 seats were occupied in the cricket stadium. On the second day, 324 out of 600 seats were occupied.

5. In her end of term examination, Salima got 33 out of 50 marks in Urdu and 7 out of 10 marks in History. What were her marks in percentages? Which subject did she do better in?

6. During a quiz Shaheen answers 60 questions and gets 36 answers right. Sara answers 80 questions and gets 56 correct answers. Give their scores in percentages and find out who is better at quizzes.

5 Distance and Time

YOUR DIGITAL RESOURCE

In this unit students will learn to:

- convert measures given in
  - kilometres to meters and vice versa
  - meters to centimetres and vice versa
  - centimetres to millilitres and vice versa
- solve real life situations involving conversion, addition and subtraction of measures of distance
- convert
  - hours to minutes and vice versa
  - minutes to seconds and vice versa
- convert years to months and vice versa, months to days and vice versa, weeks to days and vice versa
- add and subtract intervals of time in hours and minutes with carrying and borrowing
- solve real life situations involving conversion, addition and subtraction of intervals of time

MATH FLASH

You have already learnt:

- that smaller lengths are measured in cm and m
- to convert units of length:
  km to m; m to cm; cm to mm
  Examples:
  8 km = 8 × 1000 = 8000 m
  56 m = 56 × 100 = 5600 cm
  314 cm = 314 × 10 = 3140 mm
- add and subtract similar units of length
- to convert units of time:
  hours to minutes and minutes to hours
  Examples:
  7 hrs = 7 × 60 = 420 min
  240 min = 240 ÷ 60 = 4 hrs

KEY VOCABULARY

measurement, distance, metre, centimetre, kilometre, time, hours, minutes, seconds, conversion, weeks, months, days, years

Distance

Distance is a numeral measurement or value of how far objects are from each other. In mathematics, we measure the physical distance between the objects. The units used to measure the distance are kilometre, metre, centimetre and millimetre. Metre and kilometre are the units of distance in the metric system. Otherwise, distance can also be measured in other units such as foot, yards, etc.

Measuring lengths

We measure small lengths in centimetres (cm) and millimetres (mm).

Look at the following examples:

REMEMBER

'Centi' means $\frac{1}{100}$

Bigger lengths are measured in metres (m).

Look at the following examples:

Very long distances are measured in kilometres (km), such as distance from home to school.

REMEMBER

'Kilo' means 1000.

Let us recall

In New Countdown 4, we learnt that km, m, cm, and mm are the units used to measure length or distance. We have converted km to m, m to cm, cm to mm, and vice versa.

We will use the same laws of conversion of units as learnt earlier.

Conversion of units of length

Sometimes we need to convert one unit to another unit.

The table below shows relationship between units of measurement.

1 kilometre (km) = 1000 metres (m)
1 metre (m) = 100 centimetres (cm)
1 centimetre (cm) = 10 millimetres (mm)

REMEMBER

When a **bigger** unit is to be converted to a **smaller** unit: **multiply**.

When a **smaller** unit is to be converted to a **bigger** unit: **divide**.

Kilometre $\xrightarrow{\times 1000}$ metre $\xrightarrow{\times 100}$ centimetre $\xrightarrow{\times 10}$ millimetre

Millimetre $\xrightarrow{\div 10}$ centimetre $\xrightarrow{\div 100}$ metre $\xrightarrow{\div 1000}$ kilometre

Let us convert a bigger unit to a smaller unit:

60 cm × 10 = 600 mm
1.5 cm × 10 = 15 mm or 1cm 5 mm

1.5 can be written as (1 + 0.5) cm

5 m × 100 = 500 cm

9.7 m × 100 = 970 cm or 9 m 70 cm

9.7 can be written as (9 + 0.7) m

5 km × 1000 = 5000 m
0.8 km × 1000 = 800 m
6.542 km × 1000 = 6542 m or 6 km 542 m

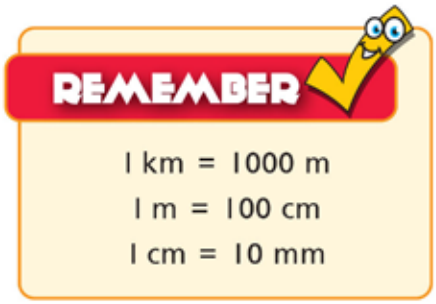
6.542 km can be written as (6 + 0.542) km

REMEMBER

To convert units, multiply or divide by the conversion factor.

Let us convert a smaller unit to a bigger unit.

75 mm ÷ 10 = 7.5 cm or 7 cm 5 mm
200 cm ÷ 100 = 2 m
30 cm ÷ 100 = 0.3 m
367 cm ÷ 100 = 3.67 m or 3 m 67 cm
4000 m ÷ 1000 = 4 km
1500 m ÷ 1000 = 1.5 km or 1 km 500 m



Examples:

1. Convert 8 km 70 m into kilometres.

Solution:

70 m = 70 ÷ 1000 km
= 0.070 km
8 km 70 m = 8.070 km

2. Convert 25 cm 5 mm into metres.

Solution:

5 mm = 5 ÷ 10 cm
= 0.5 cm
25 cm 5 mm = 25.5 cm
Now 25.5 cm = 25.5 ÷ 100 m
= 0.255 m

3. Convert 5256 cm into km

Solution:

5256 cm = 5256 ÷ 100 m
= 52.56 m
52.56 m = 52.56 ÷ 1000
= 0.05256 km

4. Convert 458 mm into km

Solution:

458 mm = 458 ÷ 10 cm
= 45.8 cm
45.8 cm = 45.8 ÷ 100 m
= 0.458 m
0.458 m = 0.458 ÷ 1000 km
= 0.000458 km

Addition and subtraction of measure of distance

Let us recall addition and subtraction of similar units of distance which we did in Book 4.

Examples:

1. 8.52 km + 9.6 km

Solution:

$$\begin{array}{r} 8.25 \text{ km} \\ +\ 9.60 \text{ km} \\ \hline 17.85 \text{ km} \end{array}$$

2. 580.825 km − 50.625 km

Solution:

$$\begin{array}{r} 580.825 \text{ km} \\ -\ 50.625 \text{ km} \\ \hline 530.200 \text{ km} \end{array}$$

3. 500 m + 215 m + 25 m

Solution:

(500 + 215 + 25) m = 740 m

4. 95.03 cm − 20.09 cm

Solution:

(95.03 − 20.09) cm = 74.94 cm

Now let us add and subtract mixed units of distances.

Examples:

1. Add 40 m 20 cm to 6 m 70 cm

Solution:

40 m 20 cm + 6 m 70 cm

Write the sum vertically and add.

$$\begin{array}{r} 40 \text{ m } 20 \text{ cm} \\ +\ 6 \text{ m } 70 \text{ cm} \\ \hline 46 \text{ m } 90 \text{ cm} \end{array}$$

2. Add 105 m 35 cm and 25 m 75 cm

Solution:

$$\begin{array}{r} {\scriptstyle 1\ 1} \quad {\scriptstyle 1} \\ 105 \text{ m } 35 \text{ cm} \\ +\ 25 \text{ m } 75 \text{ cm} \\ \hline 131 \text{ m } 10 \text{ cm} \end{array} \quad \left[\begin{array}{l} 35 + 75 = 110 \text{ cm} \\ \qquad = 1 \text{ m } 10 \text{ cm} \end{array}\right]$$

3. Subtract 8 km 300 m from 17 km 500 m

Solution:

$$\begin{array}{r} 17 \text{ km } 500 \text{ m} \\ -\ 8 \text{ km } 300 \text{ m} \\ \hline 9 \text{ km } 200 \text{ m} \end{array}$$

4. Subtract 17 km 280 m from 20 km 105 m

Solution:

$$\begin{array}{rr} {\scriptstyle 19} & {\scriptstyle 1000} \\ \not{20}\ \text{km} & 105 \text{ m} \\ -\ 17 \text{ km} & 280 \text{ m} \\ \hline 2 \text{ km} & 825 \text{ m} \end{array} \quad \left[\begin{array}{l} \text{Borrow 1 km (1000 m)} \\ \text{from 20 km} \\ 1000 + 105 = 1105 \text{ m} \\ 1105 - 280 = 825 \text{ m} \end{array}\right]$$

▶ Exercise 5a

1. Fill in the blanks.
   a. 7 km = 7000 m
   b. 23 m + 13 m 25 cm = 3625 cm
   c. 40 cm − 20 cm 9 mm = 191 mm
   d. 900 m = 0.009 km
   e. 30 km 160 m 35 cm = 3016035 cm

2. State whether the following are true or false.
   a. The height of a building can be measured in cm. (False)
   b. The distance between two far away places is measured in kilometres. (True)
   c. 7 km in metres are 700. (False)
   d. A 5 m 50 cm long rope is divided into two parts. If one part is 2 m 25 cm, the length of the other part will be 3 m 25 cm. (True)
   e. To convert kilometres into centimetres we multiply kilometres with 100 000. (True)

3. Select the correct answer from the given options.
   a. Which is the correct unit to measure the height of a tree?
      Ⓐ Centimetre Ⓑ Kilometre Ⓒ Millimetre Ⓓ Metre
   b. Convert 25 m to cm.
      Ⓐ 25 cm Ⓑ 0.25 cm Ⓒ 2500 cm Ⓓ 2.5 cm
   c. Convert 42 cm to mm.
      Ⓐ 0.42 mm Ⓑ 4.2 mm Ⓒ 42 mm Ⓓ 420 mm
   d. The sum of 10 km and 15 km 150 m is
      Ⓐ 25150 cm Ⓑ 5 km 150 m Ⓒ 25 km 150 m Ⓓ 15 km 160 m
   e. The difference of 12 km and 1800 m is
      Ⓐ 600 m Ⓑ 10200 m Ⓒ 102 km Ⓓ 1788 m

4. Write the correct unit of measurement for the following.
   a. Length of room metre.
   b. Home to market distance kilometre.
   c. Toothpaste tube length centimetre.
   d. Length of car metre.

Exercise 5a

Q1a) 1 km = 1000 m

7 km = 7000 m

b) 23 m + 13 m 25 cm

23 m = 23 × 100 = 2300 cm

2300 + 1325 = 3625 cm

c) 40 cm − 20 cm 9 mm

40 × 10 = 4 = 400 mm

20 × 10 = 200 mm

200 + 9 = 209

400 − 209 = 191 mm

d) 900 m

1 km = 1000 m

9/1000 = 0.009 km

e) 30 km 160 m 35 cm

Convert all to cm

3000000 + 16000 + 35

= 3016035 cm

5. Guess the height of each of the following objects:

	Cupboard	Chair	Glass
a.	10 cm	360 cm	10 cm
b.	500 cm	12 m	50 cm
c.	2 m	95 mm	0.8 m
d.	0.5 m	50 cm	6 cm

	Packet of Juice	Height of a Class V student
a.	12 cm	200 cm
b.	0.5 m	150 cm
c.	100 cm	0.8 m
d.	200 mm	0.5 km

6. Complete the following:
   a. 500 cm = 5000 mm 1000×500
   b. 40 cm = 0.4 m 40÷100
   c. 750 mm = 75 cm 750÷10
   d. 900 m = 0.900 km 900÷1000

7. Add or subtract, as indicated:
   a. 4.25 km − 2.78 km = 1.47 km = 1470 m
   b. 65 m − 47 m = 18 m = 1800 cm
   c. 250 m + 350 m = 600 m = 60000 cm
   d. 425 mm − 198 mm + 250 mm = 477 mm = 47.7 cm
   e. 145 m − 97 m + 687 m = 735 m = 0.735 km
   f. 4000 cm + 723 cm − 2841 cm = 1882 cm = 18.82 m
   g. 200 km + 408 km − 438 km = 170 km = 170000 m
   h. 187 cm − 95 cm + 328 cm = 420 cm = 4.2 m

▶ Real-life Story Sums

1. A dining table is 3 m long. A tablecloth hangs 20 cm on both sides. What is the length of this tablecloth?
2. The length of a shirt is 80 cm. Fatima needs to buy a fabric twice this length. What length of the fabric must she buy?
3. During a festival, a decorator hangs 10 strings of flowers. Each string is 30 cm long. What is the combined length of all ten strings of flowers?
4. A garden bench is 3 m broad, and two side chairs are 80 cm broad, each. If the three of them are placed side-by-side in the garden, how much space will they occupy along the wall?
5. Muzaffarabad is 93 km 700 m from Bagh and Bagh is 60 km from Haveli. What is the difference between both distances?

Time

DO YOU REMEMBER?

In New Countdown 4 we learnt to read and write time in hours, minutes, and seconds. We have also learnt to convert units of time from bigger units to smaller units and how to add and subtract units of time without carrying or borrowing.

We will now learn more about the conversion, addition, and subtraction of units of time.

Remembering units of time

A **second** is a small amount of time.
You wink your eyes in a second.

A **minute** is equal to 60 seconds.
Your heart beats 72 times in a minute.

An **hour** is equal to 60 minutes.
8 hours of sleep is necessary for a healthy body.

Real life Story Sums

1) $3m = 300cm$

$300 + 20 + 20 = 340cm$

2) $\frac{80}{100} = 0.8m$

$0.8 \times 2 = 1.6m$

3) $30 \times 10 = 300cm$

4) $3 \times 100 = 300$

$300 + 80 + 80 = 460cm$

5) $93km\ 700m$

$93.7km$

Difference $= 93.7 - 60$

$= 33.7km$

Conversion of units of time

We **multiply** to convert a **bigger** unit to a **smaller** unit.
We **divide** to convert a **smaller** unit to a **bigger** unit.

Conversion of hours and minutes

To convert hours into minutes, we multiply hours by 60.

Example:

1. 7 h = 7 × 60 = 420 min
2. 13 h = 13 × 60 = 780 min
3. 4 h 50 min = 4 × 60 + 50 = 290 min

To convert minutes into hours we divide minutes by 60.

Examples:

1. 120 min ÷ 60 = 2 hrs
2. 240 min ÷ 60 = 4 hrs
3. Convert 150 minutes to hours and minutes.

Solution:

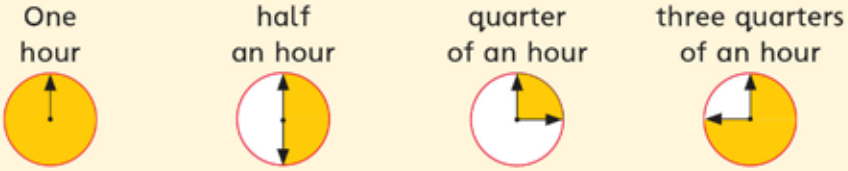
150 min ÷ 60

$$\begin{array}{r} 2\text{ h} \\ 60\overline{)\,150\text{ min}} \\ -120 \\ \hline 30\text{ min} \end{array}$$

[1 hour = 60 minute]

∴ 150 min = 2 h 30 min.

REMEMBER



1 hour = 60 minutes
Half an hour = 30 minutes
Quarter of an hour = 15 minutes
Three quarters of an hour = 45 minutes

4. Convert 1050 minutes to hours and minutes.

Solution:

1050 min ÷ 60

$$\begin{array}{r} 17\text{ h} \\ 60 \overline{)\ 1050\text{ min}} \\ -60 \\ \hline 450 \\ -420 \\ \hline 30\text{ min} \end{array}$$

∴ 1050 min = 17 h 30 min.

Conversion of minutes and seconds

To convert minutes into seconds, we multiply the number of minutes by 60.

Examples:

Convert minutes to seconds.

1. 36 min = 36 × 60 sec [1 minute = 60 seconds]
   = 2160 sec
2. 25 min 41 sec = 25 × 60 + 41
   = 1500 + 41
   = 1541 sec

To convert seconds into minutes, we divide the number of seconds by 60.

Examples:

Convert seconds to minutes.

1. 127 sec = 127 ÷ 60 min
   = 2 min 7 sec

2. 240 sec = 240 ÷ 60 min
   = 4 min

Conversion of hours and seconds

To convert hours to seconds, follow these steps.

1 hour × 60 = 60 minutes (first convert hours to minutes)
60 minutes × 60 = 3600 seconds (then convert minutes to seconds)
∴ 1 hour = 3600 seconds.

Examples:

Convert hours into seconds.

1. 5 h = 5 × 3600 sec
   = 18000 sec

2. 3 h 15 min

This can be solved by first converting hours into minutes and then the total number of minutes into seconds.

3 h 15 min = 3 × 60 + 15 minutes
= 195 min

Now 195 min = 195 × 60 sec
11700 sec

∴ 3 hours 15 minutes = 11700 seconds.

To convert seconds into hours we divide seconds by 3600.

Example:

Convert 14400 seconds to hours.

Solution:

14400 ÷ 3600 = 4 hours

▶ Exercise 5b

1. Fill in the blanks.
   a. In 145 minutes there are 2 hours and 25 minutes.
   b. Three hours and fifteen minutes make 195 minutes.
   c. Sara made a cup of tea in 7 minutes. She took 420 seconds to make the cup of tea.
   d. 4 hours 15 minutes 35 seconds = 15335 sec.
   e. 12 h 37 min = 757 min.

2. State whether the following are true or false.
   a. Half an hour is equal to 40 minutes. (False)
   b. 15 minutes is same as 900 seconds. (True)
   c. One hour is greater than 60 minutes. (False)
   d. 45 minutes is greater than half an hour. (True)
   e. 35 minutes is less than 2000 seconds. (False)

3. Select the correct answer from the given options.
   a. Which of the following units are used to measure the time of a journey between two cities.
      Ⓐ seconds Ⓑ minutes Ⓒ hours Ⓓ a.m. or p.m.
   b. How many minutes are there in 180 seconds?
      Ⓐ 30 min Ⓑ 10800 min Ⓒ 3 min Ⓓ 18 min
   c. A bus took 3 h 46 min to reach its destination. How many minutes did it take?
      Ⓐ 180 min Ⓑ 226 min Ⓒ 45 min Ⓓ 345 min
   d. 3661 seconds make?
      Ⓐ 6 h 60 sec Ⓑ 1 h 1 min Ⓒ 1 h 61 sec Ⓓ 1 h 1 min 1 sec
   e. Rehan reached home in half an hour. How many minutes is that?
      Ⓐ 15 min Ⓑ 45 min Ⓒ 20 min Ⓓ 30 min

4. Convert hours into minutes.
   a. 14 hour $14 \times 60 = 840$ b. 32 hour $32 \times 60 = 1920$ c. 12 h 49 min $12 \times 60 + 49 = 769$ d. 15 h 37 min $15 \times 60 + 37 = 937$

5. Convert minutes into hours.
   a. 60 min $\frac{60}{60} = 1$ b. 240 min $\frac{240}{60} = 4$ c. 270 min $\frac{270}{60} = 4.5$ d. 75 min $\frac{75}{60} = 1\frac{1}{4}$

1 min = 60 sec

6. Convert minutes into seconds.
   a. 140 min b. 90 min 10 sec c. 100 min d. 5 min 59 sec
   140×60=8400 90×60+10=5410 100×60=6000 5×60+59=359
7. Convert seconds into minutes.
   a. 240 sec b. 600 sec c. 75 sec d. 1820 sec
   240÷60=4 600÷60=10 75÷60=1¼ 1820÷60=30⅓
1 hr = 60 min
8. Convert hours into seconds.
   a. 4 h b. 12 h c. 10 h d. 75 h
   60×4×60=14400 60×60×12=43200 60×60×10=36000 60×60×75=270000
9. Convert seconds into hours.
   a. 7200 sec b. 18000 sec
   7200÷60=120, 120÷60=2 hr 18000÷60=300, 300÷60=5 hr
10. Convert 8 h 50 min 20 sec into seconds.
    8×60×60=28800 50×60=3000
    28800+3000+20=31820

Addition and subtraction of units of time

Sometimes we have to add or subtract time periods in real-life situations.

For addition of units of time follow the rules given below.

1. Add minutes to minutes.
2. Add hours to hours.
3. If the sum of minutes is 60 or more, then subtract 60 min (1 hour) and carry 1 hour to the hour column.

Examples:

1. How long does Sara's journey take if she walks for 25 minutes, and travels by bus for 45 minutes to reach her school? Give your answer in hours and minutes.

Solution:

Sara walks for: 25 min
Sara travels by bus: 45 min
Total time: 70 min
↓
60 min + 10 min
↓
1 hour + 10 min

Sara's total journey time = 1 hr 10 min

2. Faiz rode his bike for 1 hour. He took 15 min to rest and then rode for another half an hour. How long did the journey take him? Give your answer in minutes.

Solution:

Total journey time = 1 hour + 15 minutes + half an hour

$= (1 \times 60)$ min + 15 min + $(\frac{1}{2} \times 60)$ min

$\therefore$ total time $= (60 + 15 + 30)$ min

$= 105$ minutes

3. What is 3 h 45 min + 2 h 10 min?

Solution:

	h	min
	3	45
+	2	10
	5	55

5 h 55 min

4. Add 4 h 50 min and 3 h 35 min.

Solution:

	h	min
	4	50
+	3	35
	7^{1}	85
−		60
	8	25

85 min > 60 min

85 min = 60 min + 25 min

= 1 hr + 25 min

For subtraction of units of time follow the rules given below:

1. Subtract minutes from minutes.
2. Subtract hours from hours.
3. If the minutes to be subtracted are greater than the minutes from which we are subtracting, then borrow 60 minutes from hours to add in smaller minutes and subtract. Since 1 hour is borrowed, subtract 1 from the hour column.

Examples:

1. Subtract 2 h 15 min from 6 h 18 min.

Solution:

	h	min
	6	18
−	2	15
	4	03

2. Write vertically and subtract 55 minutes from 1 hour 35 minutes.

Solution:

h	min
	60
~~1~~	35
−	55
	40 min

→ [35 is less than 55, therefore, borrow 60 minutes from hour.
35 + 60 = 95 (1 hour = 60 min)
95 − 55 = 40 min]

3. 7 h 10 min − 2 h 45 min

Solution:

h	min
6	60
~~7~~	10
− 2	45
4	25

→ [10 min < 45 min
∴ borrow 60 min
10 + 60 = 70 − 45 = 25]

▶ Exercise 5c

1. Fill in the blanks.
   a. 135 min + 70 min = 3 hr 25 min.
   b. 4 h − 90 min = 150 min.
   c. Which one is greater? 6 h 15 min or 360 min 6 hr 15 min
   d. The duration between 3 h 58 min and 4 h 36 min is 38 min.
   e. The difference in seconds between 250 min and 2 hours is 7800.

2. State whether the following are true or false.
   a. Total time of 1 hr 30 min and 10 h 30 min is 12 h. (True)
   b. 4 hours subtracted from 4 hours 18 min 30 sec leaves 1110 sec. (True)
   c. 5 hours added to 180 sec make 5 h 3 min 10 sec. (False)
   d. 25 minutes should be added to 35 minutes to makes an hour. (True)
   e. 270 seconds are 30 seconds less than 4 minutes. (False)

3. Select the correct answer from the given options.
   a. Half an hour and quarter of an hour together make
      (A) one hour (B) one and a half hour
      (C) three quarters of an hour (D) one hour fifteen minutes
   b. 30 min + 5 h 30 min is same as
      (A) 6 h (B) 5 h (C) 4 h (D) 6 h 30 min
   c. 9 h 12 min − 4 h 32 min is equal to
      (A) 5 h 20 min (B) 6 h (C) 5 h 42 min (D) 4 h 40 min
   d. 45 minutes subtracted from 130 minutes is
      (A) 5100 sec (B) 2700 sec (C) 5700 sec (D) 7800 sec
   e. 10 h 20 m − 35 min is equal to
      (A) 45 min (B) 15 min (C) 9 h 45 min (D) 9 h 55 min

4. Write vertically and add.
   a. 47 min + 23 min
   b. 1 hr 43 min + 45 min
   c. 2 hr 15 min + 1 hr 20 min

47 + 23 = 70

(2×60)+43+45 = 148 min = 2 hr 28 min

(2×60)+15+(1×60)+20 = 215 min = 3 hr 35 min

5. Write vertically and subtract.
   a. 1 hr 46 min − 55 min
   b. 4 hr 25 min − 1 hr 10 min
   c. 7 hr 17 min − 3 hr 45 min

(1×60)+46−55 = 51 min

(4×60)+25−(60×1)+10 = 215 min = 3 hr 35 min

(7×60)+17−(3×60)+45 = 212 = 3 hr 32 min

▶ Real-life Story Sums

1. Sana read a book for 1 hour on the first day, 45 min on the second day, and 35 min on the third day. Find how many minutes she spent reading the book. Convert this time into hours and minutes.
2. Hassan read a storybook for 1 hr 25 min and then watched TV for 1 hr 45 min. How much time did he spend reading and watching TV? Give your answer in minutes.
3. Karim took 8 min 35 sec to complete a sprint. Javaid took 15 sec longer. How long did Javaid take to complete the sprint? Give your answer in seconds.
4. Bilqees takes 3 hr 25 minutes to complete a task, while Sanam takes 2 hr 45 minutes to complete the same task. Who takes longer? Find the difference in time.
5. Asher spent 50 minutes on a project, then Sara took over the task and completed the project in 55 minutes 15 seconds. How much total time was spent on the project? Give your answer in seconds.
6. Asif is taking a test. His teacher gave him 1 hour and 30 minutes to finish the test. Asif has taken 48 minutes, how much time is left?
7. The train took 8 h 40 min 50 sec to reach Karachi from Lahore. What is the time taken in minutes and seconds?
8. Bina took 1 hr 20 min to reach the shopping mall from her home. After shopping she took 70 minutes to reach home. How long did she travel for? Give your answer in hours and minutes.
9. The sunlight takes an average of 8 minutes and 20 seconds to travel from Sun to the Earth and it takes 12 minutes and 41 seconds from Sun to Mars. Find the distance in time which one is farther from the Sun.

1) $60+45+35 = 140$ 2) $(60\times1)+25+(60\times1)+45$ 3) $(8\times60)+35+15 = 530$ sec

$= 2$ hrs 20 min $= 190$ min

4) $(3\times60)+25-(2\times60)+45$ 5) $50+55$ min

Bilqees takes longer. $= 105$ min $= 105\times60$

$= 6300$ sec $+ 15$ sec

$= 6315$ sec.

6) $1\times60 = 60$ min 7) $(1\times60)+20 = 80$

$60+30 = 90$ min $80+70 = 150 = 2$ hrs 30 min

$90-48 = 42$ min

hrs min

8) $^{\circ}12.41$

$-\ 8.20$

4.21

4 hrs 21 min

Remembering the calendar

In class 4 we were introduced to the calendar. A calendar is a chart which displays the dates and days of a week. Generally it comprises a whole year, dividing into months, weeks and days.

