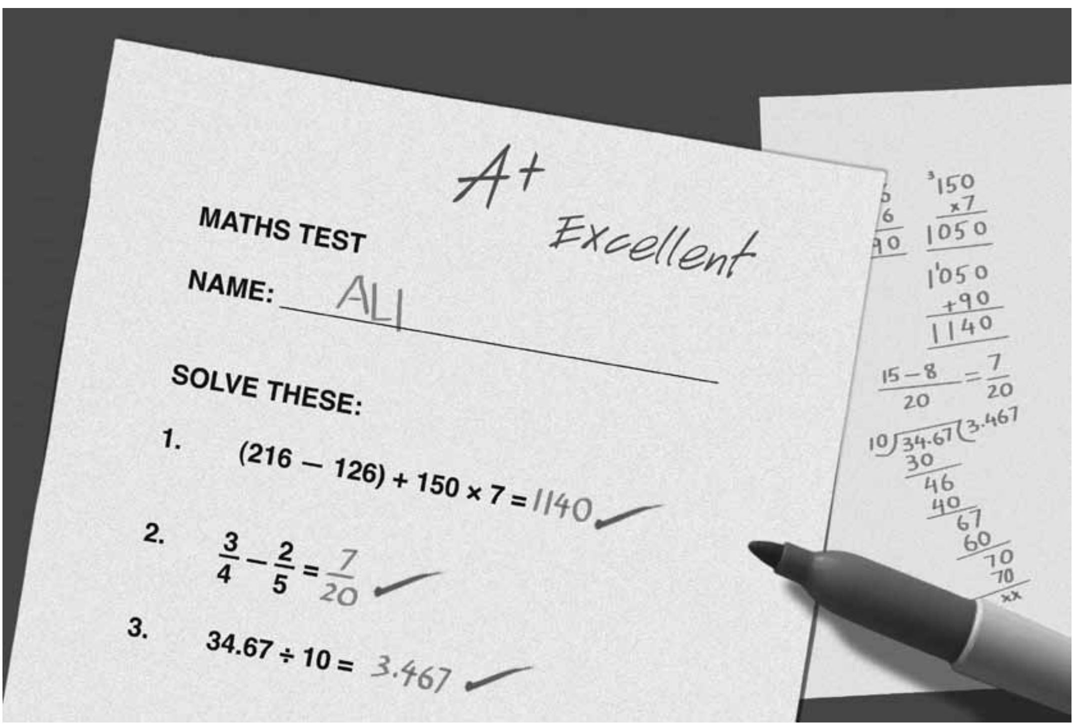
Teaching Guide 5
Revised with lesson plans

MATHS WISE



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INTRODUCTION

A. Introduction

Mathematics has always been one of the best food for the enquiring mind of a growing child. In today's world of changing lifestyles, where IT, electronic gadgetry, and finding logical solutions to problems in daily life have become the needs of the day, employers are increasingly looking for thinking minds. It has therefore become imperative that mathematics plays a significant role in education, right from the very beginning.

Teachers of pre-primary levels and classes 1, 2, 3, and 4 have already laid a foundation for open and active minds. *Maths Wise* continues to use similar informal teaching methods in order to develop in children keener mathematical skills. Thus the transition from a 'child' to a 'pupil' becomes easy and smooth.

It is recommended that pupils (up to class 5) are not subjected to rigid examinations. The teacher should be able to assess the progress of pupils with the help of a regular, weekly record of their work.

IMPORTANT

The ideal pupil-to-teacher ratio is around 8 children to 1 teacher. This is rarely possible. In a situation where a teacher may have a large class, there are two strategies which may help:

1. Willing parents may be invited to help during lessons, as 'buddy teachers' (instead of assistant teachers). Many mothers will be willing to help, as they often enjoy this activity. Some may wish to remain with the class, even after their children have moved on. It will require a week's orientation before a parent is able to work as a 'buddy teacher.'
2. Divide students into small groups so that they can work cooperatively; they will not require constant teacher attention.

   The class starts with a review of the previous day's lesson using a fun activity. It could be a short quiz or a round of mental maths. It is useful to revise tables every day. A game involving the use of hands to find answers makes tables interesting.

B. Teaching Guide for Maths Wise 5

Maths Wise 5, has been written fully in line with the requirements of the National Mathematics Curriculum and children's levels of understanding and ability.

As they grow older, children must be encouraged to think independently, explore their surroundings more boldly, and ask questions. *Maths Wise* 5 provides children with opportunities to explore, relate numbers to daily life situations and letters of the alphabet, use arithmetic operations (+, –, ×, and ÷), look for patterns in numbers, and number formations, and other objects in their environment, and find answers for themselves whenever possible.

New vocabulary, new topics, and new concepts are introduced by means of pre-topic discussions (or story-telling) and practical activities. At every step concepts are developed using examples that smoothly flow into a series of relevant exercises. Hands-on work, in addition to exercises in the books, further consolidates these concepts and encourages independent thinking.

The books provide a range of activities including puzzles, crosswords, coded message, brainteasers, and fun pages to guarantee the retention of interest and involvement of every child. There is sufficient drill for the students and challenging questions at the end of each topic and sub-topic to extend the students.

One of the great needs for a teacher, as children grow older, is to recognize differing abilities, and to address them individually in each class. The minds of some children need to be stretched and their capabilities exercised to the full, often independently of the teacher. The less mathematically-able children need greater direction and support to ensure that they do not feel left out. The activities and problems in these books are of varied levels of difficulty to meet these requirements.

The Teaching Guide for *Maths Wise* 5 contains lot of suggestions for activities which lead to lateral thinking within the confines of a school syllabus. The activities and challenges are exciting for children who have learnt to enjoy maths. It is still not too late to develop in most children a liking for the subject by encouraging them to think just a little outside the textbooks. This can be great fun both for the teacher and pupils.

1. Skills acquired by children

The activities undertaken in Classes 1, 2, and 3 will help children to achieve higher levels of comprehension and higher standards of work in Classes 4 and 5.

1. Concentration becomes automatic when children participate in practical work using objects from daily life. This helps them to relate their school work to the world around them.
2. Memory is honed and new concepts are stored into quick-recall memory through work such as tables and sequences. Mnemonics have been suggested to help memorize sequences of objects/activities. For example: BODMAS and work with 5-or 6-digit numbers which draw on recall of work done with 2-and 3-digit numbers.
3. Recognition increases as children are exposed to more ideas, such as number patterns, fractions, factors, and shapes (including animals and cartoons). Later, there are situations where they need to recall these.
4. Association occurs when children apply knowledge gained in earlier years to newer concepts. Memory and recognition are used to associate one object with another through a common characteristic. For example: a hexagon has 6 sides, a beehive has hexagonal cells.

5. The study of mathematics depends upon logic and it comes from concentration, memory, recognition, and association.
   a. Bees use hexagonal cells and not circular ones to make a hive, because in hexagonal tessellation there is no wastage of space.
   b. Use of comparative language such as long, longer, longest, comes from logic.

   As mathematics becomes more formal, it is mandatory that the interest of the children is kept alive by continuing with outdoor/indoor activities, colourful charts, making up a story to introduce a new topic, and practical demonstrations whenever possible.

   If the interest is kept alive, success will follow. Not only does learning become fun for children, the teachers will enjoy their teaching more as well.

Three painful 'Ps' which should not exist in a teacher's vocabulary are:

1. Partiality to one child kills initiative in ten. So, please no partiality to any child.
2. Pointing out mistakes in front of others is a definite *no*. It is best to look out for the best traits using positive language. Coming up from Class 4, children are still very sensitive as they settle into a more formal style of schooling.
3. Punishment is ruled out. There are no children who are beyond gentle cajoling, a smile or a hug of a teacher. Punishment, like a slap on the hand, only makes matters worse, and children tend to become stubborn. Milder punishment like standing outside the classroom may become necessary for the unruly student and can be very effective.

The positive 'Ps' which must exist in a teacher's vocabulary are:

1. Praise: employ a 'yes' attitude as often as possible. Praising good work and good behaviour will encourage other children to follow suit.
2. Patience: there is no virtue like patience, especially in a teacher. This means not losing one's temper.
3. Parent-like attitude is very reassuring. Teachers should know when to respond to attention-seeking behaviour and when to ignore it; the bottom line is the underlying sense of security a child feels.

The heights of tables and chairs must be correct for the students. Emphasis needs to be laid on correct posture when children write. If attention is not paid to this now, it can lead to a permanent bad posture and back problems.

A little exercise to relax those load-carrying shoulders helps muscles relax, and motor control improves.

With straight backs, hands on hips, forward and backward bending is helpful.

Then, the same posture, children put both hands straight ahead and start writing numbers 0 to 9 with their hands in the air, first both hands going in the same direction and then the two hands going in opposite directions, one clockwise and the other anticlockwise. (Here is an excellent opportunity to introduce these new words into their vocabulary. Does the tap open in a clockwise or an anticlockwise direction? The screwdriver and the lock on the door are further examples.)

2. Maths Lab

A maths lab for class 5 should contain some of the items included in the earlier classes. Some extra items are suggested here:

- some soft-drink bottle caps, strings of 10 bottle caps strung together, and a group of 10 strings knotted together to represent one hundred. Sets of such strings can be used for explaining numbers, addition, and subtraction.
- strings for measuring lengths of objects or a child's height
- weighing scales of 4 different types: a spring balance, an ordinary balance, a regular scale with a vertical circular dial, and a step-on weighing scale on which children can weigh themselves. Children can be taken on a field trip to the station to observe the weighing scales on which cars and other heavy objects are weighed.
- tape measures and rulers of different sizes
- a trundle wheel
- shells, small stones, beads in groups of 10s, 100s, and 1000s, 10000s wrapped securely in cloth bags
- several sets of 4 almost identical objects, one with a very slight difference, to improve observation skills
- colourful pictures or charts of shops displaying fruit and vegetables, toys, and a rack of clothes, all with price tags
- sudoku puzzles of differing levels
- fabrics or strong paper to make different objects
- solid shapes in the form of wooden blocks, balls (spheres), egg-shapes, dice (cubes), boxes (cuboids), cans (cylinders), and cones
- cubes, cuboids, cylinders, and cones made from thick card, which can be opened out and laid flat
- flat shapes cut out from thick card or wood, such as circles, squares, and triangles, so the students can feel the flat surface and count the corners and the edges. It will be useful to have flat shapes which are equal to the sides of the solids, so that children can explore the relationship between solids and their faces.
- rolls of cord and ribbon
- plastic or steel tins, jars, bowls of different sizes for comparing capacity. Bowls made of halves of dried coconut shells or bamboo segments split in half may be used.
- pencils and crayons of different colours and lengths

- charts illustrating different concepts studied
- solids made from play dough which have 2 (or more) lines of symmetry, so that they can be cut into halves along 2 axes
- squares of reflecting plastic surfaces (avoid using glass mirrors)
- 3-piece jigsaw cards with a number and corresponding multiplication and division sums, e.g. 4×2; dominoes and flashcards
- a giant number square 1 to 100 on the wall and several sheets with blank squares for children to work on
- a horizontal wooden rod with several pegs, wooden numbers hang from these
- number tabs, up to 4-, 5-, 6-, and 7-digit figures
- analogue and digital clocks
- abacus and calculators
- 12 pages to make up a calendar; sunshine, rain, and cold weather to be depicted by symbols on each day. Reinforces counting, association between weather and appropriate symbols, clothes which people wear, and food that people eat during these seasons
- plastic baskets or trays to store various objects
- a fraction wall, with fractions such as $\frac{1}{2}$ s, $\frac{1}{3}$ s, $\frac{1}{4}$ s, and $\frac{1}{5}$ s
- plastic cakes / pizzas / fruits / jars of water to demonstrate fractions and percentages
- gem clips, rubber bands
- a stopwatch
- a set of geometrical instruments
- waste bins marked PLASTICS, GLASS, and PAPER
- attractive charts and other child-friendly displays on walls for use as learning aids
- a soft board covered with chamois leather on which children can stick numbers or pictures
- to make learning enjoyable, a patch of garden in the playground, with different shrubs and pets such as rabbits, white mice, and tortoises, a fish aquarium, and an aviary would be useful. These also help create awareness of the environment.

Each *Maths Wise* book begins with a detailed review of the previous year's work. It is important to check that each child has mastered concepts learnt in the previous year and is handling these independently, with confidence.

An interesting way to do it may be to conduct a quiz following the pattern of questions in the review exercises.

C. Maths Wise 5

Numbers

Step-by-step, numbers up to hundreds of thousands are introduced. The concept has been introduced based on the students' prior knowledge. The comparison of place values has been done pictorially to aid visual learning.

It must be emphasized here that if a student is working well with 3-digit numbers, going further to 5-, 6-, or 7-digit numbers should be easy. The language used, the methodology, and the techniques are the same for carrying over and grouping or borrowing.

The concept of 4-, 5-, and 6-digit numbers is best explained by using the terms 'house of thousands' and 'house of tens'.

Less than (<), greater than (>)

A crocodile's mouth drawn on the board, always ready to grab the bigger number can be used. Similarly, the left hand with the thumb held horizontally and the forefinger held straight up, makes an angle to show less than. Similarly, the right hand can be used to show greater than.

Students are introduced to Pakistani and international numbering systems.

D. Lessons

It is suggested that the teachers spend 40 minutes per lesson. However the time spent on each lesson is entirely on the teacher's discretion and the ability of the students to grasp the concept.

UNIT 1

ASSESS AND REVIEW 1

Teaching objectives

- to reinforce learning from Maths Wise Book 4
- to work with numbers up to 100 million
- to recap decimal numbers
- to revise weights and measurements and their units
- to recap fractions, time, and shapes learnt

Learning outcomes

Students should be able to:

- demonstrate understanding of concepts learnt in Maths Wise Book 4
- perform the four operations with numbers up to 100 million
- compare decimal fractions
- work with units of weights and measurements to solve real life problems
- demonstrate understanding of fractions, time, and shapes

Teaching materials:

- additional worksheets

Learning activity

Lesson 1: 40 minutes

At the beginning of the year it is very essential to revisit the concepts that were covered during the previous year. This not only helps the students remember the concepts, but also helps them feel relaxed and settled (there is always security in a known field). Even though the surroundings are new, children get to know their new classmates thorough group work and start to bond with the teacher.

Revision is a very useful tool for you assessing the level of each student. You can assess the progress of each student through fun activities in a friendly ambience. This will inform planning of future lessons and activities, and facilitate the teaching process for optimum learning of new topics.

For this reason, the worksheets are used as revision sheets at the beginning of the year. The students enjoy working these, as a team, as well as individual work.

The sheets need to be thought-provoking rather than mathematically taxing, and conducive to lateral thinking. The students should have scope to demonstrate their thinking and their analytical skills, and simultaneously, recall the concepts learnt.

Here are some interesting buildings in different cities in the world:

A hut with a cone-shaped roof in a village

Homes with pyramid shaped roofs

A building, which looks like a LEGO house, made of different cuboids

The Cybertecture Egg in Mumbai

Take the students to a pizza shop and show them how hundreds of cardboard cut-outs of the pizza boxes are stacked, occupying very little space. The assistant picks up a cut-out and folds it to make a box. He places the pizza in it and hands it over. If it were a cylindrical box, a lot of storage space would be needed for the 100s of pizzas sold each day!

Encourage the students to make some patterns with tessellations:

Collect a number of shapes, which tessellate, as shown before. (Remember, regular pentagons do not tessellate.)

Task: Students should attempt pages 2–10.

Quiz

A. Wherever possible insert commas in the following numbers according to the Pakistani system. Simplify these and write your answers in words:

1. 35409 + 10117
2. 24375 + 3401
3. 100000 – 24379
4. 999981 – 89898
5. 45217 × 3
6. 372106 ÷ 11
7. (4374 + 5130) – 249
8. (8629 – 3421) × 3
9. 243 + 139 – 111
10. 6724 – 3274 + 1014

B. Simplify the following:

1. $1\frac{1}{2} + 3\frac{1}{3} + \frac{2}{3}$
2. $3\frac{2}{5} - 1\frac{7}{10} + 1\frac{1}{2}$

3. $5\frac{1}{7} \times 1\frac{9}{9}$

4. $4\frac{1}{6} \div 3$

5. $1\frac{1}{2} + (\frac{4}{7} \times \frac{14}{15})$

6. $\frac{2}{3} + (1\frac{1}{5} - \frac{2}{7})$

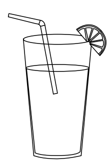
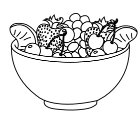
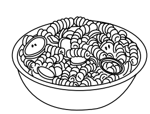
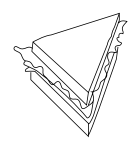
7. $7\frac{1}{11} + (\frac{6}{13} \div \frac{15}{26})$

8. $\frac{14}{47} + (\frac{3}{5} + 2\frac{3}{10})$

9. $\frac{12}{25} \times (\frac{50}{91} \times \frac{13}{24})$

10. $(3\frac{1}{15} + \frac{7}{10} \times 4\frac{5}{7} - \frac{5}{14})$

C. Below are the sales figures for 4 items at 4 different fast-food outlets. Study the table and answer the questions below:

	FRUIT JUICE 	**FRUIT SALAD** 	**PASTA SALAD** 	**FRESH SANDWICH** 	**TOTAL**
K's Korn	155	80	162	245	
Munch on	172	51	170	75	
Star Fresh	225	115	2	11	
King's Salad Bar	92	120	209	42	
Total					

1. Complete the totals column.
2. Represent the comparative sales for drinks and fruit salad on a bar graph.
3. Represent the sales of pasta and sandwiches on 2 separate pie charts.
4. Represent the total number of each food item sold as a fraction of the total sales.
5. Find the difference between the largest number of salads sold and the smallest number of sandwiches sold by any outlet.

6. Below is the price list for each outlet:

K's Korner	
Item	**Price (Rs)**
Juice	62
Salad	75
Pasta	105
Sandwich	225

Munch on	
Item	**Price (Rs)**
Juice	70
Salad	55
Pasta	78
Sandwich	215

King's Salad Bar	
Item	**Price (Rs)**
Juice	70
Salad	75
Pasta	135
Sandwich	202

Star Fresh	
Items	**Price (Rs)**
Juice	55
Salad	95
Pasta	130
Sandwich	200

1. Calculate the sales for each item at the individual outlets.
2. Calculate the total sales at each outlet.
3. Calculate the total sales for each food item at all the outlets taken together.

D. There are a 120 students in a year group.

$\frac{2}{5}$ of them like sports,

$\frac{1}{2}$ of them like music,

$\frac{5}{6}$ like art.

1. How many students like sports?
2. How many students do not like art?
3. How many more students like art than music?

E. 30 more students join the year group. Of these 23 like sports, 12 like music, and 10 like art.

1. What fraction of the students like sports now?
2. What fraction of the new students like music?
3. Which is the most popular activity now?

F. Anita is making chocolate pudding for her mother's birthday following the recipe below:

CHOCOLATE PUDDING FOR 2

You need…

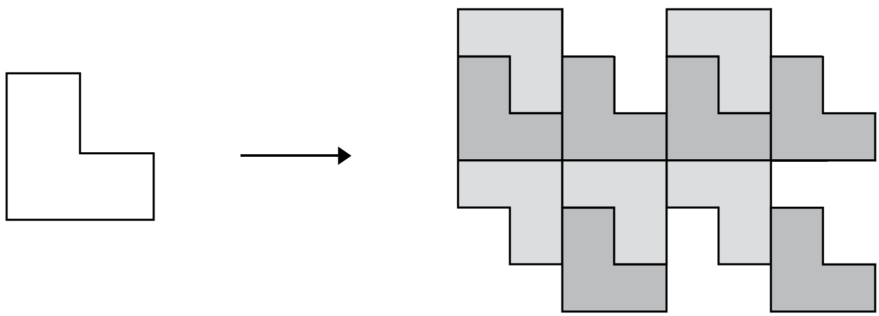
- Milk .... 250 ml
- Cocoa powder ....100 g
- Sugar .... 425 g
- Eggs 3
- Corn starch .... 40 g
- Vanila essence .... 3 drop

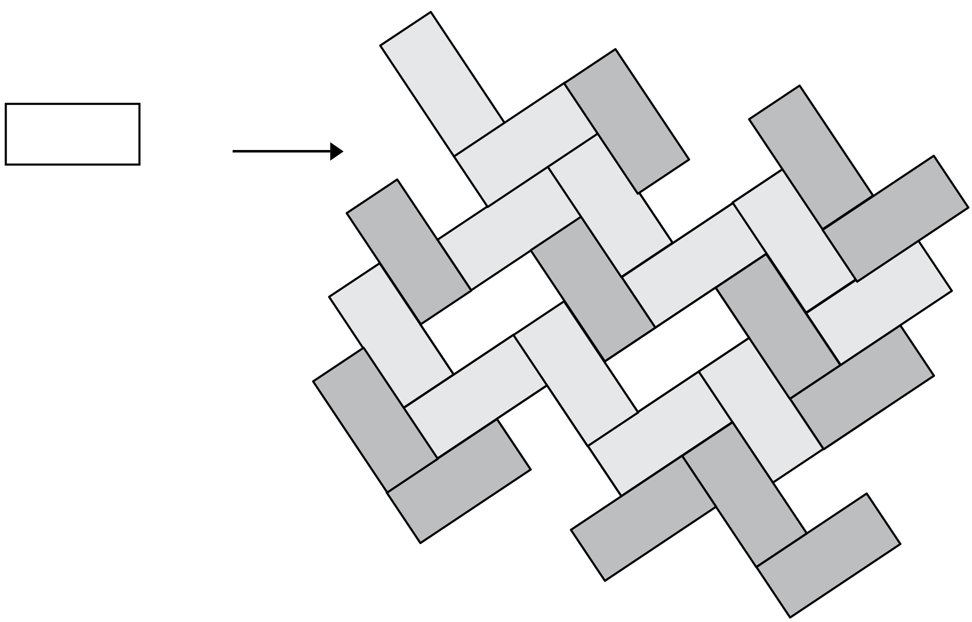
1. Rewrite the recipe for 20 guests.
2. Find the total weight of the pudding. (Assume each egg weighs 15 g and a drop of pudding essence 0.05 g.)
3. If each guest gets an equal portion of the pudding, what is the weight each guest's pudding?
4. Milk comes in cartons of 1 litre each; how many cartons does she buy?
5. If each carton costs Rs 55.20, how much money does she spend on milk?
6. Eggs come in boxes of a dozen each. How many boxes does she have to buy? Are any eggs left over?
7. A packet of starch cost Rs 22.50. How much change does she get back if pays the shopkeeper a Rs 50 note for the packet of starch?

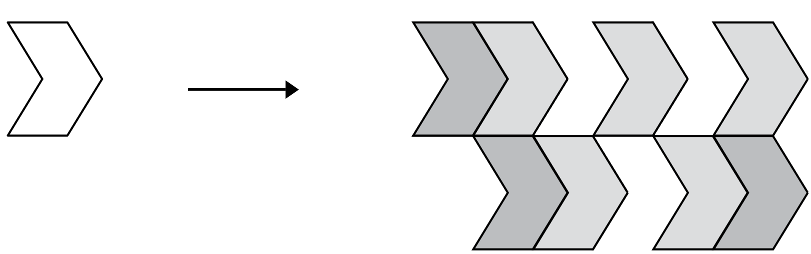
G. Simplify:

1. $2.3 + 3.02 - 1.113$
2. $7.12 + (3.09 - 2.5)$
3. 8.05×23
4. $16.484 \div 4$
5. $(11.6 + 2.094) \div 2$

Use the figure given to complete the pattern.

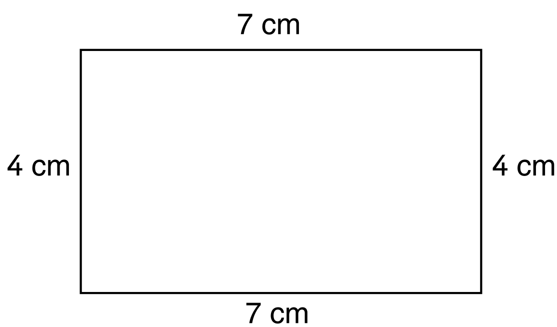






Find the perimeters of the following shapes:

1.



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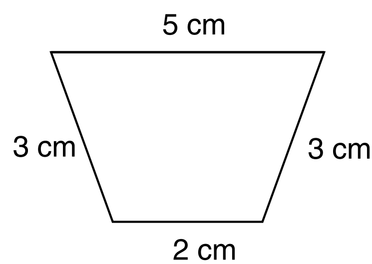

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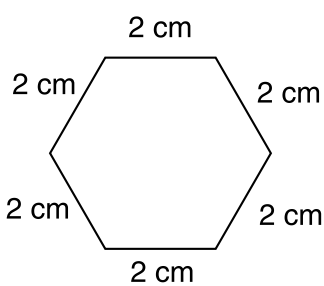
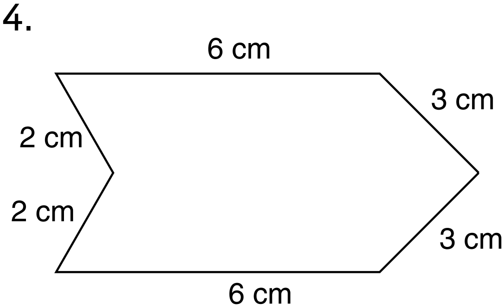
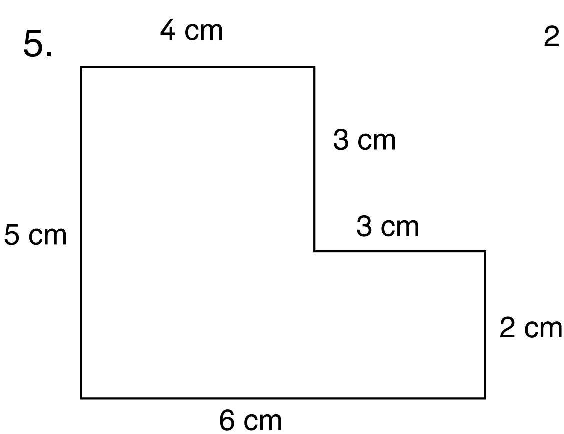


4.



5.



UNIT 2

NUMBERS AND ARITHMETIC OPERATIONS

Teaching objectives

- to revise large numbers
- to introduce the Pakistani system of place value
- to introduce place value up to 10-digit numbers and introduce the concept of a billion
- to compare and order numbers up to 10 digits
- to revise properties of addition and introduce addition of large numbers
- to revise properties of subtraction and introduce subtraction of large numbers
- to demonstrate multiplication of 3-digit numbers and verify multiplication properties
- to introduce division of 2- and 3-digit numbers
- to introduce multiplication and division by 10, 100, 1000
- to explain the order of number operations

Learning outcomes

Students should be able to:

- differentiate between the international place value system and the Pakistani system of notation
- identify numbers up to a billion, and 10-digit numbers
- add, subtract, multiply, and divide large numbers
- apply binary operations to real life situations
- perform multi-operation simplification using BODMAS

Teaching materials:

- board and markers/chalk

Learning activity

Lesson 1: 40 minutes

Step by step, numbers up to a million have been introduced in Maths Wise 4. The concept has been introduced based on the student's knowledge from previous years of place value of numbers. Comparison of place value has been done pictorially: visual and practical teaching enhances understanding and support learning.

This is not the first time the students are introduced to the concept of the international system of writing numbers. However, it is important to compare the same number in both writing styles.

Reinforce the fact that same number may be written in 2 different notations, dividing a large number into two different patterns of grouping. This does not change the value of the number. It is just two different ways of representing the same quantity.

Simple examples:

30 years is the same as 3 decades.

OR

60 apples is the same as 5 dozen apples.

OR

900 years is the same as 9 centuries.

10 000 years is the same as 10 millennia.

Answer any queries the students may have regarding the two styles. Show them how both styles of writing are used in real life. You may take newspapers of Pakistan and online international newspapers to show both styles of notation… crores and lakhs, versus billions, millions, and hundreds of thousands. The most important point to remember is that in the international system numbers are divided into ALL groups of 3: Units, Tens and Hundreds, as against the Pakistani system of notation.

International System of Notation:

H T U	H T U	H T U	Hundreds Tens Units
Billions	Millions	Thousands	Units

Pakistani System of Notation:

Tens Units	Tens Units	Tens Units	Hundreds Tens Units
Crores	Lakhs	Thousands	Units

You may want to conduct a small activity of comparing both the styles of notation. Divide the students into pairs. One student writes an 8-9 digit number in the international system of notation on a large sheet of paper and holds it up for the other student to see. The second student reads it out aloud, and writes the same number in crores and lakhs, and holds up his/her numbers. Then repeat the activity with the students taking opposite roles.

Task: Students should attempt pages 13–15.

Lesson 2: **40 minutes**

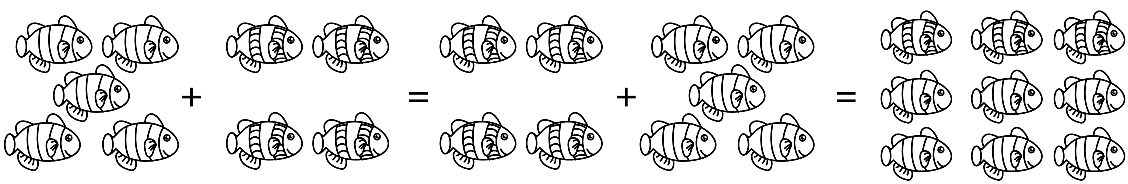
The four number operations have been handled using 6- digit numbers in Maths Wise 4. Handling larger numbers should not be difficult provided the students have understood their concepts in the previous years. Discuss the words 'sum', 'difference', 'product', and 'quotient', before they start working out problems. Revisit associative, commutative, and distributive properties as you take them through the exercises (without using the big words).

Associative, commutative, and distributive laws are big words for small ideas. The following explanations are for you to make BODMAS easier to explain to the students.

1. COMMUTATIVE LAW

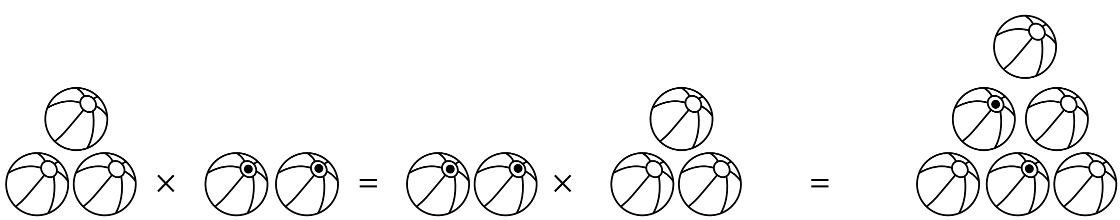
   This law says we can 'swap' numbers for additions and multiplications AND the result remains the same:

   $5 + 4 = 4 + 5 = 9$



(5 fish in a jar + 4 similar fish in a jar = 4 fish in a jar + 5 fish in a jar = 9 fish in a big jar)

$3 \times 2 = 2 \times 3 = 6$



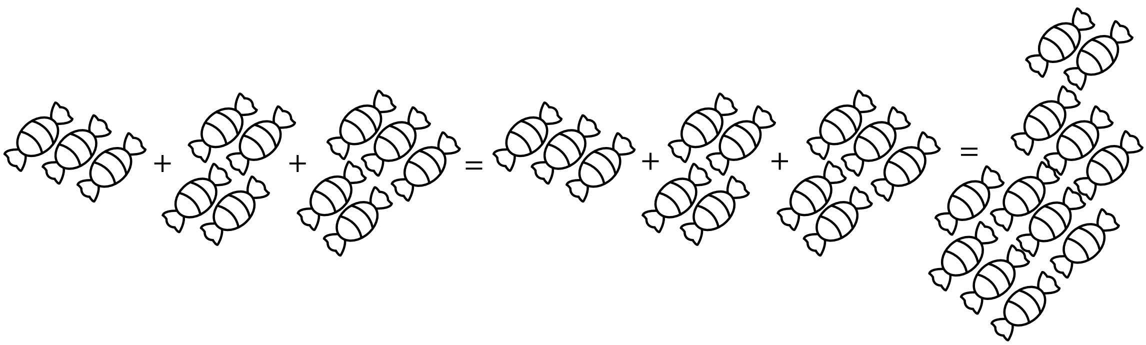
COMMUTATIVE LAW does not work for either subtractions or divisions.

2. ASSOCIATIVE LAW

   This law says that the manner in which we group numbers is not important, i.e. which group we calculate first. This law also applies to addition and multiplication.