Midnight to noon makes 12 hours.

24 hours in a day,

7 days in a week,

52 weeks in a year,

12 months in a year,

365 days in a year, except 366 days in a leap year.

REMEMBER

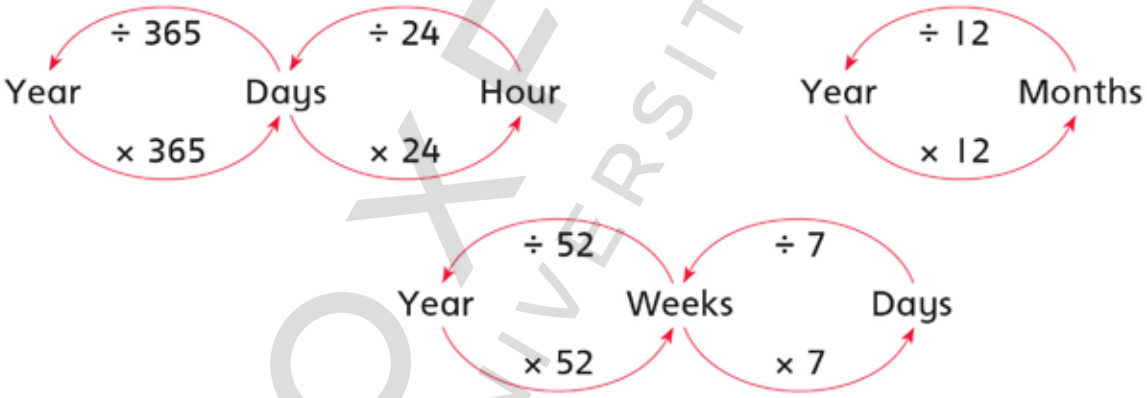
Two most common calendars are:

- Solar Calendar
- Lunar Calendar

30 days have September, April, June, and November.

All the rest have 31, except February with 28 (and 29 in leap years).

Conversion



Examples:

1. Convert 8 years into months.

Solution:

1 year = 12 months

8 years = 8 × 12 months

= 96 months

2. Convert 4 years 6 months into months.

Solution:

1 year = 12 months

4 years 6 months = 4 × 12 + 6 months

= 48 + 6 months

= 54 months

3. Convert 18 months into years.

Solution:

12 months = 1 year

18 months = 18 ÷ 12

= 1 year 6 months

$$\begin{array}{r|l} & 1 \text{ year} \\ 12 & 18 \text{ months} \\ & \underline{12} \\ & 6 \text{ months} \end{array}$$

4. How many weeks are there in 5 months?

Solution:

1 month = 4 weeks

5 months = 4 × 5

= 20 weeks

5. How many days are there in 4 weeks?

Solution:

1 week = 7 days

4 weeks = 7 × 4

= 28 days

6. How many months are there in 84 weeks?

Solution:

4 weeks = 1 months

84 weeks = 84 ÷ 4 months

= 21 months

7. Gibran took swimming classes for 4 weeks. However, he missed 3 days. How many days did he take swimming lessons?

Solution:

Number of days he was supposed to take classes = 4 × 7 = 28 days

Number of days he missed classes = 3 days

Number of days he attended classes = 28 − 3 = 25 days

February has 28 days, but in a leap year, it has 29 days.

In a solar calendar every fourth year is a leap year.

Now think: was 2018 a leap year?

Can you list 5 leap years?

▶ Exercise 5d

1. Fill in the blanks.
   a. How many days are there in 3 years? 1095
   b. How many months are there in 15 years? 180
   c. There are 56 days in 8 weeks.
   d. 730 days are equal to 2 years.
   e. There are 5 years and 10 days in 1835 days.

2. State whether the following are true or false.
   a. 8 years 9 months are equal to 452 weeks. (True)
   b. 45 months is same as 3 years and 8 months. (False)
   c. 94 days make exactly 13 weeks. (False)
   d. A leap year comes after every three years. (True)
   e. There are 52 weeks in a calendar year. (True)

3. Select the correct answer from the given options.
   a. Number of days in 10 years.
      Ⓐ 375 days Ⓑ 3650 days Ⓒ 365 days Ⓓ 3750 days
   b. Convert 96 months to years.
      Ⓐ 4 years Ⓑ 7 years Ⓒ 6 years Ⓓ 8 years
   c. How many weeks in 12 years?
      Ⓐ 144 weeks Ⓑ 84 weeks Ⓒ 624 weeks Ⓓ 4380 weeks
   d. 13 years and 8 weeks make
      Ⓐ 676 weeks Ⓑ 708 weeks Ⓒ 684 weeks Ⓓ 528 weeks
   e. In 5 year 5 months, there are
      Ⓐ 280 weeks Ⓑ 265 weeks Ⓒ 65 weeks Ⓓ 84 weeks

4. Change the given years into months.
   a. 13 years 13×12=156 months b. 7 years 7×12=84 months

5. Change the given months into years and months.
   a. 49 months 4 years 1 month b. 20 months 1 year 8 months c. 89 months 7 years 5 months d. 120 months 10 years

6. Change:
   a. 18 months into weeks 18×4=72 weeks
   b. 7 weeks into days 7×7=49 days
   c. 98 days into weeks 98÷7=14 weeks
   d. 105 days into weeks 105÷7=15

7. Change 1935 days into years, months, and weeks.
   5 years 9 months 3 weeks.

▶ Real-life Story Sums

1. Naveed went to school every day from June to August, except the 4 Sundays in each month. How many days did he attend school?
2. Javaid practised karate for 2 hours each day for 3 weeks. Calculate the number of hours he spent practicing karate.
3. A gardener has 64 saplings. If he starts planting 8 samples per day and starts on 10th September, when will he finish?

MINDBENDER

Do time machines really exist? If they really exist and you have one, where would you like to go, past or future?

You should have reasons for your answer.

Is there a unit for anything faster than a second?

ACTIVITY

Place a calendar of the current year in your classroom.

Mark the birthdays of all the students on it.

Everytime a birthday comes, paste a star on that date. In the end, you can see which month has most stars.

Real life story sums

1) (30 days - 4 sundays) + (31-4) + (31-4)

= 80 days

2) 7 x 3 = 21

2 hours x 21 = 42 hours

3) He will hire to planting on 17th september

YOUR DIGITAL RESOURCE

6 Unitary Method

In this unit students will learn to:

- calculate the value of many objects of the same kind when the value of one of these objects is given
- calculate the value of one object of the same kind when value of many of these objects are given
- calculate the value of many objects of the same kind when the value of some of these is given

MATH FLASH

You have already learnt:

- to apply the concept of multiplication in real-life situations
  Example:
  cost of 1 Mathematics book is Rs 250.
  What is the cost of 5 Mathematics books?
  Tip: Since the cost of more books is to be found, we multiply. 5 × 250 = Rs 1250
- to apply the concept of division in real-life situations
  Example:
  An amount of Rs 185 000 is to be distributed among 50 students to support their education.
  How much will each student receive?
  To find the amount received by one student, we will divide. Rs 185 000 ÷ 50 = Rs 3700

KEY VOCABULARY

unitary method, direct, proportion, inverse proportion, ratio, proportion

Unitary method

We often use the four operations when we go shopping.

- We add to find out how much our purchases cost altogether.
- We subtract to check that the shopkeeper has given us the correct change.
- We sometimes need to multiply and divide.

Examples:

What is Adil's bill for all his purchases?

1. Sweet limes

Cost of 12 sweet limes = Rs 36
Cost of 1 sweet lime = Rs 36 ÷ 12
= Rs 3
Cost of 5 sweet limes = Rs 3 × 5
= Rs 15
∴ 5 sweet limes cost Rs 15.

2. Rice

Cost of 10 kg rice = Rs 600
Cost of 1 kg rice = Rs 600 ÷ 10
= Rs 60
Cost of 3 kg rice = Rs 60 × 3
= Rs 180
∴ 3 kg rice cost Rs 180.

3. Balls

Cost of 10 balls = Rs 300
Cost of 1 ball = Rs 300 ÷ 10 = Rs 30
Cost of 7 balls = Rs 30 × 7 = Rs 210
∴ 7 balls cost Rs 210.

4. Candy jars

Cost of 3 jars = Rs 450
Cost of 1 jar = Rs 450 ÷ 3 = Rs 150
Cost of 2 jars = Rs 150 × 2 = Rs 300
∴ 2 candy jars cost Rs 300.

Adil's bill for all his purchases:

Sweet limes = Rs 15
Rice = Rs 180
Balls = Rs 210
Candy jars = Rs 300
Total = Rs 705

The method Adil used to find out how much each of his purchases would cost has a special name. It is called the **unitary method.** In this method first we find the value of a single unit, then get the required value by multiplying the total quantity with the value of the single unit.

Adil, for example, **divided 10 balls into units of one,** and he **divided 10 kg into units of 1 kg.** He then multiplied with the number of units needed to find the answer.

Here are some more examples of the unitary method in action.

Example:

A factory produces 28 bicycles each week. How many bicycles are produced in 5 days?

Solution:

Number of bicycles produced in 7 days = 28
Number of bicycles produced in 1 day = 28 ÷ 7 = 4
Number of bicycles produced in 5 days = 4 × 5 = 20
∴ the factory will produce 20 bicycles in 5 days.

Example:

If a bus covers 168 km in 4 hrs, what distance does it cover in 3 hrs?

Solution:

Distance covered in 4 hours = 168 km
Distance covered in 1 hour = 168 ÷ 4 = 42 km
∴ distance covered in 3 hours = 42 × 3 = 126 km.

▶ Exercise 6

1. Fill in the blanks.
   a. In the unitary method first we find out the cost of _____ item.
   b. If 3 kg of sugar cost Rs 210, then 1 kg of sugar will cost Rs _____.
   c. If 240 oranges can be placed equally in 15 cartons, then one carton has _____ oranges.
   d. If 4 similar chairs cost Rs 16000. The cost of such 6 chairs will be Rs _____.
   e. If the total rainfall for 5 hours was 15 mm, then the rainfall for one hour will be _____ mm.

2. State whether the following are true or false.
   a. The unitary method is used to solve mathematical problems by finding the value of a single unit. (_____)
   b. The word 'unitary' is taken from the word unit, which means more than one. (_____)
   c. The unitary method is mostly used in selling or purchasing goods. (_____)
   d. If the cost of 6 glasses is Rs 600, then the cost of 8 glasses will be Rs 4800. (_____)
   e. If one kg of rice costs Rs 150. The cost of 3.5 kg will be Rs 525. (_____)

3. Select the correct answer from the given options.
   a. If the cost of 1 mobile is Rs 35 000, what will be the cost of 5 mobiles?
      Ⓐ Rs 35 000 Ⓑ Rs 175 000 Ⓒ Rs 7000 Ⓓ Rs 3500
   b. The cost of 2 dozen pencils is Rs 72. What is the cost of each pencil?
      Ⓐ Rs 36 Ⓑ Rs 144 Ⓒ Rs 6 Ⓓ Rs 3
   c. 25 bags of rice weigh 75 kg. What is the weight of 1 bag of rice?
      Ⓐ 1875 kg Ⓑ 3 kg Ⓒ 3000 kg Ⓓ $\frac{1}{3}$ kg

d. If a car travels 50 km on 5 litres of petrol, how far will it travel on 10 litres of petrol?
Ⓐ 50 km Ⓑ 5 km Ⓒ 500 km Ⓓ 100 km

e. Three containers of ice cream cost Rs 750. The cost of one container will be
Ⓐ Rs 215 Ⓑ Rs 1250 Ⓒ Rs 25 Ⓓ Rs 250

4. What is the cost of
a. 3 bananas at Rs 36 per dozen?
b. 9 T-shirts at Rs 220 for 2?
c. 23 notebooks at Rs 60 for 3?

▶ Real-life Story Sums

1. A year's rent for a house is Rs 18 000. If the Shah family wants to rent the house for only 7 months, how much rent will they have to pay?
2. With 15 litres of petrol in its tank, a car can cover 270 km. What distance can the car cover with only 12 litres of petrol?
3. If the cost of 1 packet of crispy chips is Rs10, what is the cost of 20 packets? How many packets can be bought for Rs 130?
4. At a picnic, there were 80 sandwiches for 20 children. If 4 children do not come, how many sandwiches can each child have?
5. A dozen colour pens cost Rs 120. How much will 15 such pens cost?
6. A car travels 200 km using 20 litres of petrol. How many km can it travel on 10 litres of petrol?
7. 20 pineapples weigh 25 kg. How much will 30 pineapples weigh?

CHALLENGE

Can the unitary method be used to solve these problems?
Think carefully, and then explain your answer.

a. If a Rs 100 note is 15 cm long, how long will a Rs 20 note be?
b. If Anila is 132 cm tall at the age of 12, how tall was she when she was 2 years old?
c. If a cat catches 18 mice during one night's hunting, how many cats will be needed to catch 20 mice?

7 Geometry

YOUR DIGITAL RESOURCE

In this unit students will learn to:

- recognise straight and reflex angle
- recognise the standard units for measuring angles is 1°
- identify, describe and estimate the size of angles and classify them as acute, right or obtuse
- compare angles with right angles and recognise that a straight line is equivalent to two right angles
- use protractor and ruler to construct a right angle, a straight angle, and reflex angles.
- describe adjacent, complementary and supplementary angles
- identify and describe triangles with respect to their sides (isosceles, equilateral, and scalene)
- identify and describe triangles with respect to their angles (Acute angled triangle, Obtuse angled triangle and right-angled triangles)
- use protractor and ruler to construct a triangle when
  - two angles and their included side is given
  - two sides and included angle is given
- measure the lengths of the remaining two sides and one angle of the triangle
- recognise quadrilaterals (square, rectangle, parallelogram, rhombus, trapezium, and kite)
- identify and describe properties of quadrilaterals including square, rectangle, parallelogram, rhombus, trapezium, and kite. Classify those using parallel, equal sides and equal angles
- use protractor and ruler to construct square and rectangle when lengths of sides are given
- recognise different types of symmetry (Reflective and Rotational) in 2D figures
- identify lines of symmetry for given 2D figures
- find point of rotation and order of rotational symmetry of given 2D figures
- identify cubes, cuboids and pyramids from their nets
- describe and make 3D objects (cubes, cuboids, cylinder, cone, sphere, pyramids)

MATH FLASH

You have already learnt:

- to draw vertical and horizontal lines
- about angles and the symbol '∠'
- that angles are measured in degrees with a protractor. Example: 30°, 65°
- that angles are named according to their sizes
- that angles can be drawn by using a protractor
- to construct squares and rectangles
- recognise lines of symmetry in 2D shapes

KEY VOCABULARY

angle, degree, right, acute, obtuse, reflex, protractor, complementary, supplementary, adjacent, equilateral, isosceles, scalene, right-angled, acute-angled, obtuse-angled, hypotenuse, construction, line segment, compasses, arc, set square, intersect, quadrilateral, symmetry, 3D shapes

Angles

Now we are going to learn more about angles.

To start, complete the following crossword. It will be an interesting start for you.

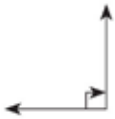
Complete the crossword by naming each angle shown in the clues.

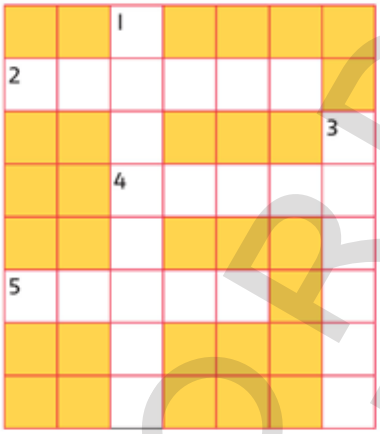
Clues across:

2.

4.

5.

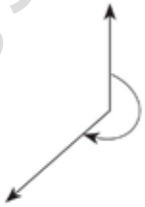




Clues down:

1.

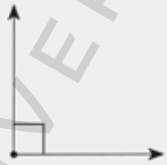
3.



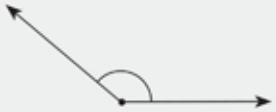
Remembering angles:

An acute angle is less than 90°.

A right angle is equal to 90°.

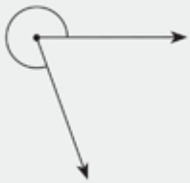


An obtuse angle is more than 90° but less than 180°.



A straight angle is equal to 180°.

A reflex angle is more than 180°.

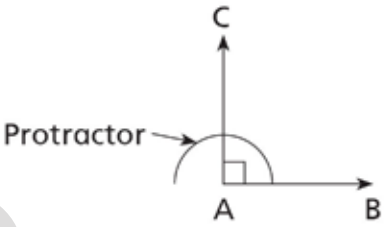


Construction of angles with a protractor

Right angle

A right angle can easily be drawn by joining a horizontal and a vertical line.

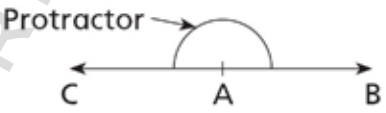
Draw a horizontal line AB. On the protractor find 90° and mark this point C. Draw a vertical line joining A to C.



Straight angle

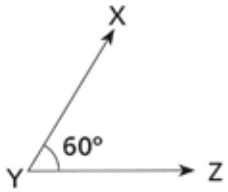
Straight angles are drawn like straight lines. On the protractor find 180° and mark this point C. Join A and C.

∠CAB = 180°.

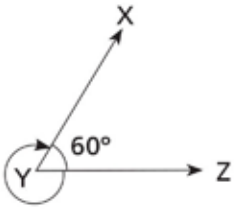


Reflex angle

In the figure shown ∠XYZ = 60°.

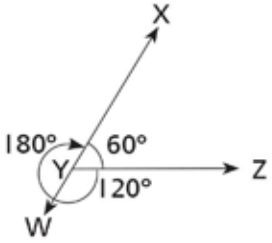


The angle between XY and YZ, marked with an arrow, **outside** ∠60° is known as a **reflex angle.**



Extend XY as shown.

Notice that ∠XYW = 180° and ∠ZYW = 120°.
∴ reflex ∠XYZ = 120° + 180° =300°



To measure a reflex angle using a half-circle protractor we remember the rule that one complete turn = 360°.

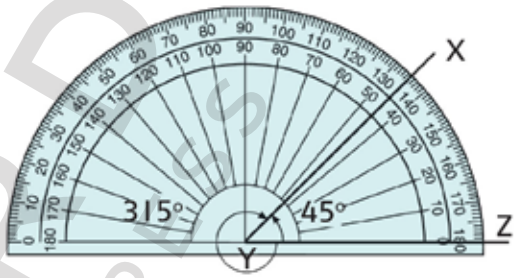
All we have to do is measure the acute angle, and subtract that number from 360° to get the reflex angle.

Here, the acute ∠XYZ = 60°.

∴ reflex ∠XYZ = 360° − 60°
= 300°

Example:

Draw a reflex angle XYZ = 315°.
∴ 360° − 315° = 45°.
Using a protractor draw an angle of 45°.
The outer angle XYZ = 315°.



Comparison of angles with right angle

We have already learnt about different types of angles in previous classes.

They are known as acute angle, obtuse angle, right angle, reflex angle, and straight angle.

You know that angles are measured using degrees. Angles can be classified by comparing them as equal to, greater than, and less than a right angle. A right angle always adds up to 90 degrees, so all 90° angles are **right angles**.

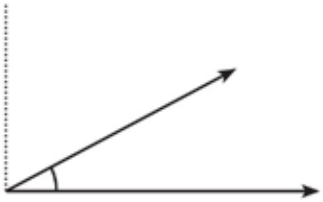
Any angle less than 90° is called an **acute angle**.

Any angle bigger than 90° is called an **obtuse angle**.

Any angle bigger than 180° is called a **reflex angle**.

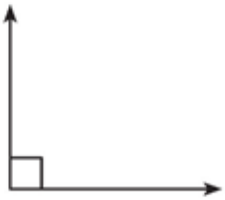
Look at the following angles.

a.



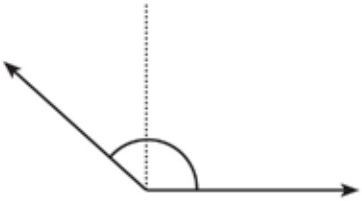
acute angle

b.



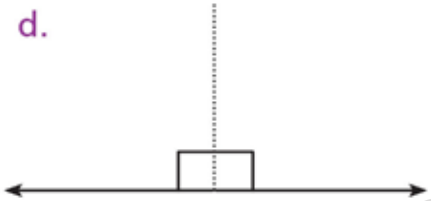
right angle

c.



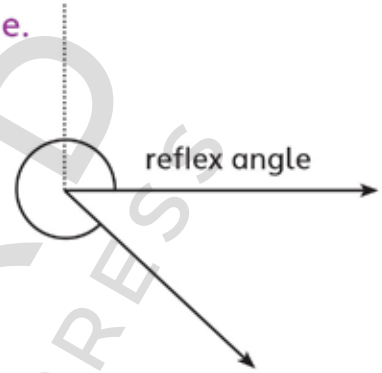
obtuse angle

d.



straight angle

e.



reflex angle

In the above figures we see that:

turn of acute angle is smaller than the turn of right angle.

turn of right angle is smaller than the turn of obtuse angle.

turn of obtuse angle is smaller than the turn of straight angle.

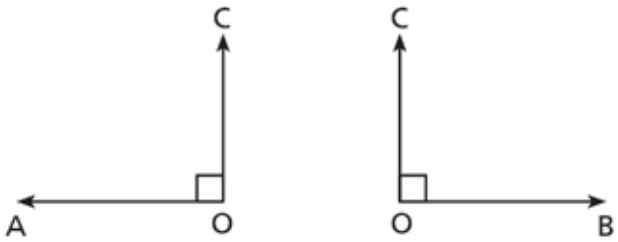
turn of straight angle is smaller than the turn of reflex angle.

Thus, we can say that:
Acute Angle < Right Angle < Obtuse Angle < Straight Angle < Reflex Angle.

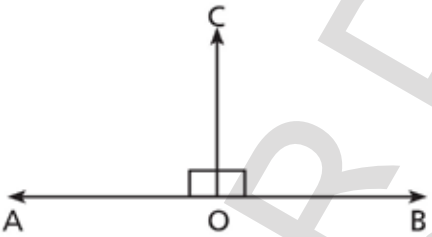
Example:

In the following shapes, mark the angles smaller than right angle with green colour, greater than right angle with blue colour, and equal to right angle with yellow colour.

Look at the figures of two right angles given below.



If we join the two right angles give above, we get a straight line AB with two adjacent angles of 90° each at the common vertex O.



Therefore, $\angle AOB = \angle AOC + \angle BOC$

$= 90° + 90° = 180°$ (a straight angle)

Hence, a straight line is equivalent to two right angles.

▶ Exercise 7a

1. Fill in the blanks.
   a. An acute angle is any angle greater than 0° but less than _____.
   b. An angle which is greater than a right angle but less than 180° is called an _____ angle.
   c. A reflex angle is any angle which is greater than ____ but less than _____.
   d. Two right angles make a _____ angle.
   e. The arms of a right angle meet each other at _____.
2. State whether the following are true or false.
   a. A reflex angle is greater than 180° and less than 360°. (_____)
   b. The sum of all the angles on a line add up to 180°. (_____)
   c. Angles at a point add up to 180°. (_____)
   d. The point where two arms of the angle meet is called the vertex. (_____)
   e. There are 90 degrees in a straight angle. (_____)

3. Select the correct answer from the given options.

a. An angle greater than 0° and less than 90° is

Ⓐ an obtuse angle Ⓑ a right angle
Ⓒ a straight angle Ⓓ an acute angle

b. An angle greater than 180° and less than 360° is

Ⓐ a right angle Ⓑ a reflex angle
Ⓒ an obtuse angle Ⓓ an acute angle

c. The magnitude of a reflex angle adjacent to ∠ABC is

Ⓐ 90° − ∠ABC Ⓑ 180° − ∠ABC
Ⓒ 90° + ∠ABC Ⓓ 360° − ∠ABC

d. An angle with magnitude 360° − 252° is

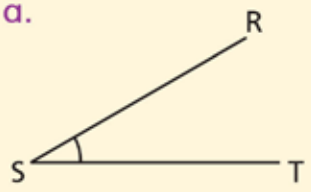
Ⓐ obtuse angle Ⓑ straight
Ⓒ reflex angle Ⓓ acute angle

e. The number of right angles in a straight line are

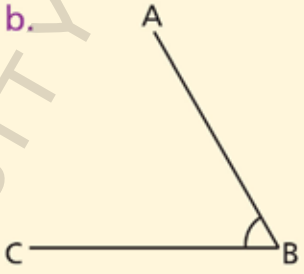
Ⓐ one Ⓑ two Ⓒ three Ⓓ four

4. Measure the following angles with the help of a protractor.

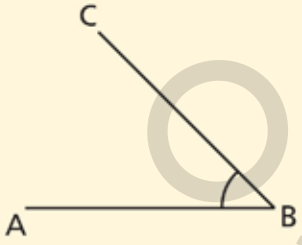
a.



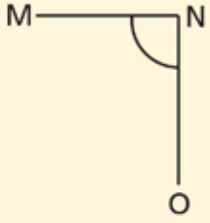
b.



c.



d.



5. Construct the following angles.

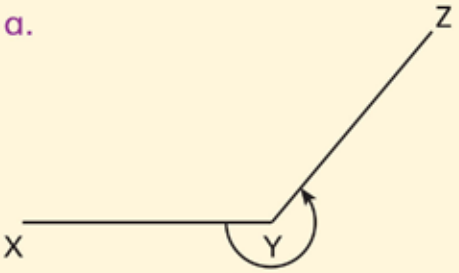
a. ∠ABC (right angle) b. ∠STU (acute angle)
c. ∠EFG (reflex angle) d. ∠PQR (obtuse angle)

6. Draw these angles, using a protractor.

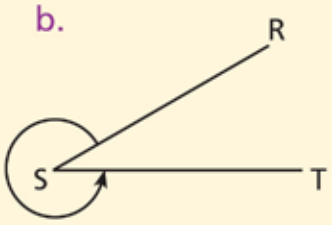
a. 40° b. 90° c. 55°
d. 60° e. 115° f. 145°

7. Calculate these reflex angles, using a protractor.

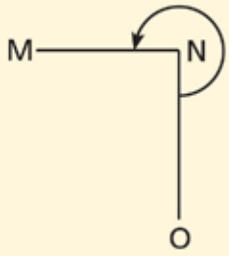
a.



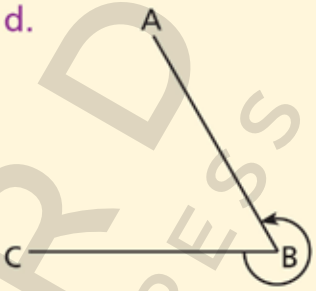
b.



c.

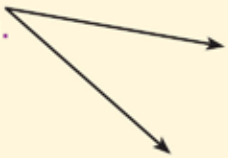


d.



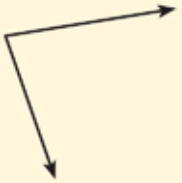
8. Draw these reflex angles, with the help of a protractor.
   a. Reflex ∠PQR = 320°
   b. Reflex ∠WXY = 290°
   c. Reflex ∠CDE = 335°
   d. Reflex ∠ABC = 200°
9. Identify the angles as smaller than 90° and greater than 90° in the following figures.

a.



b.

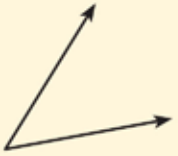
c.



d.

e.

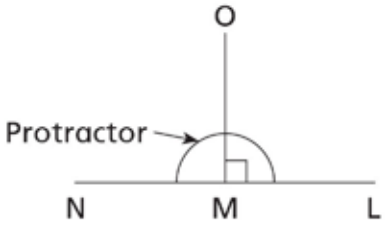
f.



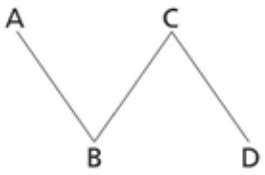
Adjacent, complementary, and supplementary angles

Adjacent angles

∠LMO and ∠NMO are known as **adjacent angles** because they have a common side MO and a common vertex M.

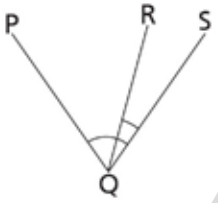


But there are exceptions:



In the above figure, ∠ABC and ∠BCD have a common arm, but do not have a common vertex. Therefore, ∠ABC and ∠BCD are **not adjacent**.

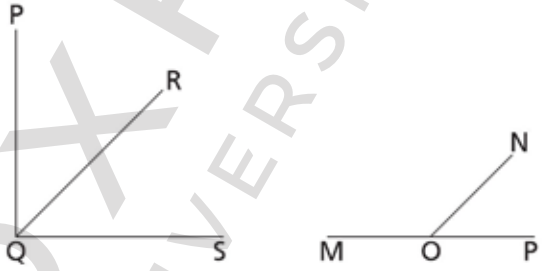
Similarly, in the figure below ∠PQR and ∠PQS have a common arm and a common vertex Q, but are **not adjacent**, because they are overlapping.



DO YOU KNOW?

Two houses will be adjacent to each other if they have a common wall.

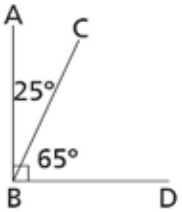
Can you name the adjacent angles in the given figures?



Complementary angles

Two angles are **complementary** if their **sum is 90°.**

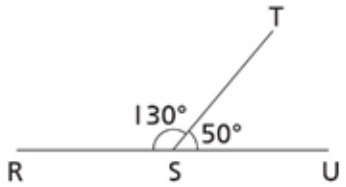
In the given figure ∠ABC and ∠CBD are complementary angles.



$$25° + 65° = 90°$$

Supplementary angles

Two angles are **supplementary** if their **sum is 180°**. That is the angles lie on a straight line.



$\angle RST + \angle TSU = 180°$
$130° + 50° = 180°$

$\therefore$ $\angle RST$ and $\angle TSU$ lie on a straight line and are supplementary.

REMEMBER

A tip to remember complementary and supplementary angles:

C for corner (L forms a corner)
C for complementary
S is for straight line
S is for supplementary

Exercise 7b

1. Fill in the blanks.
   a. Adjacent angles have a common side and a common _____.
   b. If the sum of two angles is 90°, then the angles are _____.
   c. Two angles are supplementary if their sum is _____.
   d. We can not find the _____ of 90° angle.
   e. If an angle is 85°, its supplementary angle will be _____.
2. State whether the following are true or false.
   a. The supplementary angle of a right angle is a right angle. (_____)
   b. The complementary angle of 50° is 140°. (_____)
   c. Adjacent angles share a common vertex. (_____)
   d. If $\angle ACB = 120°$ and $\angle KLM = 60°$, then they are supplementary angles. (_____)
   e. The supplementary angle of an acute angle is also an acute angle. (_____)

3. Select the correct answer from the given options.

a. The supplementary angle of 70° is

Ⓐ 100° Ⓑ 290° Ⓒ 110° Ⓓ 20°

b. ∠XYZ = 40° and ∠PQR = 60° are not adjacent because they don't

Ⓐ have equal magnitude Ⓑ sum up to 360°
Ⓒ sum up to 180° Ⓓ have a common vertex

c. Complementary angles

Ⓐ are greater than 90° Ⓑ sum up to 90°
Ⓒ add up to 180° Ⓓ are always equal

d. The complementary angle of 10° is

Ⓐ 80° Ⓑ 170° Ⓒ 90° Ⓓ 0°

e. 100° and 80° angles are

Ⓐ reflex angles Ⓑ supplementary angles
Ⓒ complementary angles Ⓓ right angles

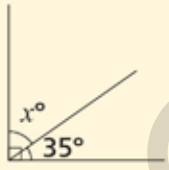
4. Find the complementary angle of the given angles.

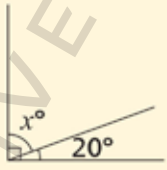
a. 65° b. 12° c. 82° d. 47°

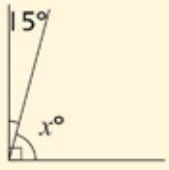
5. Find the supplementary angle of the given angles.

a. 165° b. 49° c. 88° d. 127°

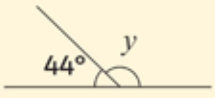
6. Find the complementary angle x in each of the following right angles, using a protractor.

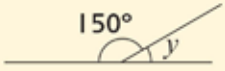
a. 

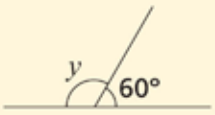
b. 

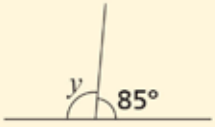
c. 

7. Find the value of y in the given set of supplementary angles.

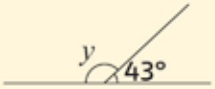
a. 

b. 

c. 

d. 

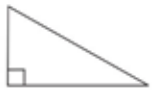
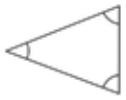
e. 

f. 

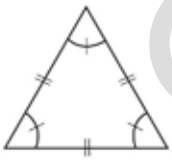
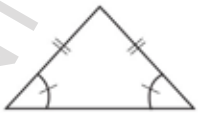
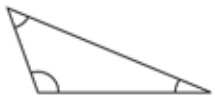
Triangles

Look at the checklist of facts about triangles.

1. Triangles are all about threes. Each triangle has **3** sides, **3** vertices, and **3** angles.
2. Triangles can be grouped into types or categories according to their sides or according to their angles:

	Grouping by Sides	Grouping by Angles	
	3 equal sides **equilateral triangle**	one right angle **right-angled triangle**	
	two equal sides **isosceles triangle**	all 3 angles acute **acute-angled triangle**	
	all sides of different length **scalene triangle**	one obtuse angle **obtuse-angled triangle**	

We can now add these points to the checklist.

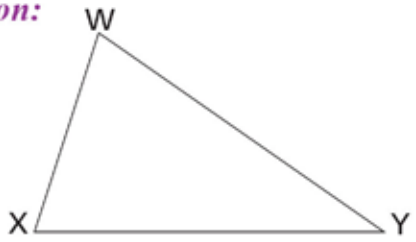
Equilateral Δs	Isosceles Δs	Scalene Δs
All 3 sides are of the same length. All 3 angles are also equal. 	2 sides are of the same length. 2 angles are of the same size. 	The length of each side is different. The size of each angle is also different. 

Notice the special symbol Δ is used for a triangle. We also have special symbols to show equal lengths and equal angles as shown in the figures above.

Example:

Measure the triangle's sides and angles, then name the triangle family to which it belongs. Present the findings in the form of a table.

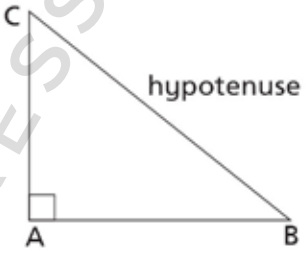
Solution:



Sides		Angles	
WY	5 cm	∠WXY	72°
YX	5 cm	∠XWY	72°
XW	3 cm	∠WYX	36°
WYX is an isosceles triangle			

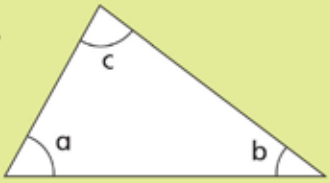
Right-angled triangle

We know that if one angle of a triangle is of 90°, the triangle is called a right-angled triangle.



In a right-angled triangle two sides of the triangle meet at 90° and the side opposite to the right angle is called the **hypotenuse**. It is always the longest side of the triangle.

- The sum of angles of a triangle is always 180°.
  $\angle a + \angle b + \angle c = 180°$
- The angles in a triangle and the degrees in a straight angle both equal 180°.



ACTIVITY

Take a blank sheet of paper or cardboard.
Draw a triangle on it, and mark each angle with dots.

Cut out your triangle, then cut the three angles from the triangle.

Arrange the three angles so as to make a straight line.

You have just shown how the three angles of a triangle make a straight angle or 180°!

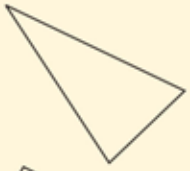
▶ Exercise 7c

1. Fill in the blanks
   a. If two angles of a triangle sum up to 130°, the measurement of third angle will be _____.
   b. A _____ triangle has all sides equal.
   c. If all the three angles of a triangle are acute, the triangle is called _____.
   d. The longest side of a right-angled triangle is called a _____.
   e. All the three sides of a scalene triangle are _____.
2. State whether the following are true or false.
   a. The side opposite the smallest angle of a triangle is the smallest. (_____)
   b. Three sides of an isosceles triangle are equal. (_____)
   c. The longest side of a right-angled triangle is called the hypotenuse. (_____)
   d. A right-angled triangle can not have two sides equal. (_____)
   e. A right-angled triangle can not have obtuse angles. (_____)
3. Select the correct answer from the given options.
   a. A triangle can be constructed if
      Ⓐ only 2 sides are given Ⓑ all 3 sides are given
      Ⓒ only 2 angles are given Ⓓ only 3 angles are given
   b. If two angles of a triangle are 50° and 100°, then the third angle will be
      Ⓐ 30° Ⓑ 50° Ⓒ 150° Ⓓ 90°
   c. A triangle with all sides equal is
      Ⓐ an isosceles triangle Ⓑ an equilateral triangle
      Ⓒ a scalene triangle Ⓓ a right-angled triangle
   d. The sum of the angles of a triangle is
      Ⓐ 100° Ⓑ 360° Ⓒ 180° Ⓓ 90°
   e. The largest angle of a right-angled triangle is
      Ⓐ 102° Ⓑ 45° Ⓒ 90° Ⓓ 60°

4. Measure the sides of these triangles and write their name equilateral, isosceles, or scalene.

a. 

b. 

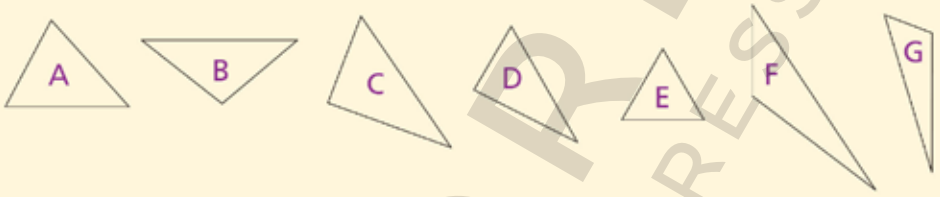
c. 

d. 

e. 

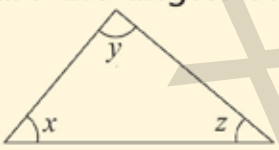
f. 

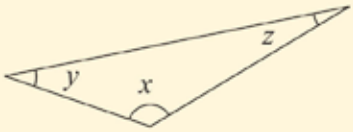
5. Look at the figures carefully and write the letters in the correct column.



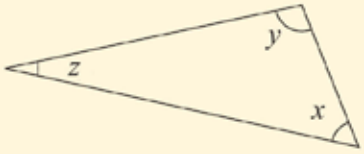
Right-angled triangle	Acute-angled triangle	Obtuse-angled triangle

6. Measure the angles of these triangles and record your findings.

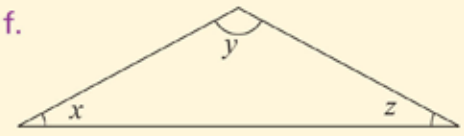
a. 

b. 

c. 

d. 

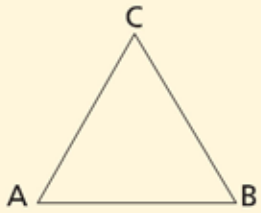
e. 

f. 

Triangle	Angles			Total of all 3 angles
	x	y	z	
a.				
b.				
c.				
d.				
e.				
f.				

7. Measure the sides of the given triangle with a ruler. Record the findings in the table. Then, with a protractor, measure the angles of the triangle and record your findings.

Length of side (cm)		Size of angle (°)	
AB		∠CAB	
BC		∠ABC	
AC		∠BCA	

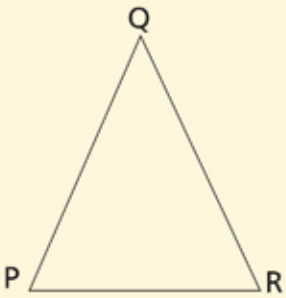


What type of triangle is this? What do you observe about its angles?

_____

8. Measure and record the sides and angles of this triangle.

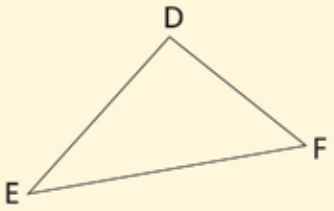
Length of side (cm)		Size of angle (°)	
PQ		∠RPQ	
QR		∠PQR	
PR		∠QRP	



What type of triangle is this? What do you notice about its angles?

_____

9. Measure and record the sides and angles of this triangle.



Length of side (cm)		Size of angle (°)	
ED		∠FED	
DF		∠EDF	
EF		∠DFE	

What type of a triangle is this?

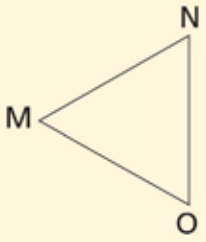
_____

What is special about its angles?

_____

10. Measure each triangle's sides and angles, then name the triangle family to which it belongs. Present the findings in the form of a table.

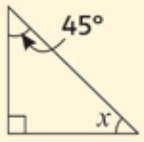
a.



b.

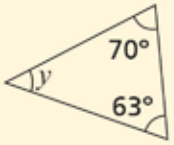
11. Without using a protractor, calculate the size of the angles marked with letters.

a.



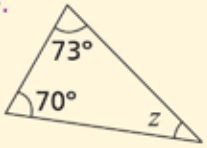
b.

c.



d.

e.



Constructing triangles

Constructing triangles using a pair of compasses and a ruler when the lengths of their sides are given

Equilateral triangle

All the sides of an equilateral triangle are equal.

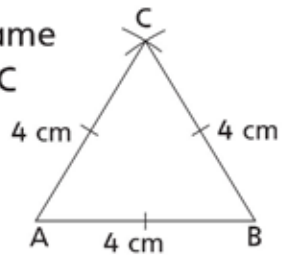
Example:

Construct an equilateral triangle with each side equal to 4 cm.

Construction Steps:

1. Draw a line $\overline{AB}$ = 4 cm using a ruler.
2. Place the point of the compasses on A and open it to point B. Make an arc of length $\overline{AB}$ above $\overline{AB}$.
3. Now take B as the centre and draw an arc of the same length which intersects the previous arc at C. Point C is the third vertex of the equilateral triangle.
4. Join A to C and B to C.

   ABC is the required equilateral triangle.



Isosceles triangle

An isosceles triangle has two opposite sides equal in length.

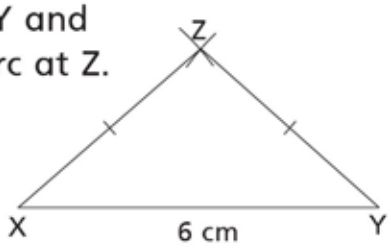
Example:

Construct an isosceles triangle with $m\overline{XY}$ = 6 cm, $m\overline{XZ} = m\overline{YZ}$ = 4 cm.

Construction Steps:

1. Draw a line $\overline{XY}$ = 6 cm using a ruler.
2. Place the pointer of the compasses on the ruler and open it to measure 4 cm.
3. Take X as the centre and draw an arc above $\overline{XY}$.
4. With the same length, fix the compasses on Y and draw another arc intersecting the previous arc at Z.
5. Joint X to Z and Y to Z.

   XYZ is the required isosceles triangle.



Scalene triangle

In a scalene triangle all the three sides are of different length.

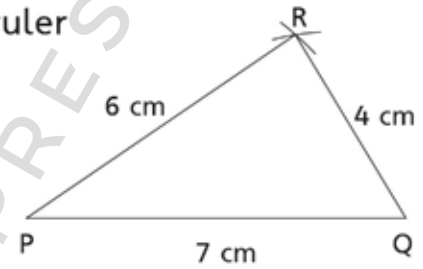
Example:

Construct a scalene triangle with $m\overline{PQ}$ = 7 cm, $m\overline{PR}$ = 6 cm, and $m\overline{QR}$ = 4 cm.

Construction Steps:

1. Draw a line $\overline{PQ}$ = 7 cm with the help of a ruler.
2. Place the pointer of the compasses on the ruler and open it to measure 6 cm.
3. Take P as the centre and draw an arc above $\overline{PQ}$.
4. Place the pointer of the compasses on the ruler and open it to measure 4 cm.
5. Take Q as the centre and draw another arc intersecting the previous arc at R.
6. Join P to R and Q to R.

   PQR is the required scalene triangle.



Constructing triangles using a protractor and a ruler when two angles and included sides are given

Equilateral triangle

The sides of an equilateral triangle are equal in length and each angle is of 60°.

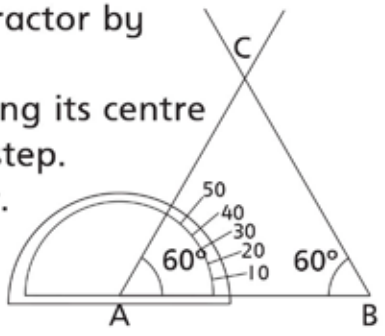
Example:

Construct an equilateral triangle with each side of 3.5 cm and $m\angle CAB = m\angle CBA = 60°$.

Construction Steps:

1. Draw a line $\overline{AB}$ = 3.5 cm.
2. Make an angle of 60° at A with the help of protractor by placing the centre point at A. Mark a dot at 60°.
3. Now place the protractor on the line $\overline{AB}$ by placing its centre point at B, mark a dot at 60°, as in the previous step.
4. Extend the lines so that they intersect each other. Name the point of intersection as C.

   ABC is the required equilateral triangle.



Isosceles triangle

An isosceles triangle has two equal sides and two equal base angles.

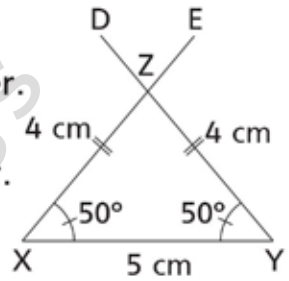
Example:

Construct an isosceles triangle with $m\overline{XY}$ = 5 cm, $m\angle ZXY = m\angle ZYX = 50°$.

Construction Steps:

1. Draw a line segment $\overline{XY}$ equal to 5 cm using a ruler.
2. Make $\angle ZXY = 50°$ at point X using a protractor.
3. Similarly, make $\angle ZYX = 50°$ at Y using a protractor.
4. $\overline{YD}$ and $\overline{XE}$ intersect each other at point Z.

XYZ is the required isosceles triangle.



Scalene triangle

All three sides of a scalene triangle have different lengths, therefore, all three angles are different.

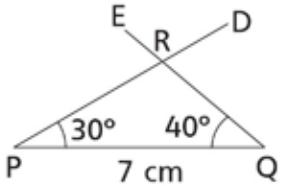
Example:

Construct a scalene triangle with $m\overline{PQ}$ = 7 cm, $m\angle RQP = 40°$, and $m\angle RPQ = 30°$.

Construction Steps:

1. Draw a line segment $\overline{PQ}$ equal to 7 cm using a ruler.
2. Make $\angle RPQ = 30°$ at point P using a protractor.
3. Similarly, make $\angle RQP = 40°$ at point Q using a protractor.
4. $\overline{PD}$ and $\overline{QE}$ intersect each other at point R.

PQR is the required scalene triangle.



Right-angled triangle

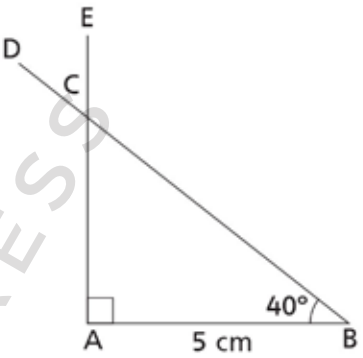
In a right-angled triangle one of the angles is 90°.

Example:

Construct a right-angled triangle with $m\overline{AB}$ = 5 cm, $m\angle A$ = 90°, and $m\angle B$ = 40°.

Construction Steps:

1. Draw a line $\overline{AB}$ measuring 5 cm.
2. Place the centre of the protractor at point A and make $\angle A$ = 90°.
3. Place the protractor at B and make $\angle B$ = 40°.
4. Extend $\overline{AE}$ and $\overline{BD}$, so that they intersect each other at point C.
   ABC is the required right-angled triangle.



Acute-angled triangle

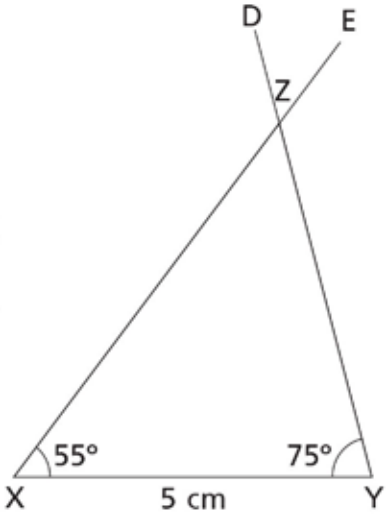
In an acute-angled triangle all the angles are acute.

Example:

Construct an acute-angled triangle with $m\overline{XY}$ = 5 cm, $m\angle X$ = 55°, and $m\angle Y$ = 75°.

Construction Steps:

1. Draw a line $\overline{XY}$ = 5 cm.
2. Place the centre of the protractor at point X and make $\angle X$ = 55°.
3. Place the centre of the protractor at point Y and make $\angle Y$ = 75°.
4. Extend $\overline{XE}$ and $\overline{YD}$, so that they intersect each other at point Z.
   XYZ is the required acute-angled triangle.



Obtuse-angled triangle

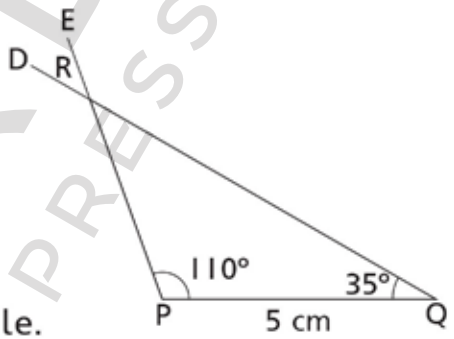
In an obtuse-angled triangle, one angle is obtuse and the other two angles are acute.

Example:

Construct an obtuse-angled triangle with $m\overline{PQ}$ = 5 cm, $m\angle P$ = 110°, and $m\angle Q$ = 35°.

Construction Steps:

1. Draw a line $\overline{PQ}$ = 5 cm.
2. Place the centre of the protractor at point P and make $\angle P$ = 110°.
3. Place the centre of the protractor at point Q and make $\angle Q$ = 35°.
4. Extend $\overline{PE}$ and $\overline{QD}$, so that they intersect each other at point R.
   PQR is the required obtuse-angled triangle.



Constructing triangles using a protractor and a ruler when two sides and the included angle are given

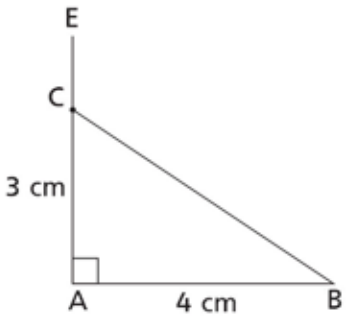
Right-angled triangle

Example:

Construct a right-angled triangle with $m\overline{AB}$ = 4 cm, $m\overline{AC}$ = 3 cm, and $m\angle A$ = 90°.

Construction Steps:

1. Draw a line $\overline{AB}$ measuring 4 cm.
2. Place the centre of the protractor at point A and make $\angle EAB$ = 90°.
3. Using a ruler, mark a point C at 3 cm on $\overline{AE}$.
4. Join B to C.
   ABC is the required right-angled triangle.



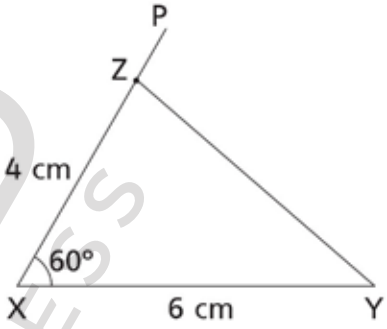
Acute-angled triangle

Example:

Construct an acute-angled triangle with $m\overline{XY}$ = 6 cm, $m\overline{XZ}$ = 4 cm, and $m\angle A = 60°$.