For addition

(3 + 4) + 5 = 3 + (4 + 5) = 12



For multiplication

(4 × 3) × 5 = 4 × (3 × 5) = 60

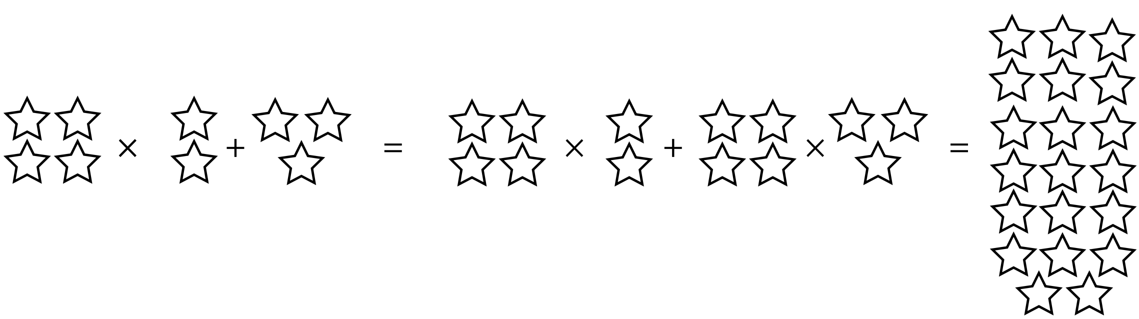
This may also be worked out practically, with various numbers.

ASSOCIATIVE LAW does not work for either subtractions or divisions.

3. DISTRIBUTIVE LAW is the best of the three laws, but needs to be worked carefully.

For addition

4 × (2 + 3) = 4 × 2 + 4 × 3 = 20



If there are 4 boxes with 2 dates and 3 orange dates each, the total is: 8 dates and 12 orange dates.

This means that 4 can be distributed over 2 and 3 in the bracket.

The Distributive Law works over subtraction in the brackets:

For subtraction

$4 \times (5 - 1) = 4 \times 4 = 16$ OR $4 \times (5 - 1) = 4 \times 5 - 4 \times 1 = 20 - 4 = 16$

Remember the topic requires a lot of practice!

Once these 3 laws have been learnt well, the students are confident applying them to different sets of numbers, go on to working with large numbers.

Team games are always an excellent way to present problems involving large numbers in expanded form, ascending and descending orders, identifying numbers 'before' and 'after' a given number and skip counting. A lot of this has been handled in the previous year, with smaller numbers. So this one step ahead should not be a problem.

One half of the class collects statistical data containing large numbers, such as population of countries, height of mountain peaks, sales figures of multi-national companies, depths below the sea level at which various life forms exist, the distances between different planets, and number of seconds in a month, and writes them on the board. (It is interesting for the class to calculate how many minutes (and seconds) each child has been on this Earth; parents and teachers, as well.) The other group reads them out aloud both in crores and lakhs, and in billions, millions, and hundreds of thousands.

Task: Students should attempt pages 18–24.

Lesson 3: 40 minutes

The new concept that has been introduced in Maths Wise 5 is the order of operations in an expression, according to the commutative, associative, and distributive laws. It is important for students to understand why we need to fix an order in which operations have to be performed in a multi-operation simplification problem. Explain this idea with a real life problem:

Example 1:

Revaz has Rs 150 in her bag. She needs to buy a geometry box for Rs 300 and have some money left for donation to an orphanage. She looked through her savings and found Rs 250 in it. Once she buys the geometry box, how much money does she have left for the donation?

This can be written as:

$150 - 300 + 250 = 400 - 300 = 100$

This can also be written as:

$150 + 250 - 300 = 400 - 300 = 100$

Revaz has Rs100 left for the donation.

So, at this level, students need to ADD before they subtract.

Example 2:

Maher goes to a shop to buy some groceries with Rs 600. Maher buys 3 kg flour at Rs 50 per kg.

If this is worked out as:

$600 - 50 \times 3 = 550 \times 3 = 1650 \times \ldots$

This is incorrect.

Therefore, rules were made which said: Work out Multiplication, before Subtraction.

$600 - 50 \times 3 = 500 - 150 = 450$ this is correct.

Or, use brackets:

$600 - (50 \times 3) = 500 - 150 = 450$

Multiplication MUST BE DONE BEFORE addition or subtraction.

The above operations need to be performed in the exact order as above. Alteration in the order will not only produce a completely different result, but will not be logically correct.

With other similar examples, one can arrive at BODMAS, which gives the order of operations as follows:

Brackets, Of (Multiplication before ×), Division, Multiplication, Addition, Subtraction

Example 3:

Zain goes to a shop to buy some groceries with Rs 500. He buys 2 kg sugar at Rs 45 per kg, 3 packets of biscuits at Rs 30 a packet, and a bottle of orange juice for Rs 125. The remaining money is distributed equally among 5 needy women. How much money did each woman get?

	$500 - 2 \times 45 - 3 \times 30 - 125$	OR		$500 - 2 \times 45 - 3 \times 30 - 125$
=	$500 - (2 \times 45) - (3 \times 30) - 125$		=	$500 - (2 \times 45) - (3 \times 30) - 125$
=	$500 - 90 - 90 - 125$		=	$500 - (90 + 90 + 125)$
=	$410 - 90 - 125$		=	$500 - 305$
=	$320 - 125$		=	195
=	195			

The second format needs to be explained. Ali's wallet has Rs 300. Ali needs to take out from his savings box Rs 50 on the 1st day, Rs 25 the 2nd day, and Rs 60 on 3rd day:

It is correct to write: Rs 300 – (50 + 25 + 60) = Rs 300 – Rs 135 = Rs 165

The concept of the use of brackets can only be explained by working this problem practically. Rs 300 in small notes in a wallet … take out Rs 50, Rs 25, and Rs 60 and

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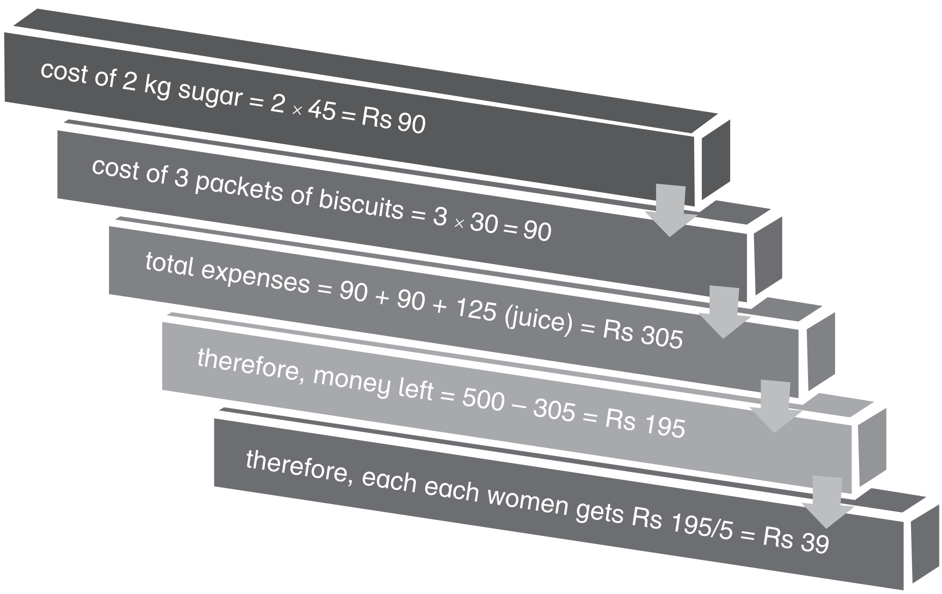
place the money on the desk. What total amount of money has been taken out from the wallet, and given out to the shopkeeper?

300 – 50 – 25 – 60 = 300 – (50 + 25 + 60) = 300 – 135 = 165

Now getting back to example 3.

Rs 195 is to be divided amongst 5 women: $\frac{195}{5} = 39$

Each woman gets Rs 39. The operations you need to perform are as follows:



To work out the entire problem, use brackets. Explain to the students the use of a bracket … a bracket tells you 'Work the problem inside the brackets first'.

500 – (2 × 45) – (3 × 30) – 125

= 500 – 90 – 90 – 125

= 500 – 350 = 195

Work out similar problems, which involve 'millions'.

Explain to the students the need of the correct order of operations and introduce the term BODMAS:

B stands for 'Brackets'

O stands for 'Of' (a form of multiplication)

D stands for 'Division'

M stands for 'Multiplication'

A stands for 'Addition'

S stands for 'Subtraction'

For example: $34 - (12 + 8) \div 5 \times 2$ (Follow BODMAS):

Brackets first: $(12 + 8) = 20$ ……… 'B'

Then, division: $20 \div 5 = 4$ ………… 'D'

Then, multiplication: $4 \times 2 = 8$ ….. 'M'

Finally, subtraction: $34 - 8 = 26$ … 'S'

WRITE THE PROBLEM DOWN LIKE THIS:

$34 - (12 + 8) \div 5 \times 2$

$= 34 - 20 \div 5 \times 2$

$= 34 - 4 \times 2$

$= 34 - 8$

$= 26$

When you teach the concept of BODMAS, do several sums on the board showing the steps split-up. Then ask volunteers to guide you through working out the expression.

Make sure that the students understand exactly how to go about performing the operations. Ask them to show the indiviual steps, as shown in the example. One by one, students come up to the board and work out several problems. Give plenty of practice.

And practice is the final word for this concept!

THE FOLLOWING INFORMATION IS FOR TEACHERS.

Another word used instead of BODMAS is PEMDAS.

BODMAS is used in Asia, the UK and the US uses PEMDAS. 'Parenthesis', ' Exponents', 'Multiplication' , 'Division', 'Addition', 'Subtraction'.

A mnemonic for PEMDAS …

Please Excuse My Dear Aunt Salma

P stands for Parenthesis (brackets) and E for Exponent (which is not used at this moment, but it can replace 'Of'.)

BODMAS uses Division before Multiplication, PEMDAS works Multiplication before Division.

If you work out a few problems, you will find that this is in order.

$9 \div 3 \times 4 = 3 \times 4 = 12$ OR $9 \times \frac{4}{3} = \frac{36}{3} = 12$

Task: Students should attempt page 26.

Additional resources:

At the end of the guide are additional worksheets 1–4. Use them for reinforcement.

UNIT 3

HCF AND LCM

Teaching objectives

- to revise factors and multiples
- to recap prime and composite numbers
- to reinforce divisibility tests
- to introduce prime factorization using the listing method, tree method, and short division
- to introduce HCF using the Venn diagram, prime factorization, and long division
- to find the LCM by listing common multiples, prime factorization, and short division of 4 numbers
- to introduce square numbers

Learning outcomes

Students should be able to:

- use divisibility rules when dividing given numbers
- differentiate between prime and composite numbers
- identify and find factors and multiples of a number
- find the HCF using the listing method, short division, and long division
- find the LCM of 4 numbers by prime factorization and the short division method

Teaching materials:

- board and markers/chalk

Learning activity

Lesson1: 40 minutes

In year 4 students were introduced to the concept of HCF and LCM. As always, start the lesson with a revision of the basic concepts. You could conduct a quiz or have a class discussion or carry out some of the suggested activities during revision.

Why do we need to find LCM of numbers?

Addition of fractions cannot be done accurately without finding the LCM of denominators.

LCM is important in everyday life for time and speed, and time and work problems, different people running around circular race tracks, timing of bells and flashing lights, such as from a lighthouse.

HCF is important to find the largest size of tiles that may fit into rooms, while constructing a building.

Any such activity is not merely useful in its mathematical field, but increases the power of reasoning and thinking.

Introduce Prime Numbers: 2, 3, 5, 7, 11, 13, and so on. A prime number is a natural number greater than 1 that can be divided ONLY by the number itself and 1. All other numbers are composite numbers.

17 is a prime number because it has no factors other than 1 and itself.

$17 \div 1 = 17$ and $17 \div 17 = 1$

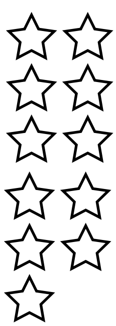
PRIME NUMBERS: 2 3 5 7 9 11 13 15 17
COMPOSITE NUMBERS: 4 6 8 10 12 14 16 18
Prime and composite numbers can be placed in groups as shown below:

COMPOSITE NUMBERS
A composite number can be placed in rectangular formats like this:

$15 = 3 \times 5$

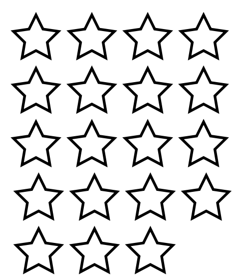
$14 = 2 \times 7$

PRIME NUMBERS
A prime number cannot be placed in rectangular formats like above.



$11 = (5 \times 2) + 1$

$7 = (2 \times 3) + 1$



$19 = (4 \times 4) + 3$

Here are the prime numbers below 100, which can be shown on the 1 to 100 number chart.
2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47, 53, 59, 61, 67, 71, 73, 79, 83, 89, 97.

Task: Students should attempt pages 29 and 30.

Lesson 2: **40 minutes**

Prime and Composite Numbers: Discuss the meaning of prime and composite numbers and the importance of prime numbers. Then perform the Eratosthenes sieve test for prime numbers and list out the first 20 prime numbers.

Explain the positioning of the prime and composite numbers in a 1 to 100 number square. The following information is important for you:

- No two prime numbers, other than 2 and 3, are consecutive.
- No prime number, other than 2, has an even number in its unit digit.
- No prime number, other than 5, has 5 or 0 in its unit digit.
- No prime number has the sum of its digits which is divisible by 3 or multiples of 3.
- No prime number has difference between the sums of alternate digits as 11, or a multiple of 11.
- The smallest prime number is 2.
- The smallest composite number is 4.

There is no biggest prime number or composite number. Numbers go into infinity > > > >

Discuss the answers to the following questions:

- Which is an even prime number? Why is it the only even prime?
- What are the number 0 and 1 called? Why?
- What are composite numbers?
- What are the differences between prime and composite numbers?
- No prime number greater than 5 ends in 5. Why?
- Which is the greatest/smallest prime number?
- How many prime numbers are there?

Put the chart of prime numbers between 1 and 1000 in class:

2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47, 53, 59, 61, 67, 71, 73, 79, 83, 89, 97, 101, 103, 107, 109, 113, 127, 131, 137, 139, 149, 151, 157, 163, 167, 173, 179, 181, 191, 193, 197, 199, 211, 223, 227, 229, 233, 239, 241, 251, 257, 263, 269, 271, 277, 281, 283, 293, 307, 311, 313, 317, 331, 337, 347, 349, 353, 359, 367, 373, 379, 383, 389, 397, 401, 409, 419, 421, 431, 433, 439, 443, 449, 457, 461, 463, 467, 479, 487, 491, 499, 503, 509, 521, 523, 541, 547, 557, 563, 569, 571, 577, 587, 593, 599, 601, 607, 613, 617, 619, 631, 641, 643, 647, 653, 659, 661, 673, 677, 683, 691, 701, 709, 719, 727, 733, 739, 743, 751, 757, 761, 769, 773, 787, 797, 809, 811, 821, 823, 827, 829, 839, 853, 857, 859, 863, 877, 881, 883, 887, 907, 911, 919, 929, 937, 941, 947, 953, 967, 971, 977, 983, 991, 997.

Divisibility rules: 'Rules of divisibility' is an important concept that is very useful in factorization, and finding HCF and LCM of numbers. Discuss these rules, one at a time. Consolidate the idea through an oral activity.

Ask the class to write down five 6-digit numbers in their exercise books. Now ask one student to read out a number from his/her list. Ask a student volunteer to say whether this number is divisible by 2, 3, 4, 5, 6, 7, 9, 10. Ask the rest of the class if they agree.

Factors and multiples:

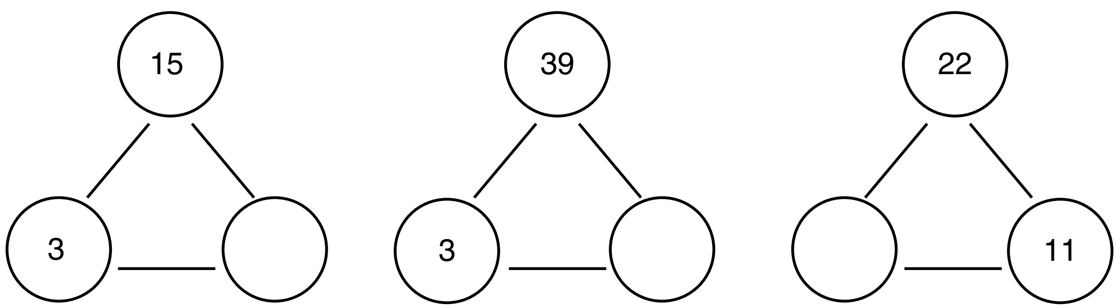
Factors:

Factors are divisors of a number which, when multiplied together, give the number itself. Every number has at least two factors, one and the number itself.

For example:

$2 \times 7 = 14$	2 and 7 are prime divisors of number 14
$3 \times 5 \times 11 = 165$	3, 5, and 11 are prime divisors of number 165
	15, 33, and 55 are also divisors of 165

Work out numbers in a triangle like the following:



15 is a multiple of 3 and 5; 3 and 5 are factors of 15

39 is a multiple of 3 and ____; ____, and ____ are factors of 39

22 is a multiple of 11 and ____; ____, and ____ are factors of 22.

Multiples:

A multiple of a number is the number multiplied by another integer.

Multiples of 7: 7, 14, 21, 28, 35, 42, 49, 56, 63, 70, 77, 84, 91, 98, 105 … to infinity

I_____I_____I_____I_____I_____I_____I_____I_____

- - - - - 7

- - - - - - - - - - 14

- - - - - - - - - - - - - - - - 21

- 28

- 35

- 42

- 49 and so on, to infinity

Multiples of 20: 20, 40, 60, 80, 100, 120, 140, 160, 180, 200 _____ and on, and on, and on _____ to infinity

I_____I_____I_____I_____I_____I_____I_____I_____

- - - - - 20

- - - - - - - - - - 40

- - - - - - - - - - - - - - - - 60

- 80

- 100

The same number is added to itself on a number line, and the addition goes on. It goes on and on to infinity.

Count in 3's: 3 - - - - ( ) - - - - 9 - - - - ( ) - - - - ( ) - - - - 18 - - - - 21 - - - - ( )

Count in 11's: 11 - - - - 22 - - - - ( ) - - - - ( ) - - - - ( ) - - - - 66 - - - - ( )

Work out more chains of numbers such as the ones shown above.

Infinity is a difficult concept for children to understand.

The grains of sand on all the beaches in the world are not infinite in number, because if some groups of people decided to count the grains, in different areas, they will be able to do so. There will be a time when all grains have been counted, and there are no more. (Of course, more grains of sand are formed all the time!)

Space is infinite; it does not end.

The number of stars may be infinite because space is infinite and the number of stars may be infinite.

Drops of water in a deep well are not infinite because sometimes the wells and rivers dry up.

Factors and multiples are especially important in working with fractions, as well as finding patterns in numbers. Finding the greatest common factor, least common multiple, and prime factors of a number are important skills in this section.

Play the guessing games. I think of a number.

1. This 2-digit number has 2 as a factor. Ask the students to guess the possible answers: 2, 4, 6, 8, 10, 12, 14, 16, …, 98
2. What are these numbers called?
3. Ask them to guess the number conclusively. Why is this not possible? Is there a largest possible answer? NO …. Why not?
4. Give them another clue. This number is also a factor of 24. Ask the students for the possible answers: 2, 4, 6, 8, 12.
5. Can they come to a conclusion? NO.
6. Give another hint: The number lies between 10 and 15.
7. The students should now arrive an answer: 12.

Task: Students should attempt page 33.

Lesson 3: **40 minutes**

Prime Factorization, LCM and HCF:

It is important to explain why students need to learn how to find the LCM of two or more numbers. Primarily, LCM of denominators makes addition of fractions possible.

For example: A tea plantation worker is paid per basket of tea leaves she plucks in a day.

If one woman plucks $\frac{3}{5}$ of a basket in the morning and $\frac{3}{4}$ of a basket after lunch, how many baskets has the she plucked during the day?

Use the LCM to create equivalent fractions to add quickly and easily: $\frac{3}{5} + \frac{3}{4}$

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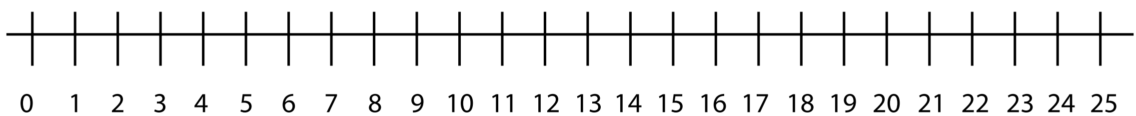
A. Find the LCM of 5 and 4.

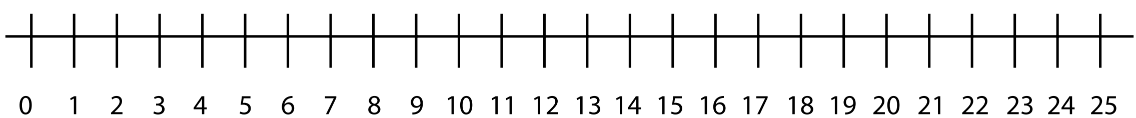
Multiples of 4

0 → 4 → 8 → 12 → 16 → 20 → 24



Multiples of 5

0 → 5 → 10 → 15 → 20 → 25



Multiples of 5: 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, …

Multiples of 4: 4, 8, 12, 16, 20, 24, 28, 32, 36, 40, 44, …

Common multiples of 5 and 4: 20, 40, 60, 80, …

Lowest common multiple is 20.

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

$\frac{3}{4} \times \frac{5}{5} = \frac{15}{20}$

$\frac{12}{20} + \frac{5}{20} = \frac{27}{20} = 1\frac{7}{20}$

The payment to the tea picker can now be calculated.

The second reason is to solve real-life problems. If two or more events are happening at different time intervals and we may need to know when they will both happen at the same time. For example: Seema has 30-minute lessons and Rumi has 45-minute lessons. If they start the first lesson at the same time, when will they next start a lesson together again?

It would be useful to use story problems to find the LCM; real-life story problems help students with the question of 'Why do I need to know this?'

Follow the steps below to explain exactly what students need to do.

Step 1: Students need to define, in their own words, each word in this mathematical term: LOWEST COMMON MULTIPLE.

What does ‘lowest’ mean? Students may define it as smallest or minimum. Record the students' ideas on the board.

What does ‘common’ mean? Students may come up with words such as common, typical, and average. Write their answers on the board.

What does ‘multiple’ mean? The answers that are formed as a result of skip counting on a number line. Ask students to provide examples: Multiples of 3 are 3, 6, 9, 12, 15, ...

Step 2: Give students a real-life example to solve.

Jassal has a soccer game every 4th day and Karate classes every 6th day. If he starts with both classes on the 1st, then when will he have a class on the same day again? Ask students to share their thinking.

If students do not have an organized way of expressing their thoughts, introduce an open number line. Use the open number line to skip count to find the lowest common multiple.

For students who need more structure than an open number line, use a 100 square grid to find LCM. Mark multiples of the two numbers in different colours; the LCM will be the smallest number with marks of both colours of pencils.

Step 3: Give students more real-life problems to solve. Be certain to have students share out their thinking. Encourage them to create their own ‘word problems’.

B. FIND THE HCF of 12 and 16

Use a similar strategy for HCF.

Factors of 16: 1 2 4 8 16

Factors of 28: 1 2 3 4 6 8 12 24

Once you have revised the concept and the method for calculating the for LCM and HCF using Venn diagrams and listing methods, discuss the drawbacks of these methods.

If there are 4 or 5 numbers whose LCM needs to be determined, the listing method will pose a huge problem. The number of multiples will be too large to compare and find out the lowest common multiple. In fact, you may have to list out too many multiples for each number to find the common number to all the given numbers. This can be very time consuming! Again, to determine the HCF of large numbers, the list of factors will be too large to compare. Also, to find out all the factors of all the numbers the time spent will be too great. Hence, the method is inefficient.

Once you have discussed the disadvantages in the listing method, your class will be ready to be introduced to the alternate method. It is a common observation that the students find calculating the LCM relatively easier than calculating the HCF. So, introduce LCM by short division first.

A. Find the LCM and HCF of 30 and 45.

   $45 = 3 \times 3 \times 5$

   $60 = 2 \times 2 \times 3 \times 5$

   LCM (every number that appears in either 45 or 60 the maximum number of times): $2 \times 2 \times 3 \times 3 \times 5 = 180$

   HCF (every number that is common to 45 and 60) $= 3 \times 5 = 15$

B. Find the HCF and LCM of, 60, 40, 144, 240.

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

   $60 = 2 \times 2 \times 3 \times 5$

   $144 = 2 \times 2 \times 2 \times 2 \times 3 \times 3$

   HCF of 40, 60, 144 $= 2 \times 2 = 4$

   LCM of 40, 60, 240 $= 2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 5 = 720$

A multiple of these numbers, 40, 60 and 144, will have each factor appearing maximum number of times in any of these numbers.

It is also interesting to give the HCF and LCM of two (unknown) numbers and ask the class to find out what the numbers are.

HCF = 3, LCM = 36 ($2 \times 2 \times 3 \times 3$)

Numbers: 12 and 9

A great deal of practice is necessary.

To begin with, the long division method for HCF might be a little overwhelming. Explain each step of the method slowly and work out several sums on the board. Ask student volunteers to solve a few problems on the board.

Task: Students should attempt pages 35–42.

UNIT 4

FRACTIONS

Teaching objectives

- to recall various types of fractions proper/improper/mixed)
- to recall equivalent fractions and their uses
- to introduce addition and subtraction of unlike fractions
- to introduce multiplication of two fractions
- to introduce division of fractions by a whole number and by another fraction
- to explain BODMAS problems using fractions
- to solve real-life problems involving fractions

Learning outcomes

Students should be able to:

- identify correctly different types of fractions
- use equivalent fractions to compare, add, and subtract unlike fractions
- multiple a fraction by another fraction
- divide a fraction by another fraction
- perform number operations involving fractions following BODMAS
- solve real-life problems using fractions

Teaching materials:

- Rangometry pieces
- sand and similar containers
- board and markers/chalk

Learning activity

Lesson 1: 40 minutes

Fractions were dealt with in Maths Wise 4. Revise the concepts and problems related to fractions taught previously.

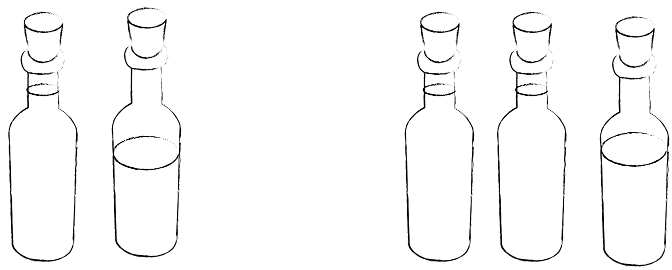
In this book the concepts have been elaborated upon and the students are introduced to a wider variety of fractions operations. The basic stress is on different types of operations related to fractions in real life applications. It is very important at this stage, as it is at every step, that students understand the concepts clearly and can work with them in real-life application. Hands-on activity is always useful to facilitate their understanding, and helps them recall the required skills.

Task: Students should attempt pages 44–45.

Lesson 2: 40 minutes

Proper and Improper fractions:

Talk about 'parts of a whole' and 'more than one whole'. Bring in real-life examples. Give the students some sand and couple of containers of the same shape and size. Then, call out some proper and improper fractions, and ask the students to fill up the containers with sand to represent the given fractions. Use Rangometry blocks, as was done in Maths Wise 4.



Addition and Subtraction of Fractions:

The students work in groups with Rangometry sets and make equivalent fractions of $\frac{1}{2}, \frac{2}{3}, \frac{1}{4}, \frac{3}{5}, \frac{5}{6}$ and any other convenient ones and share the formations with other groups, to revise addition and subtraction of fractions.

Explain that $\frac{2}{3} - \frac{1}{2}$ cannot be worked out until a 'common denominator' is found for both fractions (as was done in Maths Wise 4).

The number used as the 'common denominator' must be the lowest common multiple of 3 and 2 (i.e. 6).

Some examples:

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

$$\frac{7}{10} - \frac{4}{15} = \frac{21}{30} - \frac{8}{30} = \frac{13}{30}$$

$$\frac{1}{12} + \frac{2}{3} - \frac{3}{4} = \frac{1}{12} + \frac{8}{12} - \frac{9}{12} = 0$$

$$\frac{2}{3} \text{ of } \frac{1}{2} = \frac{2}{3} \times \frac{1}{2} = \frac{2}{6}$$

Ask the students to come up to the board, one by one, and work out a number of similar problems, orally, as well as in writing. Give assignments to be done in their exercise books till they are extremely confident with the process.

In the case of operations with mixed fractions, ask the students learn to convert the mixed fractions to improper fractions and repeat the above method.

For example:

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

$= \frac{14}{5} + \frac{7}{4}$

$= \frac{56}{20} + \frac{35}{20}$

$= \frac{91}{20} = 4\frac{11}{20}$

Repeat these exercises several times till the students are confident with addition and subtraction of unlike fractions.

Task: Students should attempt pages 48 and 49.

Lesson 3: **40 minutes**

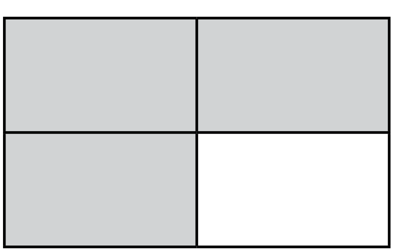
Multiplication of fractions:

Many students encounter a problem with multiplication and division of fractions when there are mixed fractions involved. A great deal of confusion can be overcome by paying close attention to the language in which the concepts are introduced, specially with division when the fraction needs to be 'inverted'.

5 apples shared by 2 children

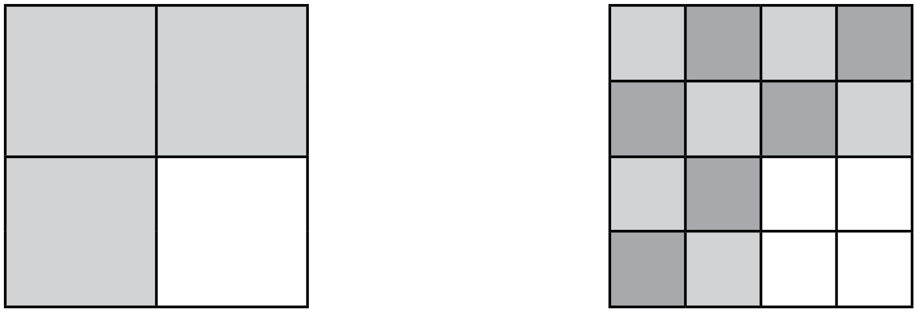
OR

5 divided by 2 OR 5 × $\frac{1}{2}$ (How many $\frac{1}{2}$ s do you get out of 5?). For example $\frac{1}{2}$ of $\frac{3}{4}$ can be interpreted diagrammatically as follows:



$\frac{3}{4}$ of the square is shaded. Now we have to shade half of the shaded region.

The shaded portion represents 3 out of 4 boxes.



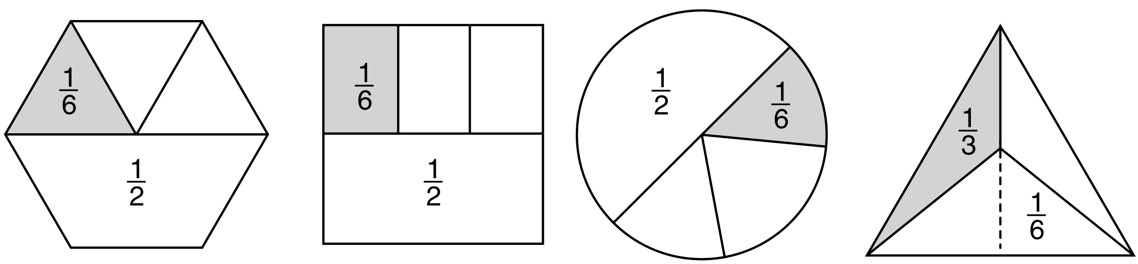
Each shaded box is divided into 4.

From the portion in light grey, half of them have been shaded in dark grey. The grey represent 6 out of 16 smaller boxes.

Hence, $\frac{1}{2}$ of $\frac{3}{4} = \frac{3}{8} = \frac{6}{16}$

Do several examples on the above lines to explain the concept of multiplication. Then introduce the rules of multiplication.

(Show $\frac{1}{2}$ of each shaded, and then $\frac{1}{3}$ of $\frac{1}{2}$ as in the circle, square, and hexagon.)



The triangle above is cut into 3 equal parts. One ‘third’ part has been cut into halves.

$\frac{1}{2}$ of $\frac{1}{3} = \frac{1}{6}$ OR $\frac{1}{2} \times \frac{1}{3} = \frac{1}{6}$

After a few practical examples of multiplication, students should solve the problems in their books.

Rules are to be looked at after they understand the concept clearly.