Construction Steps:

1. Draw a line $\overline{XY}$ measuring 6 cm.
2. Place the centre of the protractor at point X and make $\angle PXY = 60°$.
3. Using a ruler, mark a point Z at 4 cm on $\overline{XP}$.
4. Join Y to Z.
   XYZ is the required acute-angled triangle.



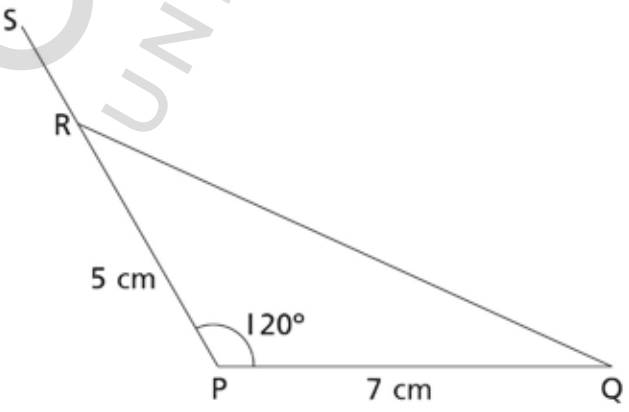
Obtuse-angled triangle

Example:

Construct an obtuse-angled triangle with $m\overline{PQ}$ = 7 cm, $m\overline{PR}$ = 5 cm, and $m\angle P = 120°$.

Construction Steps:

1. Draw a line $\overline{PQ}$ measuring 7 cm.
2. Place the centre of the protractor at point P and make $\angle SPQ = 120°$.
3. Using a ruler, mark a point R at 5 cm on $\overline{SP}$.
4. Join Q to R.
   PQR is the required obtuse-angled triangle.



▶ Exercise 7d

1. Construct an equilateral triangle where the length of each side is 4 cm.
2. Construct an isosceles triangle ABC where $m\overline{AC} = m\overline{BC} = 5$ cm.
3. Construct a scalene triangle LMN where $m\overline{LM} = 5$ cm, $m\overline{MN} = 3$ cm, and $m\overline{LN} = 6$ cm.
4. Construct a triangle DEF where $m\overline{DE} = 7$ cm, $m\overline{DF} = 7$ cm, and $m\angle EDF = 60°$. Name the triangle.
5. Construct an isosceles triangle where the base of the triangle is 6 cm and the base angle is 50°.
6. Construct a triangle PQR where $m\overline{PQ} = 7.5$ cm, $m\overline{QR} = 6$ cm, and $m\angle PQR = 45°$.
7. Construct a ΔABC where $m\overline{AB} = 4.5$ cm, $m\overline{BC} = 5.5$ cm, and $m\overline{AC} = 5.5$ cm.
8. Construct a ΔIJK where $m\overline{IJ} = 5.5$ cm, $m\overline{JK} = 5.5$ cm, and $m\angle IJK = 60°$.
9. Construct a ΔABC where $m\angle A = m\angle B = 60°$ and $m\overline{AB} = 5.5$ cm.
10. Construct a ΔPQR where $m\angle P = 53°$, $m\angle Q = 47°$, and $m\overline{PQ} = 7.5$ cm.
11. Construct a ΔJKL where $m\angle J = 68°$, $m\angle K = 82°$. What is the $m\angle L$?
12. Construct a ΔLMN, where $m\angle LMN = 35°$, $m\angle MLN = 45°$. What is $m\angle MNL$?
13. Construct a triangle whose one base angle is 90° and the other angle is 40°.

Quadrilaterals

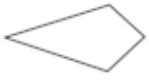
All 4-sided shapes are called **quadrilaterals** ('quadri' means four, and 'lateral' means side). These can also be called quadrangles.

All quadrilaterals can be divided to form 2 triangles.

We already know that the sum of the angles of a triangle is 180°.

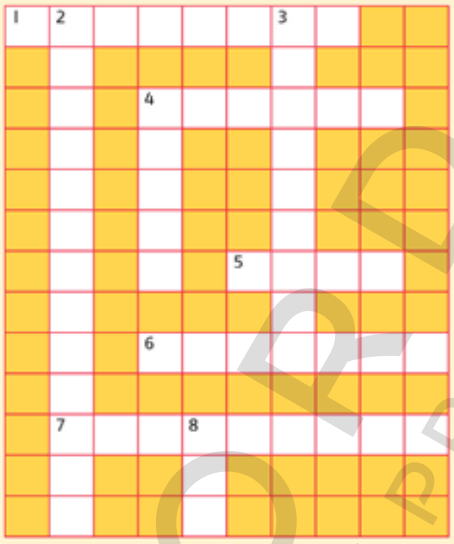
∴ Sum of angles of a quadrilateral = Sum of angles of two triangles
= 180° + 180° = 360°

These are some familiar quadrilaterals:

Shape	Name	Sides	Angles
	Square	All four sides are equal and opposite sides are parallel.	Each angle is equal to 90°.
	Rectangle	Two pairs of opposite sides are equal and parallel.	Each angle equals to 90°.
	Rhombus	All sides are equal. Two pairs of opposite sides are parallel.	Two pairs of opposite angles are equal.
	Parallelogram	Opposite sides are equal and parallel.	Opposite angles are equal.
	Kite	Two pairs of adjacent sides are equal.	
	Trapezium	One pair of opposite sides are parallel.	All the angles are unequal.

ACTIVITY

Complete the crossword.



Clues across:

1. The _____ sides of rectangles are of equal length.
4. The shape with 4 equal sides and 4 right angles.
5. The name of this shape: 
6. The shape with 4 equal sides but no right angles.
7. If my sides are 2 cm, 4 cm, 2 cm, and 4 cm and all my angles are 90° each, I'm called a _____.

Clues down:

2. The name of this shape: 
3. The name of this shape: 
4. If three angles of a quadrilateral add up to 300°, then the fourth angle will be _____ degrees.
8. If three sides of a kite are equal to 3 cm, 3 cm, and 10 cm, then the fourth side will equal _____ cm.

Constructing squares

We can construct a square by adopting any of the two methods given below.

Constructing a square using a set square and a ruler with given sides

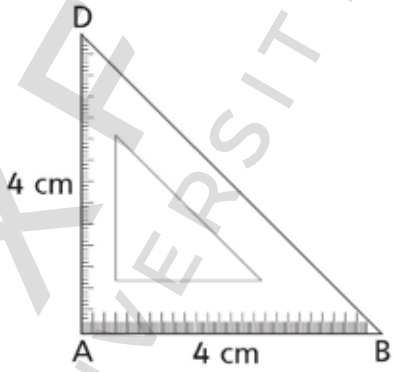
Example:

Construct a square with the help of a set square and a ruler with each side 4 cm.

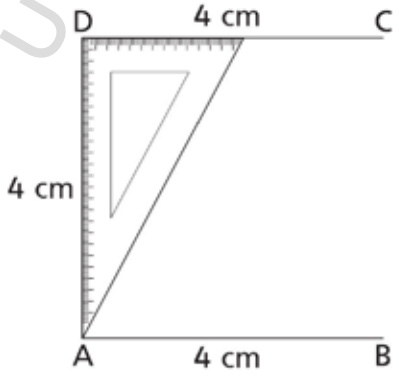
Construction Steps:

1. Draw a line $\overline{AB}$ using a ruler of length 4 cm.

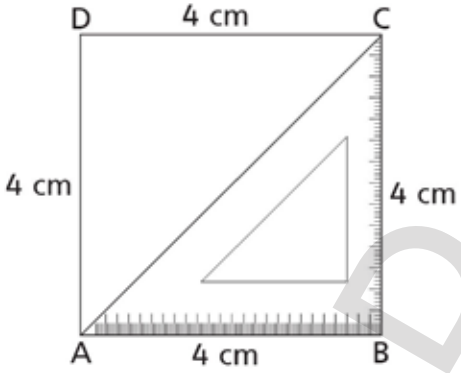
2. Set an edge of the set square on the given line so that the corner of the set square is at end A.
3. Holding the set square in place draw a perpendicular line of 4 cm from A. Mark this point as D.

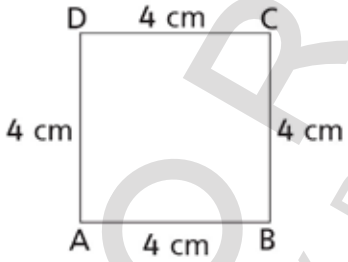


4. Place the set square on line AD and draw another perpendicular line CD equal to 4 cm.



5. Now place the set square on line AB so that the corner of the set square is on B. Draw a perpendicular from B to C such that $\overline{BD}$ = 4 cm.





∴ ABCD is the required square.

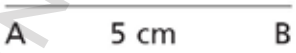
Constructing a square using a protractor and a ruler with given sides

Example:

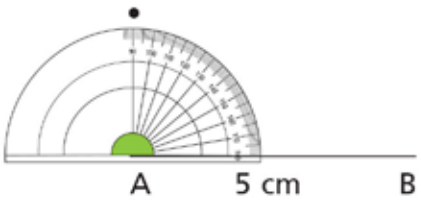
Construct a square using a protractor and a ruler with each side 5 cm.

Construction Steps:

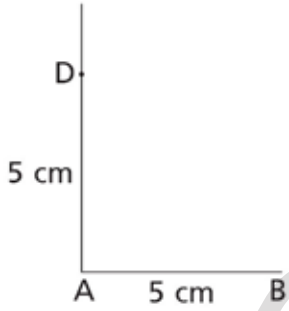
1. Draw a line $\overline{AB}$ of 5 cm using a ruler.



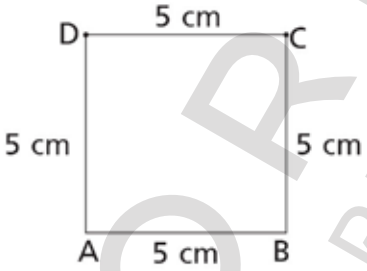
2. Place the protractor on $\overline{AB}$ such that; the centre of protractor coincides with point A and the horizontal line of the protractor is aligned with $\overline{AB}$. Mark a point at 90°.



3. Join the marked point with A, with the help of a ruler. Mark a point D on this line such that $\overline{AD}$ = 5 cm.



4. Repeat the same procedure at point B, marking $\overline{BC}$ = 5 cm.



5. Join C to D with the help of the ruler. $\overline{CD}$ should also be 5 cm.

   ∴ ABCD in the required square.

Constructing rectangles

We can construct a rectangle by adopting any of the two methods given below.

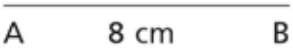
Constructing a rectangle using a set square and a ruler with given sides

Example:

Construct a rectangle using a set square and a ruler with sides $\overline{AB}$ = 8 cm, $\overline{AD}$ = 4 cm.

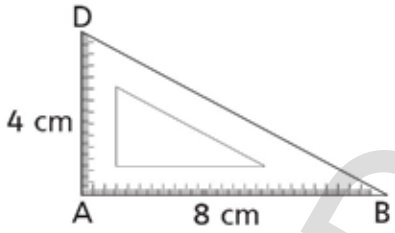
Construction Steps:

1. Draw a line $\overline{AB}$ of length 8 cm using a ruler.

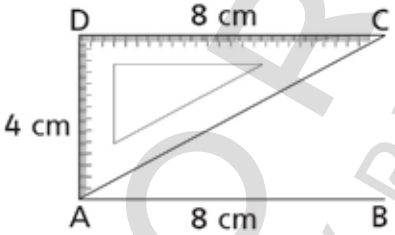


2. Set an edge of the set square on the given line so that the corner of the set square is at end A.

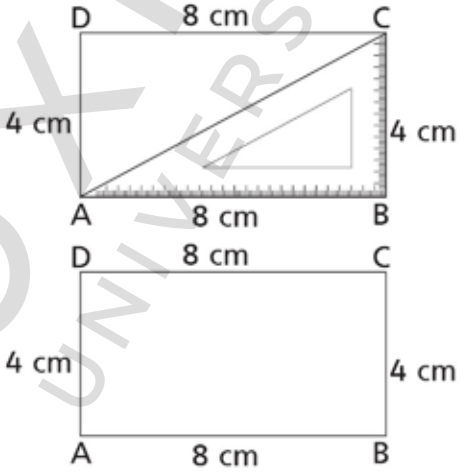
3. Holding the set square in place draw a perpendicular line of 4 cm from A. Mark this point as D.



4. Place the set square on line AD and draw another perpendicular line CD equal to 8 cm.



5. Now place the set square on line AB so that the corner of the set square is on B. Draw a perpendicular from B to C such that $\overline{BC}$ = 4 cm.



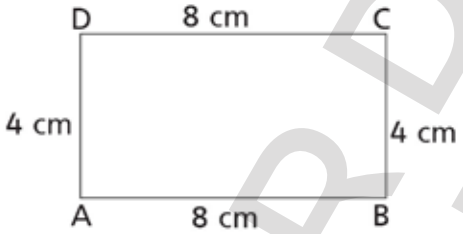
∴ ABCD is the required rectangle.

Constructing a rectangle using a protractor and a ruler with given sides

To construct a rectangle, follow the same steps as in the construction of a square.

As length and breadth of a rectangle are not the same, therefore, $m\overline{AB}$ will be equal to $m\overline{CD}$ and $m\overline{AD}$ will be equal to $m\overline{BC}$.

∴ ABCD will be the required rectangle.



▶ Exercise 7e

1. Fill in the blanks.
   a. A parallelogram with four equal sides is a _____.
   b. A quadrilateral with one pair of opposite and parallel sides is called a _____.
   c. A square has four equal sides and four equal _____.
   d. All quadrilaterals have _____ number of sides.
   e. In a parallelogram adjacent angles are _____.
2. State whether the following are True or False?
   a. The sum of all the angles of a quadrilateral is 360°. (_____)
   b. A square has only two right angles. (_____)
   c. The angles in squares and rectangles are the same. (_____)
   d. The opposite sides of a kite are parallel. (_____)
   e. Quadrilaterals are four-sided, closed figures. (_____)
3. Select the correct answer from the given options.
   a. Which one is the correct name for the given figure.

   Ⓐ Parallelogram
   Ⓑ Trapezium
   Ⓒ Rhombus
   Ⓓ Rectangle

b. Which of the following is not a property of a parallelogram?

Ⓐ A parallelogram is a quadrilateral
Ⓑ Opposite sides are equal and parallel
Ⓒ Two pairs of adjacent sides are equal
Ⓓ Opposite angles are equal

c. Which of the following shapes is a quadrilateral?

Ⓐ  Ⓑ  Ⓒ  Ⓓ 

d. The sum of the angles of a quadrilateral is always.

Ⓐ 270° Ⓑ 360° Ⓒ 180° Ⓓ 90°

e. The number of angles in a quadrilateral is

Ⓐ 3 Ⓑ 6 Ⓒ 4 Ⓓ 2

4. Name the following quadrilaterals.

a.  _____

b.  _____

c.  _____

d.  _____

e.  _____

f.  _____

5. Construct a square with the given sides.

a. 5 cm b. 8 cm c. 4.5 cm d. 6.8 cm

6. Construct a rectangle with the given sides.

a. 7 cm and 4 cm b. 11 cm and 8 cm

c. 10.2 cm and 6.3 cm d. 9.5 cm and 3.7 cm

Symmetry

In class 4 you have learnt to recognise lines of symmetry in two-dimensional (2D) shapes and complete a symmetrical figure with respect to a given line of symmetry on square grid/dot patterns.

Types of Symmetry

In this unit we will learn about two types of symmetry.

1. Reflective symmetry
2. Rotational symmetry

Reflective symmetry

Reflective symmetry is a type of symmetry where one half of an object is a reflection of the other half across a line without changing its size or shape.

A line of symmetry is a line that divides a figure into two mirror images which may be referred as **reflective symmetry**. The line where a mirror can be kept so that one half appears as the reflection of the other is called the **line of symmetry**.

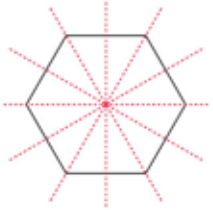
If a figure can be divided into equal parts that match, then it is said to have line symmetry or reflection symmetry. In other words, a figure has reflection symmetry if it can be reflected across a line and look the same as it did before the reflection. The reflected shape will be exactly the same as the original, the same distance from the mirror line and the same size.

Reflective symmetry is easy to see, because one half is the reflection of the other half. A figure can have one or more lines of symmetry. The line of symmetry can be in any direction.

Examples:

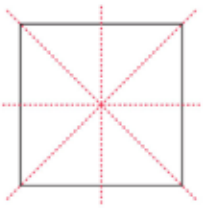
Regular polygons have as many lines of symmetry as their number of sides.

1. A regular hexagon has 6 lines of symmetry. Each line divides the hexagon into two equal parts, one mirror image of other that refers to reflective symmetry.

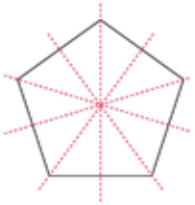


2. An equilateral triangle has 3 lines of symmetry. Each line divides the triangle into two equal parts, one mirror image of other that refers to reflective symmetry.

3. A square has 4 lines of symmetry. Each line divides the square into two equal parts, one mirror image of other that refers to reflective symmetry.



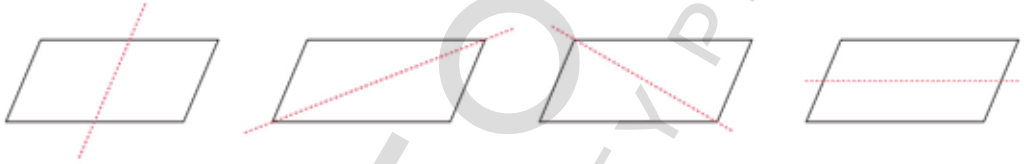
4. A pentagon has 5 lines of symmetry. Each line divides the pentagon into two equal parts, one mirror image of other that refers to reflective symmetry.



5. A rectangle has one vertical and one horizontal lines of symmetry. It is not symmetrical across its diagonals.

Reflective symmetry of Parallelogram.

A parallelogram may look symmetrical, but it is not symmetrical along any of the lines of reflection. Take cut-outs of the shapes and verify it.



Rotational symmetry

Rotation is the movement of an object along a circular path about a fixed point without changing its size or shape.

When a shape or figure can be rotated by an angle 0° to 360° about a point so that it coincides with the original shape, it is said to have a **rotational symmetry**. The point is called **point of rotation**.

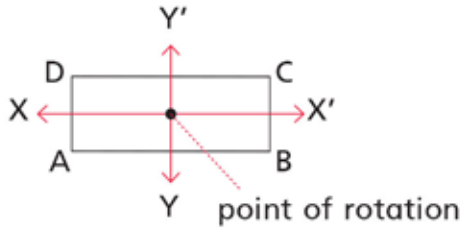
Order of Symmetry

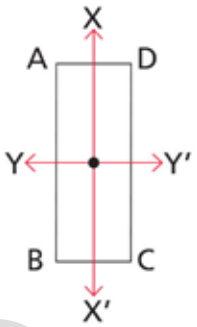
The order of symmetry of a figure or shape is the number of times it coincides with itself as it is rotated from 0° to 360° about a fixed point. As we know that regular polygons have equal side lengths so the order of symmetry is same as number of sides and angles.

Quarter turn

When a shape rotates in a circular movement, quarter turn means a rotation of 90°.

Look at the following rectangle.

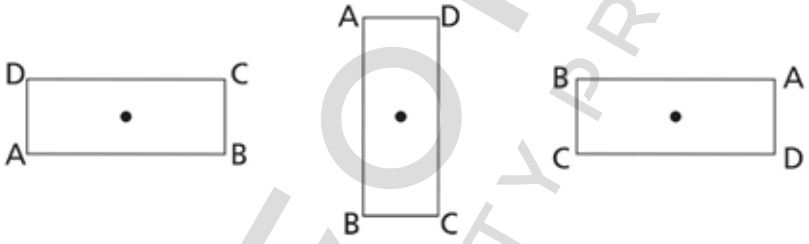




The rectangle has taken a turn of 90° i.e. quarter turn of 360° and changed its position from horizontal to vertical.

Half turn

Look at the following rectangle which takes a half turn i.e.180°. The rectangle has a rotational symmetry of order 2.

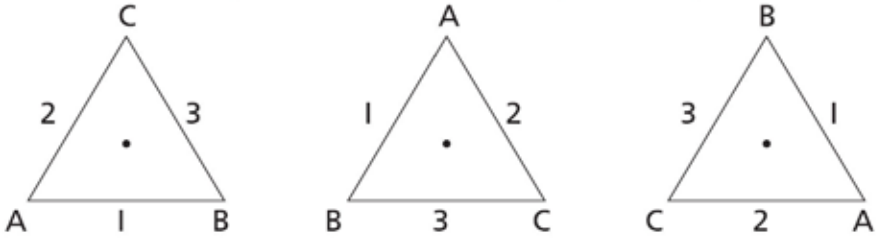


After half turn rectangle coincides the original shape. After another half turn it will again acquire the original shape and position. During a full rotation the rectangle coincides two times with its original shape and position so it has a rotational symmetry of order 2.

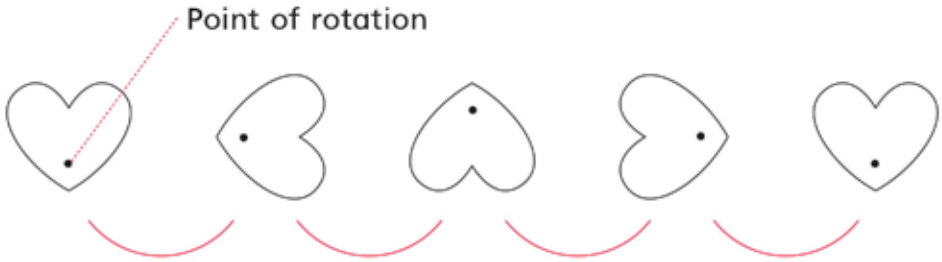
Many shapes such as rectangles, squares, circles, and all regular polygons have **rotational symmetry**. Choose an object and rotate it up to 180 degrees around its centre. If at any point the object appears exactly like it was before the **rotation**, then the object has a rotational symmetry.

Examples:

1. An equilateral triangle has **rotational symmetry** of order 3.



2. The order of rotational symmetry of a heart shape is 1.



During a full rotation the heart shape coincides with its original shape and position only once.

▶ Exercise 7f

1. How many lines of symmetry do the following shapes have?

a. b. c. d. e. f.

2. Find point of rotation and order of rotational symmetry.

a. b. c. d. e.

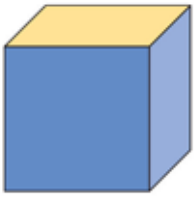
Three-dimensional Figures

Net of three-dimensional solids

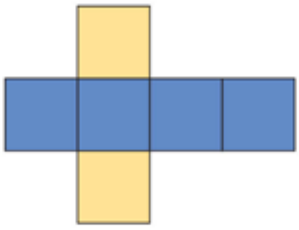
In previous classes you have learnt a lot about 3D solid shapes. Some of the solid shapes are cube, cuboid, cone, cylinder, pyramid, and sphere etc. In this unit you will learn that these solid shapes can be transformed into plane shapes. In other words, all the solid shapes can be split in plane shapes by opening them flat.

For example, let us take a cube and dissect it. Dissecting a cube means opening it along its edges. This is what it would look like

opened out flat. The open shape is called the **net of the solid** and it is a two-dimensional shape.



Cube

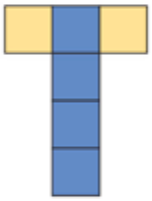


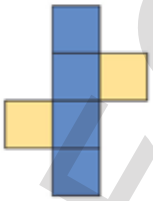
The open shape of the cube or the net of the cube

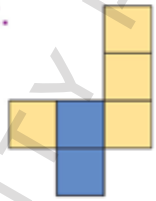
Therefore, when the surface of a three-dimensional figure is laid out flat showing each face of the figure a pattern is made which is known as the net of the three-dimensional figure. We can fold a net to make a three-dimensional figure also.

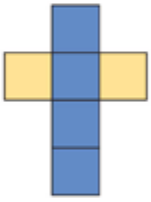
Net of a cube

A cube has six faces and can be opened differently getting different nets. Can you guess which of the following is not a net of a cube?

a. 

b. 

c. 

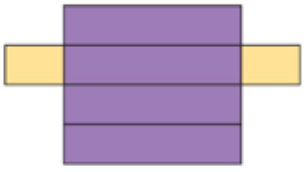
d. 

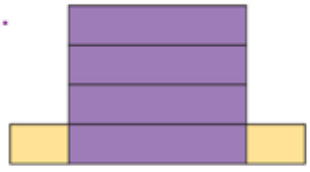
Net of a cuboid

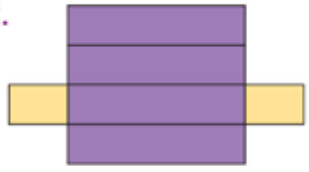
Now let us consider a cuboid. A cuboid has six faces and can also be laid out flat making a net of itself. A cuboid also has different nets with different arrangement of its faces.

Cuboid

Following are the different nets of a cuboid.

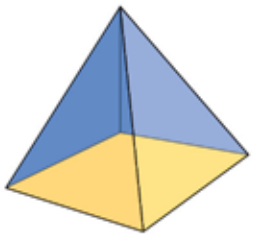
a. 

b. 

c. 

Net of a pyramid

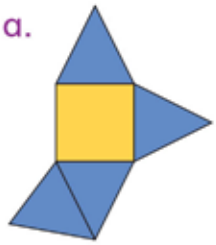
Now let us consider a square based pyramid. A square based pyramid has five faces and can also be laid out flat making a net of itself. A pyramid also has different nets with different arrangement of its faces.



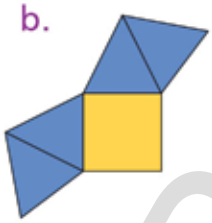
Square based pyramid

Following are the different nets of a square based pyramid.

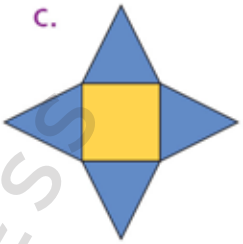
a.



b.



c.



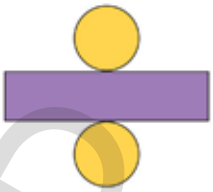
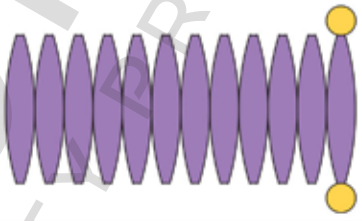
Three-dimensional objects

In geometry, **a three-dimensional** figure can be defined as a solid shape or an object that has three dimensions: length, width and height. Three-dimensional shapes have one more dimension as compared to two-dimensional shape that is thickness or depth or height.

We see three-dimensional objects all around us. Three-dimensional objects are described according to their faces, vertices, and edges. Some of the three-dimensional objects have been described for your information.

3D object	Number of faces	Number of vertices	Number of edges
Cube	6	8	12
Cuboid	6	8	12
Cylinder	3	0	2
Cone	2	1	1
Sphere	0	0	0
Pyramid	5	5	8

Three-dimensional objects can be made with the help of their nets. We have studied the nets of a cube, a cuboid, and pyramid. Now you will study some more three-dimensional shapes with their nets. You can make these solid shapes with the help of their nets.

Object	Shape	Net
Cylinder		
Cone		
Sphere		

▶ Exercise 7g

1. Complete the table.

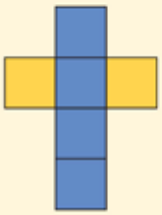
	Cube	Cuboid	Pyramid
Number of faces			
Net of the shape			

2. Draw two nets of a cuboid.

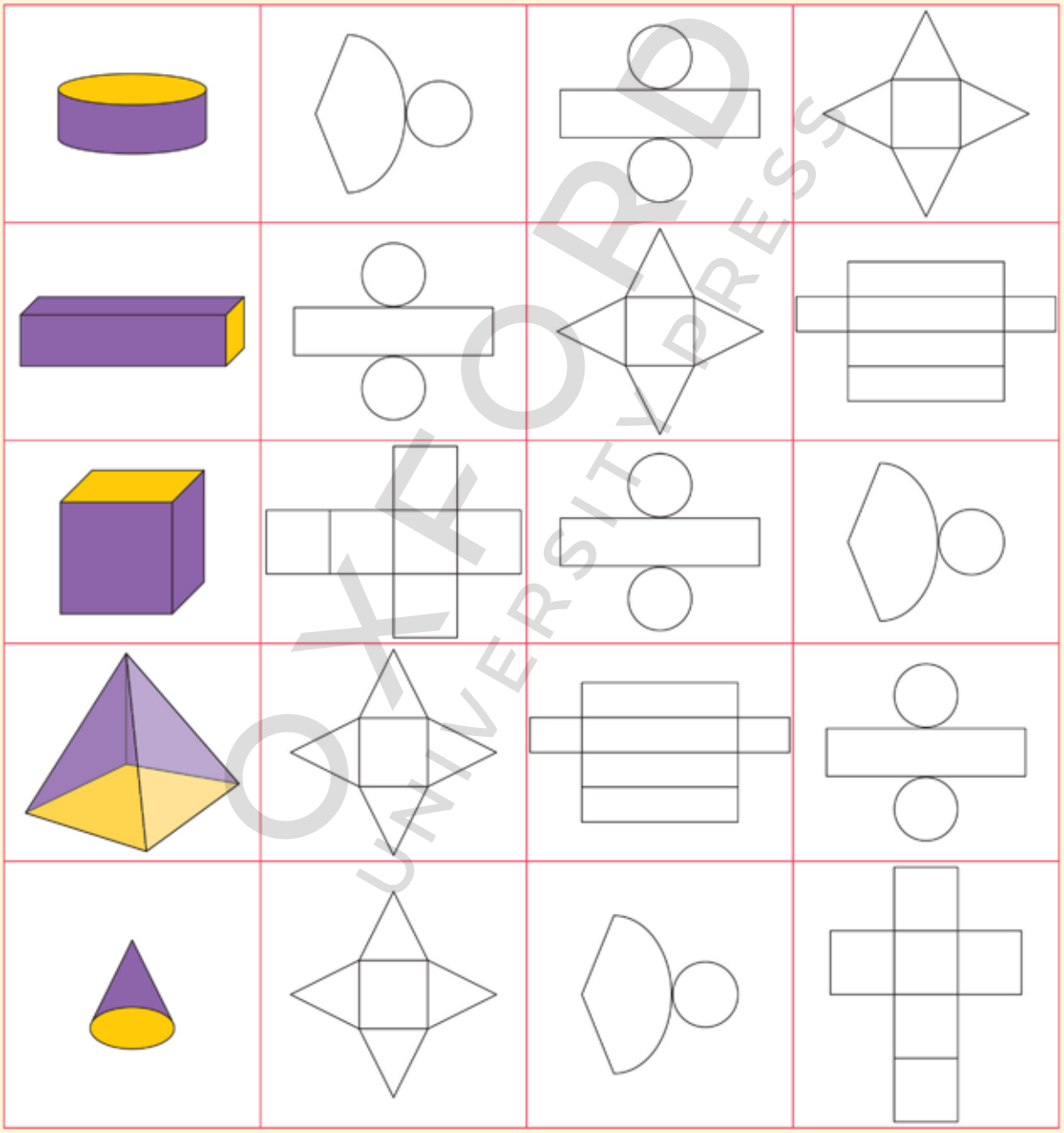
3. Which of the following shape represents a net of a cube?

a. 

b. 

c. 

4. Colour the correct net for each 3D shape.



YOUR DIGITAL RESOURCE

8 Perimeter and Area

In this unit students will learn to:

- differentiate between perimeter and area of a square and rectangular region
- identify the units for measurement of perimeter and area
- find and apply formulas to find perimeter and area of a square and rectangular region
- solve real life situations involving perimeter and area of square and rectangular regions

MATH FLASH

You have already learnt:

- to add units of length.
  Example:
  18 km + 25 km = 43 km
  29 m + 61 m + 34 m = 124 m
  7 cm + 90 cm + 83 cm = 180 cm
  Tip: The concept of adding similar units of lengths will help in finding the perimeter of various shapes.
- about closed shapes with three or more sides
  Example:

KEY VOCABULARY

region, closed figure, square grid, unit, perimeter, area, formula

Perimeter

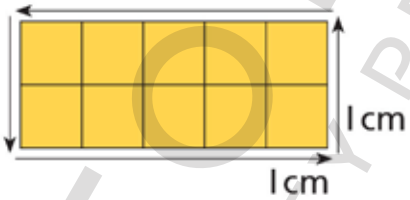
Perimeter is the path surrounding the area of a closed region. It is the sum of all the sides of a two dimensional shape.

Finding the perimeter of a shape using a square grid

If we take a square made up of four small squares with each side of 1 cm, then its perimeter is 8 cm.

(1+1+1+1+1+1+1+1) cm = 8 cm

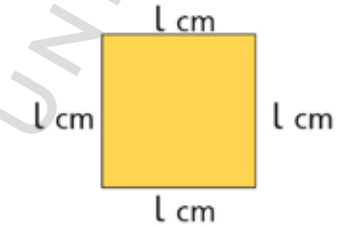
Look at the given rectangle. It is made up of 10 small squares, each with side 1 cm long.



The perimeter of the rectangle is the outside boundary of the squares. Thus, the perimeter of the given rectangle is 14 cm.

From the above examples we notice that the unit used for perimeter here is **centimetre** (cm).

Finding the perimeter of a rectangle and a square using the formula

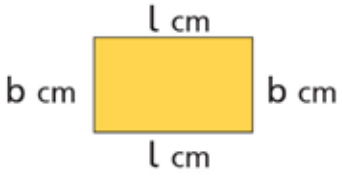


All the four sides of the given square are l cm each.

∴ Perimeter of a square = (l + l + l + l) cm
= 4l cm

Hence, the formula of the perimeter of a square = 4l

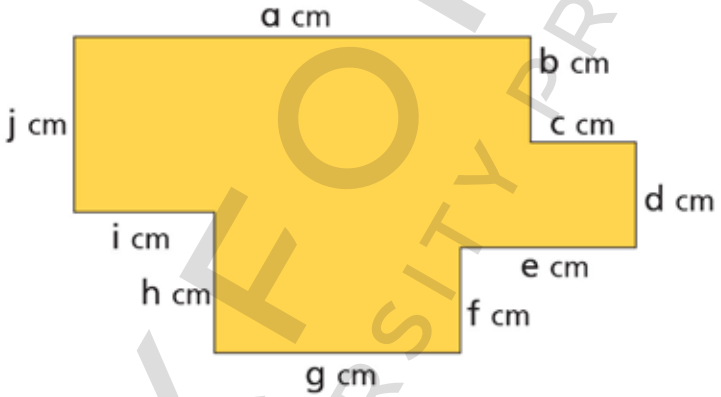
A rectangle has length 'l cm' and breadth 'b cm' as shown.



$\therefore$ Perimeter of a rectangle $= (l + b + l + b)$ cm
$= (l + l + b + b)$ cm
$= (2l + 2b)$ cm
$= 2\,(l + b)$ cm

Hence, the formula of the perimeter of a rectangle $= 2\,(l + b)$

For composite shapes we add all the outer sides of the shapes as given below:



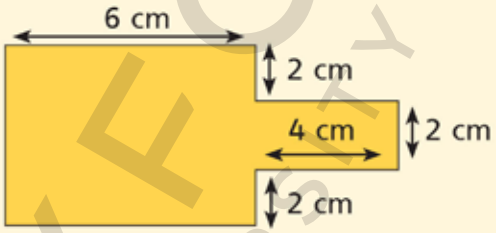
Perimeter of this composition $= (a + b + c + d + e + f + g + h + i + j)$ cm

▶ Exercise 8a

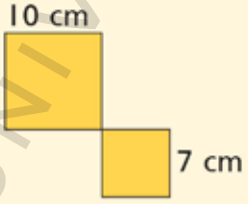
1. Fill in the blanks.
   a. We can find the perimeter of any _____ shape.
   b. Perimeter of a square with side l = _____ .
   c. Perimeter of a rectangle with sides l and b = _____ .
   d. The perimeter of a square with 8 cm each will be _____ .
   e. If the sides of a rectangle are 2 cm and 5 cm, then its perimeter will be _____ .

2. State whether the following are true or false.
   a. Perimeter is the sum of all the boundary lines of a shape. (_____)
   b. We can find the perimeter of rectangular shapes only. (_____)
   c. If the length and breadth of a rectangle is 13 cm and 15 cm respectively, then its perimeter is 28 cm. (_____)
   d. The perimeter of a square with side 23 cm is 92 cm. (_____)
   e. If the perimeter of a square is 28 cm, then its each side is 7 cm. (_____)

3. Select the correct answer from the given options.
   a. The perimeter of a square of side 'l' is measured by
      Ⓐ $l + l$ Ⓑ $4l$ Ⓒ l^2 Ⓓ $4l^2$
   b. If $l = 3$ cm and $b = 4$ cm, the units of perimeter will be
      Ⓐ cm^2 Ⓑ cm^3 Ⓒ cm Ⓓ m^2
   c. The perimeter of the following shape is

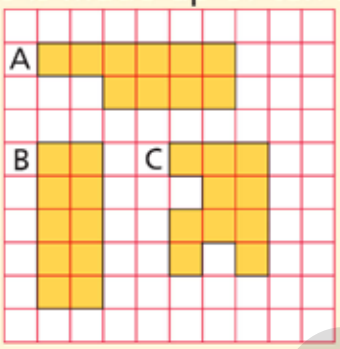


      Ⓐ 20 cm Ⓑ 32 cm Ⓒ 16 cm Ⓓ 28 cm
   d. The perimeter of the given shape is



      Ⓐ 34 cm Ⓑ 61 cm Ⓒ 68 cm Ⓓ 50 cm
   e. If 'l' is length and 'b' is breadth of a rectangle, then the formula to calculate its perimeter is
      Ⓐ $l \times b$ Ⓑ $l + b$ Ⓒ $(l + b) \div 2$ Ⓓ $2 (l + b)$

4. If each of these shapes is made up of ten squares, then:



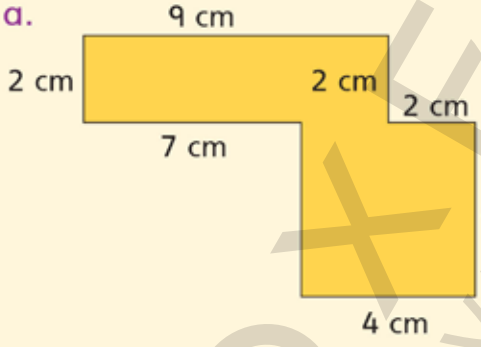
   a. calculate the perimeter of each shape.
   b. which has the greatest and which has the smallest perimeter?

5. Find the perimeter of each recangle.
   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

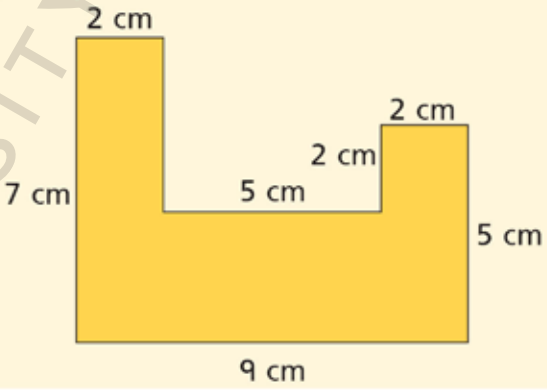
6. Find the perimeter of squares with the following sides using the formula.
   a. 30 cm
   b. 21 cm
   c. 106 cm
   d. 35 cm

7. Find the perimeter of the following shapes.

   a.



   b.



▶ Real-life Story Sums

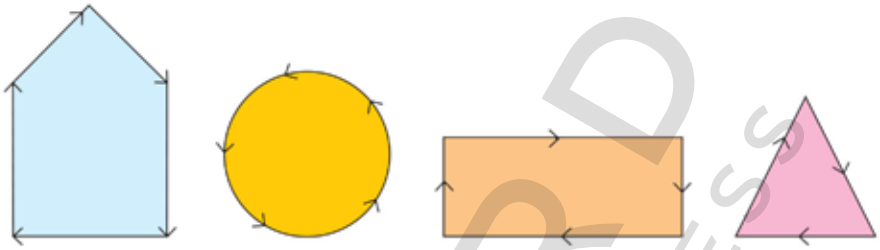
1. A rectangular swimming pool is 18 m long and 9 m wide. What is its perimeter?
2. If the dimensions of a rectangle are 8 cm by 12 m, what is its perimeter?
3. Find the perimeter of a square ground with each side of 100 m?
4. A farmer wants to put a fence around his field measuring 35 m and 50 m. How many metres of fence does he require?

Area

Region of a closed figure

Any shape surrounded from all the sides by a line where the starting and ending points of the line are the same, is a closed shape. The surface enclosed in a closed shape is the region of the closed shape.

Look at the following shapes.



The shaded parts are the region of each closed shape. Moreover, the shaded parts tell us the surface covered by the shapes.

The amount of surface a shape covers is called its **area**.

Look carefully at the given pairs of shapes. Tick (✓) the shape in each pair which has a greater area.

a. 

b. 

c. 

d. 

Tick (✓) the shape with the smaller area.

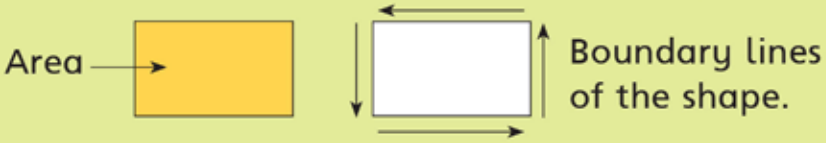
a. 

b. 

c. 

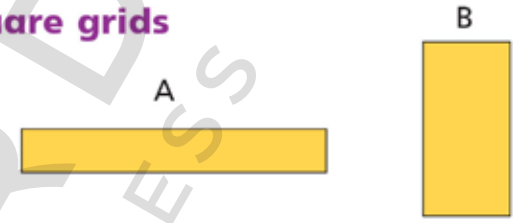
It is not easy to tell which shape has the greater area. To help us find out the area we use square grids.

Area and perimeter of a shape can be differentiated as follows:
Area is a surface covered by a closed region, while perimeter is the sum of the lengths of the boundary lines of the region.

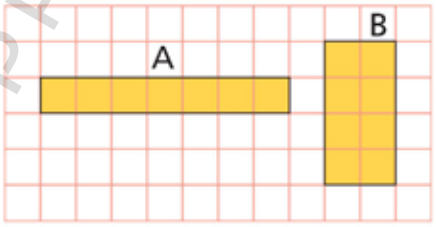


Finding the area of a shape using square grids

Look at these shapes.
It is not easy to tell which shape has the greater area.



To find out the area, let us put the shapes onto square paper.
How many squares does each shape cover?
Shape A covers 7 squares.
Shape B covers 8 squares.
So, B has a larger area than A.

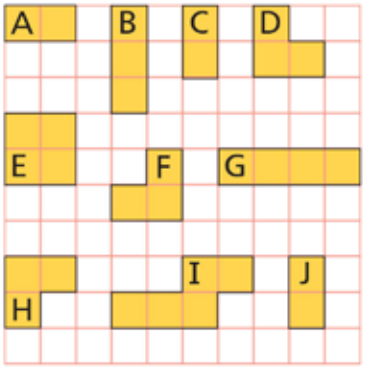


Look at the shapes marked on the grid.
Now answer these questions.

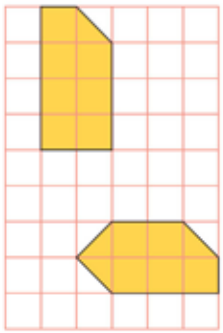
a. Which shapes have the same area as shape A?
C and J

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?
I has the largest area, A, C, and J have the smallest area.



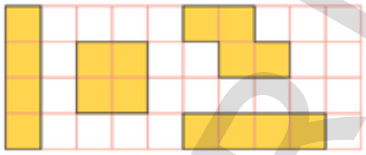
The area of this shape is $7\frac{1}{2}$ squares.



The area of this shape is $6\frac{1}{2}$ squares.
(5 whole squares + 3 half squares)

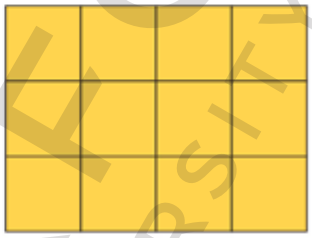
Example:

On squared paper, draw different shapes with an area of 4 squares each.



Unit of area

Here is a grid marked out in squares. With your ruler, find out how long each square's side is.

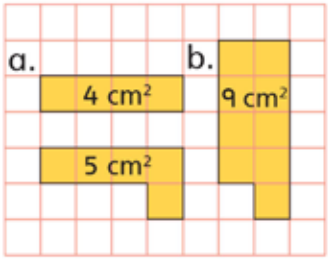


Each side is exactly 1 cm long. The grid is made up of 12 squares like this:

Each square has an **area** of **1 square centimetre.**

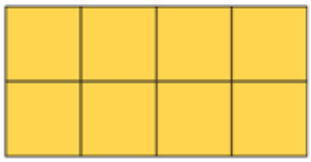
We say 'one square centimetre' and we write **1 cm²**.

Examples:



Finding the area of a rectangle and a square using the formula

Look at this rectangle. It is made up of 8 small squares, each with an area of 1 cm^2. Total area of the shape is 8 cm^2.



There are 2 rows of 4 squares each.

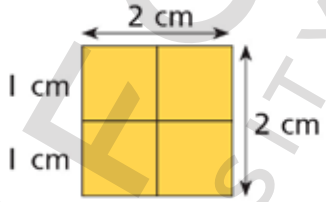
There is a very simple way of finding the area and perimeter of a rectangle.

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 = 8 cm^2.

Now, look at this square. It consists of 4 small squares each with an area of 1 cm^2.



The area of the four small squares = 4 cm^2 (There are four 1 cm^2)

To find the area of square we multiply length (l) by breadth (b), as we did for a rectangle. We know that the measure of length and breadth of a square is the same, hence:

$l \times b = l \times l = l^2$

$= 2 \times 2$

$= 4\ cm^2$

From the above description we deduce the formula for the area of a rectangle and a square

Area of a rectangle = $l \times b$

Area of a square = l^2

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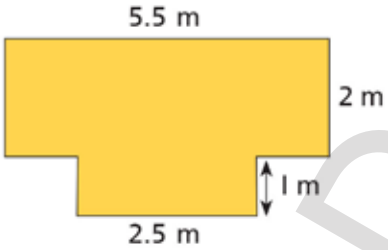
6, and 9.

6	a.		c.			d.	

Area of composite shapes

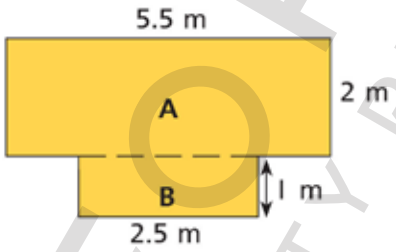
Very often we need to measure the areas of shapes which are **not** simple **squares** or **rectangles**.

For example, here is the floor plan of a living room:



How can we calculate its area?

Divide the shape into two rectangles.



Area of A = 5.5 m × 2 m = 11.0 m^2

Area of B = 2.5 m × 1 m = 2.5 m^2

The total area of the room = 11.0 m^2 + 2.5 m^2

= 13.5 m^2

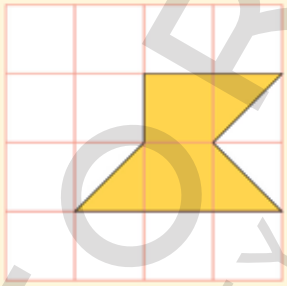
The area of the living room is 13.5 m^2.

▶ Exercise 8b

1. Fill in the blanks.
   a. The closed region in a shape is called its _____ .
   b. The area of a rectangle is equal to _____ $unit^2$.
   c. If l is one side of a square, then its area is _____ $unit^2$.
   d. In a rectangle l = 9 cm and b = 4 cm, then its area is _____ cm^2.
   e. The area of a square with side 1 cm will be _____ .

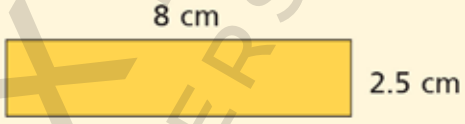
2. State whether the following are true or false.
   a. A square with side 4 cm and a rectangle with sides 8 cm and 2 cm have the same area. (_____)
   b. If the length of a rectangle is 15 cm and breadth is 10 cm, then the area of the rectangle is 25 cm^2. (_____)
   c. The area of a square with each side 5 cm is equal to 20 cm^2. (_____)
   d. The area of a composite shape can be found by dividing the shape in rectangles and squares. (_____)
   e. If l = 18 cm and b = 1 cm, then the area is 18 cm^2. (_____)

3. Select the correct answer from the given options:
   a. The area of the shaded part in the given figure is



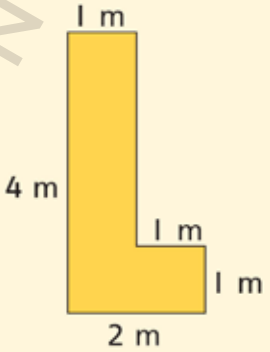
   Ⓐ $3\frac{1}{2}$ cm^2 Ⓑ 5 cm^2 Ⓒ 4 cm^2 Ⓓ 3 cm^2

   b. The area of the given rectangle is



   Ⓐ 16 cm^2 Ⓑ 200 cm^2 Ⓒ 20 cm^2 Ⓓ 10.5 cm^2

   c. The area of the given shape is



   Ⓐ 5 m^2 Ⓑ 8 m^2 Ⓒ 6 m^2 Ⓓ 9 m^2

d. If the perimeter of a square is 16 cm, then its area is

Ⓐ 8 cm² Ⓑ 12 cm²

Ⓒ 16 cm² Ⓓ 32 cm²

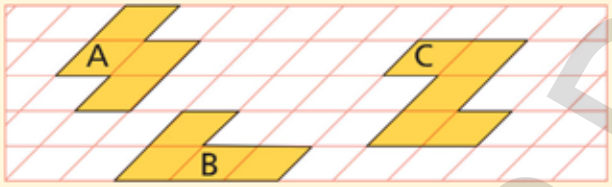
e. The side of a square is 11 cm. Its area will be

Ⓐ 11 cm² Ⓑ 121 cm²

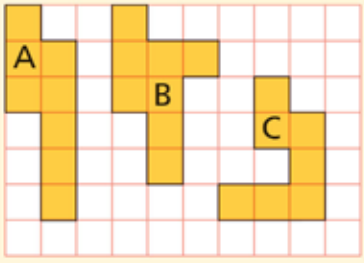
Ⓒ 121 cm Ⓓ 44 cm²

4. Which two shapes in each group have the same area?

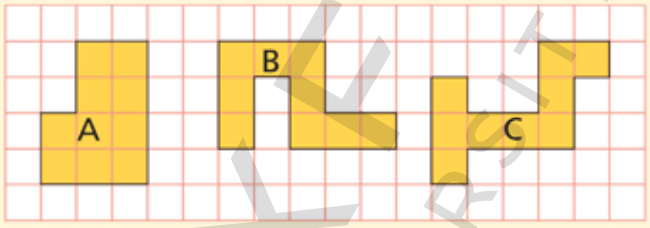
a.



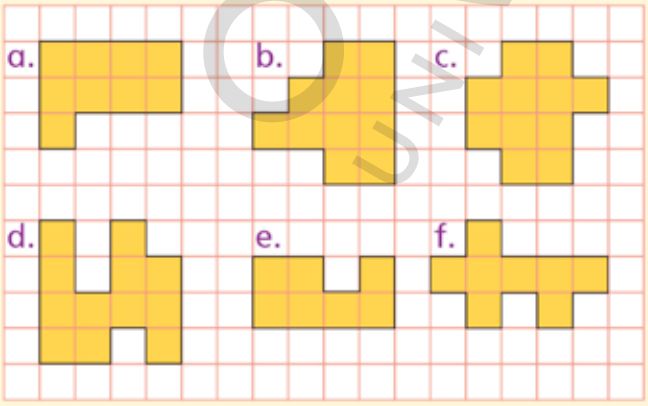
b.



c.