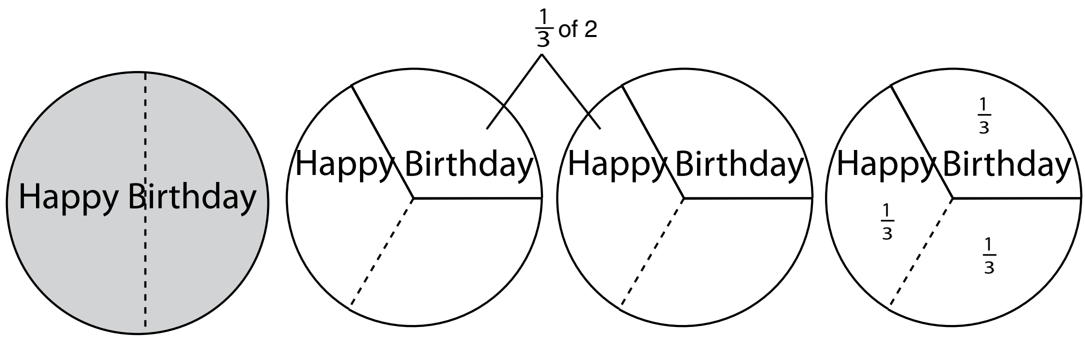
IMPORTANT: They should understand that 'of' and '×' represent to the same operation, except that, in simplication, ‘Of’ gets preference over ‘×’

Task: Students should attempt pages 53 and 54.

Lesson 4: **40 minutes**

When the students start division, it is essential that they understand the process correctly. Wooden boards or cardboard cut-outs are very useful.

Take the students back to division of whole numbers.



1 cake divided between 2 children:

$1 \div 2 = \frac{1}{2}$. Each child gets $\frac{1}{2}$ cake.

THIS IS THE SAME AS

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

OR $\frac{1}{2}$ of $1 = \frac{1}{2} \times 1 = \frac{1}{2}$.

2 cakes divided between 3 students

$2 \div 3 = \frac{2}{3}$. Each child gets $\frac{2}{3}$.

THIS IS THE SAME AS $2 \times \frac{1}{3} = \frac{2}{3}$

OR $\frac{1}{3}$ of $2 = \frac{2}{3}$.

$\frac{2}{3}$ of a cake to shared by 2 children:

$\frac{2}{3} \div 2 = \frac{2}{3} \times \frac{1}{2} = \frac{1}{3}$ each child get $\frac{1}{3}$ each

OR $\frac{1}{2}$ of $\frac{2}{3} = \frac{1}{2} \times \frac{2}{3} = \frac{1}{3}$

$\frac{1}{5} = \frac{2}{5} \times \frac{1}{2}$ (2 divided by 2 = 1)

$\frac{1}{5} = \frac{3}{5} \times \frac{1}{3}$ (3 divided by 3 = 1)

$\frac{1}{5} = \frac{4}{5} \times \frac{1}{4}$ (4 divided by 4 = 1)

Students should remember from earlier years that 'division by 2' means 'division by $\frac{2}{1}$' 'multiplication by $\frac{1}{2}$'. Make this abundantly clear by working out several examples:

$10 \div 2 = 10 \div \frac{2}{1} = 10 \times \frac{1}{2} = \frac{1}{2}$ of $10 = 5$

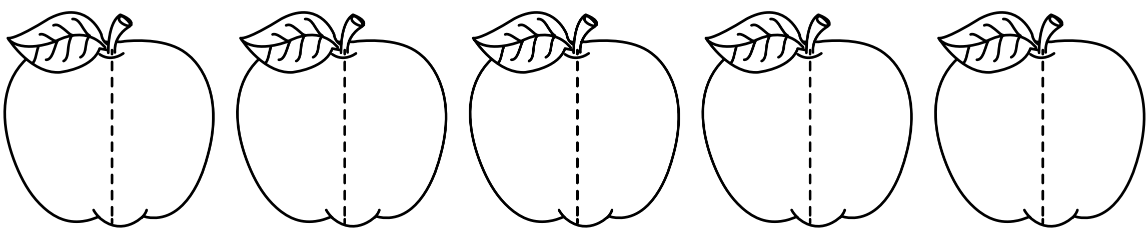
$15 \div 5 = 10 \div \frac{5}{1} = 15 \times \frac{1}{5} = \frac{1}{5}$ of $15 = 3$

$12 \times \frac{1}{2} = 12 \div \frac{2}{1} = 12 \div 2 = \frac{1}{2}$ of $12 = 6$

$21 \times \frac{1}{3} = 21 \div \frac{3}{1} = 21 \div 3 = \frac{1}{3}$ of $21 = 7$

$\frac{1}{3}$ of $9 = 9 \times \frac{1}{3} = 9 \div 3 = 9 \div \frac{1}{3} = 3$

This may sound like unnecessary repetition, but it is very important that the students understand each of these concepts.



5 apples 'divided' into $\frac{1}{2}$ s (halves)

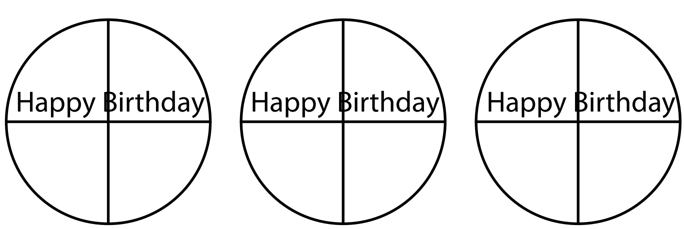
How many $\frac{1}{2}$ s (halves) do you get from 5 apples?

$5 \div \frac{1}{2} = 5 \times \frac{2}{1} = 10$ halves
5 apples give 10 half apples

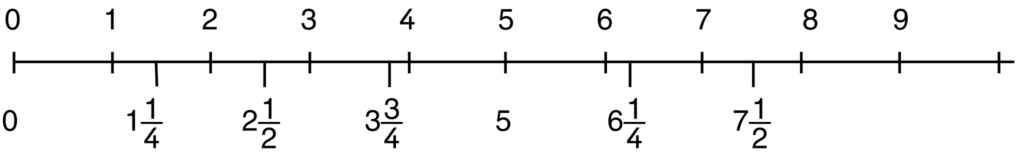
3 cakes divided into $\frac{1}{4}$ s (quarters)

How many $\frac{1}{4}$ s (quarters) will you get from 3 cakes?

$3 \div \frac{1}{4} = 3 \times \frac{4}{1} = 12$ quarter cakes
3 cakes give 12 quarter cakes



You need to decorate one window in the class. You have $7\frac{1}{2}$ m of ribbon. How many $1\frac{1}{4}$ metre pieces of ribbon can you get from this piece?



Try this practically. The students will be able to cut 6 pieces of $1\frac{1}{4}$ m ribbon strips from a $7\frac{1}{2}$ m piece. How can this be worked out?

$7\frac{1}{2} \div 1\frac{1}{4} = \frac{15}{2} \div \frac{5}{4} = \frac{15}{2} \times \frac{4}{5} = \frac{60}{10} = 6$

(Divide the numerator and denominator by 10.)

OR $1\frac{1}{4} \times 6 = \frac{5}{4} \times 6 = \frac{5}{2} \times 3 = \frac{15}{2} = 7\frac{1}{2}$

Division of fraction may be an area of concern for some students. In Book 4, simple division was introduced. Consolidate the concept with a lot of practice. Unless the students are absolutely sure of each step for working out the problem, they will face a great deal of trouble when applying division in BODMAS operations.

Example: $\frac{4}{5} \div 12$ (division of a fraction by a whole number). Ask the students to rewrite the problem as a multiplication with the divisor reciprocated, i.e. $\frac{4}{5} \times \frac{1}{12}$. Now ask them to use rules of divisibility to check whether the number in the numerator and those in the denominator have any common factor. If yes, divide both numerator and denominator by the common factor. In the example, both 4 and 12 have the common factor 4. Hence we divide both numerator and denominator by 4. Hence the reduced fraction is $\frac{1}{5} \times \frac{1}{3}$. Now multiply the numbers in the numerator together and those in the denominator together. The required answer is $\frac{1}{5} \times \frac{1}{3} = \frac{1}{15}$.

RULES TO REMEMBER FOR DIVISION OF FRACTIONS:

1. To divide one fraction by a second fraction, convert the '÷' division problem to '×', by putting '×' between two fractions and invert the fraction to the right of '×'. Solve it as for multiplication.
2. Convert mixed fractions into improper fractions, when necessary. Then solve as required.
3. Reduce the numerators and denominators by dividing (cancelling) with numbers common to both.

4. Multiply the numerators and write down the product above the bar.
5. Multiply the denominators and write down the product below the bar.
6. Convert this into a mixed number. This is your answer.

EXAMPLE:

$$9\frac{1}{3} \div 1\frac{1}{6}$$

$$= \frac{28}{3} \div \frac{7}{6}$$

$$= \frac{28}{3} \times \frac{6}{7}$$

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

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

Follow it up with a lot of examples so that the students are confident of the basic steps before you move on. It would also be a good idea to have a small class assessment at this point

Task: Students should attempt pages 57 and 60.

Lesson 5: 40 minutes

Simplification:

The new concept that has been introduced in Book 5 is the order of operations. It is important for students to understand the reason for a fixed order in which operations have to be performed in a multi-operation simplification problem. Do insist that the simplification must go from LEFT TO RIGHT of an expression.

BODMAS stands for this order…

B … Brackets

O … Of (multiplication)

D … Division

M … Multiplication

A … Addition

S … Subtraction

Operations need to be performed in this fixed order. Altering the order will result in incorrect results. It is worthwhile to mention that this concept, once again, requires a great deal of practice to perfect it. Spend sufficient time on it so that the students clearly understand the concept.

ALWAYS WORK FROM LEFT TO RIGHT.

A. Brackets must always be worked first.

$9 \times (2 + 3) = 9 \times 5 = 45$ ✓

$9 \times (2 + 3) = (9 \times 2 + 9 \times 3) = (18 + 27) = 45$ ✓

$9 \times (2 + 3) = 18 + 3 = 21$ (wrong)

B. Work from the left to the right (division first)

$\underline{30 \div 5} \times 3 = 6 \times 3 = 18$ ✓

$30 \div \underline{5 \times 3} = 30 \div 15 = 2$ X

C. Addition or subtraction first?

$\underline{4 + 8} - 5 = 12 - 5 = 7$ ✓

$4 + \underline{8 - 5} = 4 + 3 = 7$ ✓

$\underline{4 + 8} - 5 = -1 + 8 = 7$ ✓

$\underline{4 - 8} + 5 = -4 + 5 = 1$ ✓

$4 \underline{- 8 + 5} = 4 - 3 = 1$ ✓

D. In complex problems, BODMAS must be maintained.

$12 + \underline{30 \div 5} \times 3 = 12 + 6 \times 3 = 12 + 18 = 30$ ✓

$12 + 30 \div \underline{5 \times 3} = 12 + 30 \div 15 = 12 + 2 = 14$ X

$21 + \underline{25 \times 6} \div 3 - 14 = 21 + 150 \div 3 - 14 = 21 + 50 - 14$ X

$21 + 25 \times \underline{6 \div 3} - 14 = 21 + 25 \times 2 - 14 = 21 + 50 - 14 = 57$ ✓

$\underline{3 \times 5} + 4 \times \underline{9 \div 3} = 3 \times 5 + 4 \times 3 = 15 + 4 \times 3 = 27$ ✓

If you work from left to right:

- the order of addition or subtraction can be altered. (Students must understand negative numbers.)
- the order of multiplications can be altered.
- the order of division and multiplication, when they appear adjacent to each other, cannot be altered.

This concept, like many others in mathematics, requires a lot of practice to perfect it. Give the students enough examples to work on.

Additional resources:

At the end of the guide are additional worksheets 5–7. Use these for reinforcement.

UNIT 5

DECIMAL FRACTIONS AND PERCENTAGES

Teaching objectives

- to introduce like and unlike decimals
- to add and subtract decimals
- to introduce multiplication of decimals
- to introduce division of decimals
- to apply BODMAS rules to decimals
- to convert fractions to decimals and vice versa
- to practice rounding off to a given decimal place
- to introduce percentage as a special type of fraction

Learning outcomes

Students should be able to:

- explain that decimals are fractions with a special/standard denominator
- interconvert fractions and decimals
- perform addition and subtraction of decimals with correct use of place value
- perform multiplication of decimals
- perform division of decimal numbers
- apply BODMAS to decimals
- identify percentage as a special fraction
- apply the concept of fractions, decimals and percentages in real life situations

Teaching materials:

- square grid paper (10×10)
- cubes sliced into 10 by 10 by 10 smaller cubes

Learning activity

Lesson 1: 40 minutes

The teaching focus, during this year, is decimal fractions or 'decimals'. By the end of Year 5, the students should be able to identify decimals, perform the basic mathematical operations with decimals, apply BODMAS and apply decimals in real-life situations. It must be clear to the students that decimal fractions are merely another form of writing vulgar fractions with the denominators 10, 100, 1000, and so on. The decimal point is an extension point beyond which the order of 'tenths' remains from left to right:

hundreds tens units . tenths hundredths thousandths

A decimal point used on the right of the unit (or Ones) digit differentiates whole numbers and decimal fractions of the number.

IMPORTANT POINT TO REMEMBER: A decimal fraction is different form of a vulgar fraction, written as an extension of counting numbers.

The best way to introduce decimals is through the modern currency of any country: the US $, the Euros of Europe, Great Britain's pounds, or the currency of Pakistan. The class must understand the following conversions:

Rs 100	Ten Rs 10 notes (or coins)
Rs 10	Ten Re 1 coins

The students are familiar with U, T, H, and so on, in numbers. They have applied these to money, and used the four operations of +, –, ×, and ÷. It is easy to reinforce this with paper money in the classroom, emphasizing the fact that Re1 is the unit of the system.

Today, units of measurement for money, length, weight, capacity, and temperature (except time) are all metric: Rupees, metres, grams, litres and degrees. The most common use of the decimal point is money, which the students have handled since they were little, buying books, pencils, or ice creams. Two places of decimal points are most easily introduced through paper money and cardboard coins.

In the following notation, the decimal point is the place where the whole numbers ends and fractions begin, at the same rate, i.e. tenths.

	Hundred	Tens	Ones	.	$\frac{1}{10}$	$\frac{1}{100}$
	H	T	U	.	tenth	hundredth
	Rs 100	Rs 10	Re 1	.	10p	1p
A.	5	3	6	.	7	5
B.	2	4	9	.	8	0

Reads:

A. Rs 500 + Rs 30 + Rs 6 + 70 p + 5p = Rs 536.75
Rupees five hundred and thirty-six, and paise 75
OR Rs five hundred and thirty six point seven five

B. Rs 200 + Rs 40 + Rs 9 + 80 p + 0 p = Rs 249.80
Rupees two hundred and forty-nine, and paise 80
OR Rs two hundred and forty-nine point eight

The students are familiar with this, but it is useful to put it down in writing:

Ten Re 1 coins = one Rs10 note = Rs10

Ten Rs 10 notes = one Rs100 note = Rs100

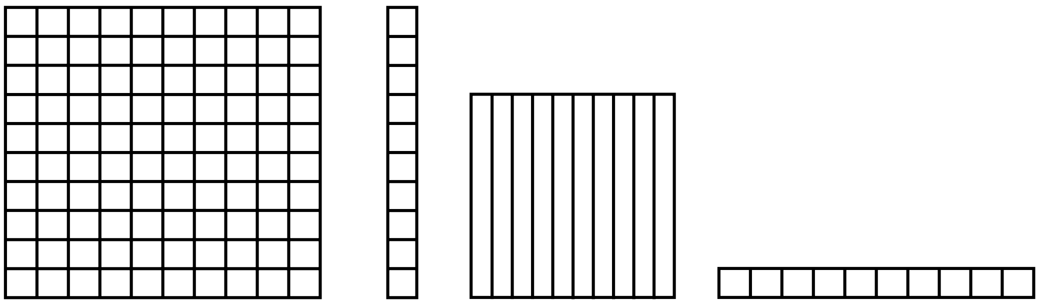
Ten Rs100 notes = one Rs1000 note = Rs1,000

Set up shops in the classroom with toy cars, paper flowers, pencils, and similar objects. Have students learn the use of decimal point, addition, subtraction, multiplication, and division of numbers with decimal point in no time, when bills are made out, and everything is worked practically.

Match the fractions with the decimals.

- $\frac{1}{2}$
- 0.25
- 0.4
- $\frac{8}{10}$
- 0.8
- 0.9
- 0.3
- $\frac{7}{10}$
- 0.2
- $\frac{9}{10}$
- 0.6
- $\frac{3}{4}$
- $\frac{1}{4}$
- 0.1
- $\frac{1}{5}$
- $\frac{3}{4}$
- $\frac{4}{10}$
- $\frac{1}{10}$
- $\frac{30}{100}$
- 0.7
- 0.5
- $\frac{60}{100}$

To generalize decimals, draw a chart like this:



TENS	ONES	.	tenths	hundredths	
4	1	.	7	5	= 41.75
2	5	.	6	2	= 25.62
1	2	.	8	2	= 12.82
1	0	.	0	0	= 10.00
3	6	.	5	0	= 36.50

Explain to the students that the places on both sides of the decimal point can be extended as shown below:

REMEMBER:

'Thousand' is $\frac{1}{10}$ of 'Ten thousand'

'Hundred' is $\frac{1}{10}$ of 'Thousand'

'Ten' is $\frac{1}{10}$ of 'Hundred'

'One' is $\frac{1}{10}$ of 'Ten'

'Tenth' is $\frac{1}{10}$ of 'Unit' or 'One'

'Hundredth' is $\frac{1}{10}$ of 'tenth'

'Thousandth' is $\frac{1}{10}$ of 'hundredth', …

PLACE VALUE AND DECIMALS

millions	hundred thousands	ten thousands	thousands	hundreds	tens	ones	and	tenths	hundredths	thousandths	ten-thousandths	hundred-thousandths	millions
					3	1	.	7	5				

The students must understand that these figures can represent most physical measurements, such as

money: cost of a bar of a flower bouquet: Rs 41.75

weight of a child: 25.62 kg

height of a tree: 12.82 m

litres of juice: 2.00-litre bottle of juice

temperature: 36.5° C on a hot day

EXCEPT TIME … nature did not create the metric system!

To be able to use decimal fractions confidently, the students must first understand the decimal notation and the equivalence of decimals to vulgar fractions (and, later, to percentages).

Cost of a flower bouquet is Rs $40 + 1 + \frac{7}{10} + \frac{5}{100}$

Rs $41 + \frac{70}{100} + \frac{5}{100}$

Rs $41 + \frac{75}{100}$ = Rs 41.75

Weight of a child is $20\text{ kg} + 5\text{ kg} + \frac{6}{10} + \frac{2}{100}$

$= 25\text{ kg} + \frac{60}{100} + \frac{2}{100}$

$= 25.62\text{ kg}$

More of these examples should be worked on the board.

The students will now have a good understanding of the concepts of decimals as fractions and be familiar with the decimal representation of numbers. Revise the concept before you move on to operations with decimals.

Task: Students should attempt pages 62 and 63.

Lesson 2: **40 minutes**

Talk about the meaning and significance of the decimal point. If you feel the need, give each student a 10 × 10 grid and ask them to colour squares to represent the given decimal fractions. Ask the students to make tables as shown below. Call out several decimal numbers and ask the students to write them in the correct positions. The left portion of the tables represents the whole number and the right portion represents the fractional parts. The dot separates the fractional parts from the whole numbers.

THOUSANDS	HUNDREDS	TENS	UNIT	•	TENTHS	HUNDREDTHS	THOUSANDTHS
			4	•	2		
			0	•	2	3	
		9	1	•	5	6	4
2	0	0	3	•	1	2	9

REPEAT: a decimal fraction is a vulgar fraction (with the denominator of 10, 100, 1000, …. 'Multiples of 10') written in a different manner.

Expanded form of the numbers in the above table:

$$4 \times 1 + \frac{2}{10} = 4.2$$

$$0 \times 1 + \frac{2}{10} + \frac{3}{100} = 0.23$$

$$9 \times 100 + 1 \times 1 + \frac{5}{10} + \frac{6}{100} + \frac{4}{1000} = 901.564$$

$$2 \times 1000 + 0 + 3 \times 1 + \frac{1}{10} + \frac{2}{100} + \frac{9}{1000} = 2003.129$$

Once the students understand the decimal notation as an extension of place value, teaching the number operations will be easy. The numbers on the right side of the decimal point are merely an extension of a series of numbers which go up 10 times, from right to left, and go down 10 times, from left to right, exactly as whole numbers do.

Lesson 3: **40 minutes**

Addition and Subtraction:

Add 2.3 and 4.5. Ask the students to think of the problem as 23 + 45. How would they have attempted it?

TENS	UNITS
2	3
4	5
6	8

Encourage the students to think of the decimal problem in a manner similar to whole numbers, except there is a decimal pointer separator between the 2 digits: units and tenths. Let them write down the problem as shown below and perform addition as shown above.

UNITS	•	TENTHS
2	•	3
4	•	5
6	•	8

Similarly, to attempt a problem with unequal number of places on the left side and the right side of the decimal point, fix the position of the decimal point and the arrange the digits according to their place values. Then, perform the operations as usual.

For example: 20.45 – 3.451

TENS	UNITS	•	TENTHS	HUNDREDTHS	THOUSANDTHS
2	0	•	4	5	0
	3	•	4	5	1
1	6	•	9	9	9

It is extremely important that the students understand that adding 0's to the left of any whole numbers has no value, and adding 0's to the right of the decimal places has no value.

hundreds	tens	units	•	tenths	hundredths	thousandths
	4		•	9		
0	4		•	9	0	
0	0	4	•	9	0	0

IMPORTANT: 4.9 = 04.90 = 004.900

TO THE RIGHT OF A DECIMAL POINT: adding 0 to the right of the number does not change the number.

0.030 = 0.300 = 0.3000

TO THE LEFT OF A DECIMAL POINT: adding 0 to the left of the number does not change the number.

35 = 035 = 0035 = 00035

Task: Students should attempt page 66.

Lesson 4: **40 minutes**

Multiplication:

Multiplication of decimals can be carried out exactly the same way as multiplication of whole numbers. However, it is essential to align the decimal points correctly.

A. For example: 4 × 35.9 (Decimal fraction multiplied by a whole number)

Practically the problem may be thought of as 4 strips, each of length 35.9 units placed end to end. Add the lengths repeatedly to obtain the total length.

35.9 + 35.9 + 35.9 + 35.9

Total = 143.6

To represent it as a multiplication problem, use the tabular form below:

HUNDREDS	TENS	UNITS	•	TENTHS
	3	5	•	9
				4
1	4	3	•	6

First step: $0.9 \times 4 = \frac{9}{10} \times 4$ = 36 tenths = 3.6

Second step: The 'carry over' of 3 is done just like the 'carry over' in whole numbers. The rest is normal multiplication

B. Example: .02 × 1.5 (Decimal fraction multiplied by a decimal fraction)

Convert decimal fraction to vulgar fractions.

$.02 \times 1.5 = \frac{2}{100} \times \frac{15}{10} = (2 \times 15)/(100 \times 10) = \frac{30}{1000} = 0.030 \; \frac{30}{1000} = 0.030$

Explain the same example using the decimal representation:

0	•	0	2	
1	•	5		
0	•	0	3	0

There are a total number of 3 decimal places in 0.02 and 1.5; the total number of decimal places in the product must be 3, as well.

RECAP

$2 \times 15 = 30$

$2 \times 1.5 = 3.0$

$0.2 \times 0.15 = 0.030$

$0.02 \times 1.5 = 0.030$

The students will have to count the total number of decimal places occupied by the multiplier and the multiplicand and adjust the number of decimal places in the product, accordingly. If the multiplier has 2 places of decimal and the multiplicand has 1 place, the product MUST HAVE 2 + 1 = 3 places of decimal.

It is simpler to work out multiplications in this manner:

A. EXAMPLE: 2.3×0.17

2.3×0.17

Multiply without decimals: $23 \times 17 = 391$

2.3 has **1 decimal place**

0.17 has **2 decimal places**

Product has **3 decimal places** 0.391

B. EXAMPLE: $5.9 \times 1.02 \times 0.7$

Multiply without decimals $59 \times 102 \times 7 = 42126$

5.9 has **1 decimal place**

1.02 has **2 decimal places**

0.7 has **1 decimal place**

Product has **4 decimal places** 4.2126

Several multiplications need to be worked out like this, because in everyday life the students will find an assortment of situations where these occur.

Cost of 5.5 l at Rs 105.75 per litre

Travelling by bus, tickets costs Rs 12.50 per person; half price for a child. The family needs 4 adult tickets and one child's ticket.

2.5 kg tomatoes at Rs 50.80 per kg

2.5 m of fabric for a dupatta at Rs 650.75 per metre

RULE: When multiplying decimal fractions, IGNORE the decimal points. Find the product. The answer will have as many decimal places as those in the original numbers. Mark the decimal point accordingly.

Task: Students should attempt page 69.

Lesson 5: **40 minutes**

Division:

Division of numbers with decimals can be performed in the same way as division of whole numbers, keeping the position of the decimal place fixed in the dividend and the quotient.

Ignore the decimal point; work out the division and insert the decimal point again just above its position in dividend.

For example: 23.405 ÷ 5

The position of the decimal remains unaltered when the divisor has no decimal places.

```
      4 . 6 8 1
   ____________
5 ) 2 3 . 4 0 5
```

```
          4 . 6 8 1
    _______________
5 )     2 3 . 4 0 5
        2 0
      ___________
          3 4
          3 0
        _________
            4 0
            4 0
        _________
              0 5
                5
        _________
                0
```

When you need to divide a decimal fraction by another decimal fraction, remove the decimal places for the divisor and shift the decimal point correspondingly for the dividend, as shown above:

For example : 43.028 ÷ 0.4

Here, the divisor has only one place after the decimal. To remove the decimal from it we have to multiply both the divisor and the dividend by 10.

$\frac{43.028}{0.4} = (43.028 \times 10)/(0.4 \times 10) = \frac{43.028}{4}$

Division is carried out as above: 430.28 ÷ 4

So, 43.028 ÷ 0.4 = 107.57

Once the students are confident with the methods for the four basic operations, it will be simple to carry out multi-operational numerical problems. Revise the BODMAS rule again. Then go on to simplification.

Task: Students should attempt pages 71–76.

Lesson 6: 40 minutes

Having explained the concept and the methods of working with decimals, introduce percentages as a special format of decimal fractions. Give each students 10 × 10 grid papers (100 squares).

Ask them to colour some squares. Ask them to call out the number of squares they have coloured as a fraction and as a decimal number.

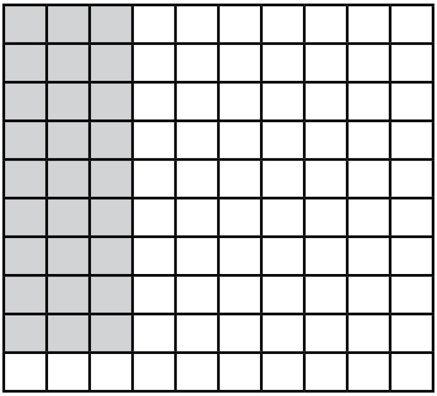
Shahana colours 25 squares; she has covered 25% of the page.

Riaz colours 49 squares; he has covered 49% of the page.

This will be an easy way of introducing the new way of representing the vulgar fraction as a decimal fraction. Introduce the symbol for percentage %.

It is interesting to note the history of the % sign. It evolved from the Italian term per cento. Originally, it was written as pcento. Eventually, the 'p' disappeared and the two 0s for 100 were separated by a horizontal line, $\frac{0}{0}$.

This eventually took the form of %.



Fraction coloured = 27 out of 100

$\frac{27}{100}$ as a vulgar fraction

0.27 as a decimal fraction

27% as a percentage

Take the students to the library to research on the various types of data that are written as percentages: percentage of the population living with low incomes, women and children in Pakistan as percentages of the total population, percentage of air crashes, percentage increase in prices the world over, etc.

Discuss in class the uses, advantages, and disadvantages of fractions, decimal fractions, and percentages. Also ask the students to deliberate on the need for the concept of percentages given the fact that we already have the concepts of fractions and decimals in place.

Operations with percentage can be dealt with easily once the students are aware of the significance of the conversion of a percentage to a fraction or a decimal.

Task: Students should attempt pages 78–82.

Additional resources:

At the end of the guide are additional worksheets 8–10. Use these for reinforcement.

UNIT 6

MEASUREMENTS: DISTANCE, TIME, AND TEMPERATURE

Teaching objectives

- to explain conversion from one unit of length to another
- to practise conversion between units of time
- to introduce smaller and larger units of length and time
- to add and subtract by converting unlike units to like units
- to introduce measurement of temperature
- to introduce the Fahrenheit and Celsius temperature scales
- to explain conversion between the Fahrenheit and Celsius temperature scales

Learning outcomes

Students should be able to:

- apply the correct units of measurement
- convert from one unit to another
- apply conversion of units to real-life problems
- use the units of temperature and inter-convert them correctly

Teaching materials:

- board and markers/chalk
- conversion table

Learning activity

Lesson 1: 40 minutes

The concepts of length and time have already been introduced in the earlier books. In this book the ideas are revisited and the students are introduced to the units of temperature. Choosing the right unit of measuring a particular object has already been dealt with in the earlier books and by now the students are ready to convert a given measurement to a suitable unit.

Begin the lesson by revising the various units of length as an oral activity. Recall the prefixes for the various units of the length commonly used, and what they represent.

The commonly used measurements of length (weight and mass) are:

millimetres	milligrams	millilitres
centimetres	grams	litres
metres	kilograms	kilolitres
kilometres		

A millimetre (mm) is used for measurement of small lengths, such as thickness of the soft cover of a book.

It is a tiny measurement.

---

1 centimetre = 10 millimetre

A centimetre (cm) is used for measurements of thickness 10 times that of 1 mm, e.g. the thickness of an eraser or the width of a nail on your hand.

Centimetres are used to measure the width of a table or the thickness of a door.

1 cm = 10 mm

---

1 metre = 100 centimetres

A metre used to measure lengths 100 times that of 1, e.g. the height of the roof, the width of a floor

1 m = 100 cm = 1000 mm

---

1 kilometre = 1000 metres

A kilometre (kilo) means 'thousand' and is used to measure lengths 1000 times that of 1 km, e.g. the distance between 2 cities, the distance that a car travels in an hour.

1 km = 1000 m = 1, 00, 000 cm = 10, 00,000 mm

Put up in class the chart of the prefixes given below and the mnemonic to remember these by.

Unit of measurement of length: Metre(m)

PREFIX	MEANING	UNITS OF MEASUREMENT
kilo	thousand times (× 1000)	(Km) (Kg) (Kl)
hecto	hundred times (× 100)	(Hm) (Hg) (Hl)
deca	ten times (× 10)	(Dm) (Dg) (Hl)
Unit of measure		Metre, Gram, Litre
deci	one tenth (1 ÷ 10)	(dm) (dg) (dl)
centi	one hundredth (1 ÷ 100)	(cm) (cg) (cl)
mille	one thousandth (1 ÷ 1000)	(mm) (mg) (cl)

A common mnemonic for memorizing the order of the above units is given below. You can ask the students to create their own.

- **Khan Habib Drives motorcars during cold months**
- **Km Hm Dm m dm cm mm**

Do plenty of oral work in class as revision. Keep the figures simple so that the students can focus on the conversion.

Ask questions like:

- How many Hm are there in 10 km?
- Convert 13 mm into cm?
- How many m in 45 Hm?
- How many cm in 4 m?
- How many m in 0.2 km?

Since the measurement of length uses the metric (or decimal) system, all calculations should be easy for the students. Ask them to calculate the conversions mentally and differentiate the problems that require multiplication from those that require division.

Once the students are confident with conversions, move on to the number operations with measurements in different units of length.

PROBLEM

1 km 50 m + 2 km 67 m

There are two ways to handle a problem like this.

<u>Method 1:</u>

Convert the above terms into smaller units (m).

1 km 50 m = 1050 m and 2 km 67 m = 2067 m

1050 m + 2067 m = 3117 m

3117 m = 3 km 117 m

<u>Method 2:</u>

Recap the additions of decimal fractions (1 km = 1,000 m). Place the decimal points one below another and add, as is done for natural numbers.

1 km 50 m = 1.050 km and 2 km 697 m = 2.987 km

$$\begin{array}{rcccc} & 1 & . & \overset{1}{0} & 5 & 0 \\ + & 2 & . & 9 & 8 & 7 \\ \hline & 4 & . & 0 & 3 & 7 \\ \hline \end{array}$$

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This is a simpler and more straightforward method.

Either of these two methods works well, as long as the students understand them.

Subtraction of different units of length can be taught along the same lines, where the numbers are placed one below another, with the decimal point aligned properly.

12 kg 350 g – 9 kg 569 g

$$\begin{array}{cccccc} & 1 & \overset{1}{2} & . & 3 & 5 & 0 \\ - & & 9 & . & 5 & 6 & 9 \\ \hline & & 2 & . & 7 & 8 & 1 \\ \hline \end{array}$$

Check:

$$\begin{array}{cccccc} & \overset{1}{2} & . & 7 & 8 & 1 \\ + & 9 & . & 5 & 6 & 9 \\ \hline 1 & 2 & . & 3 & 5 & 0 \\ \hline \end{array}$$

The same metric system applies to grams and litres:

Equivalents in metric systems

1 km (kilometre) = 1000 m (metre)

1 m (metre) = 1000 mm (millimetre)

1 kg (kilogram) = 1000 g (gram)

1 g (gram) = 1000 mg (milligram)

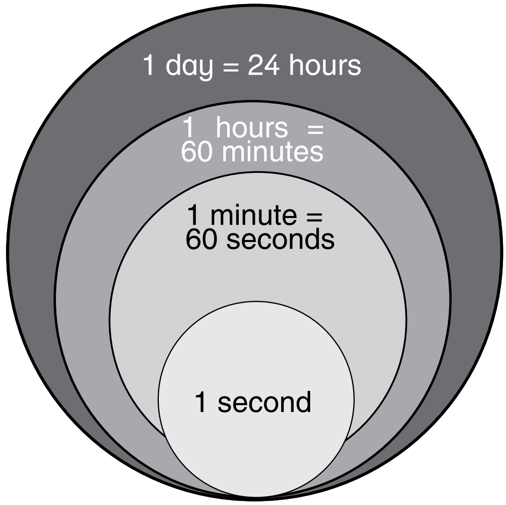
1 kl (kilolitre) = 1000 l (litre)

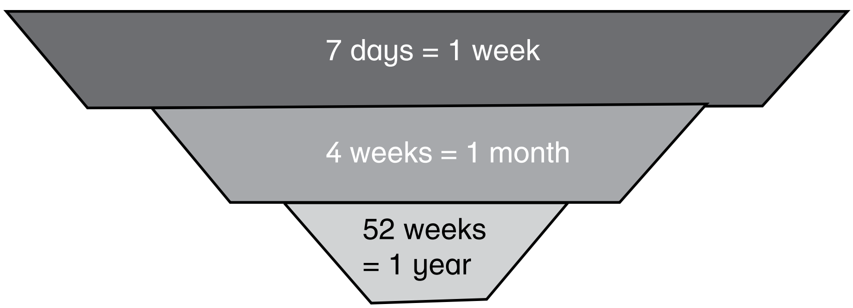
1 l (litre) = 1000 ml (millilitre)

Task: Students should attempt pages 84–88.

Lesson 2: 40 minutes

Units of time have already been introduced in Maths Wise 4. This book introduces the number operations with time expressed in different units. Before going into number operations, revise the different units of time and the inter-conversion between them.





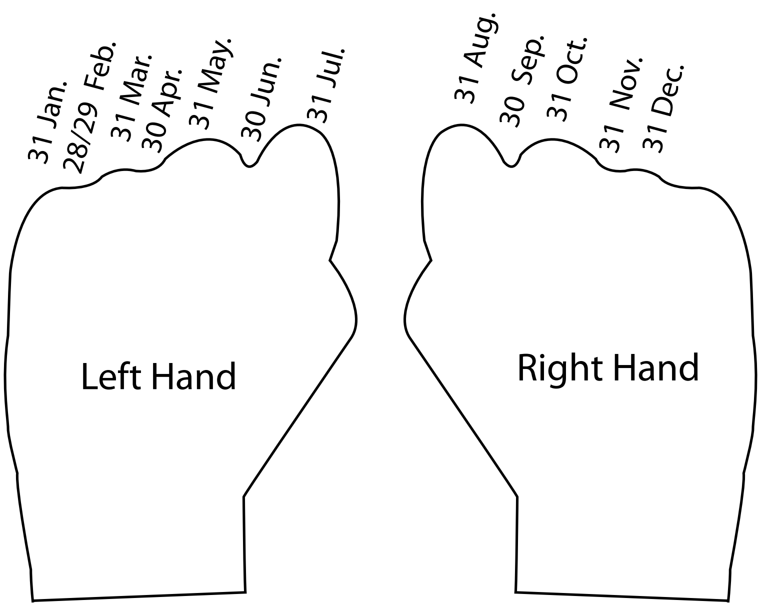
Divide the students into groups and assign a project to each group. Each group should make a colourful chart showing the different conversion of the units. Present it to the rest of the class. Display the charts in the classroom and refer to them when you do addition and subtraction of different units of time.

Name of Unit	**Symbol**	**Definition**
millennium		1000 years
century	(c)	100 years
decade	(dec)	10 years
year	(yr)	365 (a fraction) days, 52 (+a fraction) week (the time it takes for the Earth to rotate around the Sun)
leap year		366 days (appears every 4^{th} year)

month	(mo)	i) 28 days in February 30 days in April, June, September, November 31 days in Jan, Mar, May, Jul, Aug, Oct, Dec ii) 4 weeks (+ a fraction)
fortnight	(fn)	14 days or 2 weeks
week	(wk)	7 days
day		24 hours
hour	h	60 minutes
minute	min	60 seconds
second	sec	the time it takes for light to travel nearly 300 million metres.

The above chart is for the general understanding of time. The basic unit is a second; and a year is the time it takes the Earth to go round the Sun. Everything is derived from nature.

Divisions of time are man-made. And man has not been able to convert the calculation of time into metric system. The Earth revolves around the Sun taking 365¼ days, i.e. one revolution of the Earth around the Sun. This cannot be converted into a metric system. The students easily learn the 'number of days in a month' on the knuckles of both their hands.



For addition, subtraction, multiplication, and division, the carrying-over and borrowing will not be in groups of 10 as in the metric system. The conversion units are different units. Hence, the students have to be very careful when carrying over or borrowing. You may choose any one of the following methods to discuss in class and let the students follow. Let us take the example:

PROBLEM 1: 14 h 45 min + 20 h 34 min

Method 1:

This method is not recommended as a regular method for addition and subtraction of hours and minutes; but is a good way for the students to practice number operations.

Convert the larger unit (hour) to the smaller unit (minutes) and perform addition as usual. The sum obtained can be converted back to the original units.

14 hr 45 min = 14 × 60 + 45 min = 840 min + 45 min = 885 min

Similarly, 20 hrs = 20 × 60 + 34 min = 1200 min + 34 min = 1234 min

$$\begin{array}{rr} & 885 \text{ min} \\ + & 1234 \text{ min} \\ \hline & 2119 \text{ min} \\ \hline \end{array}$$

To convert 2119 into hours and minutes:

$\frac{2119}{60}$ = 35 h 19 min = 1 day 11 h 19 min

$$\begin{array}{rr} & 14 \text{ h } 45 \text{ min} \\ + & 20 \text{ h } 34 \text{ min} \\ \hline \multicolumn{2}{l}{1 \text{ day } 11 \text{ h } 19 \text{ min}} \\ \hline \end{array}$$

<u>Method 2:</u>

Retain the figures in their original units.The conversion factor is used only when carrying over.

	Hours		**minutes**
	1 hr carried over		
1	4	4	5
2	0	3	4
3	5	1	9

Here 45 + 34 =79
min = 1 hr 19 min

Choose one of the above methods to practise various additions and subtractions of time units in the class. It is always better to use the same methods in addition and subtraction of length, time, and other units of measurement, whenever possible.

Task: Students should attempt pages 89–97.

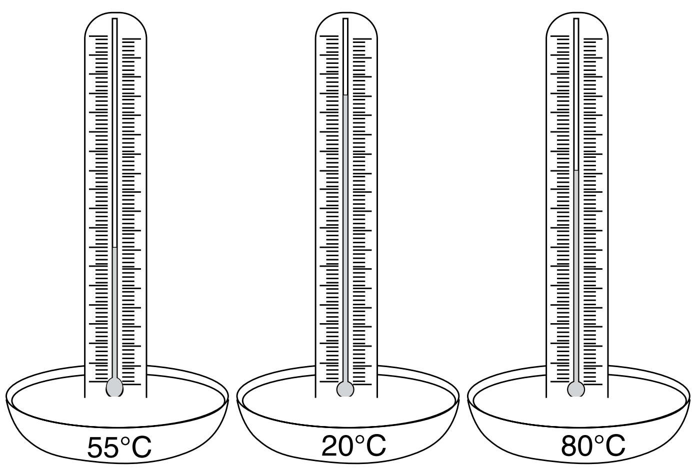
Lesson 3: **40 minutes**

Temperature:

Temperature is being introduced for the first time in Maths Wise 5. The students are already aware of temperature: hot in summer and cold in winter.

Arrange for students to run around outside. 'Oh! It is so hot!' says one. 'No, it is not so hot!' says the second. Who is right? What is hot?

Pour water of different temperatures (NOT boiling) into 3 or 4 bowls.



Students dip their fingers into the various bowls and discover that each bowl contains water of a different temperature, ranging from cold to very warm. This is where the concept of temperature is demonstrated.

Just as watches and clocks tell the time, and a metre rod measures length, there are thermometers of various kinds to show how hot or cold the air or water is.

Temperature is the numerical measurement of hot and cold, and one has to believe what the thermometer says, not how hot or how cold one feels.

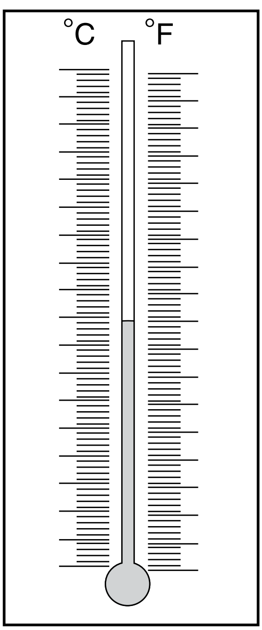
Talk about temperatures in the summer, when temperatures soar. In the winter it is cold and the temperature can fall quite low. It is useful to have a world map showing different temperatures in different areas around the world. If a Pakistani cricket team goes to Australia to play cricket in December, it will be very, very hot! Why?

The temperature of a body goes up when one has fever. This temperature is also determined by a thermometer.

The units of temperature have not been formally introduced, but students are already familiar with the use of the terms 'degrees Celsius' or 'degrees Fahrenheit' during the weather report on the news or in magazines and newspapers.

Both Celsius and Fahrenheit scales are used to measure temperature. It is worthwhile to explain how a thermometer works.

Most materials, such as water, air, and metals, expand when they are heated. In the same way, the mercury (which is a liquid metal) in the thermometer also expands and rises in the glass tube as the temperature rises. Discuss the type of thermometer that is used when someone has fever and the body is hot.



In Pakistan and other Asian countries, temperature is measured with a Celsius thermometer. In some Western countries, the Fahrenheit scale is more popular.

If possible, show the students a thermometer with graduations in Celsius and Fahrenheit. Ask them to compare the two scales. Now put the thermometer(s) into a cup of hot tea. Ask the students to read the temperature of the tea on the thermometer(s). Repeat the exercise with different liquids in daily use, such as iced water, water from the tap, and so on. Let the students make a note of the temperatures and compile it into a chart to be displayed in class.

(Measurement of ice and other solids is not handled at this level.)

A couple of examples on the board and readings on thermometers will demonstrate to the students that Celsius and Fahrenheit are inter-convertible by the formula $C/5 = (F - 32)/9$.

Give the students a couple of temperatures in Celsius and ask them to calculate their Fahrenheit equivalents. Similarly, ask them to convert Fahrenheit temperatures to Celsius

Task: Students should attempt pages 100–102.

Additional resources:

At the end of the guide are additional worksheets 11–14. Use these for reinforcement.

UNIT 7

UNITARY METHOD; RATIO AND PROPORTION

Teaching objectives

- to compare quantities of the same kind as a ratio
- to compare the relationship between 2 quantities as a proportion
- to introduce direct and inverse proportion
- to introduce percentage ratio
- to introduce the unitary method

Learning outcomes

The students should be able to:

- compare 2 quantities by expressing them as a ratio in the simplest term
- differentiate quantities which are directly/inversely proportional
- use the unitary method to solve real life problems (both direct and inverse)

Teaching materials:

- board and markers/chalk
- coloured paint
- clear plastic cups
- large bowl

Learning activity

Lesson 1: 40 minutes

Ratio is another way of comparing two similar quantities as a fraction, as a ratio ('to') and as a percentage.

Demonstrate using paint of two different colours, e.g. red and blue. Put blue paint into three clear plastic cups and red paint in 4 cups. Pour all the paint into a large bowl, mix it together, and pour it back into the cups. There will be 7 cups of purple paint.

This is one set of mixed paints. Make some more.

Sets	A	B	C	D	E	F	G	H
Cups of blue paint	3	6	9	12	15	18	21	24
Cups of red paint	4	8	12	16	20	24	28	32
Cups of purple paints	7	14	21	28	35	42	49	56

Every cup of purple paint is the same shade. Therefore, in each set, for every 3 cups of blue there are 4 cups of red. In each cup, the proportion of blue and red are is in the ratio of 3:4.

Give other examples: a vase with 3 roses and 2 lilies.

Roses	3	6	9
White Lilies	2	4	6
Total flowers	5	10	15

The greater the number of vases, the greater the number of roses and lilies, in the same ratio.

REMEMBER, $\frac{2}{5} = \frac{4}{10} = \frac{6}{15} = \frac{8}{20}$

And $\frac{3}{5} = \frac{6}{10} = \frac{9}{15} = \frac{12}{20}$

Another classroom activity:

List on the board the heights of four students. Ask them to stand in descending order and compare heights using the terms 'taller than' and 'shorter than':

Sharmila: 1 m 30 cm = 1.30 m = 130 cm

Akhtar: 1 m 25 cm = 1.25 m = 125 cm

Shiraz: 1 m 20 cm = 1.20 m = 120 cm

Afroze: 1 m 10 cm = 1.10 m = 110 cm

Note for the teacher: Please check heights of your students in Class V.

The students write out the heights as a ratio. Then convert them to fractions in the lowest terms. Most importantly, the units in which the heights are expressed have to be same. For example,

Ratio of Afroze's height to that of Akhtar's 110 : 130 = 11 : 13 (after dividing by 10)

Carry out similar exercises with the students, comparing various quantities such as age (in years), weight (in kg), number of books in their bags, number of cousins, etc. This can be a fun way of introducing and explaining the concept of ratio. Reiterate the need to express each quantity in the same unit, and to reduce each fraction to its simplest form.

Explain that a ratio is a pure number; it has no units as the units for both the quantities nullify each other.

As always, proportion should be taught starting with examples from real life. Start with a couple of the following examples:

DIRECTLY PROPORTIONAL

A cook is paid Rs 5000 per month.

Earnings = 5000 × months worked

At a party, 2 cartons of juice per person are needed.

Total cartons of juice required = 2 × the number of guests

A hired car charges Rs 250 per hour.

Total amount to be paid = 250 × the number of hours

The above pairs of items in the above examples are DIRECTLY PROPORTIONAL to each other.

WHEN ONE QUANTITY INCREASES, THE OTHER QUANTITY ALSO INCREASES AT THE SAME RATE.

INVERSELY PROPORTIONAL

The amount of light on a planet increases as the distance of the Sun from a planet decreases.

The number of cockroaches in the house will reduce as the frequency of the visits of the pest controller increases.

The number of days it takes to paint a room will decrease as the number of painters on the job increase.

Pairs of items in the above examples are INVERSELY PROPORTIONAL to each other.

WHEN ONE VALUE INCREASES, THE OTHER VALUE DECREASES AT THE SAME RATE.

Ask the students to suggest examples of their own and write them on the board. Oral numerical problems are fun.

EXAMPLES:

- A 10 km journey costs Mahmud Rs 300. How much will a 15 km journey cost?
- A picnic meal for 15 boys from a welfare home costs Rs 800. How much will a similar meal cost for 21 boys?

Ask for suggestions to solve the problem. Some students will answer intuitively. They will halve the price of the 10 km journey, and add that amount to the cost of a 10 km journey. Take your lead from that and ask how they would find the required amount if the figures were such that they could not be halved.

On the board, work out the cost of a 1 km journey and then multiply by the required number (in this case 15) to find the correct answer.

Establish 'Reduce it to 1 first' as a standard strategy/method. Solve several word problems so that the students are comfortable with this unitary method. Also emphasize the fact that proper statements MUST be written, and steps of working MUST be shown correctly. Here is an example:

Cost for a 20 km journey	= Rs 340
Cost of 1 km journey	= Rs 340 ÷ 30
Cost of 15 km journey	= Rs $\frac{340}{30} \times 15$ = Rs 170

15 meals cost	Rs 800
1 meal costs	Rs 800 ÷ 15
21 meals cost	Rs $\frac{800}{15} \times 21$ = Rs 1120

Task: Students should attempt pages 107 and 108.

Additional resources:

At the end of the guide is an additional worksheet 15. Use it for reinforcement.

UNIT 8

GEOMETRY

Teaching objectives

- to demonstrate the use of a protractor to construct a right angle, straight angle, and reflex angle
- to explain adjacent angles, complementary angles, supplementary angles
- to define a triangle
- to explain classification of triangles based on i) sides ii) angles
- to show construction of triangles
- to define quadrilaterals
- to demonstrate construction of a square and a rectangle using a set-square and ruler

Learning outcomes

Students should be able to:

- use a protractor to construct angles
- differentiate between complementary and supplementary angles
- calculate the complement and supplement of a given angle
- define and classify triangles based on the sizes of their angles and lengths of sides
- construct a triangle using a pair of compasses and a ruler when the lengths of its 3 sides are given
- identify and define quadrilaterals
- construct a quadrilateral using set-square and a ruler

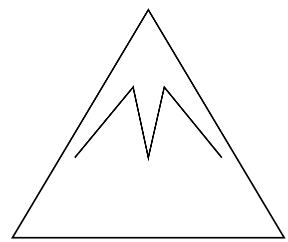
Teaching materials:

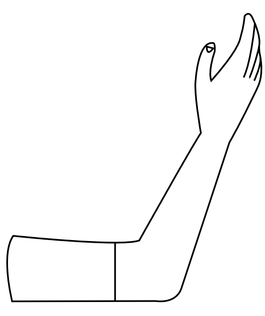
- geometry box
- ruler
- set-squares
- clock with moveable hands
- board and markers/chalk

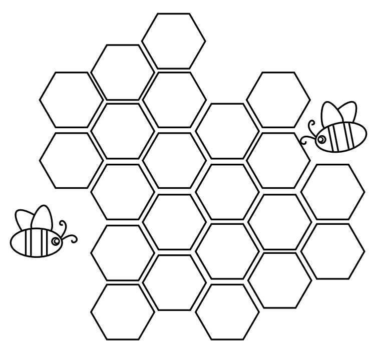
Learning activity

Lesson 1: 40 minutes

Many examples of geometry are to be found in nature. The shape of the Earth (spherical), the shape of the Sun seen from the Earth (circle), the elliptical path of the Earth around the Sun, rays of the Sun and the raindrops falling from the skies (straight line), the various shapes of leaves and flowers, the hexagons in beehives, the banks of a river and the lines on the back of a squirrel (parallel lines), the peak of the mountain (angle and a cone), the rotation of the Earth, the revolution (elliptical), angles between the branches of trees, at our knees and our elbows, and between our fingers, and the angle which the foot makes with the leg; all these, and more, are basic geometry.



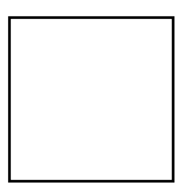


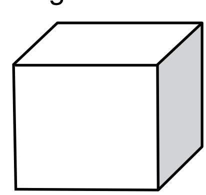


Students become familiar with geometrical concepts as soon as they are born, for example, in the shape of mother's eyes and the retina, the ball in their pram, etc.

This lesson deals with plane geometry, i.e. flat shapes, which can be drawn on a paper. A point, a straight line, a triangle, a quadrilateral, a circle, and so on.

Figures in plane geometry have 2 dimensions. Look at these diagrams:





1. (Length) 2. (L and B) 3. (L, B, and H)

Dimensions:

Discuss the significance of dimensions.

A point has no dimensions; no length and no breadth.

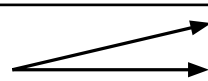
A straight line has one dimension: ONLY length.

All flat (2D) shapes on paper have two dimensions: length and breadth (or width).

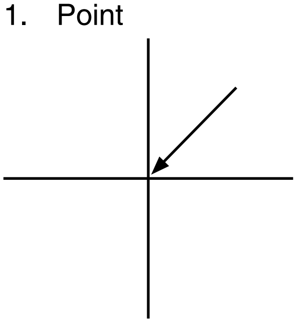
All solid (3D) objects have 3 dimensions (these shapes cannot be drawn on paper): length, breadth, and height.

It is interesting to note that even though a child touches and feels 3D objects at the beginning of his or her life, geometrical studies begin with 2D objects.

This lesson starts with revision of some of the basic definitions of geometric terms: a point, a straight line, a ray, a line segment, an angle, a triangle, a quadrilateral. You may want to make this more interesting by using a fun worksheet. Test the students with a 3-way matching worksheet as suggested below. Students have to match one item in the first column to its corresponding item in column 2, and its corresponding item in column 3.

COLUMN 1	COLUMN 2	COLUMN 3
POINT		shortest distance between 2 points
RAY		has no dimension only existence
STRAIGHT LINE	•	part of a straight line
LINE SEGMENT		formed when 2 straight lines intersect at a point
ANGLE		starts from a point and extends indefinitely on one side

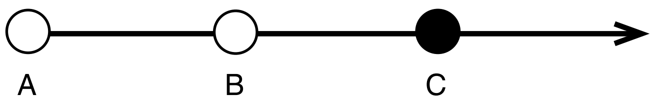
1. Point



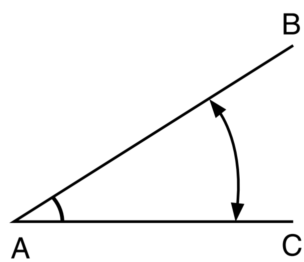
2. Straight line

3. Line segment AB

4. Ray



5. Angle



Once you have revised the basic definitions and the students have recalled the names and shapes of the above, move on to angles. Angles have already been dealt with in detail in Year 4, so just revise the basic facts. Ask questions and as students come up with the facts, list them on the board. Make sure you revise the following points, with the help of moving hands of a clock.

- What is an angle?
- How is it formed?
- What is a vertex?
- Which are the arms of an angle?
- How do you label an angle?
- What are the different types of angles?
- Form the following angles with your arms:

    An acute angle

    A right angle

    An obtuse angle

    A straight angle

    A reflex angle

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- A complete angle (possible when the child holds his or her hands horizontally straight, and takes a full turn around, on the ground)

What are clockwise and anticlockwise rotations? It is interesting to talk about why clockwise runs from left to right? It all started in the northern hemisphere, where the shadow of the Sun went around from left to right.

Ask one or two students to stand up with their arms stretched out at straight angles, and show clockwise and anticlockwise movements to form various angles. This can also be done with the hands of a clock.

It will be interesting to discuss why the hands of a clock move from left to right, and that is known as clockwise direction. Why?

Look at the Sun rising in the sky. It moves from the left, goes almost over your head, to the right (we are in the northern hemisphere of the Earth). The inventors of the clock were in the northern hemisphere, and the shadow of the sundial moves from left to right. The hands are actually modeled after the shadow on a sundial, and it began to be known as clockwise direction.

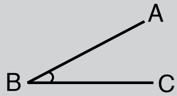
It useful to talk about clockwise and anticlockwise movements of hot and cold taps, the regulators of old fans, or the switches attached to gas and electric burners. Ask the students to observe these at home. They should note their observations and discuss these the next day.

Make a colourful chart of the different types of angles and display it in class. The following template will be useful:

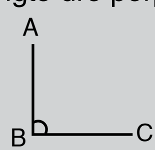
ANGLES

When 2 straight lines intersect at a point, an angle is formed. There are different types of angles.

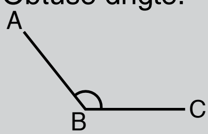
Acute angle: less than a right angle.



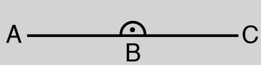
Right angle: when the 2 arms of an angle are perpendicular to each other, the angle formed is called a right angle.



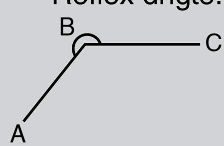
Obtuse angle:



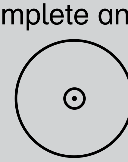
Straight angle:



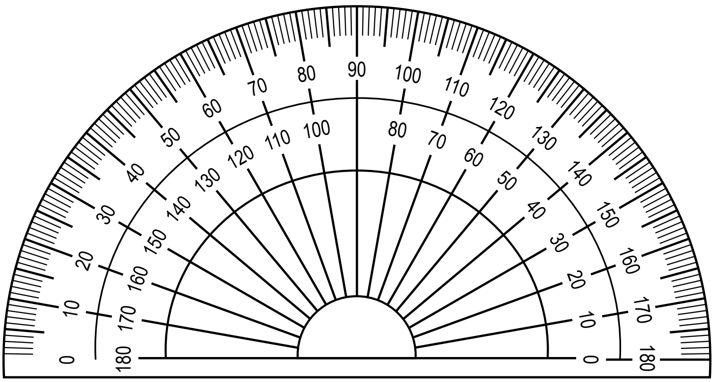
Reflex angle:

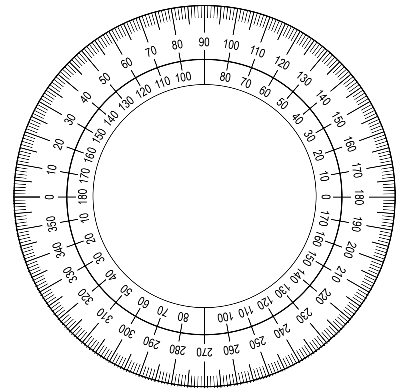


Complete angle:

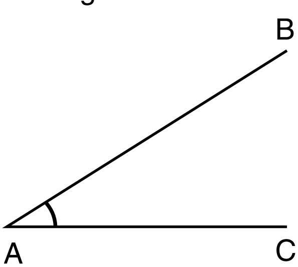


Once the students are aware of what the different angles look like, they must learn how to construct them accurately. For this, introduce the protractor and explain the different parts of the protractor. Initially, they may be a bit confused about the two scales on the protractor. Explain that different scales are used depending on the side of the base line you want to draw the angle from. Teach them various steps for using a protractor:





1. Mark the vertex with a point.
2. Draw a straight line through the vertex to represent the base arm of the angle.
3. Now place your protractor (180°) so that the centre of the protractor lies on the vertex and the 0° line coincides with the base line.
4. Now measure the required degree along the correct scale and mark the point with a dot.
5. Remove the protractor and join the dot to the vertex using a ruler.
6. Label the angle using the labeling convention and write the measurement on the angle.



Give the students plenty of practice in construction of triangles. Ask them to draw angles of different sizes so that they spend enough time drawing acute/right/obtuse/reflex angles. Make sure the students are confident about drawing the different types of angles.

Explain:

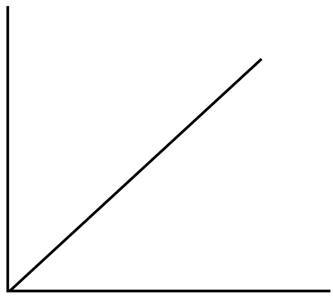
- A pair of angles which add up to a 90° are called complementary pairs.

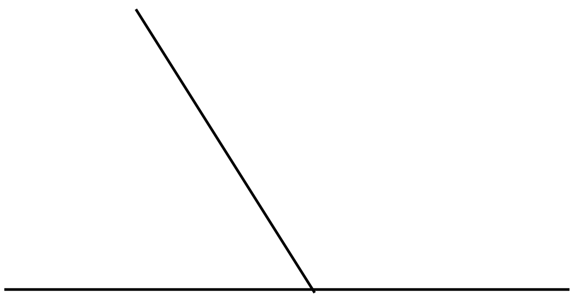
  Work with cut-outs of complementary pairs of angles.

  Example: 30° and 60° angles. Place them side-by-side and show that they make a right angle. You might want to introduce 'perpendicular lines' at this stage.
- A pair of angles that add up to 180° are called supplementary angles.

  Example: 50° and 130°

Ask the students to write down some pairs of complementary and supplementary angles.



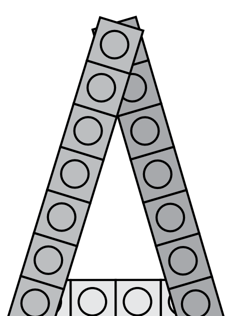


Task: Students should attempt pages 110–115.

Lesson 2: **40 minutes**

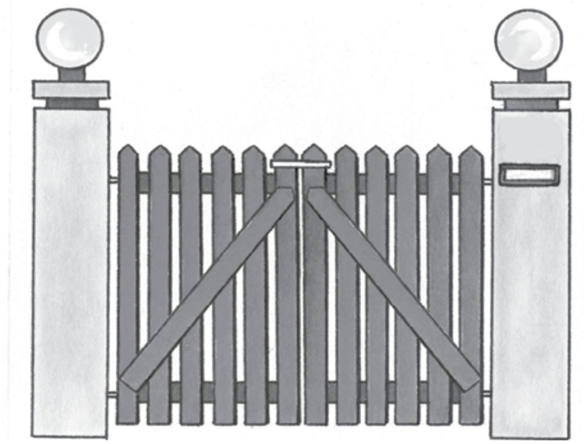
Triangles: A triangle has 3 sides and 3 angles.

Triangles are also found in nature; you see one every day when you look at the mirror! The outline your nose makes with your face is a triangle. Cut an orange across the wedges; you will see that each wedge of an orange has a triangular shape. In a spider's web, there are many triangles.



It is interesting to note that a triangle is the strongest shape in geometry. If you press down a triangle made from Lego pieces, it will not bend; the pressure on the tip of the triangle is absorbed by the base of the triangle. Therefore, high telephone towers are made with triangular sides.

Sides of pyramids are triangular. That is the reason why the Egyptians made pyramids and not cuboid buildings. The sides of the Eiffel Tower are also triangular in shape.



Look at this garden gate. The outside shape is a rectangle, make from planks of wood. The carpenter usually joins one set of opposite corners to make the gate stronger (by creating two triangles). The same thing is often done with fences.

Point out some triangular shapes in the classroom, such as patterns on a grill of the window. A ribbon put across the board divides it into 2 triangles. There are some wooden triangular boards in the box of shapes which young students play with. Mithai often comes in triangles. Samosas are triangular. 'Tri' refers to 3, e.g. tripods and trilingual (someone who speaks 3 languages). How many students in the class are trilingual?

Introduce a triangle as a 2-dimensional closed shape with 3 sides and 3 angles. Divide the students into groups of 4 or 5 and give them each a geo-board and a few rubber bands. Ask them to make 3 different types of triangle using the apparatus given.

Once they are ready with their sets of triangles, call each group to come and present their triangles to the class and explain why the triangles are different from each other, with reference to the sizes of angles and sides.

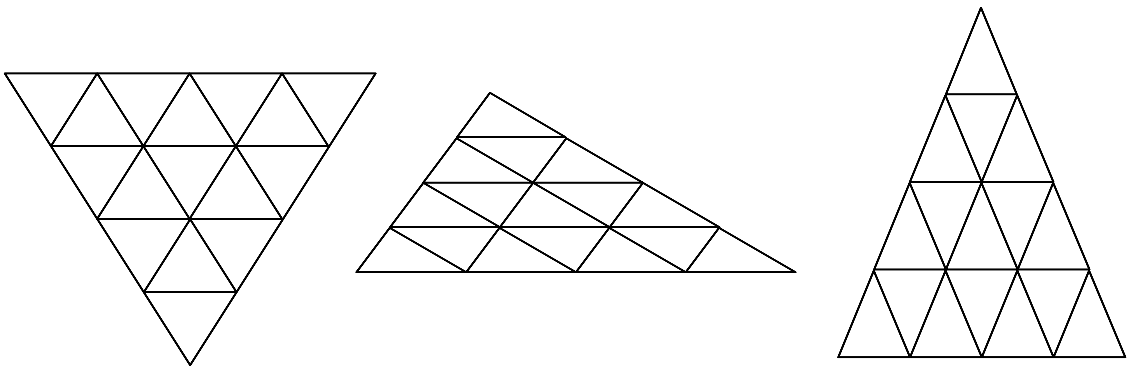
As the students present their work. List the properties they use to distinguish between different triangles. Once all the groups have made their presentations, summarize the criteria that they have used to differentiate the triangles, and formalize the concept.

Triangles are classified according to the lengths of their sides and sizes of their angles. You could use a branch diagram to illustrate the different types of triangles.

The students note down the properties of triangles:

- Right-angled triangle: has one 90°angle (the size of the sides is not important)
- Equilateral triangle: has 3 equal sides and 3 equal angles
- Isosceles triangle: has any two equal sides and two equal angles (the angles are opposite the equal sides)
- Scalene triangle: has no equal sides, no equal angles
- Acute angled triangle: all angles are acute.

Work with different types of triangles, with 10-12 identical pieces of the same shape and size. You will find that each kind of triangle can be tessellated.



Once you have discussed the different types of triangles, give the students some coloured paper and templates or stencils of the different types of triangles. Ask them to trace the triangles onto the coloured paper, cut them out, and glue these in their exercise books. Then they should write the names and the properties of each of the triangles.

This is the first time that students will construct geometric figures. Before you start with actual constructions, explain the significance of constructions, the differences between the instructions 'draw' and 'construct' the basic rules of construction.

Accurate construction of geometric shapes is required to make blueprints for cars, 22-wheeled trucks, airplanes, buildings, bridges, malls, and the city plans (even cake boxes and pizza boxes).

When you teach the method of constructing triangles, explain the parameters that should be provided. Tell them that for a 3-sided figure, the values of at least 3 parameters should be provided.