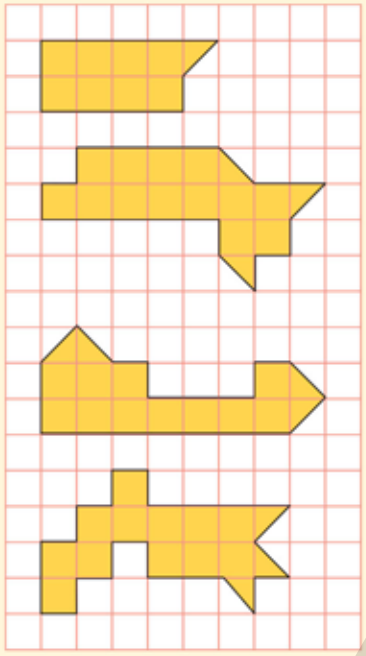


5. Find the area of these shapes, when each side of the small square is 1 cm.

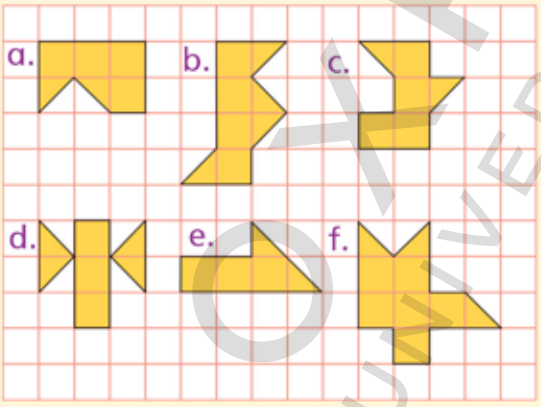


6. On squared paper, draw different shapes with an area of:
   a. 8 squares each
   b. 10 squares each
   c. 3 squares each
   d. 16 squares each

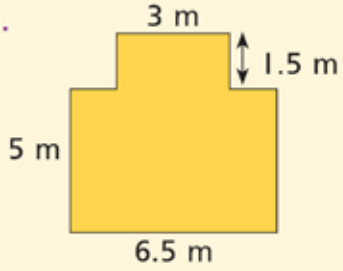
7. Find the area of each shape.

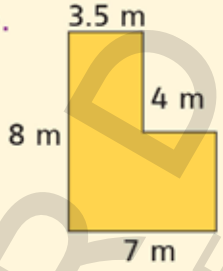


8. Which three shapes shown below have the same area?

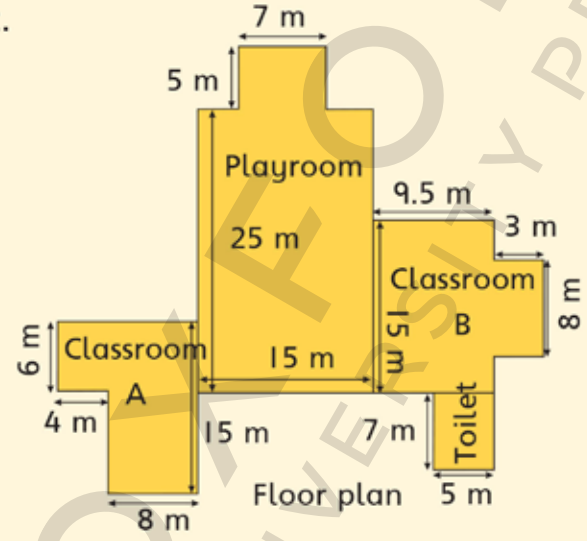


9. On a paper with centimetre squares, draw these shapes.
   a. A rectangle with an area of 8 cm^2.
   b. Any shape with an area of $10\frac{1}{2}$ cm^2.
   c. A square with an area of 16 cm^2.
   d. A rectangle with an area of 15 cm^2.

10. Use the formula to work out the area of the following rectangles.
    a. l = 10 cm, b = 7 cm
    b. l = 21 m, b = 5 m
    c. l = 18 cm, b = 9 cm
    d. l = 35 m, b = 6 m
11. Use the formula to workout the area of the following squares.
    a. l = 13 cm
    b. l = 40 cm
    c. l = 17 cm
    d. l = 12 cm
12. Work out these floor areas by dividing the shapes into rectangles.
    a.


    b.


13. This is a floor plan of a school building. Work out the area of each room in it.



▶ Real-life Story Sums

1. A rectangular field is 20 m × 15 m. What is its area?
2. The area of a fertile field is 512 m². A square piece of field with side 20 m is used to plant potatoes. How much area is left unplanted?
3. If the area of a room is 270 m² and its length is 18 m, find its breadth.

YOUR DIGITAL RESOURCE

9 Data Handling

In this unit students will learn to:

- find and describe average of given quantities in the data
- solve real life situations involving average
- organise the given data using bar graph
- read and interpret a bar graph given in horizontal and vertical form
- draw horizontal and vertical bar graphs for given data
- solve real life situations using data presented in bar graphs

MATH FLASH

You have already learnt:

- that block graphs are used to represent data
- that in a block graph and a line graph, types of items are indicated on the horizontal axis and the number of items are presented on the vertical axis
- to read and interpret bar graphs in vertical and horizontal form
- to read and interpret line graphs

KEY VOCABULARY

average, block, column, bar, graph, data, information, tally marks, vertical axis, horizontal axis, scale

Averages

Here are the exam results of three students of class 5:

Ahsan	
Maximum marks of each subject: 100	
Math	92%
English	74%
Science	68%
History	22%
Geography	58%
Urdu	16%

Bilal	
Maximum marks of each subject: 100	
Math	75%
English	43%
Science	100%
History	49%
Geography	53%
Urdu	64%

Taha	
Maximum marks of each subject: 100	
Math	86%
English	64%
Science	72%
History	90%
Geography	30%
Urdu	88%

The teacher wants to find out which of these students have done the best work, overall. She first adds up the total marks of each student.

Ahsan scores: 92 + 74 + 68 + 22 + 58 + 16 = 330 marks

Bilal scores: 75 + 43 + 100 + 49 + 53 + 64 = 384 marks

Taha scores: 86 + 64 + 72 + 90 + 80 + 88 = 480 marks

From this, the teacher sees that Taha has got the highest **total** marks. She now divides each total by the number of subjects to arrive at the **average** marks scored by each student.

Ahsan: $\frac{330}{6}$ Average marks = 55%

Bilal: $\frac{384}{6}$ Average marks = 64%

Taha: $\frac{480}{6}$ Average marks = 80%

$$\text{Average} = \frac{\text{Sum of values}}{\text{Number of values}}$$

The term average refers to the middle or central point in a data. It help us make sense of the information and data we see all around us.

For example, a doctor may wish to know the height of children aged 10 years. He can do this by measuring and writing down the heights of some children.

Rabia's height: 145 cm

Ayesha's height: 148 cm

Maria's height: 143 cm

Saher's height: 147 cm

Arif's height: 150 cm

There is a difference in height between Maria and Arif, despite the fact that they are of the same age. The data is not very useful to the doctor until he works out the average.

$$\text{Average height} = \frac{\text{Total height}}{\text{Number of children}} = \frac{733 \text{ cm}}{5} = 146.6 \text{ cm}$$

The doctor gets the useful information that the **average height** of children aged 10 is 146.6 cm. He can then see how many children are **above** the average height and how many are **below** the average height.

Example:

Find the average of 12, 6, 21, and 13.

Solution:

12 + 6 + 21 + 13 = 52

Total number of quantities = 4

Average = 52 ÷ 4

= 13

REMEMBER

To find the average of a set of quantities, add them together, then divide the total by the number of quantities.

▶ Exercise 9a

1. Fill in the blanks.
   a. An average is obtained by adding the quantities together and dividing the sum by _____ .
   b. Average tells about the central value of _____ .
   c. The average of 7, 9, 10 and 18 is _____ .
   d. The average of 1000, 1000, and 1000 is _____ .
   e. To find the average of 18, 14, 15, and 17 we divide _____ by 4.
2. State whether the following are true or false.
   a. The average of the first five numbers is 3. (_____)
   b. The average is the largest value in a data. (_____)
   c. To find the average we divide the sum of data by the number of quantities. (_____)
   d. The average of 2.5, 4.5 and 6.5 is not 4.5. (_____)
   e. If the sum of the heights of 20 girls is 2640 cm, their average height will be 132 cm. (_____)

3. Select the correct answer from the given options.

a. The average of 10, 20, and 30 is

Ⓐ 60 Ⓑ 6 Ⓒ 20 Ⓓ 180

b. To find the average of 2.5, 3.5, 4.5, and 5.5, we divide their sum by

Ⓐ 2 Ⓑ 4 Ⓒ 8 Ⓓ 10

c. If each of the 5 logs is 5 m long, then the average length is

Ⓐ 30 m Ⓑ 125 m Ⓒ 25 m Ⓓ 5 m

d. To find the average of a set of quantities, the quantities are

Ⓐ added Ⓑ multiplied Ⓒ subtracted Ⓓ divided

e. The average of a data will be

Ⓐ the highest value Ⓑ the lowest value
Ⓒ the mean value Ⓓ an odd number

4. Work out the average of these sets.

a. 14, 27, 5, 19, 10
b. Rs 36, Rs 14, Rs 17, Rs 42, Rs 101
c. 8 cm, 25 cm, 15 cm, 32 cm, 10 cm

5. Below are the weights recorded for four 10-year-old children. Work out the average weight of the children.

Name	Weight
Mona	34.0 kg
Kashif	36.2 kg
Aslam	35.8 kg
Insia	40.0 kg

▶ Real-life Story Sums

1. Saad buys a kilogram of the biscuits from a bakery on 6 different days. The prices he pays are Rs 8, Rs 10, Rs 7.50, Rs 12, Rs 11.75, and Rs 9.25. Find the average price.
2. Over a 4-month period, Moiz's monthly income was Rs 5000, Rs 4000, Rs 2500, and Rs 1000. What was his average income for that period?
3. Study the table given below. It shows the number of girls and boys studying at a primary school.

Class	Girls	Boys
KG I	24	20
KG II	21	23
1	26	20
2	25	19
3	18	26
4	20	24
5	27	22

Find

a. The average number of girls in each class.
b. The average number of boys in each class.
c. The total number of children in the school.
d. The average number of children in each class.

Block graph

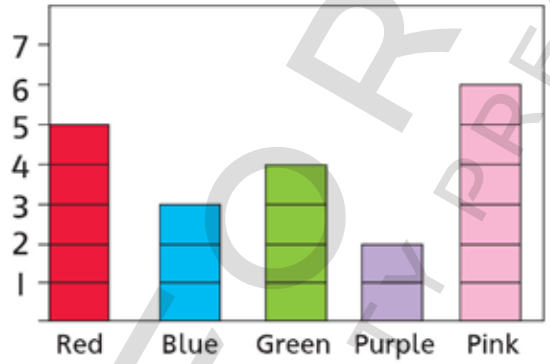
We have already learnt that block graphs are used to represent data. In a block graph, types of items are indicated on the horizontal axis and the number of items are presented on the vertical axis.

For example, children in a group of 20 may be asked to compile the data of their favourite colours like, red, blue, green, purple and pink. First, they will have to keep a tally of the colours liked by different children in the group.

Colours	Number of children
Red	□□□□□
Blue	□□□
Green	□□□□
Purple	□□
Pink	□□□□□□

Key: □ = 1 child

The above data can now be represented on a chart made up of squares as given below.

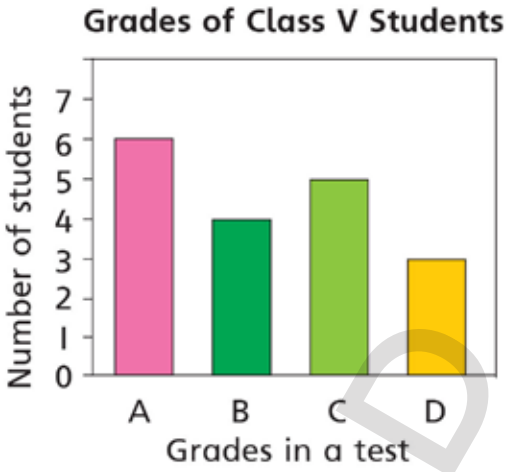


Column graph and bar graph

A column graph displays data in vertical bars.
Graphs have four components.

1. Title: It gives us the information displayed on the graph.
2. Labels: They are displayed on the horizontal and vertical axes to tell what is shown on each axis.
3. Scales: These are the numbers representing the units used. They increase from bottom to top by an equal amount.
4. Categories: Categories are represented by the bars and labelled under each bar.

Example:



Title: Grades obtained by Class V students in a test.
Labels: Number of students and Grades in a test.
Scale: One square = One student
Categories: A, B, C, and D

The above chart displays a column graph displaying the grades obtained by 18 students in the test.

Bar graph

A bar graph or bar chart is a representation of data which helps us compare information.

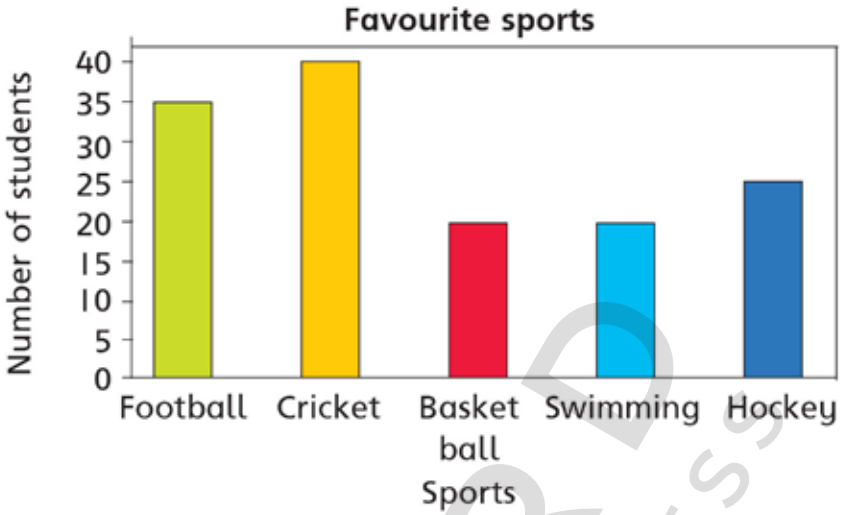
For example, the number of people travelling by car, bus, and on foot.

In a column and bar graph, the numerical data is represented by rectangles, called **bars**, of equal width and with equal spacing between each bar. Remember each bar represents one numerical data, therefore, there will be as many bars as the number of values in the numerical data.

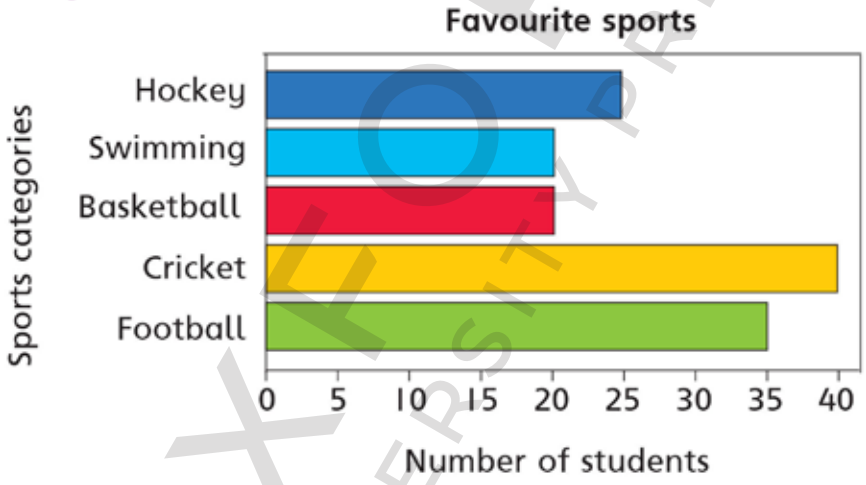
Data can be displayed vertically and horizontally through bar graphs.

Example:
A PE teacher wants to know which game the students like the most. He conducted a survey, taking information from 140 students about their favourite sports. This information was then represented on a bar graph.

Vertical representation



Horizontal representation



Now, carefully go through the following questions and their answers.

1. What does the title of the given bar graph show?
   Favourite sports by a group of students.
2. How many students have been surveyed?
   35 + 40 + 20 + 20 + 25 = 140 students
3. What sport is liked most?
   Cricket
4. Which sports are liked least?
   Swimming and basketball.
5. Cricket and football are liked by how many students altogether?
   35 + 40 = 75 students

Data

A collection of facts and statistics gathered or available for analysis and calculation about a specific topic is called **data**.

Organising data means arranging the data to make it meaningful, easy to understand, and more useful. It is helpful in presenting, analysing and drawing conclusions about data in numerical forms. To organise data, we first make a data collection table.

Example:

Given below is the random data of numbers occurring repeatedly. Arrange this data in a collection table.

4, 3, 5, 9, 5, 2, 2, 7, 8, 9, 8, 6, 4, 11, 13, 10, 12, 13, 11, 7, 8, 8, 10, 1, 8, 2, 3, 12, 2, 4, 2

Solution:

Here the lowest number is 1 and the highest number is 13.

We can now organise this data as shown.

The simplest way to organise data is to use **tally marks**. Basically a tally mark represents the number of times a particular situation occurs.

For example, if one student likes to play cricket, we mark one tally '/' in the table against cricket.

We mark like this '////' till 4 students.

When the fifth student says he likes cricket, we do not write '/////'.

Instead we mark a line diagonally or horizontally across the four tally marks like ~~////~~ or ~~////~~ to form a group of 5.

The addition becomes easier when we add in 5s.

For example, 7 values will be expressed as ~~////~~ // and 10 values will be written as ~~////~~ ~~////~~ and so on.

Data	Tally marks	Number of occurrence
1	/	1
2	𝍸	5
3	//	2
4	///	3
5	//	2
6	/	1
7	//	2
8	𝍸	5
9	//	2
10	//	2
11	//	2
12	//	2
13	//	2
		31

The randomly occurring numbers (data) have been organised in particular groups. This organised data can be used to make a bar graph either vertically or horizontally.

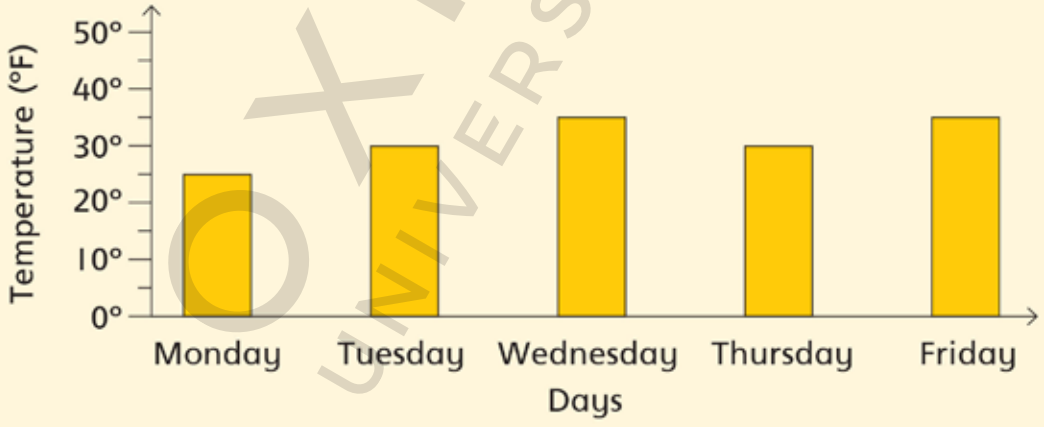
We can summarise data handling as follows:

▶ Exercise 9b

1. Fill in the blanks.
   a. The randomly collected information about an event or category is known as _____ .
   b. Bar graphs can be represented horizontally or _____ .
   c. The topic of the graph is known as _____ .
   d. Graphs are made on two axis _____ and _____ .
   e. Graph represented in blocks is known as _____ graph.

2. State whether the following are true or false.
   a. Bar graphs have space between the bars. (_____)
   b. In a column graph, columns are drawn horizontally. (_____)
   c. A vertical bar graph can also be represented horizontally. (_____)
   d. Title of the graph means unit taken on horizontal axis. (_____)
   e. The information shown on the horizontal and vertical axes are known as labels. (_____)

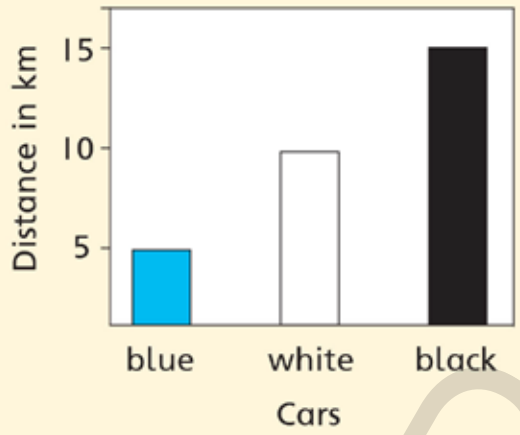
3. Select the correct answer from the given options.
   a. A record of the temperature from Monday to Friday is given in the bar graph below.



By how many degrees is the temperature on Monday less than the temperature on Wednesday?

Ⓐ 60°F Ⓑ 35°F Ⓒ 10°F Ⓓ 25°F

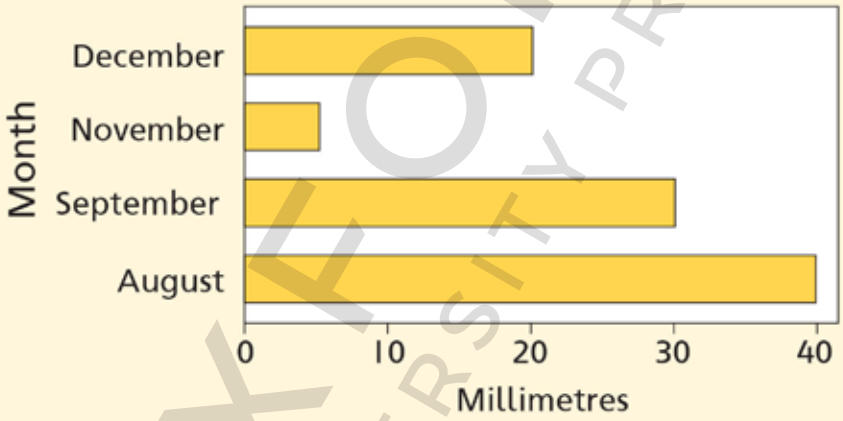
b.



The total distance covered by all three cars is

Ⓐ 15 km Ⓑ 20 km Ⓒ 30 km Ⓓ 10 km

c. The following graph shows the record of rainfall in August, September, November, December.



The rainfall in December is

Ⓐ double of November Ⓑ more than September

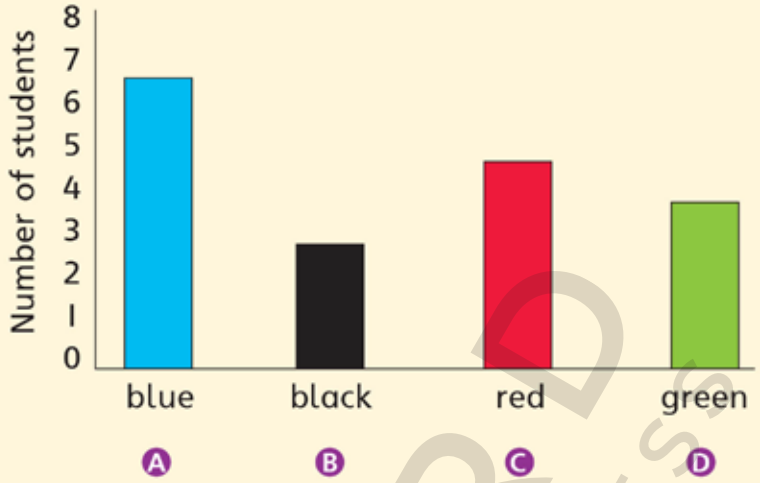
Ⓒ half of August Ⓓ equal to September

d. Column graphs are represented

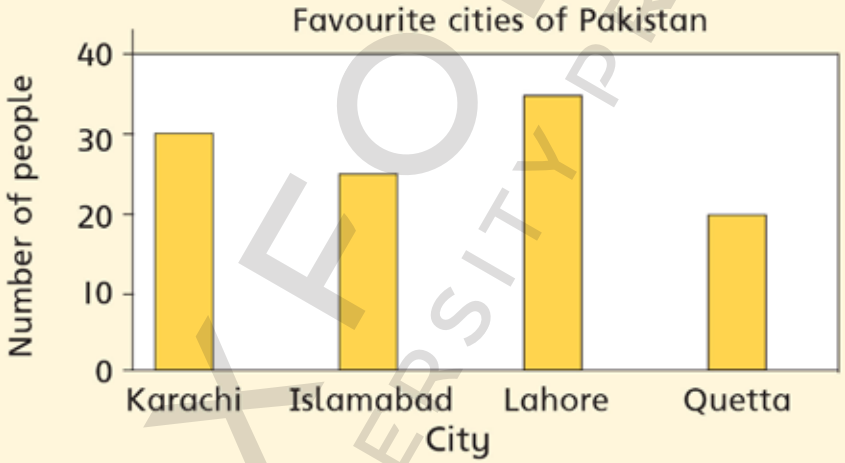
Ⓐ horizontally Ⓑ in boxes

Ⓒ in a line Ⓓ vertically

e. In the following bar graph identify the least favourite colour of students of class 5.



4. Interpret the following bar chart.



Answer the following questions.

a. How many people like Islamabad?
b. How many people like Lahore?
c. Which is the most liked city?
d. What is the total number of people who liked Karachi and Islamabad?
e. What is the total number of people surveyed for this data?

5. The data given below indicates the number of children engaged in different activities.

Activities	Sketching	Singing	Dancing	Outdoor games	Video games
No. of children	15	12	14	20	25

Draw a horizontal bar graph to display the given data.

6. Following is the weight (in kg) of 20 students of Class V.
20, 15, 12, 14, 14, 15, 12, 12, 16, 16, 13, 12, 20, 18, 18, 16, 15, 14, 14, 19

Construct a table and draw a vertical bar graph for the data given above.

Numbers

1. Write in expanded form.
   a. 962 430
   b. 720 482
   c. 2 464 209
   d. 6 730 141
2. Write each number in International system.
   a. 605003
   b. 8532986
   c. 462456
   d. 6040564
3. Write vertically and solve.
   a. 4 695 132 + 69 549 + 5905
   b. 1 680 519 − 893 745
   c. 16 213 × 264
4. Divide using long division method.
   a. 46 239 ÷ 38
   b. 38 168 ÷ 46
5. Round off to the nearest 10.
   a. 269
   b. 8490
   c. 7851
6. Round off to the nearest 100.
   a. 506
   b. 6952
   c. 45 023
7. Round off to the nearest 1000.
   a. 11 425
   b. 438 421
   c. 6 846 680

WORKSHEET 2

1. Write these numbers in International system.
   a. 4900938 b. 1670324
2. Round off to the nearest 100.
   a. 15 550 b. 84 472
3. Copy and complete.
   a. 384 691 ÷ 372 b. 605 827 ÷ 453
4. Put the correct sign (>, < or =) in the box.
   a. 8 404 567 ☐ 8 404 657 b. 6 005 426 ☐ 6 005 246
   c. 8 194 250 ☐ 8 194 250
5. Write your answer in words.
   a. 100 more than 999 999 b. 1000 more than 1 890 999
   c. The successor of 2 617 599
6. Add these numbers.

```
  1 0 1 1 0 0
  2 5 6 0 3 1
  4 8 5 9 2 1
+ 6 3 1 1 5 9
-------------
```

   Write the total according to the International system.

   ☐

7. Add the smallest 7-digit number to the greatest 5-digit number. Write your answer in words.
8. What is the difference between the place value of the 2s in 8 234 260?
9. Write the numbers in International System.

	Number	International System
a.	3462054	
b.	7258900	
c.	1050000	

WORKSHEET 3

Choose the correct answer from the given options.

1. What is the value of the digit 6 in 60 594?

   a. 6000 b. 60 000

   c. 600 d. 600 000

2. The sum of the place value of 6 in the numeral 646 060 is

   a. 606 060 b. 660 000

   c. 660 600 d. 600 000

3. The product of 840 and 1000 is

   a. 84.20000 b. 84 000

   c. 840 000 d. 8400

4. The predecessor of 907 000 is

   a. 907 600 b. 906 000

   c. 906 999 d. 907 199

5. 9999 + 999 = _____

   a. 10 000 b. 10 999

   c. 10 900 d. 10 998

6. If 9 pens cost Rs 135, what will the cost of one pen be?

   a. Rs 6 b. Rs 9.50

   c. Rs 11.20 d. Rs 15

7. The greatest 6-digit number that can be formed using the digits 2, 0, 1, 5, 7, 8 is

   a. 105 782 b. 875 210

   c. 857 210 d. 872 510

WORKSHEET 4

Choose the correct answer and underline it.

1. 99 ÷ 11 has the same value as:

   a. (2 + 3) + 4 b. 3 × (3 × 2)

   c. 99 ÷ 10 + 1 d. 11 − 2 × 0

2. What is $1\frac{4}{5} \times \frac{2}{3}$?

   a. $1\frac{1}{5}$ b. $1\frac{4}{5}$ c. $\frac{8}{15}$ d. $1\frac{8}{15}$

3. 8649 rounded off to the nearest 100 is

   a. 8600 b. 8650 c. 8610 d. 8700

4. 13.8 × 10 is the same as

   a. 138 b. 1380 c. 13800 d. 138.5

5. The prime number after 19 is

   a. 21 b. 24 c. 23 d. 29

6. What will the cost of 70 cans of cola be, when one costs Rs 7.70?

   a. Rs 539.00 b. Rs 5390 c. Rs 593 d. Rs 5390.50

7. Which of these is divisible by 4?

   a. 1650 b. 2832 c. 1718 d. 3910

8. What is the value of 55.899 when rounded off to 2 decimal places?

   a. 55.90 b. 56 c. 55.00 d. 55.80

HCF and LCM

1. Tick (✓) only those numbers which are divisible by 4.

   a. 624 b. 308 005 c. 3060 d. 864 442

2. Circle those numbers, which are divisible by 6.

   a. 1572 b. 18 060 c. 43 034 d. 66 603

3. Write any 4-digit number which is divisible by 3 but not by 6.

4. Tick (✓) only the numbers which are divisible by 8.

   a. 846 000 b. 22 408 c. 1318 d. 903 000

5. Write the numbers whose prime factors are shown, using brackets to help you.

   a. $2 \times 2 \times 2 \times 3 \times 3 \times 5$ b. $2 \times 3 \times 3 \times 7$

6. Break down these numbers into their prime factors, using the division method.

   a. 148 b. 210 c. 365

7. Find the HCF of these sets, using the division method.

   a. 36 and 108 b. 24, 112 and 72

   c. 38, 95 and 114

8. Find the LCM of these pairs of numbers, remembering to include common factors only once.

   a. $2 \times 2 \times 3$ and $2 \times 2 \times 2 \times 3$ b. $3 \times 3 \times 5$ and $3 \times 5 \times 7$

   c. $5 \times 5 \times 7$ and $2 \times 5 \times 7$

9. Find the LCM of these sets.

   a. 9, 18 and 21 b. 10, 14 and 30

   c. 12, 16 and 20 d. 24, 30 and 40

Fractions

1. Reduce these fractions to their lowest terms.
   a. $\frac{25}{55}$ b. $\frac{72}{81}$ c. $\frac{27}{270}$
2. Complete the equivalent fractions.
   a. $\frac{4}{7} = \frac{\square}{35}$ b. $\frac{64}{88} = \frac{8}{\square}$ c. $\frac{25}{40} = \frac{\square}{8}$ d. $\frac{\square}{42} = \frac{5}{6}$
3. Write these as mixed numbers.
   a. $\frac{25}{3}$ b. $\frac{61}{8}$ c. $\frac{77}{10}$
4. Write these as improper fractions.
   a. $5\frac{11}{12}$ b. $7\frac{2}{7}$ c. $10\frac{2}{5}$ d. $12\frac{6}{7}$
5. Fill in the missing numbers.
   a. $\frac{7}{8} = \frac{}{96}$ b. $\frac{8}{9} = \frac{112}{}$ c. $\frac{72}{96} = \frac{}{}$
6. Reduce these to their lowest terms, then change into mixed numbers.
   a. $\frac{38}{16}$ b. $\frac{44}{24}$ c. $\frac{110}{60}$
7. Rewrite these fractions so that they have a common denominator.
   a. $\frac{2}{7}$ and $\frac{3}{14}$ b. $\frac{21}{32}$ and $\frac{3}{8}$ c. $\frac{5}{8}$ and $\frac{3}{20}$ d. $\frac{3}{4}$ and $\frac{9}{10}$
8. Complete these, making sure each answer is in its lowest terms.
   a. $\frac{2}{5} + \frac{1}{4}$ b. $5\frac{3}{4} + 2\frac{5}{6}$ c. $1\frac{5}{6} + \frac{2}{5}$ d. $2\frac{5}{6} + \frac{2}{2}$
9. Now, subtract. Write each answer in its lowest terms.
   a. $5\frac{1}{2} - 3\frac{3}{8}$ b. $7\frac{2}{3} - 3\frac{3}{10}$ c. $8\frac{1}{3} - 4\frac{1}{9}$ d. $12\frac{2}{5} - 6\frac{7}{8}$

WORKSHEET 7

1. Copy and complete the table.

	$\frac{1}{6}$ of $\frac{1}{2}$	is the same as	$\frac{1}{6} \times \frac{1}{2}$	=	$\frac{1}{12}$
a.	$\frac{2}{3}$ of $\frac{1}{5}$				
b.	$\frac{3}{4}$ of 2				
c.	$\frac{7}{8}$ of $\frac{2}{3}$				

2. Solve these, giving each answer in its lowest terms.

   a. $\frac{5}{8} \times \frac{3}{4} \times 1$ b. $\frac{2}{3} \times \frac{5}{6} \times 0$ c. $1\frac{5}{6} \times \frac{7}{11}$ d. $3\frac{1}{8} \times \frac{2}{5}$

3. Write the reciprocals of the following.

   a. $21\frac{1}{5}$ b. $10\frac{4}{5}$ c. $2\frac{1}{4}$

   d. $\frac{1}{999}$ e. 100 f. $15\frac{1}{3}$

4. Solve these.

   a. $18 \div \frac{3}{4}$ b. $\frac{1}{4} \div \frac{2}{3}$ c. $\frac{1}{8} \div 3$ d. $1 \div \frac{15}{16}$

5. Solve these, thinking carefully about which operation you need to use. Make complete statements.

   a. Babar starts the day with 15 kg of potatoes for sale in his shop. He sells $4\frac{2}{5}$ kg before 10 a.m. and $6\frac{1}{10}$ kg between 10 a.m. and noon. What weight is left over for the afternoon? Give your answer (i) in fractions; (ii) in kg and g.

   b. Salim took $\frac{3}{4}$ hours to draw a picture. Saad took only $\frac{4}{5}$ of the same period of time to draw a picture. How long did Saad take to complete his picture? Give your answer (i) in minutes; (ii) as a fraction of an hour.

WORKSHEET

Decimals

1. Write these common fractions as decimals.
   a. $3\frac{1}{2}$ b. $\frac{1}{10}$ c. $2\frac{7}{10}$ d. $100\frac{1}{2}$
   e. $10\frac{3}{5}$ f. $3\frac{4}{5}$
2. Change into common fractions.
   a. 10.01 b. 18.05 c. 35.75 d. 25.25
   e. 33.04 f. 100.2
3. Write these lengths in cm.
   a. 6 cm 5 mm b. 15 cm 9 mm
   c. 10 cm 1 mm d. 8 cm 7 mm
4. Copy and fill in the missing symbols (+, −, ×, or ÷).
   a. 0.06 _____ 10 = 0.6 b. 5.91 _____ 10 = 0.591
   c. 9.1 _____ 2.1 = 7 d. 2.02 _____ 1.01 = 3.03
5. Write numbers to match the statements.
   a. 9 in the ones place , 4 in the tens place, 6 in the hundredths place, 0 in the tenths place.
   b. 0 in the hundredths place, 5 in the thousandths place, 0 in the tenths place, 9 in the ones place.
6. Write as decimals.
   a. $\frac{5}{1000}$ b. $8\frac{9}{100}$ c. $200\frac{9}{10}$ d. $4\frac{21}{1000}$
   e. $\frac{117}{1000}$ f. $15\frac{5}{100}$
7. Write the place value of the coloured digit.
   a. 14.032 b. 492.032 c. 25.174 d. 645.53
8. Write these in decimal fractions.
   a. $3\frac{4}{25}$ b. $8\frac{7}{200}$ c. $14\frac{65}{500}$

WORKSHEET 9

1. Put the correct sign <, >, or = in the box.

   a. $\frac{8}{100} \square \frac{8}{10}$ b. $\frac{10}{1000} \square \frac{1}{100}$

   c. $0.004 \square 0.040$ d. $1.75 \square 1\frac{75}{100}$

2. Rewrite the numbers in ascending order.

   a. $\frac{17}{100}, \frac{17}{1000}, \frac{173}{1000}, \frac{13}{100}$ b. 18.413, 18.143, 18.341, 18.431

   c. 0.012, 0.12, 0.002, 0.001 d. $\frac{3}{50}, \frac{5}{100}, \frac{1}{25}, \frac{90}{1000}$

3. Write the numbers in descending order.

   a. 5.063, 5.6, 5.003, 5.36 b. 11.064, 11.604, 11.406, 11.1

   c. $\frac{8}{100}, \frac{6}{50}, \frac{4}{25}, \frac{1}{20}$

4. Tick (✓) the largest decimal number in each set.

   a. 18.95, 18.90, 18.05 b. 600.60, 600.65, 606.05

5. Tick (✓) the shortest length in each set.

   a. $4\frac{2}{5}$ cm, 4.5 cm, 0.4 m b. $1\frac{1}{1000}$ cm, 100 cm, 1002 m

6. Round off to 2 decimal places.

   a. 18.494 b. 143.099 c. 475.199

7. Change into decimals, rounding off to 3 decimal places.

   a. $\frac{4}{9}$ b. $\frac{6}{7}$ c. $\frac{14}{15}$

WORKSHEET 10

Addition and subtraction with decimals

1. Draw a place value chart, and put the numbers into it.
   a. 39.51
   b. 110.064
   c. 14.5
2. Solve the following sums.
   a. 302.48 − 208.24
   b. 619.052 + 341.006
   c. Rs 116.35 − Rs 89.74
3. Solve the following.
   a. 482.11 + 653.938
   b. 3.19 + 27.974 + 8.8
   c. 49.34 − 8.7
   d. 732.11 − 28.932

WORKSHEET 11

1. Rewrite these in descending order.
   a. 3.011, 3.101, 3.001, 3.301
   b. $\frac{28}{100}, \frac{3}{10}, \frac{8}{100}, \frac{500}{1000}$
2. Write vertically and solve.
   a. 13.962 − 6.841
   b. 482.04 + 75.938 + 1.2
3. Multiply the following.
   a. 1.769 × 100
   b. 1.3 × 7.9
   c. 72.034 × 24
   d. 0.117 × 0.3
4. Divide the following.
   a. 115.02 ÷ 18
   b. 0.42 ÷ 0.14
   c. 621.17 ÷ 100
   d. 3.2 ÷ 0.04
5. Change these into decimal fractions.
   a. $\frac{3}{2}$
   b. $\frac{15}{25}$
   c. $\frac{13}{8}$
6. Solve these problems, writing complete statements.
   a. How many 0.25 litre cups can be filled from a 4.5 l jug of lemonade?
   b. Chef Nasir finds 12.25 kg of flour in the cupboard. To bake one apple pie, he needs 1.75 kg of flour. How many pies can he bake?
   c. In the beginning of July, Sara weighed 51.25 kg. By the end of the month, she weighed 54.15 kg. How much weight had she gained?
   d. At an end-of-term party, 12 chocolate cakes are shared equally between 40 children. How much does each child get? Give your answer as a decimal fraction.
   e. The string attached to Zia's kite is 20.65 m long. If Zia lengthens it by 7.5 m, how long will the string be?

Percentages

1. Write as percentages (to 2 decimal places, if necessary)

   a. $\frac{7}{20}$ b. $2\frac{2}{9}$ c. 0.51 d. $\frac{8}{25}$ e. $4\frac{4}{7}$

   f. 1.2 g. $\frac{8}{9}$ h. 8 i. 1.032

2. Write as fractions in their lowest terms:

   a. 28% b. 72% c. 600%

3. Change into decimals.

   a. 48% b. 2.5% c. 142%

4. Calculate:

   a. 40% of Rs 480 b. 75% of 600 l

   c. 5% of 7000 km

5. Work out the price of these items on special offer.

   a. Softy Soap: 10% off on Rs 5.50

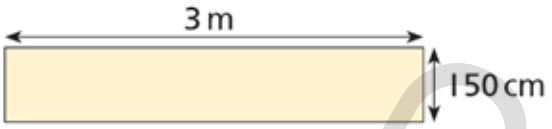
   b. Transistor radio: 20% off on Rs 260

   c. School bag: 15% off on Rs 125

Area and perimeter

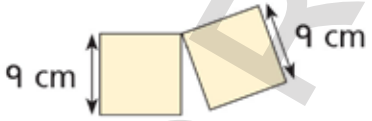
Choose the correct answer and underline it.

1. What is the area of the given figure?



a. 40 cm^2 b. 450 cm^2 c. 4.5 cm^2 d. 45 m^2

2. What is the total area of the two mats shown?



a. 81 cm^2 b. 180 cm^2 c. 162 cm^2 d. 64 cm^2

3. The area of a square is 49 cm^2. What is its perimeter?

a. 14 cm^2 b. 28 cm c. 280 cm d. 490 cm^2

4. The perimeter of a rectangular field whose length is 200 m and breadth is 180 m is

a. 760 m b. 7600 m c. 76 cm^2 d. 760 cm^2

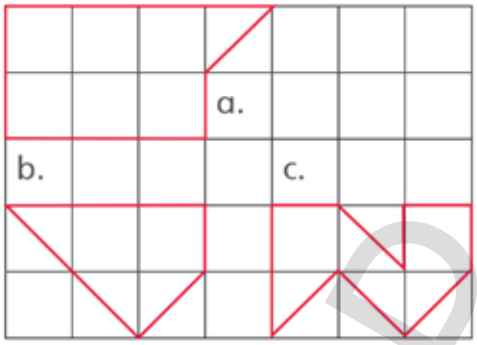
5. Solve the following word problems.

a. The length and breadth of a rectangular field are 12 m and 8 m respectively. What is the area of 3 such fields?

b. A square garden has to be paved with bricks all around. Find the perimeter of the garden if the length of one side is 6.5 m.

WORKSHEET 14

1. Write the area, in cm^2, of each shape shown below.

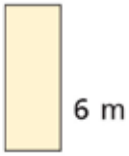


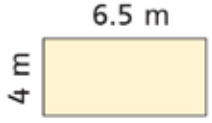
2. Draw the following shapes on a centimetre square paper.
   a. A rectangle with an area of 8 cm^2.
   b. Any shape with an area of $10\frac{1}{2}$ cm^2.
   c. A square with an area of 16 cm^2.
   d. A rectangle with an area of 15 cm^2.

3. Complete the table.

Rectangle		Area	Perimeter
length	breadth		
5 cm	2 cm		
16 cm	10 cm		
21 cm	3 cm		

4. Find the area and perimeter of each shape.
   a. 

   b. 

   c. 

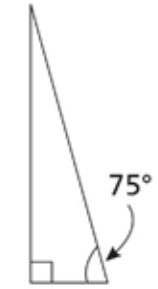
5. Solve the problems.
   a. If the area of a carpet is 32 m^2 and its breadth is 4 m, what is the length?
   b. A builder has enough bricks to construct a rectangular compound wall with a perimeter of 96 m. If one side of the wall is 30 m, what is the width of the other side?

Geometry

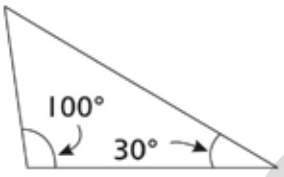
WORKSHEET 15

1. Find the missing angles in these triangles.

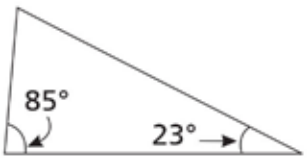
a.



b.

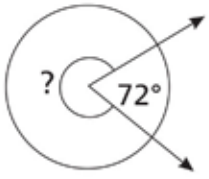


c.

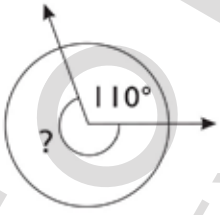


2. Find the angle at each point.

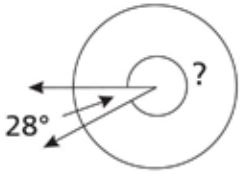
a.



b.



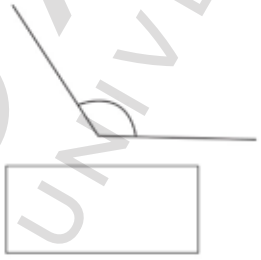
c.



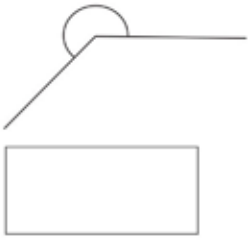
3. Estimate the size of these angles. Then label them acute, reflex, obtuse, or right.

a.

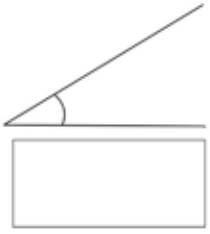
b.



c.



d.



4. Draw an angle of 85° to the nearest degree. Mark it acute or obtuse.

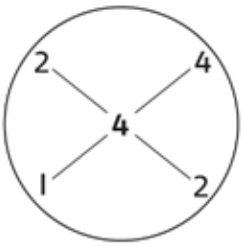
5. a. The supplementary angle of 29° is _____.
   b. The complementary angle of 43° is _____.

MATH LAB ACTIVITY 1

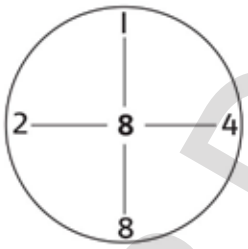
Objective: To study factorisation of prime and composite numbers

Materials required:

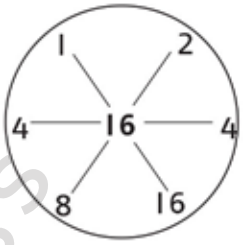
1. Cardboards cut out in circular shapes with numbers, prime or composite, written in the centre. For example, 2, 6, 7, 12, 13, 16, 50, 75, 100 and so on.



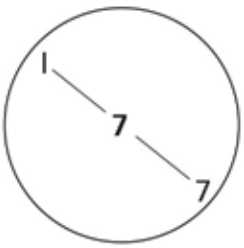
1, 2, 4



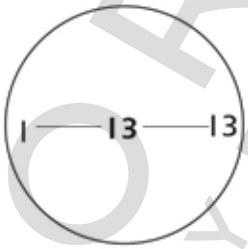
1, 2, 4, 8



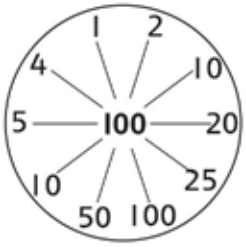
1, 2, 4, 8, 16



1, 7



1, 13



1, 2, 4, 5, 10, 20, 25, 50, 100

Steps:

1. The teacher writes some numbers on the board and discusses the definitions of prime numbers and composite numbers.
2. The students are then asked to go up to the board one by one and identify the numbers that are prime and those that are not.
3. The teacher calls a student and asks him/her to draw a circle on the board and write any number in the centre of the circle.
4. Then another student is asked to write the factors of the number near the circumference of the circle as shown above.
5. Now, the class is divided into groups of four and each group is handed a cardboard disc. Each group needs to work out the factors of at least 4 numbers. When all have finished, the groups exchange their factor wheels and correct each other's work.

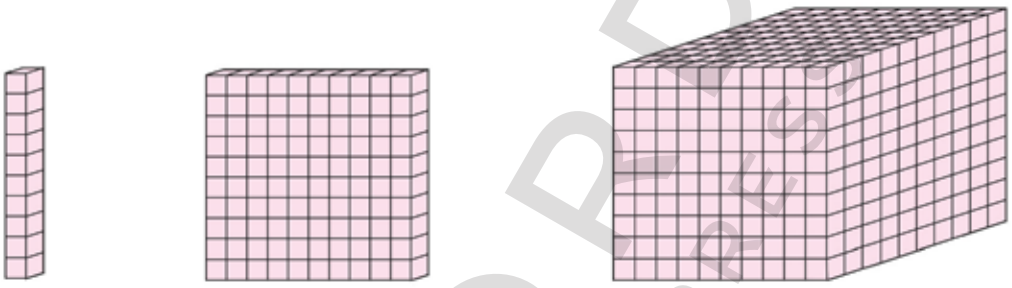
Teacher's Note: Let the students know that the number 1 was not a part of the discussion because 1 is neither prime nor composite. It has only 1 factor. All prime numbers have 2 factors while all composite numbers have 3 or more factors.

MATH LAB ACTIVITY 2

Objective: To introduce decimals to children

Materials required:

1. Wooden cubes, square rods and slabs of various sizes, each with a metallic ring screwed on one side to hang it from.
2. Paper strips marked Tens, Ones, Tenths, Hundredths and Thousandths.
3. Space on a wall to hang these shapes.



Steps:

1. The teacher discusses the sizes of the various solids. 10 small cubes are arranged to make one rod, 10 rods to make a slab, and 10 slabs to make a big cube. So, there are 1000 small cubes in a big cube.
2. The teacher then discusses $\frac{1}{10}$th, $\frac{1}{100}$th and $\frac{1}{1000}$th of a whole. This is followed up with the teacher displaying the big cube and its decimal fractions to the children.
3. She explains that the big cube is the ones cube (or a whole cube).
4. One of the students is asked to place the ones cube against the wall. One more student comes up and hangs the strip with 'ones' written on it, above the big cube.
5. Then, another student puts the slab on the hook in the 'tenths' column, the rod in the 'hundredths' column and the small cube in the 'thousandths' column.

Teacher's Note: The concept of decimals can be taught with square cut outs from sheets of a notebook. It is worth taking the trouble to explain the decimal system properly pupils have no problems dealing with decimal fractions. Conversion rods are very useful for teaching grams to kilograms, centimetres to metres, or vice versa.

MATH LAB ACTIVITY 3

Objective: To learn simple facts of addition and subtraction

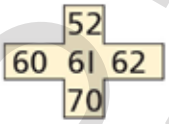
Materials required:

1. Wall charts displaying:
   a. 1 to 100 Number Square (Square of 10)
   b. 1 to 64 Number Square (Square of 8)
   c. 1 to 81 Number Square (Square of 9)
   d. 1 to 49 Number Square (Square of 7)
2. Several number crosses to fit the above number squares, all kept face down in a box.

Steps:

1. The teacher asks a student to take out a number cross and show it to the class. The rest of the children help the student decide which number square it will fit into.
2. The teacher explains that this can be found by calculating the difference of any two consecutive numbers, vertically. She explains this with the help of 3 examples.

22 − 14 = 14 − 6 = 8
(Square of 8)



70 − 61 = 61 − 52 = 9
(Square of 9)

69 − 59 = 59 − 49 = 10
(Square of 10)

3. Different students are then asked to pick up number crosses from the box and place them on the correct number square.
4. The teacher points out that the three vertical numbers in any number cross always have the same sum as the three horizontal numbers.

   For example, in the first two number crosses given above:

   13 + 14 + 15 = 6 + 14 + 22 = 42. Also, 3 × 14 = 42

   52 + 61 + 70 = 60 + 61 + 62 = 183. Also, 3 × 61 = 183
5. The children then carry out these calculations with different number crosses.

Teacher's Note: If a number series has an odd number of terms, and the difference between two consecutive numbers is equal, then the sum of the series can be found by multiplying the number in the centre by the number of terms in the series.
For example, in the series: 42 53 64 75 86 (difference between two consecutive numbers = 11),
42 + 53 + 64 + 75 + 86 = 320 = 5 (numbers in the series) × 64 (number in the centre)

When the number of terms is even, such as 9 + 11 + 13 + 15, remove the first or the last number, total the remaining numbers, and add the sum to the removed number,
i.e. 11 + 13 + 15 = 3 × 13 = 39, and 39 + 9 = 48. So, the sum of the series is 48.

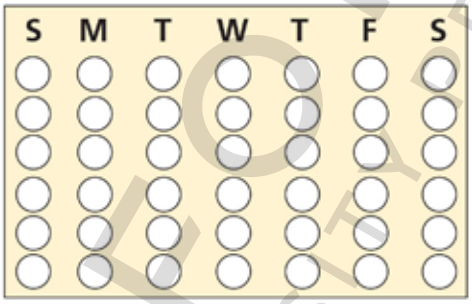
Objective: To make a permanent calendar

Materials required:

1. One rectangular cardboard of any convenient size for all the students in the class with numbers written on it as shown below and another larger one for the teacher.