In Year 5 students will learn to construct triangles with 3 sides given, so recall once again how to measure the length of a straight line and how to draw a straight line of a given length.

The book handles the construction of triangles with the following parameters given:

- three sides
- two angles and the length of the side between
- two sides and an angle between the two sides

The students enjoy working with a compass and drawing various figures. Triangles will be quite easy to follow.

Task: Students should attempt pages 117–123.

Lesson 3: 40 minutes

A lot of practice is necessary to attain the level of accuracy and perfection desirable. So spend enough time on construction of triangles before moving ahead. It is essential that the students measure all the 3 angles of a triangle to make sure that they add up to 360 degrees. Remind the students that all these are 2D shapes.

Ask the students to work with matchsticks to form various shapes. They will find that the shapes they can construct are all equilateral:

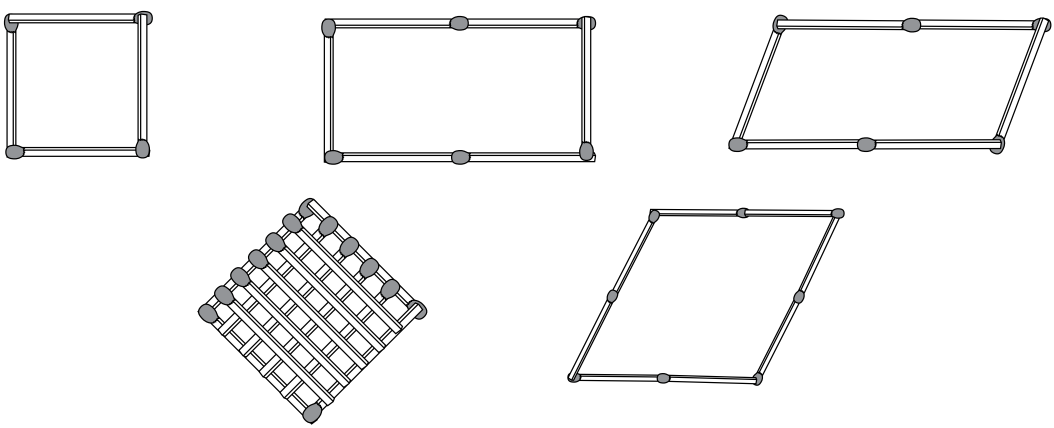
An equilateral triangle

A square

A rhombus (or a diamond)

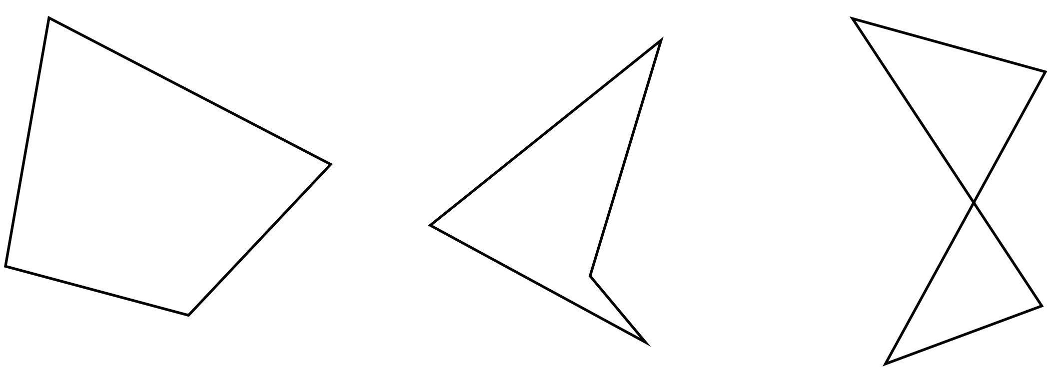
A parallelogram

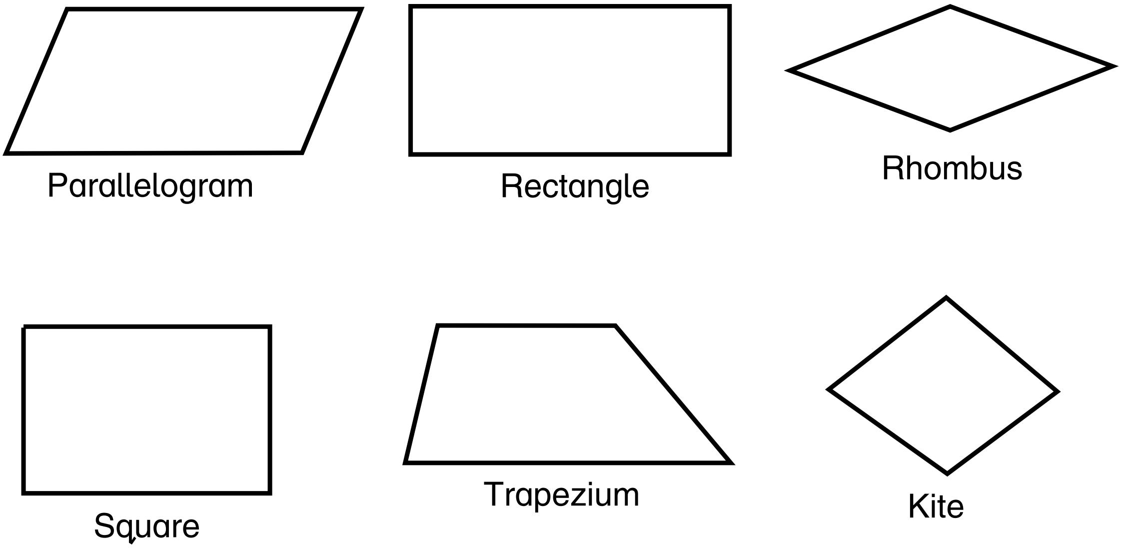
(Regular pentagon and hexagons and others are also possible.)



It is helpful to display charts with different types of quadrilaterals (as shown in the book) as a reminder to students. It is interesting for them to see how different irregular quadrilaterals can look.

The following quadrilaterals cannot be made from matchsticks (sides are unequal).





Different sizes and shapes of quadrilaterals help the students to see what shapes parallelograms, kites, rhombuses, trapeziums, and arrowheads can take.

It is worth mentioning that some students may experience difficulty in carrying out the process effectively. Some students cannot focus to read the measurements from the ruler correctly due to eyesight problems; some are unable to hold the compass firmly due to neuro-motor problems. Also, dyslexic and left-handed students may have trouble with constructions. Be very patient with them and organize a special one-to-one session with them or ask a teaching assistant to help you, without becoming impatient and without using negative language. You may also pair students of different abilities and encourage peer tutoring. As a word of compassion, do not push these students too much. They may not be able achieve the level you are expecting from them, but that is not because they are not trying, it is because they are unable to!

Explain the meaning of ‘quadra’: many animals are quadrupeds; a ‘quadragenarian’ is a person between the ages of 40 and 49; a quadrilateral is a 4-sided geometric figure, which is also known as a quadrangle; a quadraplex is a building divided into four residences.

Tetra also refers to four. A tetragram is a 4-letter word, such as POST, GRAM, and so on. A quadruped, a 4-legged animal, may also be referred to as a tetrapod (tripod – 3 legs). Cement tetrapods are placed so that they are interlocked and act as breakwater to protect the sea front against the pressure of waves; 50% of Japan’s 36,000 km coastline has been covered and altered in some way by tetrapods. One finds tetrapods along the beaches of Hawaii, and in many other cities around the world.

Task: Students should attempt pages 123–126.

Additional resources:

At the end of the guide are additional worksheets 16 and 17. Use these for reinforcement.

UNIT 9

PERIMETER AND AREA

Teaching objectives

- to introduce the concept of perimeter and its practical applications
- to introduce the formula for finding the perimeter of a square and a rectangle
- to introduce the concept of area
- to introduce the formula for finding the area of a square and a rectangle
- to explain the application of area in practical situations
- to explain how to calculate the area and perimeter of irregular shapes

Learning outcomes

Students should be able to:

- explain the concept of perimeter and apply it in practical situations
- use the formula to find the perimeter of a square and a rectangle
- explain the idea of area
- use the formula to find the area of a square and a rectangle
- apply the concept of area in practical situations
- find the areas and perimeters of irregular shapes using a square grid and approximation

Teaching materials:

- board and markers/chalk
- 1 cm × 1 cm square grid paper

Learning activity

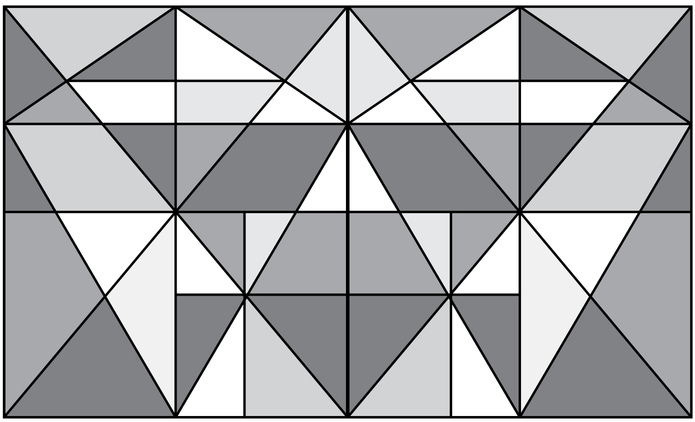
Lesson 1: 40 minutes

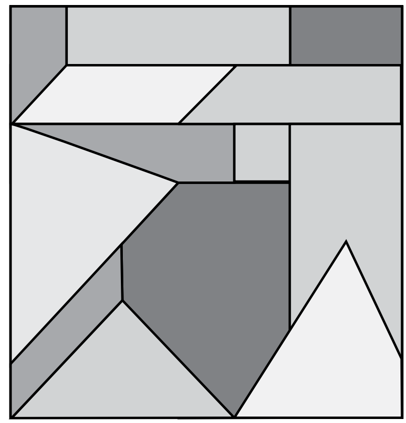
The concepts of area and perimeter have already been introduced in previous years. In Year 5, the concept is refined and formalized with the introduction of the mathematical formulae for finding the areas and perimeters of 2D shapes, such as a square and a rectangle.

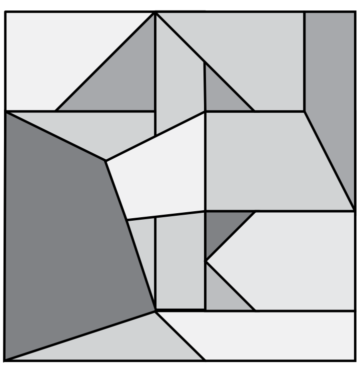
Revise the concepts with some hands-on activity.

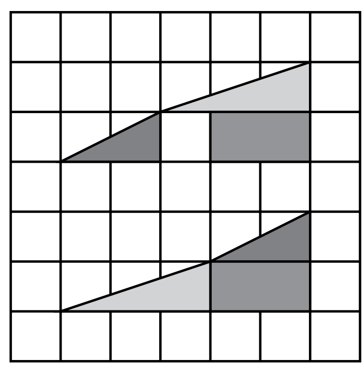
A concept that should be explained is that flat shapes have 2 dimensions: length and breadth (also referred to as width). Measurements of desktops, pieces of chart paper and broad ribbons clarify the 2D concept. All 2D surfaces can be laid flat on the desk or the floor.

Extra activity: It is interesting to work with different 2D shapes and see how they tessellate.









In this unit, the students learn about the concepts of area and perimeter of 2D shapes.

Perimeter:

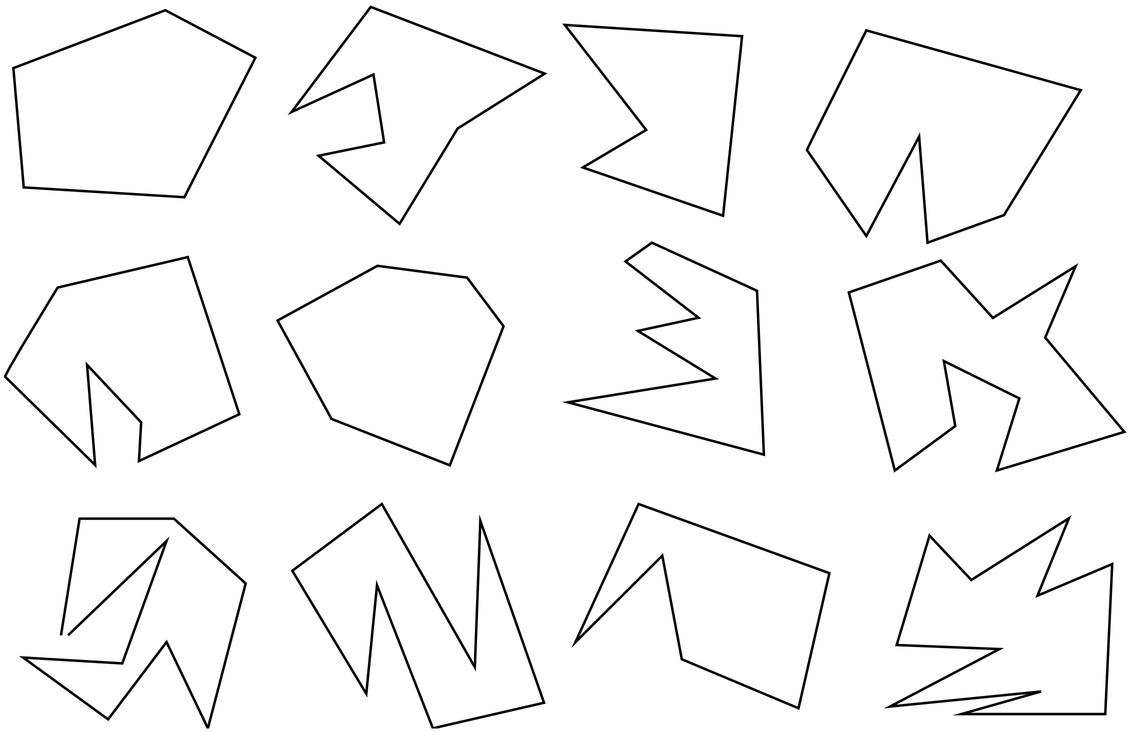
In the construction activity with matchsticks, the matchsticks formed the perimeter of each figure.

Let students explore the concept of perimeter by walking around a garden or around the classroom: they can talk about perimeter in terms of ‘footsteps’. Then they can tie ribbons or strong thread around a desk or around the board. The perimeter, in these cases, will be measured in terms of metres or centimetres.

Divide the students into groups of 3 or 4 and give each group straws cut into lengths of 5 cm, 10 cm, and 15 cm with which to make different-sized polygons.

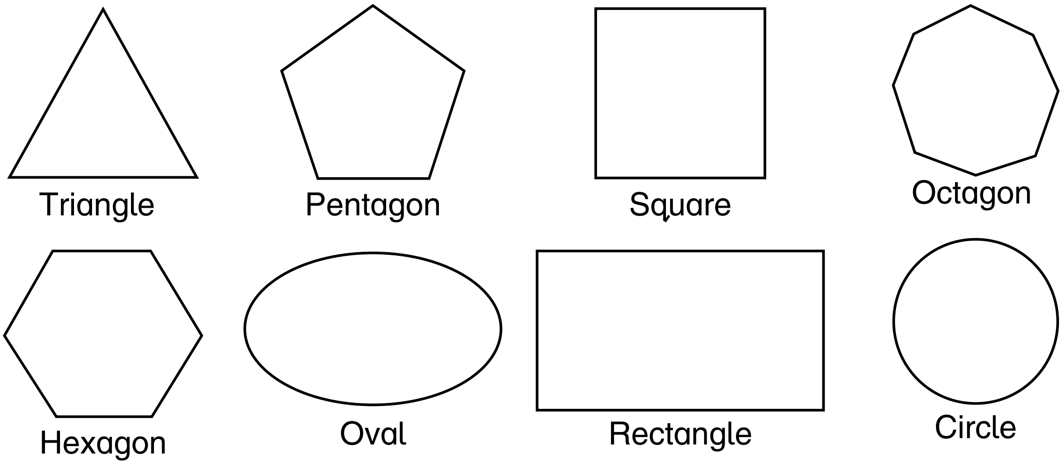
Polygons:

A polygon is a closed figure with any number of sides (not necessarily equal sides).

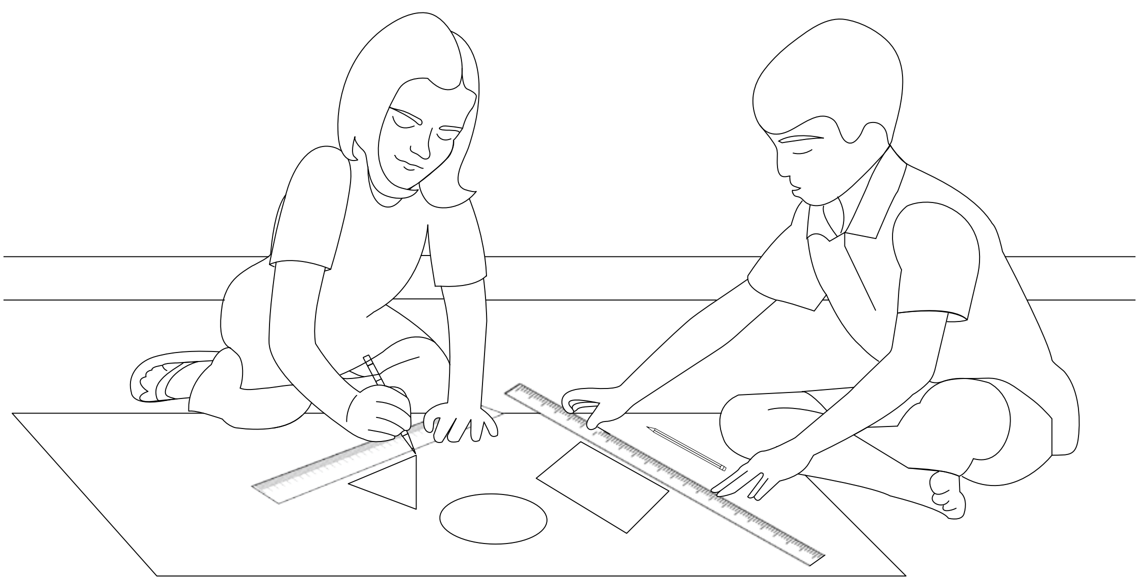


REGULAR POLYGONS:

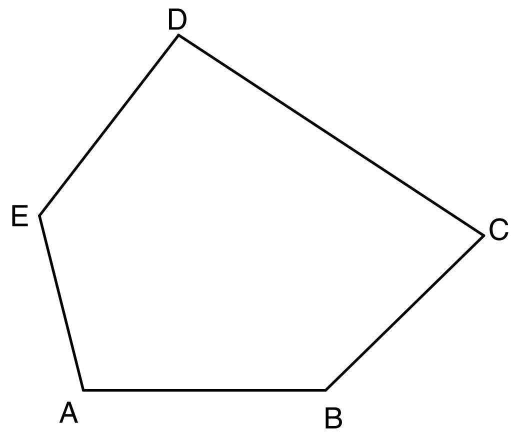
A regular polygon is also a closed figure, BUT all sides and angles must be equal.



It helps to have random polygons with 3 sides, 4 sides, 5 sides 6 sides, etc. drawn on the board or on the floor.



Students measure the sides and add the lengths.



Pentagon ABCDE

AB = 20 cm

BC = 17 cm

CD = 30 cm

DE = 18 cm

EA = 14 cm

Perimeter of ABCDE

= AB + BC + CD + DE + EA = 99 cm

Ask students to draw random polygons in their exercise books. Each student measures the sides, writes down the lengths, and finds the perimeter of each figure, as shown above.

Tell a story. Make it interesting and funny so that the students are drawn in and take an interest in the story and hence the lesson.

Mr and Mrs Rahim invited 32 people to a get-together. To accommodate their guests they set up eight tables, with tops of different-sized squares or rectangles.

The guests need to bring chairs from the side of the hall to the individual tables. They rearrange the seating arrangements so different families can sit together in groups of 3, 4, or 5. Mr Rahim protests, knowing the arrangements won't work, but no one listens. After a great deal of confusion the guests realize Mr Rahim was right.

Narrate just the first part of the story, until the guests begin to move the tables. Then tell the students that they are going to help Mr Rahim arrange the tables so that no tables are crowded.

Place squares and rectangles on your table, so that the students can work out a seating pattern.

They may be confused initially, but exasperation always gives way to delight when they realize that the only way to get 32 places at the table is with Mr Rahim's original plan!

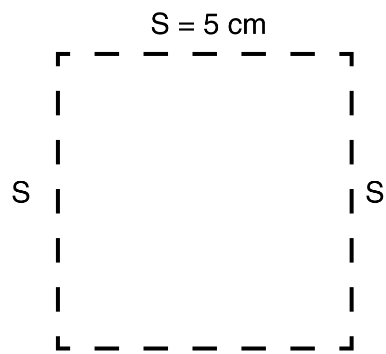
Soon, the class will work out that, if each table had 4 people, one on each side, the seating will be correct.

This exercise may not teach the students how to calculate area or perimeter, but it helps them differentiate between the perimeter of a shape and its area.

Then, introduce the formula for calculating the perimeter of a square and a rectangle.

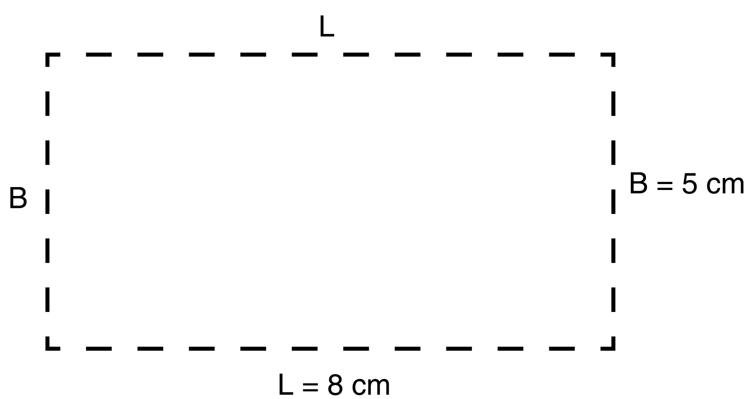
A square has 4 equal sides, each side with the length of 5 units.

So, the perimeter of a square is 4 × length of each side = 4 × 5 = 20 units.



A rectangle has two pairs of equal sides, L being the length, B being the breadth.

The perimeter = 2 × length + 2 × breadth = 2(L + B) = 2 (8 + 5) = 2 × 40 = 80 cm



In real-life situations, to find the perimeter of a square or a rectangular room, students may prefer to add all the 4 sides, rather than apply the formulae. Allow them to do that, until they realize that the use of the formulae makes the problem easier.

Task: Students should attempt pages 129–131.

Lesson 2: **40 minutes**

Before moving on to area use the activity below to reinforce the distinction between the area and the perimeter of a shape.

REMEMBER: Perimeter is 1-dimension, and area is 2-dimension.

Area:

The length (L) of a square is 1 cm, and the breadth (B) is 1 cm. (In a square, L = B)

Area = 1 cm^2

Perimeter = 4 cm

This means that the square covers space with area of 1 $cm^{2.}$

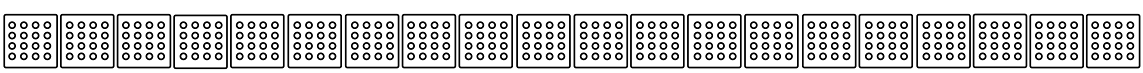
If an ant walks around the 4 sides, it will cover a distance of 4 cm. This is the perimeter of the square.

Students always seem to focus closely on lessons that involve edible objects, because they know that when the work is done, they can eat it all up!

IMPORTANT: Make sure that the snacks do not get soiled! Also, remember that certain children may have allergies.

Set up a few workstations. Give each student a packet of 20 Cheeselets or small cumin biscuits or other square biscuits (with each side 1 cm). Use these to compare and contrast the area and perimeter of different rectangles given below.

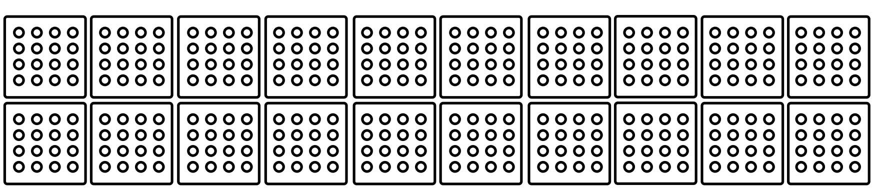
Students place 20 biscuits (each 1cm square) in the following patterns:



L = 20 cm B = 1 cm

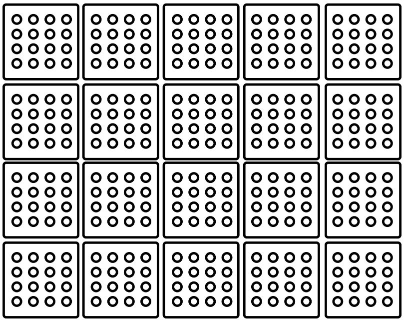
Area: 20 biscuits = 20 cm^2

Perimeter: 20 + 20 + 1 + 1 = 42 cm.

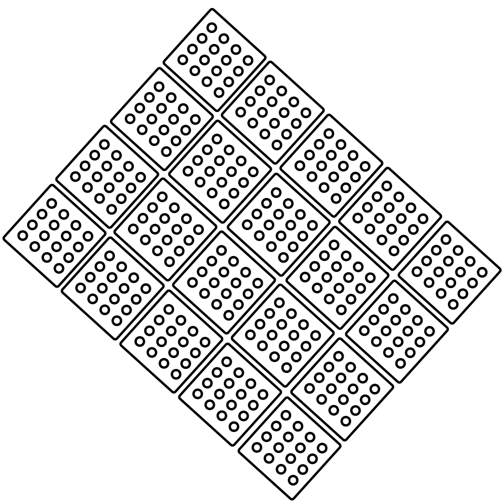


Area: 20 biscuits = 20 cm^2

Perimeter: 10 + 10 + 2 + 2 = 24 cm



Area: 20 biscuits = 20 cm^2
Perimeter: 5 + 5 + 4 + 4 = 18 cm



Area: 20 biscuits = 20 cm^2

Perimeter: 5 + 5 + 4 + 4 = 80 cm.

The area of each pattern is 20 cm^2, but the perimeters vary.

Working in reverse, if a ribbon loop of 30 cm is the perimeter, one can have rectangles with these areas:

Area = 8 cm × 7 cm = 56 cm^2

Area = 9 cm × 6 cm = 54 cm^2

Area = 10 cm × 5 cm = 50 cm^2

Area = 11 cm × 4 cm = 44 cm^2

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Area = 12 cm × 3 cm = 36 cm^2

Area = 13 cm × 2 cm = 26 cm^2

Area = 14 cm × 1 cm = 14 cm^2

It is interesting to note that with perimeter constant, as one side becomes longer, the area reduces! The slimmer the rectangle, the larger the area.

Once the students have enjoyed themselves with this activity, introduce the mathematical formula for the area of a square and a rectangle.

Take an example of a square, with L = 5 cm, B = 5 cm.

The area of the square = 5 × 5 cm = 5 cm^2 = 25 cm

The perimeter = 4 × 4 cm = 16 cm

Area of a square = side × side = L^2 cm^2

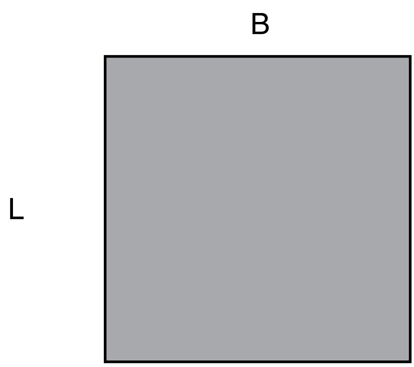
Using the formula, $A = L^2$

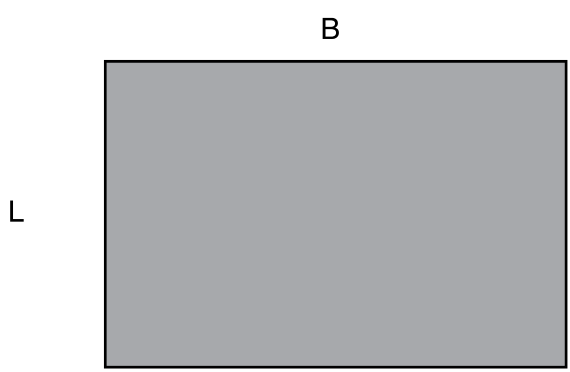
Area of a square biscuit: 1 cm × 1 cm = (1 × 1) cm^2 = 1 cm^2

Area of a square table top: 1 m × 1 m = (1 × 1) m^2 = 1 m^2

Area of a square tile: 10 cm × 10 cm = (10 cm × 10 cm) = 100 cm^2

Area of an open space on the highway 1 km × 1 km = (1 × 1) km^2 = 1 km^2





A rectangle has two pairs of equal sides 2 L and 2 B.

(Use rectangles formed by the square biscuits, as examples.)

Therefore, area = (L × B) cm^2

A rectangle with length 3 cm, breadth 2 cm
Area = 2 cm × 3 cm = (2 × 3) cm^2 = 6 cm^2

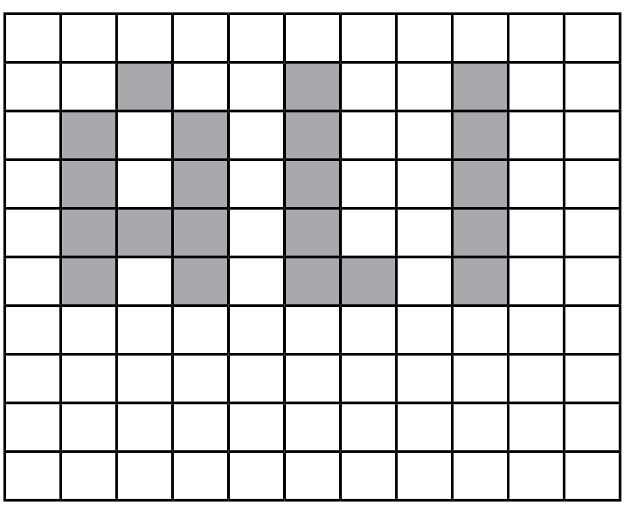
A table top: length = 50 cm; breadth = 20 cm
Area = 50 cm × 20 cm = (50 × 20) cm^2 = 100 cm^2

A square tile with one side 10 cm
Area = 10 cm × 10 cm = (10 × 10) cm^2 = 100 cm^2

Follow this up with a lot of oral activity and application to real-life situations. It is essential to show the concept of area with square biscuits, tiles on the floor, or a paper grid. In everyday life, the students have seen the tiles being laid in new homes, or a carpet for the sitting room floor. The perimeter comes in when the carpet needs to be finished by the layer, or the floor has a border all around, different from the tiles.

End this topic with drawings on a square grid. This activity is always a huge favourite with the students. Give each student a cm grid paper. First they use the square cm graph paper to write out their names. Next, they find the area and perimeter of each letter and add those together to find the area and perimeter of their entire name. Allow the students to compare the perimeters and areas of their names.

Encourage peer tutoring/help because when one student is having trouble visualizing how letters A or M can be made out of squares, a group member is always there to help.



Ali finds the area occupied by his name, and the perimeter of each letter.

Area: A = 10 cm^2, L = 6 cm^2, I = 5 cm^2 Total area = 21 cm^2

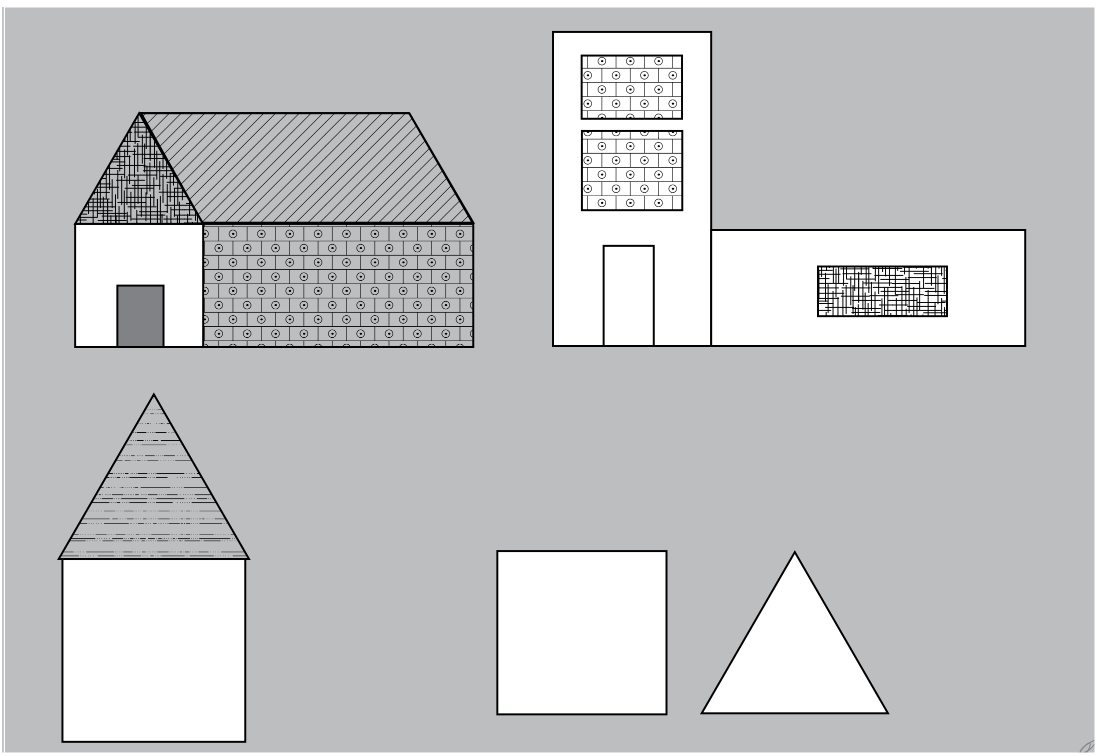
Perimeter: A = 25 cm, L = 14 cm, I = 12 cm, Total perimeter = 51 cm

A chart with all the letters of the alphabet written in this names is useful.

Task: Students should attempt pages 133–135.

Lesson 3: **40 minutes**

This interesting activity enables students to create an area and perimeter neighbourhood. Print and photocopy cm grids onto coloured paper. Let the students select four different colours to create a house, roof, door, and windows. Drawing the polygons and cutting and fitting them together into different shapes requires substantial use of problem-solving skills. Once the project is ready, let them calculate the area and perimeter of each element. Completed houses can be displayed on a bulletin board along with details of the area and perimeter of the shape.



Far more complex compositions are often visualized by 9 to10 year olds.

Task: Students should attempt pages 136 to 140.

Additional resources:

At the end of the guide are additional worksheets 18–20. Use these for reinforcement.

UNIT 10

INFORMATION HANDLING

Teaching objectives

- to draw and interpret a bar graph/column graph
- to draw and interpret a pie chart
- to introduce averages

Learning outcomes

Students should be able to:

- identify a graphical representation of data
- draw a bar graph, a column graph, or a pie chart from given data
- draw conclusions from a bar chart, a column graph, and a pie chart
- calculate averages

Teaching materials:

- sample graphs from newspapers, the Internet, or magazines
- charts
- Excel sheets

Learning activity

Lesson 1: 40 minutes

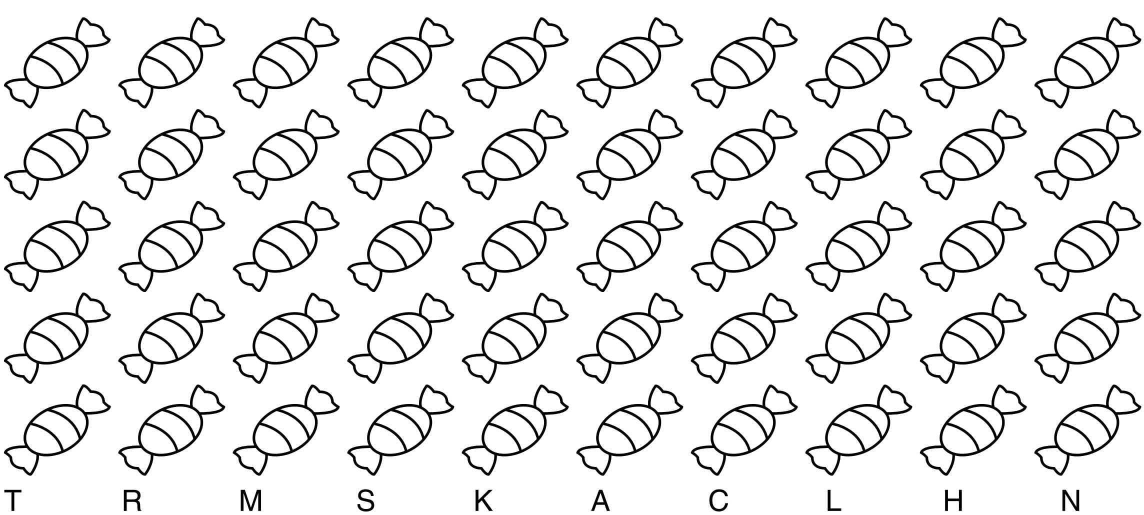
Introduce the concept of average as 'normal' or 'something that is in the middle of a range'. It involves flattening out a range of numbers.

Tahira's mother bought 100 sweets for her birthday party. Fifty were given to the children of the domestic staff. She packed the remaining 50 into 10 gift packets for Tahira's friends. But, the packets did not all contain the same number of sweets. She put 6 or 7 in each packet and realized that she was running out of sweets, so she started putting 3, 4, or 5 in the remaining packets.

Tahira picked the largest one containing 8 sweets; Rahman's packet held 6, Mehru's 6, Syeeda's 6, Kishwer's 5, Alia's 5, Charu's 4, Lara's 4, Hameed's 3, and Neera's 3.

ACTUAL NUMBER OF SWEETS RECEIVED BY 10 CHILDREN

AVERAGE NUMBER OF SWEETS RECEIVED BY A CHILD



What was the average number of sweets each child received? The average is calculated by dividing the total number of sweets by the number of children at the party.

$\frac{50}{10} = 5$

B. Flavours of ice creams

10 different varieties of ice creams available at 'KREEMY CORNER'. One cone of each of the 10 flavours costs:

Fudge and brownie ice cream: Rs 50

Chocolate and nuts: Rs 45

Chocolate: Rs 40

Chocolate ribbon: Rs 38

Cherry: Rs 35

Strawberry: Rs 32

Blueberry: Rs 30

Vanilla with chocolate sauce: Rs 75

Vanilla and nuts: Rs 25

Vanilla: Rs 20

What is the average price of an ice cream cone?

C. Speed of a car over a long distance is often described in terms of 'average speed'.

The Ali family went for a picnic to Kalri Lake which is 130 km from Karachi. The family left home at 7 a.m. and reached at 10 a.m. What was the average speed of the car?

This means that the car may have gone very fast on a highway, at a speed of 80 km per hour or at a much lower speed of 30 km per hour, during traffic.

D. Cherrapunji (in India) is the wettest place in the world. The total rainfall during June, 2013, was 1525 mm. This means the daily rainfall would be in the region of $\frac{1525}{30}$ mm, which is approximately 50 mm every day.

NOTE FOR THE TEACHER: It is important to qualify the data being represented by the average. Is the average rainfall for a day in Cherrapunji the average over a month? Or a whole year? Or has the average been calculated over a few days? Or a few years?

The average of a set of data may or may not coincide with a particular item of data in the group; it is representative of the group as a whole. Explain the method of calculating the average: add up all the data in the survey and divide the total by the number of data items.

Give the students plenty of practice with the concept so that they are confident in finding averages.

Task: Students should attempt pages 145–147.

Lesson 2: **40 minutes**

Graphs were dealt with in detail in Book 4. Basically, a graph (at this level) is a pictorial depiction of the relationship between two variables.

In Unit 10, the emphasis is on the interpretation of graphs and calculation of averages from graphs.

Start by revising the basic concepts of a graph. You may want to base the revision on a question/answer pattern.

1. What is a graph?

   It is a pictorial representation of two sets of information.
2. Why is it useful?

   It gives you quick and easy access to the information.
3. What are the different types of graphs that you have learnt about?

   Bar graph, column graph, pie graph, and line graph.
4. What are the essentials in a graph?

   A set of axis, a scale, a key, 2 sets of information to be represented.

A. Bar graph

Give the students a topic about which they can conduct a survey and collect data. For example, let the topic be 'The number of cartoon shows each student is allowed to watch'. Let them ask their friends in class as well as their friends in the neighbourhood (a minimum of 25). Help them tabulate the data. Ask them to count the number of children that are allowed to watch only one cartoon show, how many are allowed 2, how many are allowed 3, and so on. Sample tabulation is given below:

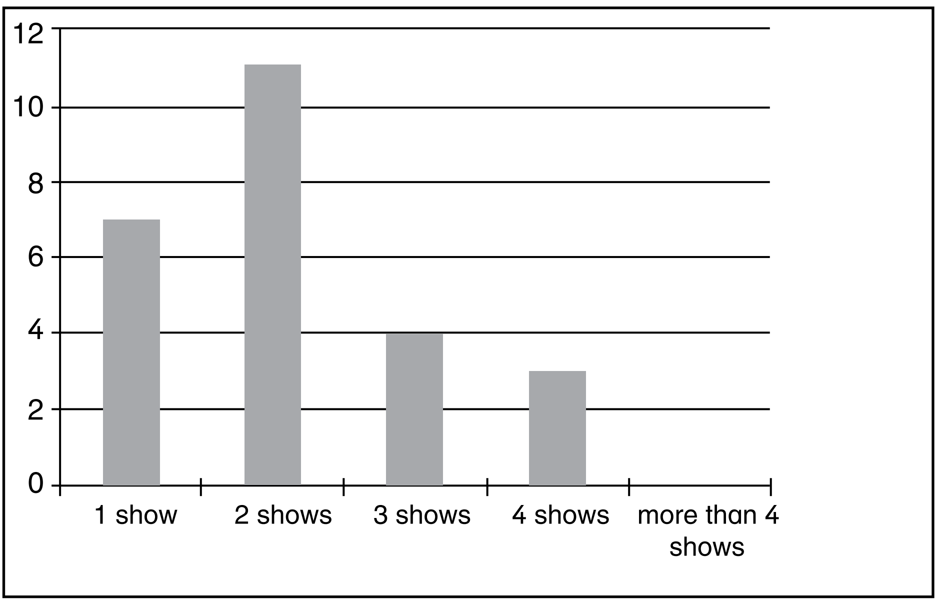
Number of shows	Number of children
1 show	7
2 shows	11
3 shows	4
4 shows	3
More than 4 shows	0
TOTAL	25

Now ask them to represent the information on a bar graph. As they do so, recall the different parts of a graph. You may conduct a small oral quiz to revise the concept. Show them the graph below and ask them to name the different components.

TITLE: Number of cartoon shows you are allowed to watch in a day

Revisit the steps for a bar graph:

- Draw a pair of axes.
- Choose a suitable scale; generally 1 cm = 1 unit.
- Find the heights of each bar according to the data given for example, the height of the bar representing 1 show is 7 cm, the height of the bar representing 2 shows a day will be 2 cm and so on (remember to keep to the scale).
- Use a ruler or graph paper to plot the points.
- Use a ruler to join them to form rectangles.
- Write the scale and make a legend.



Scale: 1 cm = 1 unit

Once the basic steps have been revised, go over the steps for drawing a bar graph and a pie chart from the set of data given above.

B. Steps for a pie chart:

To construct a pie chart, let the children collect data on their favorite sport. A sample collection is given below.

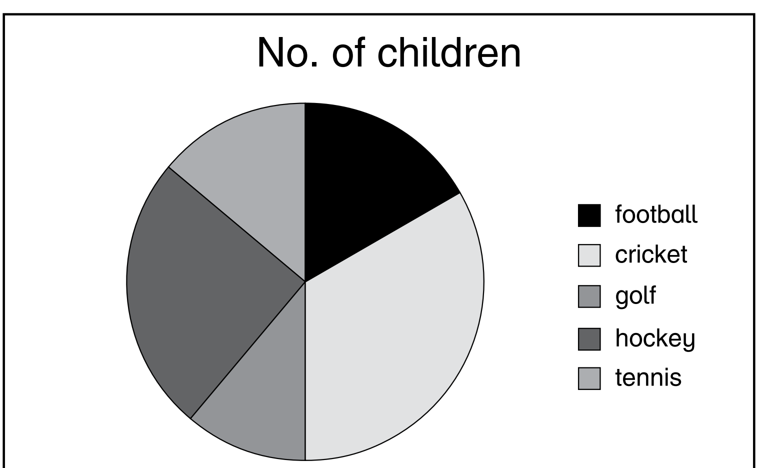
Sport	No. of children
Football	12
Cricket	23
Golf	7
Hockey	18
Tennis	10

Revisit the steps to construct a pie chart:

- Convert each frequency to it proportional part of the whole.
- For example, data A is 12 parts out of a total of (12 + 23 + 7 + 18 + 10 = 60)
- Data = $\frac{12}{60} = \frac{1}{5}$
- Calculate the proportional part out of 360°.

  $\frac{12}{60} \times 360°$

  $= \frac{1}{5}$ of $360° = 72°$
- Draw a circle of a suitable radius
- In the circle, mark sectors with the angles calculated proportionate to the data
- Label the corresponding sectors correctly
- The pie chart is ready, make a legend for the pie chart.



Once the students have revised the basics, ask them to conduct surveys on various topics.

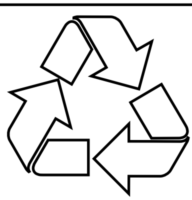
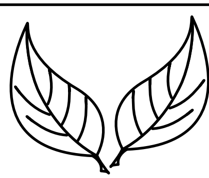
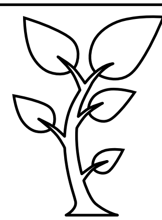
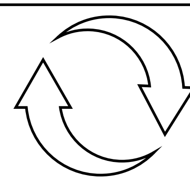
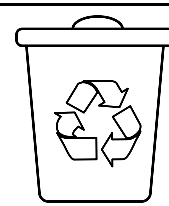
Given below is a template for an interesting survey, which you might want the students to conduct and represent the information on a bar/pie chart. This activity may be given to the students as a mathematics project.

What is the most important thing young people can do to protect the environment?

- Recycle.
- Plant trees.
- Buy only eco-friendly products.
- Raise money to save environment.
- Raise awareness about the environmental issues.

You could include other topics of concern or ask the students for their choice of topics for a survey. It is preferable that the students choose topics which relate to their daily life and are thought-provoking.

Do include other topics of everyday concern (such as use of plastics, wastage of paper) or ask the students for their choice of topics for a survey.

Once their survey is complete, help the students to tabulate the data and represent it on a bar or a pie chart. Ask each student to present his/her survey results and draw conclusions from them. Discuss these topics in class and encourage them to think about the local social issues, and give their individual opinions on the matters.

Introduce the concept of average as a representative of a group. An average of a set of data may or may not coincide with a particular data in the group. It is a representative of the group as a whole. Teach the method of calculating averages: add up all the data in the survey and divide it by the number of observations. Give the students enough practice in the concept till they are confident.

Task: Students should attempt pages 151 to 154.

Additional resources:

At the end of the guide are additional worksheets 21 and 22. Use these for reinforcement.

UNIT 11

ASSESS AND REVIEW 2

Teaching objectives

- to revise the concepts learnt throughout the year
- to recap place value
- to revise fractions and percentages
- to solve problems using the four operations, i.e. addition, subtraction, multiplication, and division
- to revise measurement of distance, time, and temperature
- to revise the divisibility rules
- to recap ratio and proportion
- to identify complementary and supplementary angles, and adjacent angles
- to solve problems related to perimeter and area
- to revise the concept of average and interpret data presented in bar graphs and pie charts

Learning outcomes

The students should be able to:

- identify the place values in given numbers
- demonstrate an understanding of fractions and percentages
- solve problems using the four operations, i.e. addition, subtraction, multiplication, and division
- demonstrate an understanding of measurement distance, time, and temperature
- use the divisibility rules
- solve problems related to ratio and proportion
- demonstrate understanding of complementary, supplementary angles, and adjacent angles
- solve problems related to perimeter and area
- solve problems related to averages and interpret data presented in bar graphs and pie charts

Teaching materials:

- additional worksheets

Learning activity

Lesson 1: **40 minutes**

NUMERICAL PROBLEMS: Wherever possible, put commas in the correct places, first using the Pakistani system and then the international system of numbering. Work out each of the following, and write the answer in words:

1. 3484184 + 452749
2. 238956 + 453867
3. 3456398 – 14740
4. 69574 – 49794
5. 957484 × 56
6. 57309 × 102
7. 5697493 ÷ 12
8. 865033 ÷ 25
9. 4737030 + 5746 – 453804
10. 9894775 – 5869386 + 473863
11. (5474 + 5868) × 15
12. (58667 – 16745) ÷ 16
13. 12 × (972457 + 477)
14. (84543 – 9970) × (428956 - 414828)
15. 346 + 989 × 23 – 568
16. 7594.857 + 45.5769
17. 6453.457 – 447.28293
18. 4975.854 × 97.09
19. 567.9745 ÷ 1.2
20. 0.07457 × 3.94
21. $2\frac{4}{5} + 5\frac{1}{4} - 3\frac{1}{2}$
22. $3\frac{3}{4} \times 4\frac{7}{10} \times \frac{8}{9}$
23. $\left(\frac{12}{25} + 1\frac{2}{5}\right) \div \frac{20}{57}$
24. $\frac{1}{2}\left(\frac{3}{8} + \frac{1}{2}\right) - \frac{13}{24}$
25. $\frac{7}{16} \div \left(\frac{2}{3} + \frac{8}{9}\right) + \frac{4}{5} \times \frac{35}{36}$

Lesson 2: **40 minutes**

APPLICATIONS:

1. Calculate 23% of 4500 g.
2. Calculate $\frac{3}{4}$ of 404 ml.
3. What is 12.5% of Rs 2300?
4. How much is 0.45 of 10000 mm?
5. What is $\frac{2}{15}$ of a dozen?
6. Prime factorize 4620.
7. Find the HCF and LCM of: 742 and 1162.
8. Find the greatest number, that divides 35, 105 and 700 without leaving a remainder.
9. 3 clocks chime at intervals of 30 min, 1 hr, and 1 hr 15 min. If they chimed together at 12 noon, at what time would they chime together again?
10. Find the number between 110 and 130 which is divisible by 6, 10, and 12.
11. Calculate 25% of 10% of 1000 kg. Write your answer in grams.
12. A tumbler can hold 250 ml of water. Shahid drinks $\frac{3}{5}$ th of the tumbler of water. How much water did he drink? How much water is left?
13. In a garden of 540 plants, $\frac{2}{5}$ bear fruits, $\frac{1}{9}$ bear flowers and the remaining plants bear neither. How many plants bear neither fruit nor flowers?
14. Mohsin is writing a 2400 words essay for his school project. He writes $\frac{1}{5}$ of the essay on the first day, $\frac{2}{3}$ of the remainder on the second day, and 220 words on the third day. Now he only has to write the conclusion. How long was his conclusion?
15. Shazia is practising for her 100 m freestyle competition. She records her times on 5 consecutive days: 20.5 s, 21.03 s, 19.98 s, 20.2 s, 21 s. Calculate her average times over these 5 days.
16. Mikael has Rs 45.09. He distributes it equally among his 4 money boxes. How much money did he put in each money box? Is there any money left over? How much?
17. Rose water comes in bottles of 150 ml each. Shazia buys 23 such bottles for her shop. How much rose water has she stored?
18. Ali reaches his gymnasium at 11:30 am. Before arriving at the gym, he had spent 45 minutes on the bus, 12 minutes waiting for the bus, and 7 minutes walking to the bus stop from his house. What time did he leave his house?
19. The cost of 17 watermelons is Rs 511.70. Find the cost of 20 such watermelons.
20. The area of a square ground is 14400 sq m. Find the cost of mowing the lawn at Rs10.50 per square metre. What is the cost of fencing lawn at a cost Rs 24.25 per m?

21. Hamza is doing a science experiment on germination. His observations are shown as below.

Condition	No water	No light	Too cold	Too hot	Bad seeds	Control	Total
No. of sprouts	2	4	1	0	3	10	

i) Represent the information on a bar graph.

ii) Represent the information on a pie chart.

iii) Calculate the average number of seeds that sprout.

22. Construct Δ ABC in which AB = 5.9 cm, AC = 4.2 cm and BC = 3.8 cm.

23. Construct a quadrilateral with each side 5.3 cm. What is the special name of this quadrilateral?

24. Construct the quadrilateral ABCD in which AB = 8 cm, BC = 6.9 cm, CD = 5.7 cm, and DA = 7.5 cm.

25. Draw the angles 25° and 145° using a protractor. Calculate the complement of 25° and supplement of both 25° and 145°.

Lesson 3: **40 minutes**

For a little number fun

During a spare period, begin by writing 3 or 4 lines of these pyramids on the board and ask the students to complete these in their exercise books, WITHOUT THE USE OF A CALCULATOR. It will be interesting to find out how many of the class are able to follow the pattern and complete the pyramid, without having to multiply the numbers.

$$1 \times 8 + 1 = 9$$
$$12 \times 8 + 2 = 98$$
$$123 \times 8 + 3 = 987$$
$$1234 \times 8 + 4 = 9876$$
$$12345 \times 8 + 5 = 98765$$
$$123456 \times 8 + 6 = 987654$$
$$1234567 \times 8 + 7 = 9876543$$
$$12345678 \times 8 + 8 = 98765432$$
$$123456789 \times 8 + 9 = 987654321$$

$$1 \times 9 + 2 = 11$$
$$12 \times 9 + 3 = 111$$
$$123 \times 9 + 4 = 1111$$
$$1234 \times 9 + 5 = 11111$$
$$12345 \times 9 + 6 = 111111$$
$$123456 \times 9 + 7 = 1111111$$
$$1234567 \times 9 + 8 = 11111111$$
$$12345678 \times 9 + 9 = 111111111$$
$$123456789 \times 9 + 10 = 1111111111$$

$$9 \times 9 + 7 = 88$$
$$98 \times 9 + 6 = 888$$
$$987 \times 9 + 5 = 8888$$
$$9876 \times 9 + 4 = 88888$$
$$98765 \times 9 + 3 = 888888$$
$$987654 \times 9 + 2 = 8888888$$
$$9876543 \times 9 + 1 = 88888888$$
$$98765432 \times 9 + 0 = 888888888$$

$$1 \times 1 = 1$$
$$11 \times 11 = 121$$
$$111 \times 111 = 12321$$
$$1111 \times 1111 = 1234321$$
$$11111 \times 11111 = 123454321$$
$$111111 \times 111111 = 12345654321$$
$$1111111 \times 1111111 = 1234567654321$$
$$11111111 \times 11111111 = 123456787654321$$
$$111111111 \times 111111111 = 12345678987654321$$

At the end of the work out of each pyramid, it is worthwhile to check the answer on a calculator for the class to see.

Lesson 4: **40 minutes**

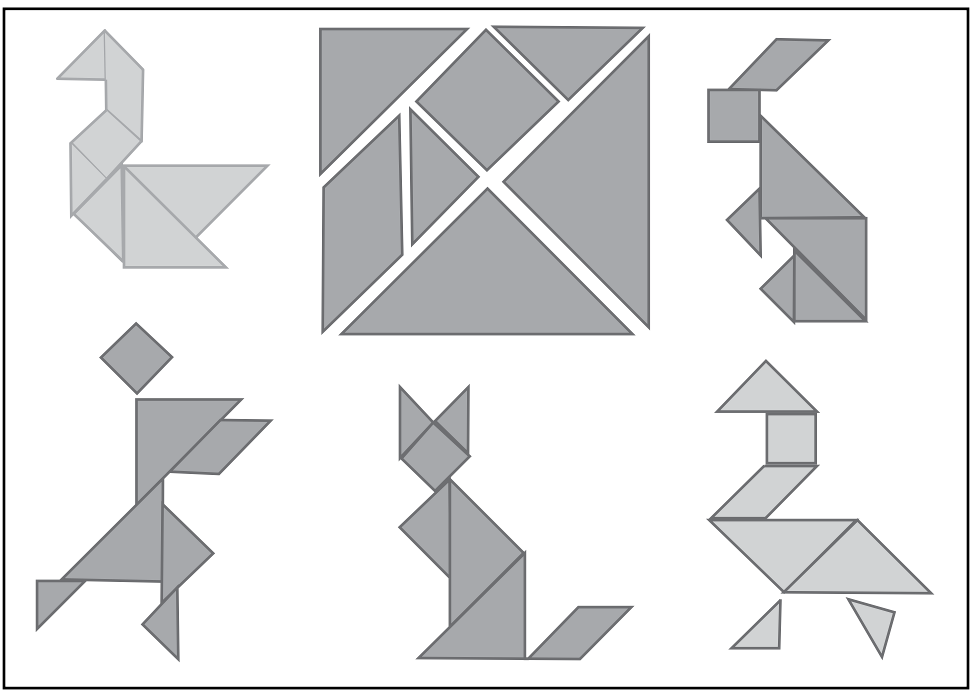
This puzzle is a Chinese puzzle, called a Tangram.

A square has been cut into these 7 shapes, as shown below. The various forms are made without folding.

Five triangles and two quadrilaterals (of given sizes) tessellate together to form a square, as shown. Each student has a set of shapes (tangrams are easily available), and looks at the various figures. Each student tries to recreate the figures on his or her desk. Many more different figures can be formed with these 7 pieces.

Draw this on the board and ask:

1. How many different shapes do you see? (5 triangles and 2 quadrilaterals)
2. How many different quadrilaterals do you see? (Two: a square and a parallelogram)
3. What kind of triangles are these? Are all of these right-angled triangles? (Yes)



4. What figures do you see?

Task: Students should attempt pages 156 to 161.

Additional resources:

At the end of the guide are additional worksheets 23–27. Use these for reinforcement.

Worksheet 1

Subtraction

1.
```
  7124290
- 3489167
---------
```

2.
```
  6029770
-  515854
---------
```

3.
```
  7627480
- 4623842
---------
```

4.
```
  2029770
- 2241105
---------
```

5.
```
  1610064
- 1151671
---------
```

6.
```
  6963287
- 3422393
---------
```

7.
```
  6409661
- 2503404
---------
```

8.
```
  5878310
-  453793
---------
```

Worksheet 2

Addition

1.

$$\begin{array}{r} 43415 \\ 52779 \\ 922622 \\ 920562 \\ +\;405727 \\ \hline \\ \hline \end{array}$$

2.

$$\begin{array}{r} 24868 \\ 295111 \\ 46043 \\ 718646 \\ +\;791039 \\ \hline \\ \hline \end{array}$$

3.

$$\begin{array}{r} 79207 \\ 729746 \\ 61989 \\ 573100 \\ +\;964817 \\ \hline \\ \hline \end{array}$$

4.

$$\begin{array}{r} 987897 \\ 81927 \\ 29407 \\ 112107 \\ +\;30359 \\ \hline \\ \hline \end{array}$$

5.

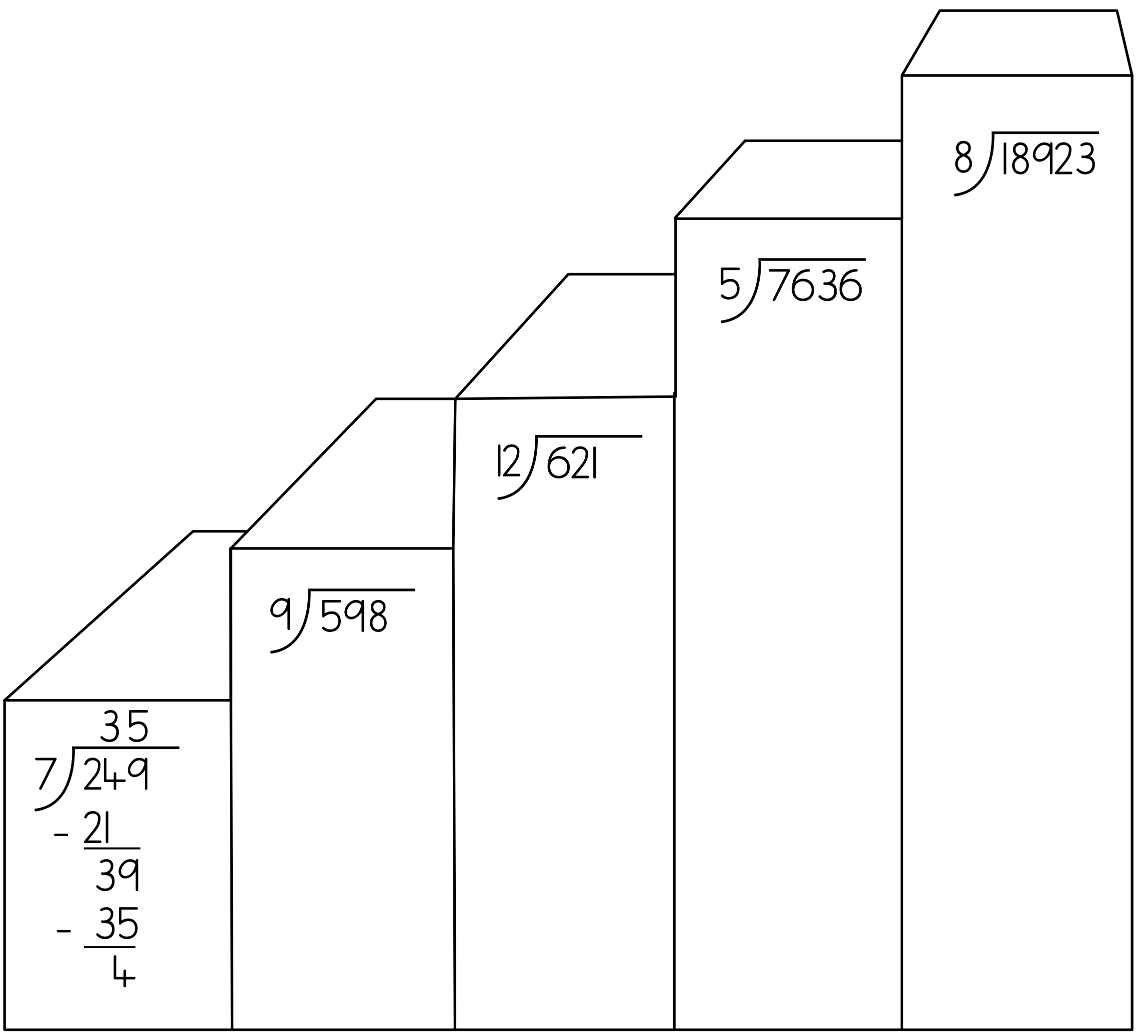
$$\begin{array}{r} 19766 \\ 465465 \\ 873811 \\ 987357 \\ +\;97470 \\ \hline \\ \hline \end{array}$$

6.

$$\begin{array}{r} 99511 \\ 597729 \\ 854896 \\ 821004 \\ +\;86409 \\ \hline \\ \hline \end{array}$$

Worksheet 3

Make it to the top of the stairs by solving each division problem. The first one has been done for you.



Worksheet 4

Solve.

$5 + 8 \div 2 - 7$ Ans:	$12 \times 3 - 42 + 7$ Ans:
$4 \div 1 + 8 \times 2$ Ans:	$17 \times 3 + 15 \div 3$ Ans:
$29 - 6 \times 5 + 14$ Ans:	$31 \times 2 - 54 - 3$ Ans:
$16 \div 8 + 5 + 17$ Ans:	$28 + 4 \times 5 \div 5$ Ans:
$32 + 9 \times 6 - 84$ Ans:	$62 - 33 \div 3 + 14$ Ans:

Worksheet 5

Write < than, > than, or =.

$\frac{1}{2}$ ☐ $\frac{6}{4}$	$\frac{11}{11}$ ☐ $\frac{2}{6}$
$\frac{5}{4}$ ☐ $\frac{5}{7}$	$\frac{4}{11}$ ☐ $\frac{4}{2}$
$\frac{1}{3}$ ☐ $\frac{10}{10}$	$\frac{1}{4}$ ☐ $\frac{12}{1}$
$\frac{11}{12}$ ☐ $\frac{8}{12}$	$\frac{2}{10}$ ☐ $\frac{12}{10}$
$\frac{8}{9}$ ☐ $\frac{8}{9}$	$\frac{5}{7}$ ☐ $\frac{5}{4}$
$\frac{5}{4}$ ☐ $\frac{5}{7}$	$\frac{8}{4}$ ☐ $\frac{8}{4}$
$\frac{1}{7}$ ☐ $\frac{1}{2}$	$\frac{4}{12}$ ☐ $\frac{6}{3}$

Worksheet 6

Solve.

1. $11\frac{3}{10} + 6\frac{4}{6} =$

2. $11\frac{3}{10} + 6\frac{4}{6} =$

3. $20\frac{5}{10} + 8\frac{2}{5} =$

4. $15\frac{2}{3} + 16\frac{8}{12} =$

5. $17\frac{8}{12} + 15\frac{1}{6} =$

6. $11\frac{4}{6} + 6\frac{5}{11} =$

7. $16\frac{1}{2} + 3\frac{1}{3} =$

8. $14\frac{8}{9} + 1\frac{3}{13} =$

Worksheet 7

Solve.

1. $11\frac{7}{10} - 7\frac{2}{4} =$

2. $8\frac{2}{3} - 8\frac{2}{6} =$

3. $15\frac{2}{3} - 5\frac{7}{9} =$

4. $17\frac{4}{6} - 14\frac{4}{7} =$

5. $9\frac{4}{7} - 9\frac{4}{12} =$

6. $14\frac{8}{12} - 13\frac{3}{4} =$

7. $17\frac{3}{8} - 16\frac{9}{11} =$

8. $15\frac{2}{5} - 14\frac{1}{3} =$

Worksheet 8

Write the following fractions as decimals.