						1	2	3	4	5	6	7
2	3	4	5	6	7	8	9	10	11	12	13	14
9	10	11	12	13	14	15	16	17	18	19	20	21
16	17	18	19	20	21	22	23	24	25	26	27	23
23	24	25	26	27	28	29	30	31				
30	31											

2. One more cardboard of the same size with holes punched in it to fit over the above cardboard (or transparent sheets can be printed with circles or boxes of the same size). A larger one for the teacher should also be made.



Steps:

1. The teacher picks up one cardboard of each type and puts the punched cardboard on top of the numbered one.
2. One of the students is called and asked to show the date of the day, using the two rectangles.
3. Suppose the date is 19th and it is a Wednesday. The student shows this by placing the 3rd hole in the middle column of the punched card on top of the number 19. The numbers show through the transparency sheet or holes.
4. Other students are also asked to check out different dates of different months in the same way. Once the day and the date is matched, all the days of a month fall into the required pattern.

Teacher's Note: You may ask one of the students to write a row of numbers from the rectangle on the board. Then, ask another student to write the second row of numbers without looking at the calendar. Tell them to remember that the number below a given number in a calendar is 7 more than the number itself.

Answers

Exercise 1a

1. a. 7 b. 5 million c. 35 030 386
d. 885 500 e. 300 thousand
2. a. True b. False c. False d. True
e. False
3. a. A b. C c. C d. D e. B
4. a. 1 900 000 b. 8 000 000
c. 7 050 806
5. a. 2 905 384 b. 7 031 700
c. 1 320 059 d. 4 301 637
6. a. Four million b. Six millions five hundred thousand
c. Two million one hundred and forty-nine thousand d. Two million eight hundred and forty thousand three hundred and thirty-three
e. Three million one hundred and eighty-five thousand six hundred and twenty f. Five million four hundred and one thousand six hundred and twenty-six
7. a. 70 thousand or 70 000
b. 9 million or 9 000 000
c. 5 hundred thousand or 500 000
d. 8 million or 8 000 000
e. 90 thousand or 90 000
f. 5 million or 5 000 000
8. a. 3 000 000 + 700 000 + 60 000 + 1000 + 800 + 30 + 0
b. 400 000 + 00 000 + 3000 + 000 + 70 + 5
c. 7 000 000 + 500 000 + 10 000 + 2000 + 800 + 40 + 7
d. 700 000 + 00 000 + 1000 + 000 + 10 + 0
9. a. 9 630 928, 9 613 829, 9 603 298
b. 3 416 053, 3 415 933, 3 410 623
c. 3 685 632, 3 685 623, 3 684 362
10. a. 9 998 999 b. 1 456 788
c. 4 300 099 d. 2 488 900

Exercise 1b

1. a. 20110 b. 5 852 106 c. 100 000
d. 3 843 584 e. 3 999 249
2. a. True b. True c. False d. False
e. True
3. a. C b. B c. C d. A e. B
4. a. 999 969 b. 1 263 556
c. 9 99 999 d. 1 333 720
e. 781 971 f. 680 191
g. 1 272 771 h. 1 398 548
i. 8 043 506
5. a. 1 037 686 b. 661 529
c. 674 510 d. 750 371
e. 901 478 f. 248 217
g. 484 682 h. 385 890
6. a. 250 624 b. 2 696 182
c. 482 834 d. 707 148
e. 625 440 f. 164 371
7. a. 291 610 b. 109 187
c. 853 111 d. 464 651
e. 816 207 f. 47 868
g. 53 784 h. 486 609
i. 11 607
8. a. 900 000 b. 1
9. a. 202 276 b. 561 615
c. 3 974 662 d. 183 083
e. 54 308 f. 69 512
10. a. 838 328 b. 592 700
c. 208 864 d. 104 523
11. a. 934 231
b. Lahore; 14 330 1131
c. 3 970 074 d. Quetta, 2 202 641
e. 2 971 247

Exercise 1c

1. a. 1000 b. 38 695 c. 904 000
d. 5 e. 588
2. a. True b. False c. True d. False
e. False
3. a. D b. A c. D d. B e. C
4. a. 105 320 b. 7 935 000
c. 836 010
5. a. 4 501 800 b. 9 200 000
c. 6 413 200
6. a. 61 850 000 b. 20 018 000
c. 32 112 000
7. a. 4708 b. 3820 c. 9421
8. a. 84 b. 800 c. 327
9. a. 56 b. 92 c. 70
10. a. 20 787 745 b. 43 015 017
c. 47 897 344 d. 90 33 612
11. a. 3 556 800 b. 830 300
c. 7 717 472 d. 717 850
e. 8 166 755 f. 30 742 560
12. a. 1802 R 8 b. 3496 R 3
c. 1047 R 18 d. 1355 R 27
e. 1331 R 3 f. 3792 R 2
13. a. 1211 R 10 b. 537 R 28
c. 526 R 2 d. 2027 R 41
e. 2746 R 8 f. 1750 R 7

Real-life Story Sums

1. 325 boxes 2. Rs. 15 646 720
3. Rs 2 705 4. (i) Rs 6 366 615
(ii) Rs 76 399 380 5. 630 km
6. 37 520 mm 7. Rs 9 550 000
8. 500 000 people 9. Rs 3 983 700
10. Rs 10 250 11. Rs 1 637 500

Exercise 1d

1. a. Rule : Subtract 9
Missing numbers: 67, 58, and 31
b. Rule: Add 7
Missing numbers: 52 and 73
c. Rule: Add 9
Missing numbers: 27, 45, 72, and 81
d. Rule: Divide by 3
Missing numbers: 2889 and 107
2. a. 37,41, 45, 49, 53, 57
b. 4, 8, 16, 32, 64, 128
c. 10, 15, 20, 25, 30, 35
3. a. Rule: Subtract 11
Next three terms: 44, 33, 22
b. Rule: Subtract 13
Next three terms: 261, 248, 235
c. Rule: Subtract 45
Next three terms:730, 685, 640
d. Rule: Divide by 2
Next three terms: 28, 14, 7
4. a. Rule: Add 11 (diagonal numbers)
31, 42, 53, 64, 75, 86, 97
b. Rule: Subtract 9
66, 57, 48
c. Rule: Diagonal numbers from 89 -23;
89, 78, 67, 56, 45, 34, 23

Exercise 2a

1. a. 6 b. 9 c. 6 d. 8 e. 9 and 10
2. a. True b. False c. False d. True
e. True
3. a. B b. C c. A d. D e. A
4. a and b 5. a and d 6. a and b
7. b, c and d 8. b and d

Exercise 2b

1. a. 1 b. greater c. highest common
factor d. product e. 72
2. a. True b. True c. False d. True
e. False
3. a. C b. A c. D d. A e. C
4. a. 4 b. 9 c. 2 d. 1
5. a. 20 b. 6 c. 75
6. a. 3 b. 4 c. 12 d. 4 e. 7
7. a. 1 b. 1 c. 1 d. 1 e. 1

Real-life Story Sums

1. 6 m 2. 36 days 3. 14 cm

Exercise 3a

1. a. $2\frac{7}{15}$ b. $\frac{13}{22}$ c. $\frac{9}{10}$ d. $1\frac{37}{60}$
e. $\frac{1}{10}$

2. a. True b. True c. False d. True e. True

3. a. D b. C c. B d. A e. B

4. a. $\frac{7}{20}$ b. $\frac{17}{26}$ c. $6\frac{13}{21}$ d. $18\frac{11}{36}$ e. $2\frac{11}{70}$ f. $16\frac{11}{30}$ g. $34\frac{1}{9}$ h. $14\frac{7}{16}$

5. a. $\frac{5}{24}$ b. $\frac{4}{33}$ c. $\frac{2}{35}$ d. $\frac{4}{20}$ e. $\frac{15}{56}$ f. $\frac{3}{16}$ g. $4\frac{1}{14}$ h. $1\frac{4}{27}$

Real-life Story Sums

1. $1\frac{1}{4}$ km 2. $2\frac{3}{8}$ cups 3. $9\frac{1}{2}$ litres 4. $\frac{3}{10}$ 5. $\frac{11}{15}$

Exercise 3b

1. a. 4 b. 1 c. $\frac{2}{5}$ d. $\frac{7}{18}$ e. $\frac{2}{3}$

2. a. False b. True c. True d. False e. True

3. a. B b. A c. C d. D e. B

4. a. $\frac{5}{2} = 2\frac{1}{2}$ b. $\frac{4}{4} = 1$ c. $\frac{3}{5}$ d. $\frac{4}{3} = 1\frac{1}{3}$

5. a. $\frac{8}{3}$ b. $\frac{14}{5}$ c. $\frac{9}{4}$ d. $\frac{7}{3}$ e. $\frac{5}{6}$ f. $\frac{6}{2}$

6. a. 4 b. 6 c. 10 d. $\frac{7}{2}$ e. $\frac{4}{3}$ f. 2

7. a. 2 b. $1\frac{1}{2}$ c. 1 d. $2\frac{1}{2}$ e. $\frac{1}{4}$

9. a. $\frac{1}{3}$ of $\frac{1}{4}$ b. $\frac{1}{4}$ of $\frac{1}{2}$

10. a. $\frac{3}{8}$ b. $\frac{1}{10}$ c. $\frac{1}{12}$ d. $\frac{1}{6}$

11. a. $\frac{2}{15}$ b. $\frac{2}{15}$ c. $\frac{1}{5}$ d. $\frac{1}{12}$

12. a. $\frac{2}{27}$ b. $\frac{7}{40}$ c. $\frac{5}{48}$ d. $\frac{5}{16}$ e. $\frac{3}{44}$ f. $\frac{7}{40}$

13. a. $\frac{1}{21}$ b. $\frac{4}{35}$ c. $\frac{1}{18}$ d. $\frac{1}{11}$ e. $\frac{3}{20}$ f. $\frac{7}{66}$ g. $\frac{3}{56}$ h. $\frac{5}{108}$

14. a. $\frac{1}{6}$ b. $\frac{2}{5}$ c. $\frac{1}{2}$ d. $\frac{5}{9}$ e. $\frac{2}{5}$ f. $\frac{9}{16}$

15. a. $\frac{2}{5} \times \frac{5}{6}$ b. $\frac{3}{8} \times \frac{5}{6}$

16. a. $\frac{1}{6}$ b. $\frac{5}{9}$ c. $\frac{1}{2}$ d. $\frac{3}{5}$ e. $\frac{8}{15}$ f. $\frac{1}{8}$

17. a. $\frac{4}{7}$ b. $\frac{21}{32}$ c. $\frac{7}{18}$ d. 3 e. $\frac{5}{9}$ f. $\frac{7}{15}$ g. $\frac{3}{5}$ h. $\frac{9}{35}$

18. a. $7\frac{1}{5}$ b. $3\frac{15}{16}$ c. $3\frac{21}{32}$ d. $38\frac{1}{2}$ e. $\frac{14}{81}$ f. $8\frac{37}{40}$ g. $\frac{1}{7}$ h. 3 i. $5\frac{13}{15}$

Real-life Story Sums

1. $\frac{1}{12}$ m 2. $7\frac{1}{5}$ cm 3. 138 kg 4. $4\frac{1}{2}$ km 5. $8\frac{1}{8}$ km 6. $\frac{1}{6}$

Exercise 3c

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

2. a. True b. False c. True d. False e. True

3. a. A b. B c. C d. D e. A

4. a. $\frac{1}{30}$ b. $\frac{1}{28}$ c. $\frac{1}{21}$ d. $\frac{5}{64}$ e. 8 f. 9 g. 4 h. 30 i. $1\frac{1}{2}$ j. $\frac{1}{2}$ k. $\frac{1}{2}$ l. $2\frac{1}{2}$

7. a. $1\frac{3}{4}$ b. $\frac{1}{14}$ c. 111 d. 64 e. $2\frac{22}{25}$ f. 182 g. 1000 h. $1\frac{13}{30}$ i. $\frac{3}{20}$ j. $2\frac{1}{10}$ k. $3\frac{7}{19}$ l. $1\frac{24}{25}$ m. $3\frac{2}{7}$ n. $2\frac{8}{29}$

Real-life Story Sums

1. $\frac{2}{9}$ bowl of ice-cream 2. 12 books 3. 4 chocolates each 4. $\frac{2}{5}$ m 5. 6 cup cakes

Exercise 4a

1. a. 175.19 b. 800.101 c. 132.999 d. 1153.881 e. 764.505

2. a. False b. True c. False d. True e. True.

3. a. C b. A c. B d. B e. D

4. a. < b. < c. > d. >

5. a. 17.56, 17.3, 8.05, 8.04
b. 19.46, 19.4, 11.95, 11.94
c. 542.6, 542.56, 541.56, 154.56
d. 18.431, 18.413, 18.341, 18.143

6. a. 5.03, 5.06, 5.36, 5.6
b. 11.40, 11.60, 110.64, 114.4

c. 14.2, 14.27, 27.14, 27.4
d. 130.45, 130.5, 131.45, 132.45
e. 3.48, 3.8, 5.05, 5.2
7. a. 94.24 b. 960.058 c. 26.61
d. 1424.478 e. 1136.048 f. 39.964
g. 40.64 h. 703.178

Real-life Story Sums

1. Rs 3715.75 2. 167.763 km
3. 3.679 litres 4. Rs 1677.87 5. 0.775 km

Exercise 4b

1. a. 15.003 b. 60 c. 100 d. 0.25 e. 100
2. a. False b. False c. False d. True
e. True
3. a. A b. D c. A d. B e. A
4. a. 7.23 b. 181.7 c. 651 d. 23.35
e. 95.71 f. 28.62 g. 803.04 h. 149.7
5. a. 3.4 b. 0.76 c. 0.09 d. 0.12
e. 0.14 f. 0.31 g. 0.46 h. 106.01
6. a. 596.7, 5967 b. 298.1, 2981
c. 64.8, 648 d. 73.2, 732
7. a. 70.318 b. 0.5651 c. 21.624
d. 4.1694 e. 0.183 f. 0.2483
g. 0.03411 h. 0.00455
8. a. 10 b. 100 c. 10 d. 100
9. a. 4.9575 b. 13.728 c. 0.1813
d. 62.648 e. 2.187 f. 9.3744
g. 32.234 h. 0.5289 10. a. 4.1 b. 2.1
c. 2.1 d. 5
11. a. 20 b. 2.78 c. 5.35 d. 3.7
12. a. 0.25 b. 0.06 c. 0.875 d. 0.55
e. 0.4 f. 0.52
13. a. 7.2 b. 8.4 c. 9.9 d. 6.1
14. a. 6.14 b. 14.11 c. 2.50
d. 148.01
15. a. 9300 b. 700 c. 1400 d. 8800
e. 11000 f. 1000

Real-life Story Sums

1. 23 pieces 2. 5 pieces 3. Rs 5.05
4. 271.25 5. 603.75 6. 3.04 kg
7. Estimated cost of two dresses is Rs 5400.
Yes, she has enough money to purchase both the dresses.

Exercise 4c

1. a. 100 b. 352% c. $\frac{4}{5}$ d. Rs 108
e. $\frac{38}{100}$
2. a. True b. True c. False d. False
e. True
3. a. D b. B c. D d. D e. C
4. a. $\frac{70}{100}$ b. $\frac{90}{100}$ c. $\frac{80}{100}$ d. $\frac{20}{100}$
e. $\frac{44}{100}$ f. $\frac{84}{100}$
5. a. 57.14 b. 78.57 c. 18.75 d. 10.53
6. a. 70% b. 25% c. 37.5% d. 19%
e. 90% f. 16.67%
7. a. 90% b. 99% c. 60% d. 80%
e. 60% f. 32%
8. a. $\frac{3}{10}$ b. $\frac{9}{20}$ c. $\frac{89}{100}$ d. $\frac{6}{25}$ e. $\frac{8}{25}$
f. 1
9. a. 28.57% b. 35.71% c. 55.56%
d. 46.15% e. 23.08% f. 13.33%
10. a. 425% b. 635% c. 606%
d. 160% e. 380% f. 870%
11. a. 600% b. 1700% c. 5800%
d. 900% e. 2300% f. 7900%
12. a. 23% b. 739% c. 701%
d. 469% e. 390% f. 300%
13. a. $\frac{3}{4}$ b. 3 c. $\frac{21}{100}$ d. $\frac{19}{50}$
e. $1\frac{7}{20}$ f. 8
14. a. 0.35 b. 1.18 c. 0.98 d. 1.40
e. 0.06 f. 1.63
15. a. 39% b. 60% c. 100% d. 4%
e. 55% f. 152%
16.

10%	$\frac{10}{100}$	0.10 or 0.1	$\frac{1}{10}$
1%	$\frac{1}{100}$	0.01	$\frac{1}{100}$
75%	$\frac{75}{100}$	0.75	$\frac{3}{4}$

Real-life Story Sums

1. a. Rs 72 b. Rs 52 c. Rs 680 d. Rs11.88
2. Rs 9350 per month
   Rs 112 200 in one year
3. Rs 8750
4. a. 50% cows on Saleem's farm 30% cows on Hasan's farm
   b. On 27th March 48% seats
   On 28th March 54% seats
5. Urdu 66% History 70%.
   She worked better in History
6. Shaheen: 60% Sara: 70%
   Sara is better at quizzes

Exercise 5a

1. a. 7000 m b. 3625 cm c. 191 mm
   d. 0.9 km e. 3 016 035 cm
2. a. False b. True c. False d. True
   e. True
3. a. D b. C c. D d. C e. B
4. a. metre b. kilometre
   c. centimetre d. metre
5. Cupboard: 2 m, Chair: 50 cm,
   Glass: 10 cm, Juice: 12 cm,
   Height: 150 cm
6. a. 5000 mm b. 0.4 m c. 75 cm
   d. 0.900 km
7. a. 1.47 km, 1470 m
   b. 18 m, 1800 cm c. 600 m, 60000 cm
   d. 477 mm, 47.7 cm e. 735 m, 0.735 km
   f. 1882 cm, 18.82 m
   g. 170 km, 170 000m h. 420 cm, 4.2 m

Real-life Story Sums

1. 3 m 40 cm or 340 cm
2. 1 m 60 cm or 1.60 m
3. 300 cm or 3 m 4. 460 cm or 4.60 m
5. 33 km 700 m

Exercise 5b

1. a. 2 hr 25 min b. 195 min
   c. 420 sec d. 15335 sec e. 757 min
2. a. False b. True c. False d. True
   e. False
3. a. C b. C c. B d. D e. D
4. a. 840 min b. 1920 min c. 769 min
   d. 937 min
5. a. 1 hr b. 4 hr c. $4\frac{1}{2}$ hr d. $1\frac{1}{4}$ hr
6. a. 8400 sec b. 5410 sec c. 6000 sec
   d. 359 sec
7. a. 4 min b. 10 min c. $1\frac{1}{4}$ min
   d. $30\frac{1}{3}$ min
8. a. 14 400 sec b. 43 200 sec
   c. 36 000 sec d. 270 000 sec
9. a. 2 hr b. 5 hr
10. 31 820 sec

Exercise 5c

1. a. 3 h 25 min b. 150 min
   c. 6 hr 15 min d. 38 min e. 7800 sec
2. a. True b. True c. False d. True
   e. False
3. a. C b. A c. D d. A e. C
4. a. 70 min. b. 2 h 28 min
   c. 3 h 35 min
5. a. 51 min b. 3 h 15 min
   c. 3 h 32 min

Real-life Story Sums

1. a. 140 min. 2 hr. 20 min
2. 3 h 10 min, 190 min
3. 8 min. 50 sec or 530 sec
4. Bilqees takes longer time by 40 minute 5. 6315 sec 6. 42 min
7. 520 min 50 sec or 31250 sec
8. 2 hr 30 min 9. 4 min 21 sec

Exercise 5d

1. a. 1095 days b. 180 months
   c. 56 days d. 2 years
   e. 5 years 10 day
2. a. True b. False c. False d. True
   e. True
3. a. B b. D c. C d. C e. A
4. a. 156 months b. 84 months
5. a. 4 years 1 months b. 1 year 8 month c. 7 years 5 months

d. 10 years.
6. a. 72 weeks b. 49 days
c. 14 weeks d. 15 weeks
7. 5 years 9 months 3 weeks

Real-life Story Sums

1. 80 days 2. 42 hours.
3. 17th September

Exercise 6

1. a. Unit or 1 b. Rs 70
c. 16 oranges d. Rs 24000 e. 3 mm
2. a. True b. False c. True d. False
e. True
3. a. B b. D c. B d. D e. D
4. a. Rs 9 b. Rs 990 c. Rs 460

Real-life Story Sums

1. Rs 10 500 2. 216 km
3. Rs 200 13 packets 4. 5 sandwiches
5. Rs 150 6. 100 km 7. 37.5 kg

Exercise 7a

1. a. 90° b. Obtuse angle
c. 180°, 360° d. Straight e. 90°
2. a. True b. True c. False d. True
e. False
3. a. D b. B c. D d. A e. B
4. a. 30° b. 60 c. 45° d. 90°
7. a. 230° b. 330° c. 270° d. 300°
9. a. Smaller than 90°
b. Greater than 90°
c. Smaller than 90°
d. Smaller than 90°
e. Greater than 90°
f. Smaller than 90°

Exercise 7b

1. a. Vertex b. Complementary
c. 180° d. complementary e. 95°
2. a. True b. False c. True d. True
e. False
3. a. C b. D c. B d. A e. B
4. a. 25° b. 78° c. 8° d. 43°
5. a. 15° b. 131° c. 92° d. 53°
6. a. 55° b. 70° c. 75°
7. a. 136° b. 30° c. 120° d. 95°
e. 80° f. 137°

Exercise 7c

1. a. 50° b. equilateral
c. acute angled triangle
d. hypotenuse e. unequal
2. a. True b. False c. True d. False
e. True
3. a. B b. A c. B d. C e. C
4. a. Equilateral b. Equilateral
c. Isosceles d. Scalene e. Scalene
f. Scalene
5. C and D: right-angled triangle
A, B and E: acute-angled triangle
F and G: obtuse-angled triangle
6. a. $x = 50°$, $y = 90°$, $z = 40°$
b. $x = 130°$, $y = 30°$, $z = 20°$
c. $x = 82°$, $y = 70°$, $z = 28°$
d. $x = 55°$, $y = 100°$, $z = 25°$
e. $x = 70°$, $y = 90°$, $z = 20°$
f. $x = 30°$, $y = 120°$, $z = 30°$
7. AB = BC = AC = 2.5 cm
$\angle A = \angle B = \angle C = 60°$
Equilateral triangle
All three angles are equal.
8. PQ = QR = 3.7 cm, PR = 3 cm
$\angle P = \angle R = 65°$, $\angle Q = 50°$
Isosceles triangle
Two angles are equal.
9. ED = 2.9 cm, DF = 2.4 cm, EF = 3.7 cm,
$\angle E = 40°$, $\angle D = 90°$, $\angle F = 50°$
Scalene triangle
All three angles are different.
10. a. MO = ON = MN = 2.4 cm
$\angle O = \angle M = \angle N = 60°$
Equilateral triangle
b. US = 4 cm, UT = 1.6 cm, ST = 3.8 cm,
$\angle S = 25°$, $\angle U = 70°$, $\angle T = 85°$
Scalene triangle
11. a. $x = 45°$ b. $p = 74°$ c. $y = 47°$
d. $t = 90°$ e. $z = 37°$

Exercise 7e

1. a. Rhombus b. Trapezium
c. Angles d. Four e. Supplementary
2. a. True b. False c. True d. False
e. True
3. a. B b. C c. D d. B e. C
4. a. Trapezium b. Parallelogram
c. Square d. Rectangle e. Rhombus
f. Kite

Exercise 7f

1. a. 2 b. 4 c. 6 d. 1
e. 1 f. 1
2. Order of rotational symmetry
a. 1 b. 1 c. 4 d. 1 e. 1

Exercise 7g

1. Number of faces of a cube: 6
Number of faces of a cuboid: 6
Number of faces of a pyramid: 5
3. c

Exercise 8a

1. a. closed b. 4 l c. 2(l + b)
d. 32 cm e. 14 cm
2. a. True b. False c. False d. True
e. True
3. a. B b. C c. B d. C e. D
4. a. A= 16 cm B= 14 cm C= 18 cm
b. Shape C has the greatest perimeter.
Shape B has the smallest perimeter.
5. a. 14 cm b. 22 cm c. 12 cm d. 20 cm
6. a. 120 cm b. 84 cm c. 424 cm
d. 140 cm
7. a. 34 m b. 36 cm

Real-life Story Sums

1. 54 m 2. 40 m 3. 400 m 4. 170 m

Exercise 8b

1. a. area b. l × b c. l × l d. 36 cm^2
e. 1 cm^2
2. a. True b. False c. False d. True
e. True
3. a. A b. C c. A d. C e. B
4. a. A and B b. A and B c. B and C
5. a. 9 cm^2 b. 11 cm^2 c. 11 cm^2
d. 12 cm^2 e. 7 cm^2 f. 8 cm^2
7. a. $8\frac{1}{2}$ cm^2 b. $14\frac{1}{2}$ cm^2 c. 13 cm^2
d. $13\frac{1}{2}$ cm^2
8. a, c, and d
10. a. 70 cm^2 b. 105 m^2 c. 162 cm^2
d. 210 m^2
11. a. 169 cm^2 b. 1600 cm^2 c. 289 cm^2
d. 144 cm^2
12. a. 37 m^2 b. 42 m^2
13. Area of classroom A = 144 m^2
Area of classroom B = 166.5 m^2
Area of playroom = 410 m^2
Area of toilet = 35 m^2

Real-life Story Sums

1. 300 m^2 2. 112 m^2 3. b = 15 m

Exercise 9a

1. a. Number of quantities b. data
c. 11 d. 1000 e. 64
2. a. True b. False c. True d. False
e. True
3. a. C b. B c. D d. A e. C
4. a. 15 b. Rs 42 c. 18 cm 5. 36.5 kg

Real-life Story Sums

1. Rs 9.75 2. Rs 3125 3. a. 23 b. 22
c. 315 d. 45

Exercise 9b

1. a. data b. vertically c. Title
d. x and y e. block graph
2. a. True b. False c. True d. False
e. True
3. a. C b. C c. C d. D e. B
4. a. 25 b. 35 c. Lahore d. 55
e. 110