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

2. $\frac{90}{100} =$

3. $9\frac{67}{100} =$

4. $9\frac{463}{1000} =$

5. $\frac{5}{10} =$

6. $\frac{46}{100} =$

7. $\frac{93}{100} =$

8. $8\frac{53}{100} =$

9. $\frac{9}{14} =$

10. $1\frac{3}{10} =$

11. $\frac{7}{10} =$

12. $8\frac{4}{10} =$

Worksheet 9

Division

1. $1.08 \div 0.02 =$ ________ 2. $1.90 \div 0.05 =$ ________

3. $0.49 \div 0.07 =$ ________ 4. $1.98 \div 0.09 =$ ________

5. $1.60 \div 0.02 =$ ________ 6. $0.27 \div 0.03 =$ ________

7. $0.35 \div 0.05 =$ ________ 8. $0.50 \div 0.05 =$ ________

9. $1.98 \div 0.09 =$ ________ 10. $0.36 \div 0.03 =$ ________

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Worksheet 10

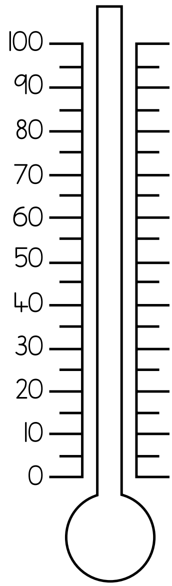
Change the following decimals to percentages and vice versa, as indicated.

1. ________ = 0.4
2. 58% = ________
3. 84% = ________
4. ________ = 0.72
5. ________ = 0.51
6. 3% = ________
7. 13% = ________
8. 44% = ________
9. ________ = 0.45
10. 48% = ________

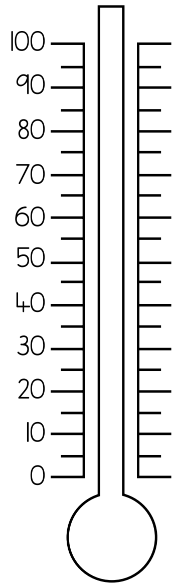
Worksheet 11

Shade the thermometers to show the temperatures.

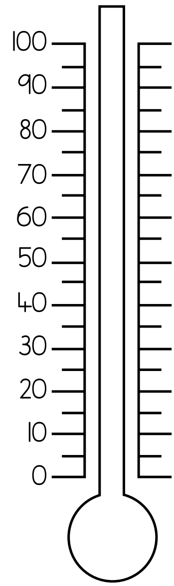
30°C



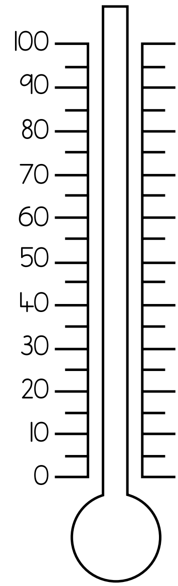
50°C



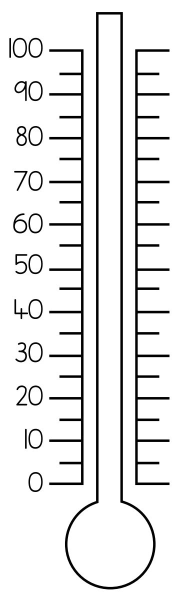
40°C



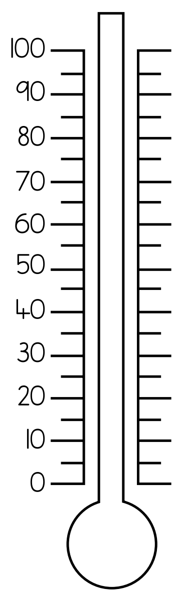
90°C



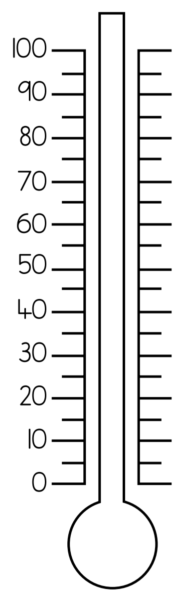
10°C



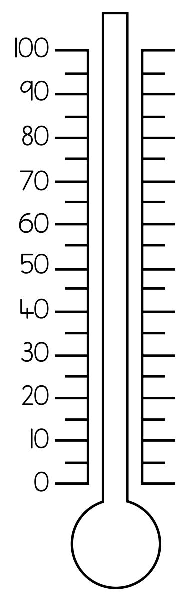
70°C



85°C

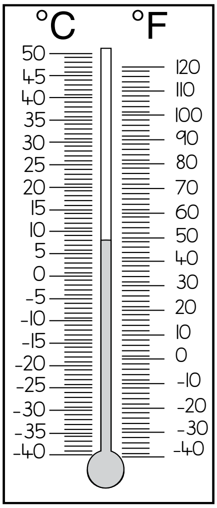


95°C

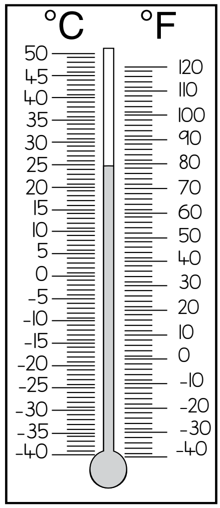


Worksheet 12

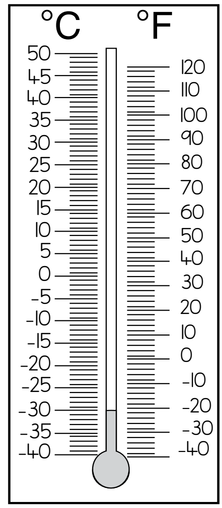
Write the temperature shown on each thermometer.



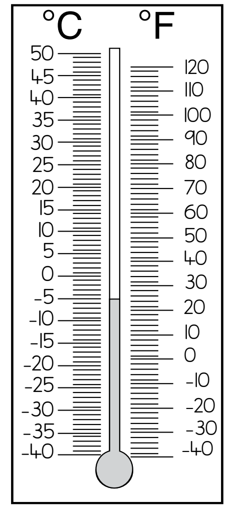
10 °C = _____ °F



77 °F = _____ °C



–30 °C = _____ °F



23 °F = _____ °C

Formula to convert °C to °F	Formula to convert °F to °C
$F = C \times \frac{9}{5} + 32$	$(F - 32) \times \frac{5}{9}$
Convert from Celsius into Fahrenheit.	Convert from Fahrenheit into Celsius
50 °C = ________________ °F	203 °F = ________________ °C
75 °C = ________________ °F	86 °F = ________________ °C
80 °C = ________________ °F	149 °F = ________________ °C
45 °C = ________________ °F	158 °F = ________________ °C

Worksheet 13

Hours and Minutes

Example: 6 hours = ______________ minutes 1 hour = 60 minutes 6 hours = 6 × 60 minutes = 360 minutes

Convert the following hours to minutes.	Workspace
1. 12 hours = ______________ minutes 2. 4 hours = ______________ minutes 3. 6 hours = ______________ minutes 4. 10 hours = ______________ minutes 5. 14 hours = ______________ minutes 6. 5 hours = ______________ minutes 7. 3 hours = ______________ minutes 8. 17 hours = ______________ minutes 9. 9 hours = ______________ minutes 10. 15 hours = ______________ minutes	

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Worksheet 14

Days and Hours

Example:
6 days = ____________ hours
1 day = 24 hours 6 days = 6 × 24 minutes = 144 hours

Convert the following days to hours.	Workspace
1. 15 days = ____________ hours 2. 6 days = ____________ hours 3. 5 days = ____________ hours 4. 12 days = ____________ hours 5. 1 day = ____________ hours 6. 2 days = ____________ hours 7. 7 days = ____________ hours 8. 9 days = ____________ hours 9. $3\frac{1}{2}$ days = ____________ hours 10. 10 days = ____________ hours	

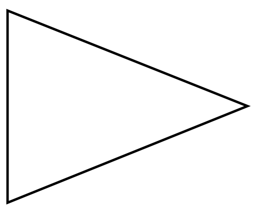
Worksheet 15

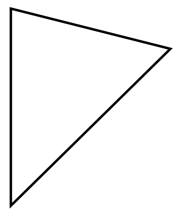
Simplify Ratio: Word Problems

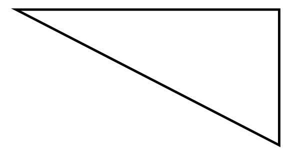
Questions	Workspace
There are 14 boys and 16 girls in class 4. Find the ratio of boys to girls. Answer:	
Dina bought 6 bananas and 10 apples. What is the ratio of bananas to apples? Answer:	
Sana has 8 sweets and Sarah has 10 sweets. Find the ratio. Answer:	
For a birthday party, Ahmed orders 10 chicken and 15 vegetable pizzas. Find the ratio. Answer:	

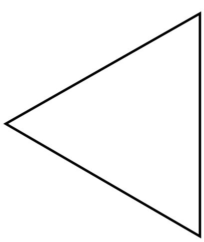
Worksheet 16

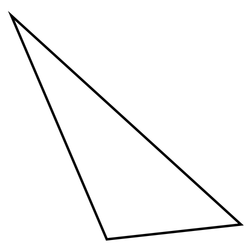
Identify each triangle based on angles (acute, obtuse, or right-angle).

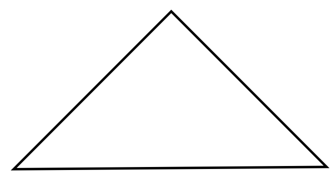


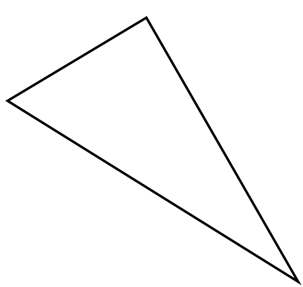


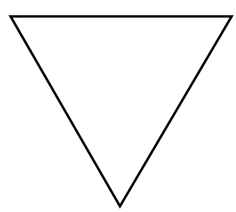


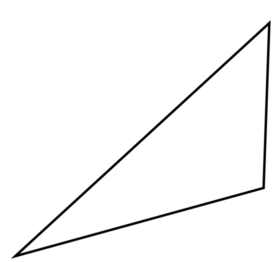






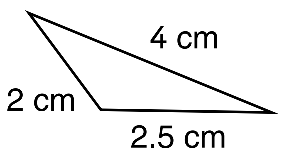
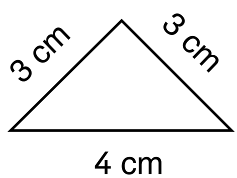
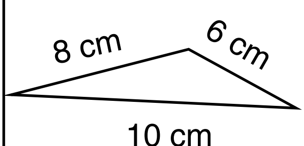
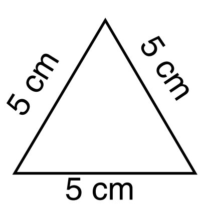
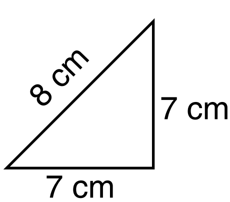






Worksheet 17

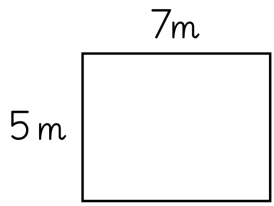
Tick the correct name for each triangle.

Triangle	Equilateral	Isosceles	Scalene	Acute	Obtuse	Right
						
						
						
						
						

Worksheet 18

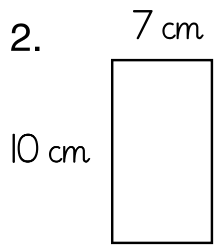
Find the area of each rectangle.

1.



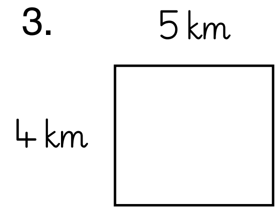
Area = __________

2.



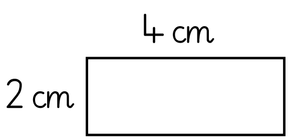
Area = __________

3.



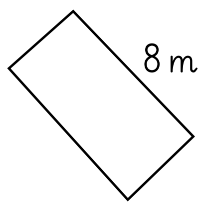
Area = __________

4.



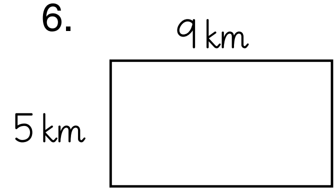
Area = __________

5.



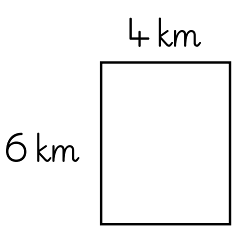
Area = __________

6.



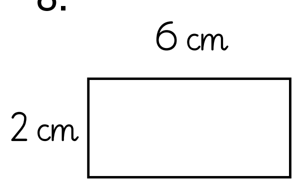
Area = __________

7.



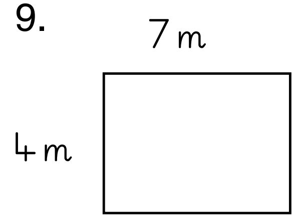
Area = __________

8.



Area = __________

9.

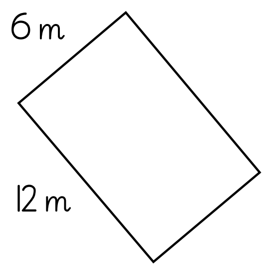


Area = __________

Worksheet 19

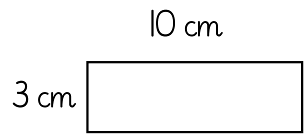
Find the perimeter of each rectangle.

1.



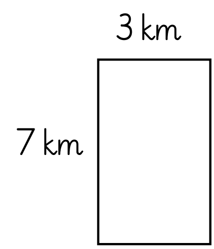
Perimeter = ________

2.



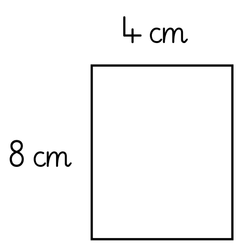
Perimeter = ________

3.



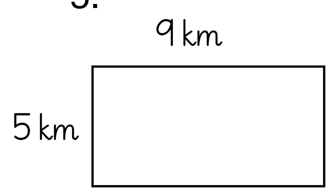
Perimeter = ________

4.



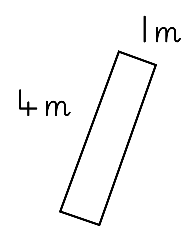
Perimeter = ________

5.



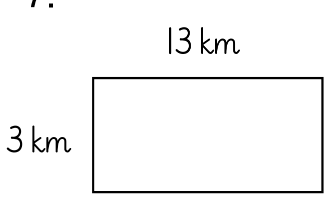
Perimeter = ________

6.



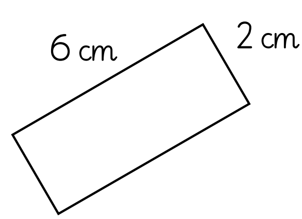
Perimeter = ________

7.



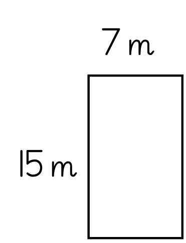
Perimeter = ________

8.



Perimeter = ________

9.



Perimeter = ________

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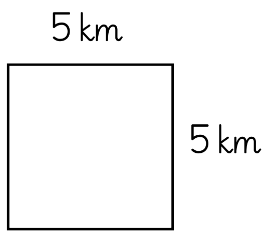
Worksheet 20

Find the area and perimeter of each square.

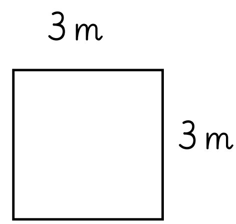
1.



Area: __________

Perimeter: __________

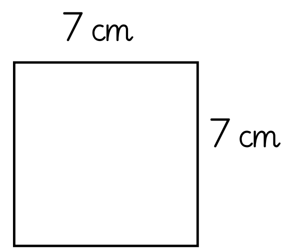
2.



Area: __________

Perimeter: __________

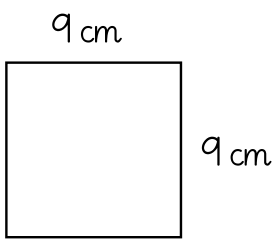
3.



Area: __________

Perimeter: __________

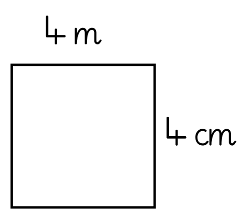
4.



Area: __________

Perimeter: __________

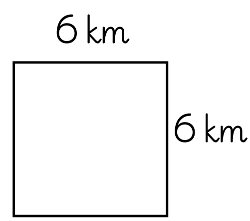
5.



Area: __________

Perimeter: __________

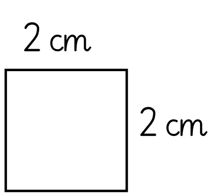
6.



Area: __________

Perimeter: __________

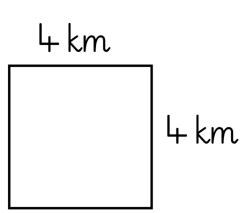
7.



Area: __________

Perimeter: __________

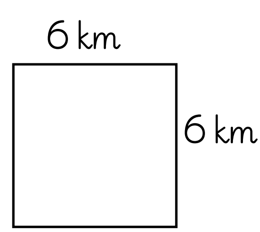
8.



Area: __________

Perimeter: __________

9.

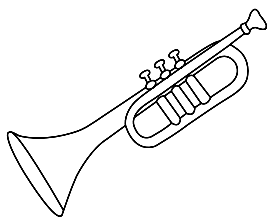
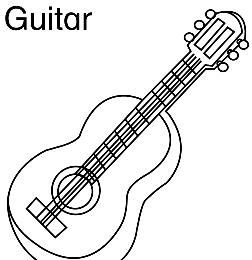
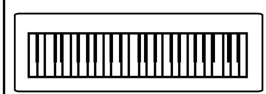
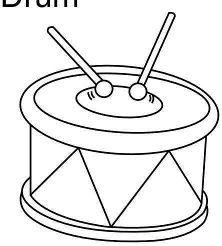


Area: __________

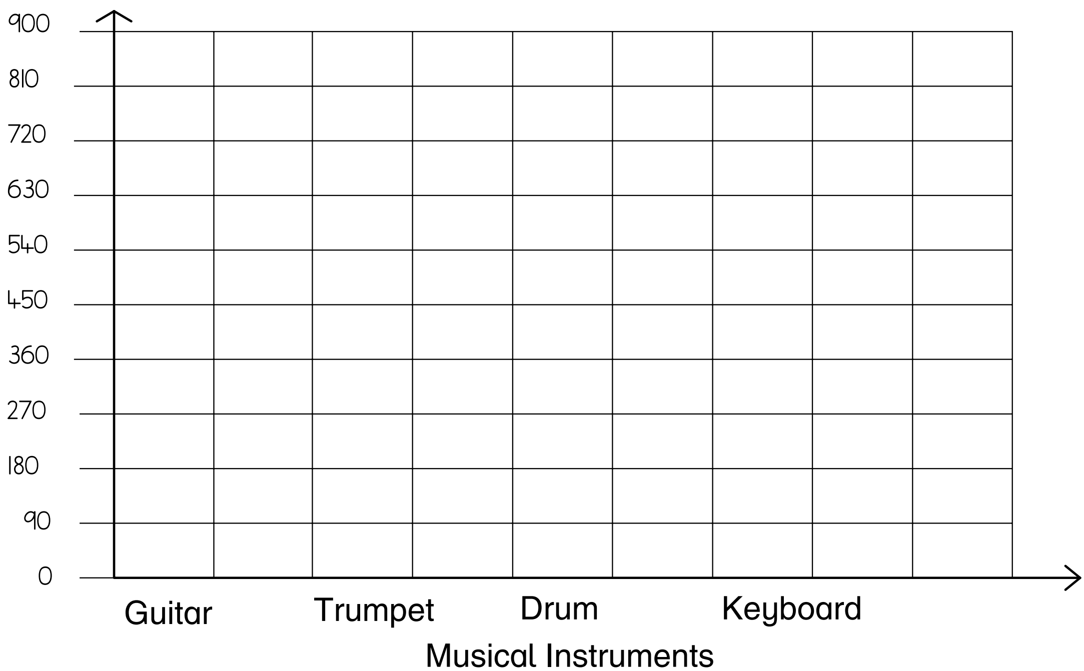
Perimeter: __________

Worksheet 21

A music store keeps the data on their sales of musical instruments. Draw a bar graph to represent the data and answer the questions.

Trumpet	Guitar	Keyboard	Drum
			
720	650	405	400

Sales of Musical Instruments



1. How many more guitars than drums were sold? ____________
2. Which two instruments have equal sales? ____________
3. What is the difference between trumpet and guitar sales? ____________
4. How many instruments were sold in all? ____________

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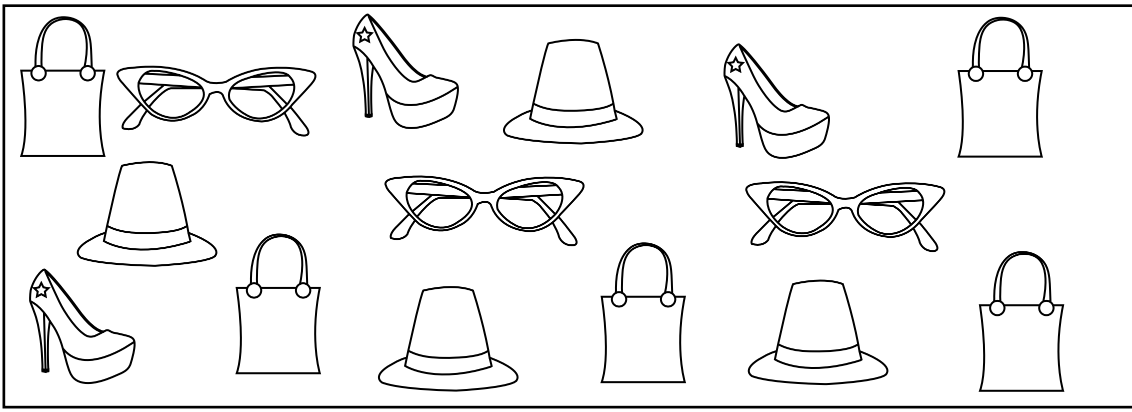
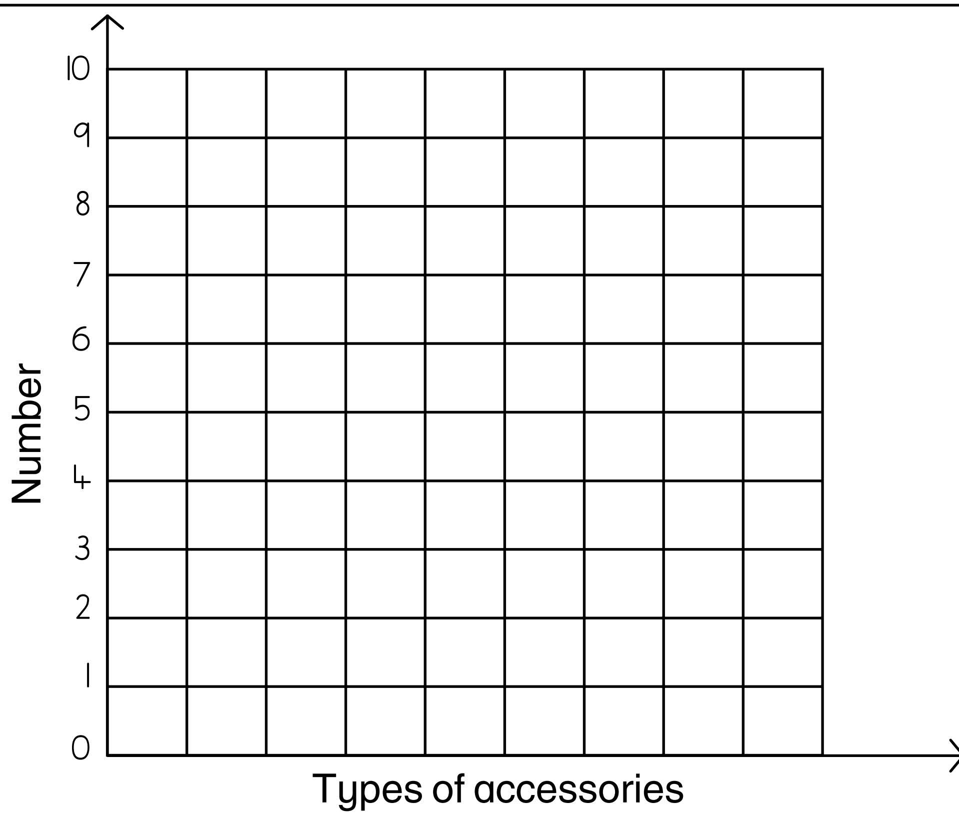
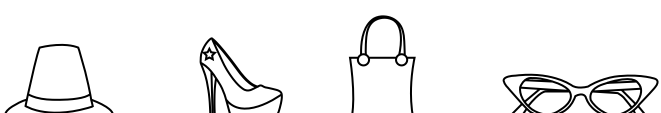
Worksheet 22

Count and create a bar graph.







Worksheet 23

Decimals addition

Write the answer to each problem.

1. $\begin{array}{r} 47.15 \\ +\ 19.36 \\ \hline \end{array}$ ______

2. $\begin{array}{r} 43.99 \\ +\ 12.76 \\ \hline \end{array}$ ______

3. $\begin{array}{r} 53.72 \\ +\ 77.92 \\ \hline \end{array}$ ______

4. $\begin{array}{r} 84.17 \\ +\ 68.21 \\ \hline \end{array}$ ______

5. $\begin{array}{r} 29.36 \\ +\ 66.84 \\ \hline \end{array}$ ______

6. $\begin{array}{r} 23.56 \\ +\ 79.14 \\ \hline \end{array}$ ______

7. $\begin{array}{r} 62.49 \\ +\ 18.75 \\ \hline \end{array}$ ______

8. $\begin{array}{r} 53.72 \\ +\ 77.92 \\ \hline \end{array}$ ______

9. $\begin{array}{r} 84.17 \\ +\ 68.21 \\ \hline \end{array}$ ______

10. $\begin{array}{r} 29.36 \\ +\ 66.84 \\ \hline \end{array}$ ______

11. $\begin{array}{r} 23.56 \\ +\ 79.14 \\ \hline \end{array}$ ______

12. $\begin{array}{r} 62.49 \\ +\ 18.75 \\ \hline \end{array}$ ______

13. $\begin{array}{r} 76.30 \\ +\ 22.97 \\ \hline \end{array}$ ______

14. $\begin{array}{r} 44.29 \\ +\ 11.04 \\ \hline \end{array}$ ______

15. $\begin{array}{r} 81.97 \\ +\ 69.14 \\ \hline \end{array}$ ______

16. $\begin{array}{r} 29.86 \\ +\ 76.33 \\ \hline \end{array}$ ______

17. $\begin{array}{r} 68.25 \\ +\ 41.36 \\ \hline \end{array}$ ______

18. 37.89 + 82.15 = ______

19. 32.44 + 21.88 = ______

20. 37.19 + 28.24 = ______

21. 68.67 + 29.82 = ______

22. 21.99 + 78.32 = ______

23. 52,45 + 34,58 = ______

24. 84.77 + 39.12 = ______

25. 63.84 + 29.81 = ______

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Worksheet 24

Adding decimals

Find the sum. Remember to regroup.

1. Rs 7.49 + Rs 1.36 = ______

2. 4.18 + 5.59 = ______

3. Rs 5.22 + Rs 3.49 = ______

4. 4.34 + 2.56 = ______

5. Rs 8.21 + Rs 4.49 = ______

6. 3.28 + 9.22 = ______

7. 2.77 m + 4.59 m = ______

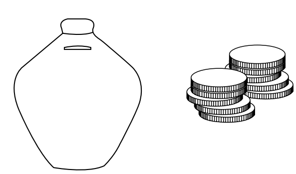
8. 6.58 km + 3.54 km = ______

9. 7.37 cm + 2.76 cm = ______

10. 8.09 m + 4.96 m = ______

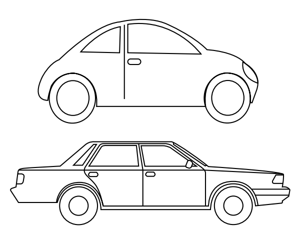
Solve each problem.

Seema has saved Rs 3.99. Her mother gives her Rs 1.62. How much does she have in total?



______

Mrs Ahmed's car is 4.53 m long. Mr Ahmed's car is 5.24 m long. How long must their driveway be in order to fit both cars end to end?



______

Worksheet 25

Solve.

$(5 + 17) \div 11$ Ans:	$5 \times (26 - 13)$ Ans:
$48 \div (14 - 12)$ Ans:	$(12 + 3) \times 2$ Ans:
$(11 \times 6) + 14$ Ans:	$78 - (27 \div 9)$ Ans:
$80 \div (6 + 4)$ Ans:	$(18 \times 3) - 21$ Ans:
$(37 + 6) \times 2$ Ans:	$12 - (56 \div 7)$ Ans:

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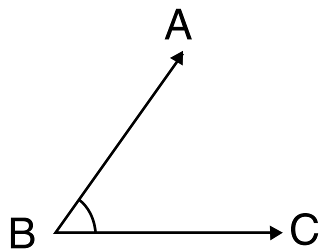
Worksheet 26

Use a protractor to measure the following angles.

1.



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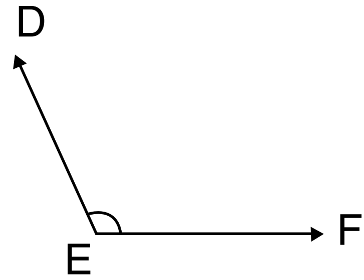
2.



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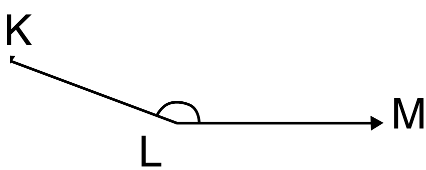
3.



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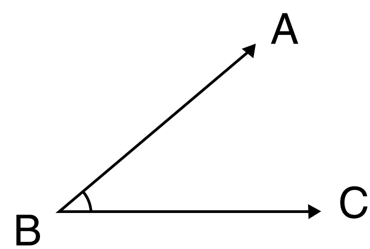
4.



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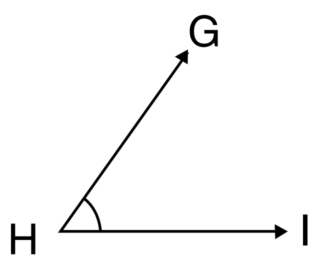
5.



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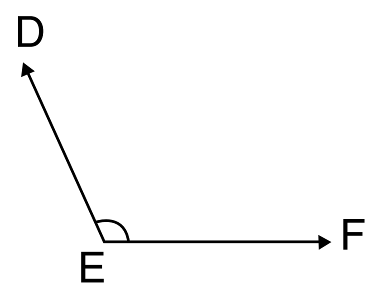
6.



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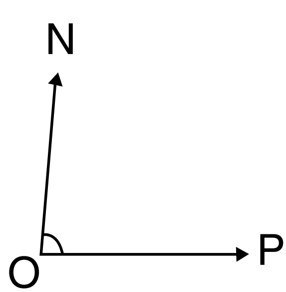
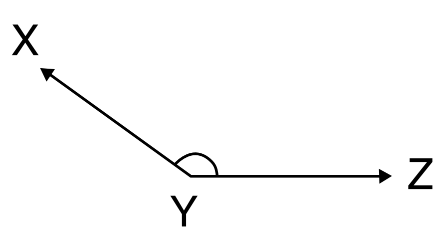
7.

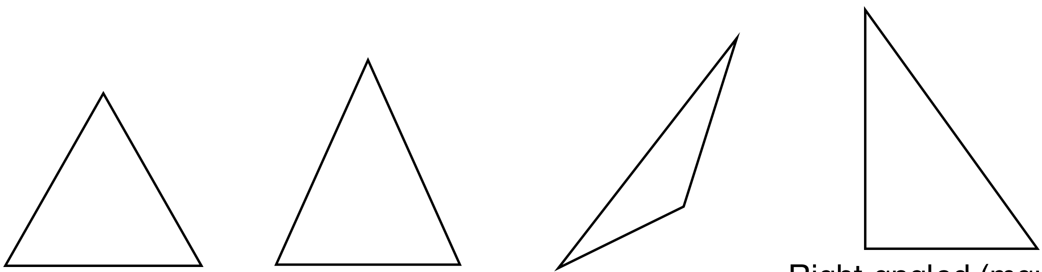


8.

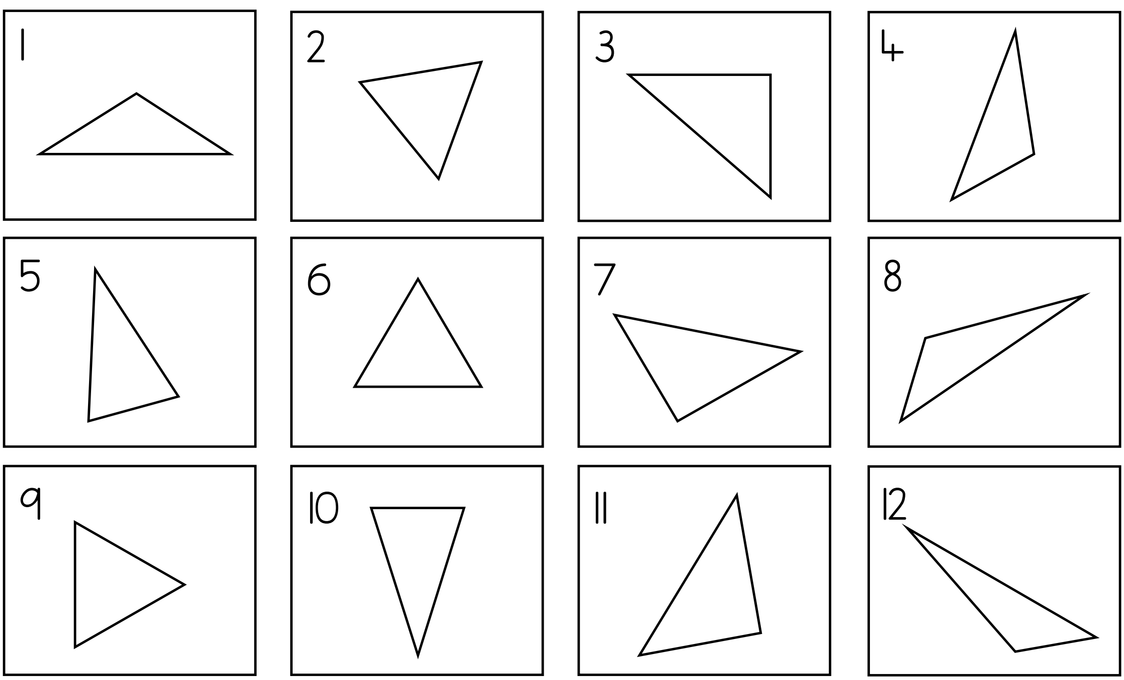


Worksheet 27

Look at these different triangles.



Equilateral (all sides equal; is also isosceles)	Isosceles (two sides equal)	Scalene (all side different)	Right-angled (may be isosceles or scalene, but one angle must be a right-angle)



List the triangles that are:

Equilateral ______________________________

Isosceles ______________________________

Scalene ______________________________

Right-angled ______________________________

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Answers to Book 5

Unit 1: Assess and Review 1

Exercise 1

1. 104,260,000	2. 123,069,000	3. 260,599	4. 103,944,000
5. 8 million			

Exercise 2

1. 404,040	2. 200,048,503	3. 6,337,027	4. 45,097,012

Exercise 3

1. 429,576 inches	2. 1,073,940	3. 10.91

Exercise 4

90,001

Exercise 5

0.001, 0.02, 0.112, 0.121

Exercise 6

1. 16:25	2. 00:10	3. 12:30	4. 21:18

Exercise 7

1. 1278	2. 12	3. 1419

Exercise 8

16,002 railway compartments

Exercise 9

8548 m

Exercise 10

468,505,600 sq.km

Exercise 11

1. 11:00 p.m.	2. 12:54 a.m.	3. 12:45 p.m.

Exercise 12

1324

Exercise 13

18

Exercise 14

535150

Exercise 15

Rs 423.20

Exercise 16

1. $<$ 2. $>$ 3. $=$ 4. $<$ 5. $>$ 6. $>$ 7. $<$

Exercise 17

10.22 carats

Exercise 18

Sohail by 0.75 m

Exercise 19

orange

Exercise 20

630 kernels

Exercise 21

Siddiq by $\frac{1}{10}$ km

Exercise 22

1. $3 \; \& \; \frac{8}{9}$ 2. $9 \; \& \; \frac{2}{11}$ 3. $10 \; \& \; \frac{3}{6}$ 4. $11 \; \& \; \frac{9}{8}$

Exercise 23

1. $\frac{14}{3}$ 2. $\frac{67}{10}$ 3. $\frac{100}{3}$ 4. $\frac{100}{9}$

Exercise 24

Anwaar plays more.

Exercise 25

Check the angles the students draw.

Exercise 26

1. 12 2. 81 3. 1 4. 12

Exercise 27

obtuse angle, acute angle, right angle, acute angle

Exercise 28

1. 168 2. 48 3. 360 4. 1092

Exercise 29

96

Exercise 30

42, 84

Exercise 31

30

Exercise 32

19, 50

Exercise 33

26 kg 700 g

Exercise 34

1. $\frac{3}{4}$ 2. $\frac{6}{7}$ 3. $\frac{15}{27}$ 4. $\frac{1}{4}$

Exercise 35

1 and 4 are groups of like fractions.

Exercise 36

Tazeen got the biggest share and Maham the smallest.

Exercise 37

1. 24 2. $\frac{5}{7}$ 3. 0 4. $\frac{3}{8}$ 5. $\frac{1}{12}$ 6. $\frac{5}{8}$

Exercise 38

13.95 kg

Exercise 39

1. 5700 minutes 2. 310 minutes 3. 4 minutes

Exercise 40

1. 5 hrs 59 mins 2. 7 hrs 30 mins 3. 8 hrs 59 mins

Exercise 41
40 mins 40 secs

Exercise 42
4320 flowers

Exercise 43
Check the lines the students draw.

Exercise 44
670, 532

Exercise 45
Check the lines the students draw.

Exercise 46
1. sqaure
2. parellogram
3. rectangle
4. trapezium

Exercise 47
1. circumference
2. diameter
3. centre
4. equal

Unit 2: Numbers and Arithmetic Operations

Exercise 1
1. Only the number: 4,085,000
2. 400,000,000 + 50,000,000 + 8,000,000 + 500,000 + 60,000 + 1000 + 90 + 7
3. Two hundred and sixty-one million, four hundred and fifty-six thousand and eight hundred and seven
4. 2 is in 10 millions place
5. 345,682,510

Exercise 2
1. 123,453,298
2. 3,892,046,710
3. 2, 004,097,012
4. 6,045,337,027
5. 25,040,015

Exercise 3
1. Five billion, seven hundred and sixty-two million, nine hundred and sixty-six thousand, eight hundred and fifty
2. Three hundred and fifty million, nine hundred and seventy-six thousand, two hundred and twenty-five
3. One billion, thirty-four million, eight hundred and seventy-three thousand, three hundred

4. Five billion, one hundred and twenty-three million, eight thousand, four hundred and fifty
5. Nine billion, eight million, forty thousand and five

Exercise 4

1. 1,256,788,004	2. 4,467,543,098	3. 106,763,005
4. 46,583,930,400	5. 302,639,264	

Exercise 5

1. >	2. <	3. >	4. >	5. >

Exercise 6

1. 48,014,300; 418,320,200; 481,630,450
2. 431,573,694; 542,516,019; 1,114,532,481
3. 3,229,208,751; 6,479,248,517; 9,456,240,715
4. 4,234,530,216; 4,256,053,612; 4,345,035,812

Exercise 7

1. 16,065,679	2. 13,093,421	3. 93,246,956
4. 647,219,011	5. 51,386,961	6. 796,423,716
7. 2,470,201,844	8. 149,470,717	9. 1,851,425,727

Exercise 8

1. 660,757,611	2. 71,936,787	3. 410,629,209
4. 486,155,852	5. 49,089,134	6. 14,719,708
7. 71,741,609	8. 51,469,060	9. 783,111,257

Exercise 9

1. 978,896,452	2. 89,439,794	3. 93,818,702
4. 11,126,401	5. 77,535,805	6. 40,000,001
7. 37,640	8. 8,645,336	

Exercise 10

1. Karachi	2. 16,791,379	3. 8,917,521	4. 18,201,147

Exercise 11

1. 140,584,815	2. 324,766,650	3. 529,664,135
4. 350,756,000	5. 236,071,504	

Exercise 12

1. 69,377 R78 2. 27,092 R 243 3. 6186 R 855 4. 973
5. 1572

Exercise 13

1. Rs 212,925,000 2. Rs 275,053,450 3. 1001 4. 604,800 secs
5. Rs 1,338,525,000 6. 1500 mins 7. 5669 min 8. 1,027,601

Exercise 14

1. 1119 2. 2530 3. 484 4. 0
5. 0 6. 226

Activity

3	4	12	9	3	3
7	5	6	2	8	16
21	20	2	18	24	17
7	4	10	40	8	48
22	48	26	2	16	10
15	12	36	3	8	24
6	45	5	9	2	14
9	15	3	12	4	6

Unit 3: HCF and LCM

Exercise 1

1. 2 2. remainder 3. 18 4. 7 5. 4
6. multiples 7. 0 8. 99 9. 2 10. 195

Exercise 2

2. 24 3. 30 4. 84

Exercise 3

2. 7 3. 11 4. 6

Exercise 4

2. 6 3. 7 4. 8.

Exercise 5

1. by 3 6543; 20,058; 67,800; 12,609; 456,984
2. by 4 29,612; 48,232; 67,800; 456,984
3. by 6 20,058; 67,800; 456,984

4. by 9 6543; 12,609; 456,984
5. by 11 1870; 15,686; 70,202; 29,612; 456,984

Exercise 6

1. 3 2. 8 3. 3 4. 9 5. 7 6. 35

Exercise 7

1. 900 2. 180 3. 96 4. 132 5. 84

Exercise 8

1. LCM: 36; HCF 3 product of 12 and 9: 108; product of LCM and HCF: 108
2. not possible
3. not possible
4. not possible

Exercise 9

1. 3 2. 60 3. 20

Exercise 10

1. 11:30 a.m.
2. 185
3. 36
4. 20 children, 4 books, 5 toys
5 a. 20 ml b. 9, 10 times
6. after 30 secs, 2nd time after 60 secs
7. 16
8. after 6 days

Activity

1. D	I	V	I	4. S	I	B	L	E
				I				V
2. F		3. P		X		6. O	N	E
O		R			7. T			N
U		I			E		8. Z	
9. R	E	M	A	I	N	D	E	R
		E					R	
			10. F	A	C	T	O	R
11. T	W	O						

Unit 4: Fractions

Exercise 1

proper $\frac{5}{15}, \frac{2}{5}, \frac{1}{3}, \frac{1}{9}$

improper $\frac{16}{7}, \frac{10}{10}$

mixed $7\frac{5}{12}, 3\frac{1}{2}, 7\frac{1}{3}, 9\frac{6}{9}$

unit $\frac{10}{10}$

Exercise 2

1. $7\frac{1}{2}$
2. $3\frac{2}{7}$
3. $12\frac{2}{9}$
4. $3\frac{3}{16}$

Exercise 3

1. $\frac{13}{3}$
2. $\frac{100}{9}$
3. $\frac{77}{9}$
4. $\frac{45}{2}$

Exercise 4

1. 20   2. 63   3. 104   4. 5

Exercise 5

1. $\frac{4}{5}$ 2. $\frac{11}{12}$ 3. $\frac{11}{2}$ 4. $\frac{2}{5}$

Exercise 6

1. $\frac{1}{2}, \frac{3}{2}, \frac{13}{2}$ 2. $\frac{1}{4}, 1\frac{1}{4}, \frac{23}{4}$

Exercise 7

1. $<$ 2. $>$ 3. $=$

Exercise 8

1. $\frac{7}{11}$ 2. $\frac{2}{28} = \frac{1}{14}$ 3. 0   4. 1

Exercise 9

2. $\frac{7}{9}$ 3. $\frac{3}{4}$ 4. $\frac{14}{31}$

Exercise 10

1. $\frac{3}{4}$ 2. $\frac{41}{24}$ 3. $1\frac{2}{9}$ 4. $1\frac{1}{4}$ 5. $\frac{3}{5}$

6. $5\frac{17}{35}$ 7. $10\frac{1}{12}$ 8. $2\frac{1}{6}$ 9. $5\frac{19}{24}$ 10. $3\frac{7}{34}$

11. $14\frac{29}{42}$ 12. $\frac{7}{20}$ 13. $1\frac{1}{60}$ 14. $2\frac{3}{20}$ 15. $\frac{7}{15}$

Exercise 11

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

3. Rs $51\frac{1}{2}$ 4. 8 cm   5. Arman, $\frac{5}{8}$ more

6. $6\frac{2}{3}$ m   7. $5\frac{1}{2}$ cm   8. $4\frac{1}{8}$ m

Activity

	$3\frac{3}{4}$				$13\frac{3}{4}$	
$2\frac{1}{4}$	$1\frac{1}{2}$			8	$5\frac{3}{4}$	
$1\frac{1}{4}$	1	$\frac{1}{2}$		$4\frac{3}{4}$	$3\frac{1}{4}$	$2\frac{1}{2}$

Exercise 12

1. $\frac{8}{15}$ 2. $\frac{3}{14}$ 3. $\frac{1}{6}$ 4. $3\frac{1}{4}$

5. $\frac{5}{6}$ 6. $\frac{3}{22}$ 7. $84\frac{3}{20}$ 8. $4\frac{2}{3}$

Exercise 13

1. 16 hours 2. 25 seconds 3. 3 days 4. 6

5. 80 paisa 6. 75 cm 7. 500 ml 8. 6 days

Exercise 14

1. 20 m 2. $\frac{1}{5}$ 3. $\frac{2}{21}$ 4. $\frac{5}{24}$ 5. 3 eggs

Exercise 15

1. $\frac{4}{5}$ 2. $\frac{8}{15}$ 3. $\frac{4}{15}$ 4. $2\frac{4}{7}$ 5. $\frac{25}{26}$

Exercise 16

1. $4\frac{1}{2}$ 2. $22\frac{1}{2}$ 3. 6 pieces 4. 25 pieces

Challenge

15 boards

Activity

THEY ALREADY HAVE BILLS.

Exercise 17

1. $1\frac{7}{20}$ 2. $\frac{5}{9}$ 3. 0 4. $1\frac{1}{4}$ 5. $\frac{1}{2}$ 6. 4

Unit 5: Decimal Fractions and Percentages

Exercise 1

1. $\frac{2}{10} = 0.2$ 2. $\frac{75}{100} = 0.75$

Exercise 2

1. 1.9   2. 0.45   3. 57.3   4. 10.9

Exercise 3

2. 0.55 m   3. 0.575 m   4. 0.05 m

Exercise 4

2. $\frac{3}{4}$ 3. $\frac{2}{25}$ 4. $3\frac{1}{2}$ 5. $10\frac{3}{4}$

Exercise 5

1. 2831.47   2. 303.2   3. 1004.308   4. 4.05

Exercise 6

1. $>$ 2. $>$ 3. $=$ 4. $<$

Exercise 7

1. 8.854   2. 461.18   3. 67.425   4. 111.968   5. 104.895

Exercise 8

1. 12.74   2. 19.09   3. 3.378   4. 54.001   5. 361.125

Exercise 9

1. 11.8   2. 6.02   3. 10.293

Exercise 10

1. 12.4   2. 17.269   3. 5.0784   4. 0   5. 1.125

Exercise 11

1. 100   2. 1000   3. 10   4. 100   5. 100

Exercise 12

1. 68.25 m   2. Rs 217.00

Exercise 13

1. 450 cm   2. 15,250 g   3. 510 cm   4. 1500 ml   5. 55 mm

Exercise 14

1. 3.467	2. 0.90678	3. 0.48623	4. 0.0034	5. 0.001009
6. 3.24	7. 12.5	8. 46.5	9. 110	10. 1

Exercise 15

2. 100	3. 1000	4. 100	5. 0

Exercise 16

2. 0.0175	3. 0.0175	4. 17.5	5. 0.175

Exercise 17

1. 4.5	2. 0.90	3. 34.52	4. 6.500
5. 9.500	6. 2.360	7. 20.50	

Exercise 18

1. 198.583	2. 3.3	3. 0	4. 0.46	5. 2.25

Exercise 19

1. a. 3.8	b. 60.0	c. 196.9	
2 a. 8.97	b. 37.90	c. 500.00	
3. b. 4.98	c. 116.67	d. 73.89	d. 49.02

Exercise 20

1. Rs 15.10	2. 18 m	3. 300.2 kg	4. 10.23 cm
5. 75.3 km	6. 45.3	7. Hafiz by 0.3 sec	8. Rs 75
9. 6 cups	10. 176.85 kg		

Challenge 1

$7 \div 0.7 \times 7 \div 0.7 = 100$

Challenge 2

9.95, 11.08, 12.21	(+1.13)
3.4, 2.9, 3.3	(+ 0.4, – 0.5)
0.47, 0.60, 0.57	(+ 0.13, – 0.03)
0.8, 8, 80	(× 10)

Exercise 21

2. 32%	3. 45%	4. 80%	5. 60%	6. 150%

Exercise 22

Per cent	Fraction	Decimal Fraction
35%	$\frac{35}{100}$	0.35
50%	$\frac{50}{100}$	0.50
45%	$\frac{45}{100}$	0.45
75%	$\frac{75}{100}$	0.75
5%	$\frac{5}{100}$	0.05
1%	$\frac{1}{100}$	0.01
129%	$\frac{129}{100}$	1.29
245%	$\frac{245}{100}$	2.45
525%	$\frac{525}{100}$	5.25

Exercise 23

1. $\frac{65}{100}$, 65%, 35%
2. $\frac{43}{100}$, 43%, 57%

Exercise 24

2. $\frac{1}{2}$ 3. $\frac{1}{20}$ 4. $\frac{1}{4}$ 5. 4 6. $\frac{3}{2}$

Exercise 25

2. 0.07 3. 0.02 4. 0.15 5. 0.90 6. 1.25

Exercise 26

2. 87% 3. 1% 4. 56% 5. 23% 6. 225%

Exercise 27

Only Exercise 27.4 is incorrect the correct answer is 0.015.

Exercise 28

1. 6% 2. 175% 3. 36% 4. 75%
5. 40% 6. 6% 7. 180% 8. 412.5%

Exercise 29

1. 60% 2. 170% 3. 50% 4. $\frac{4}{25}$

Exercise 30

1. 30% 2. maths 90% 3. $\frac{1}{2}, \frac{1}{5}, \frac{4}{5}, \frac{3}{25}$
4. a. 20% b. 80%
5. a. 60% b. 312 c. 208
6. a. 53% b. 47%

Activity

cricket (40%), football (20%), basketball (30%), badminton (10%)
1. cricket 2. badminton 3. 160

Unit 6: Measurement: Distance, Time, and Temperature

Exercise 1

3. 0.8932 4. 9300 5. 0.326 6. 6084
7. 8.11 8. 34500 9. 4.050 10. 9530
11. 47.8 12. 45,000

Exercise 2

2. 1265 3. 1 km 567 m 4. 3 cm 9 mm 5. 3020 6. 12

Exercise 3

1. 15 m 79 cm 2. 20 m 10 cm 3. 56 km 475 m
4. 5 cm 2 mm 5. 56 m 5 cm

Exercise 4

1. 528.92 km 2. 42.05 m 3. 4.25 km
4. 2.05 m 5. 1.015 km

Exercise 5

1. 141 km 34 m 2. 111 m 82 cm 3. 22 cm 2 mm
4. 10 km 910 m 5. 9 km 91 m 6. 5 m 77 cm

Exercise 6

1. 784.241 km 2. 1.875 km 3. 6400.1 km
4. 37,552 km 5. 2.5 km 6. 251.78 km

Exercise 7

1. 240 secs 2. 180 mins 3. 96 hrs 4. 250 mins
5. 460 secs

Exercise 8

1. 5 mins 52 secs 2. 7 hrs 30 mins 3. 10 days 20 hrs
4. 4 hrs 50 mins 5. 8 years 11 months

Exercise 9

1. 2 hrs 5 mins 2. 11 mins 22 secs
3. 5 weeks 1 day 4. 4 years 3 months

Exercise 10

1. 09.00 a.m. 2. 1 hour 3. 3 hours 15 minutes
4. 1 hour 45 mins 5. 0900 hrs, 1000 hrs, 1600 hrs

Exercise 11

7 hrs 50 min

Exercise 12

1 min 46 secs

Exercise 13

2. 69 hrs 2 mins 3. 41 hrs 20 mins 4. 59 mins 47 secs
5. 49 mins 12 secs 6. 81 mins 24 secs

Exercise 14

2. 3 hrs 34 mins 3. 10 hrs 34 mins 4. 5 mins 19 secs
5. 4 mins 16 secs 6. 23 mins 48 secs

Exercise 15

1. 49 days 2. 40 weeks 3. 432 weeks 4. 8 weeks
5. 96 months 6. 144 months 7. 1095 days 8. 5 months
9. 120 days 10. 12 weeks

Exercise 16

1. 7:45 a.m. 2. 22:05 hours 3. 8 hrs. 45 min
4. 4 hrs. 49 min 5. 4 hrs 35 min

Challenge

7 June
31/12/06, 11:52 p.m.

Exercise 17

1. 35°C 2. 39°C 3. 4°C 4. 45°C

Exercise 18

2.5°C

Exercise 19

70°C

Exercise 20

1. 12°C 2. 7°C 3. birds

Exercise 21

1. 50°C 2. 20°C 3. 2°C 4. 81.5°F
5. 59°F 6. 140°F

Exercise 22

1. mild 2. 0°C 3. 15 degrees

Exercise 23

1. 27°C 2. 23°C

Unit 7: Unitary Method; Ratio and Proportion

Exercise 1

1. 1950 kg 2. 200 km 3. 25 kg 4. 16 days
5. 500 men 6. 960 kg 7. 3 days 8. 150 pages
9. 16 days 10. 16 nights

Exercise 2

1. proportion 2. ratio 3. directly 4. decrease

Unit 8: Geometry

Exercise 1

arms; vertex; acute, 90°; obtuse, straight; right; 360°

Exercise 2

1. ∠DCB = 26°, acute 2. ∠EFG = 125° obtuse
3. ∠MNO = 55°, acute 4. ∠PQR 98°, obtuse

Exercise 3

Check the students' work.

Exercise 4

2. any corner of the classroom
3. any corner of your book
4. any corner of the teacher's desk

Exercise 5

300°, 340°, 250°, 310°

Exercise 6

Check the students' work.

Exercise 7

∠POR and ∠ROS ; ∠ROS and ∠SOQ
∠DOA and ∠AOC ; ∠AOC and ∠COB; ∠COB and ∠BOD; ∠BOD and ∠DOA

Exercise 8

1. complementary
2. supplementary
3. supplementary
4. complementary
5. complementary

Exercise 9

1. 57°
2. 124°
3. 102°
4. 68°
5. 174°
6. 177°
7. 14°
8. 25°
9. 72°
10. 12°

Exercise 10

3. 90°
4. 60° (30 × 2 = 60)

Exercise 11

equilateral, scalene, scalene
isosceles, scalene, equilateral

Exercise 12

right-angled triangle, right-angled triangle, acute-angled triangle
obtuse-angled triangle, obtuse-angled triangle, acute-angled triangle

Exercise 13

Triangle	Angle 1	Angle 2	Angle 3	Sum
ABC	90°	30°	60°	180°
PQR	90°	45°	45°	180°
XYZ	100°	50°	30°	180°

Exercise 14

The triangles PQR and DEC cannot be drawn as the sum of two of the sides in each triangle is less than the third side.

Exercise 15

Check the students' work; triangle XYZ cannot be drawn with the given measurements.

Exercise 16

Check the students' work.

Exercise 17

1. square	2. rhombus	3. parellelogram
4. rectangle	5. trapezium	

Exercise 18

Check the students' work.

Exercise 19

Check the students' work.

Activity

1. rhombus	2. parallelogram	3. trapezium
4. rhombus	5. kite	6. an irregular quadrilateral

Unit 9: Perimeter and Area

Exercise 1

2. m	3. km	4. cm

Exercise 2

1. 22 cm	2. 24 cm	3. 24 cm	4. 19 cm

Exercise 3

1. 16 m
2. a. 50 m b. Rs 3750
3. 1 km 4. 10 m 5. 16 m

Exercise 4

1. 8 cm^2	2. 16 cm^2	3. 12 cm^2

Exercise 5

1. a. 4 cm^2 b. 70 cm^2 c. 15 cm^2
2. L = 8 cm, B = 2 cm, P = 20 cm, A= 16 cm^2
3. 64 m^2

4. Length (cm)	Breadth (cm)	Perimeter (cm) 2 (l + b)	Area (cm^2) $l \times b$
14	10	48	140
20	15	70	300
12.5	8.5	42	106.25
15	6	42	90
25	20	90	500

Exercise 6

1. Rs 6000 2. Rs 192,000 3. Rs 1.8 million

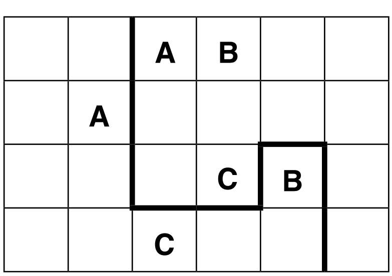
Exercise 7

1. P = 90 cm, A = 506.25 m^2
2. P = 112 m, A = 768 m^2
3. P = 150 cm, A = 1250 cm^2
4. a. B = 10 m b. A = 300 m^2 c. Rs 4500 d. P = 80 m
   e. Rs 2000
5. 210 m
6. Sonia runs 1200 m (150 + 150 + 150 + 150) × 2
   Nina runs 1080 m (100 + 80 + 100 + 80) × 3
   Sonia runs 120 m
7. 12 m
8. a. Hexagons and equilateral triangles as their area is the easiest to calculate.
   b. because they leave gaps in between (the shape does not tessellate)

Challenge

The first challenge shows two diagrams. Help the students calculate taking the hint.

The second challenge is solved as shown below:



Unit 10: Information Handling

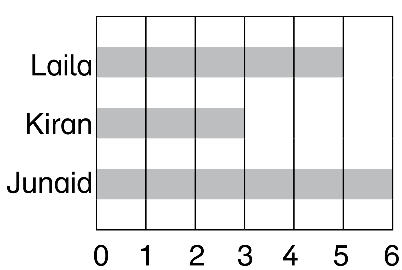
Exercise 1

2. 45 3. 55 4. 3 5. 758 m 6. 5

Exercise 2

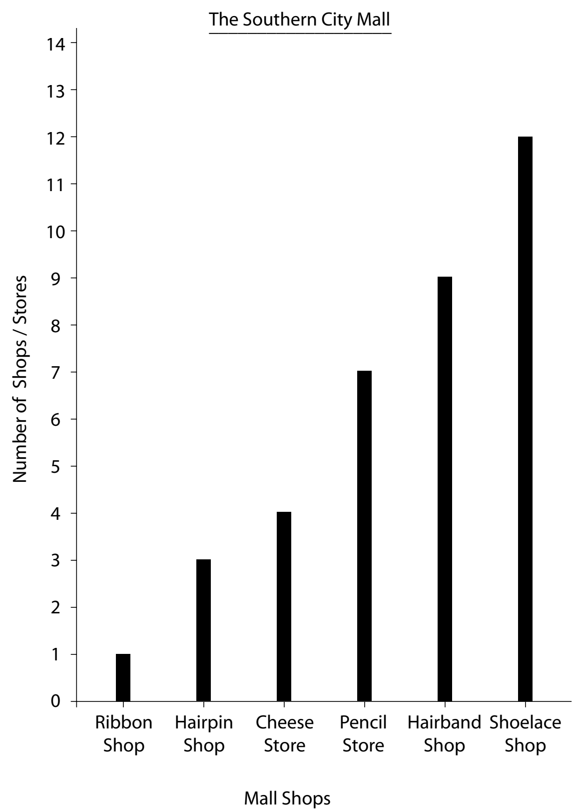
1. Rs 280
2. a. Younis: 113.6, Yousuf: 92.8, Imran: 74.8, Kamran: 83.6, Syed: 78.4, Iqbal: 69.6
   b. 69.6, 74.8, 78.4, 83.6, 92.8, 113.6
   c. three players
3. 66.8 grams
4. 40 km
5. 340 kg
6. b. 2 + 4 = 6÷2 = 3 (odd); 24 + 26 + 50 ÷ 2 = 25 (odd)
   a. 3 + 5 = 12 ÷2 = 6 (even); 15 = 17 = 32 ÷ 2 = 16 (even)
7. town A: 83°C, town B: 8.8°C—town A is colder.

Exercise 3



Exercise 4

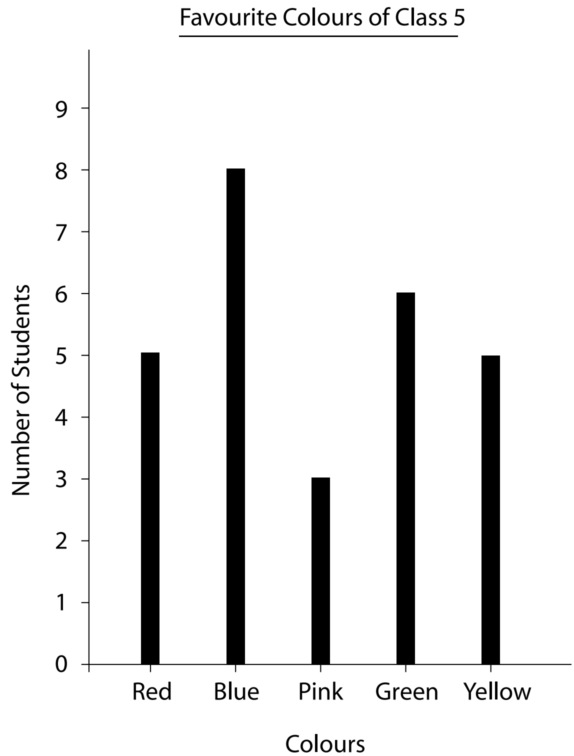
The graph will look like the one given below. It can be either a horizontal bar graph or a vertical bar graph as shown.



Exercise 5

1. four bars
2. labels
3. the bar for the blue whale since it has the maximum length
4. the bar for the humpback whale
5. Check the graphs the students draw.

Exercise 6



Exercise 7

1. The graph shows information about the sports played by students of Class 5.
2. There are 5 bars, since 5 sports are listed.
3. cricket
4. Hockey and volley ball
5. 50 students
6. 5:2

Exercise 8

The answers will vary.

Exercise 9

1. Rs 675 2. Rs 675

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Unit 11: Assess and Review 2

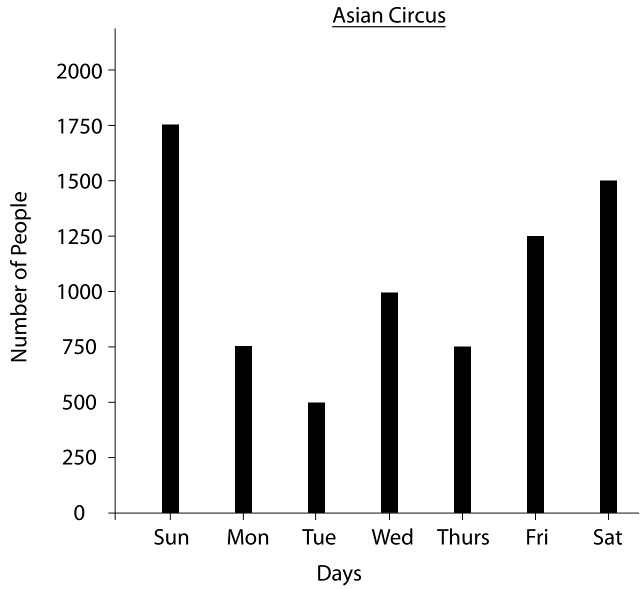
Exercise 1

i. 20,480,503 2. 162,337,027 3. 45, 097,012

Exercise 2

1.	7080 kg	2. 5	3. 8 m	4. 60
5.	100, 111, 102	6. 36	7. 5-2/5	8. 500 secs
9.	Check the angles drawn by the students.			
10.	10,050 m			
11.	a. Rs 5.07	b. Rs 14. 58	c. Rs 0. 54	d. 5.67 m
	e. 333.450 km	f. 56.560 kg	g. 2.5 l	h. 0.150 g
12.	4 children			
13.	1.45 m			
14.	Yes			
15.	a. 23 days	b. 72 days	c. 9 days	
16.	cabbage			
17.	Skardu			
18.	10.87 m			
19.	15 hours			
20.	1. 57°	2. 86°	3. 130°	4. 240°
	5. 320°	6. 160°		
21.	a. windows	b. 180°	c. door	
22.	678, 411, 693			
23.	a. 7	b. 9	c. 13	
24.	a. 96	b. 3420	c. 390	d. 360
25.	Rs 160,000			
26.	Rs 7200			
27.	857,750 bulbs, 17,155 cartons			
28.	a. 28%	b. 60%	c. 100%	
29.	a, d, f, and g, are complimentary			
	b, and h, are supplementary			
	c, e, i, and j, are neither			
30.	64 l			
31.	130°			
32.	a. 0.42	b. 0.77	c. 1.83	d. 0.88
33.	1. 12.6	2. 29.1	3. 2.5	4. 3.4
	5. 5.2	6. 89.4		
34.	a. 16.12	b. 100.43916	c. 36.694	d. 15.007
	e. 6.145	f. 4	g. 48	h. 31.65

35.



36. a. 30° b. 72° c. 180° d. 15°

37. a. right angle b. obtuse angle c. acute angle
d. reflex angle

38. 1. 23.99 2. 3.71 3. 4.45 4. 44.04
5. 999.47 6. 7.44

39.