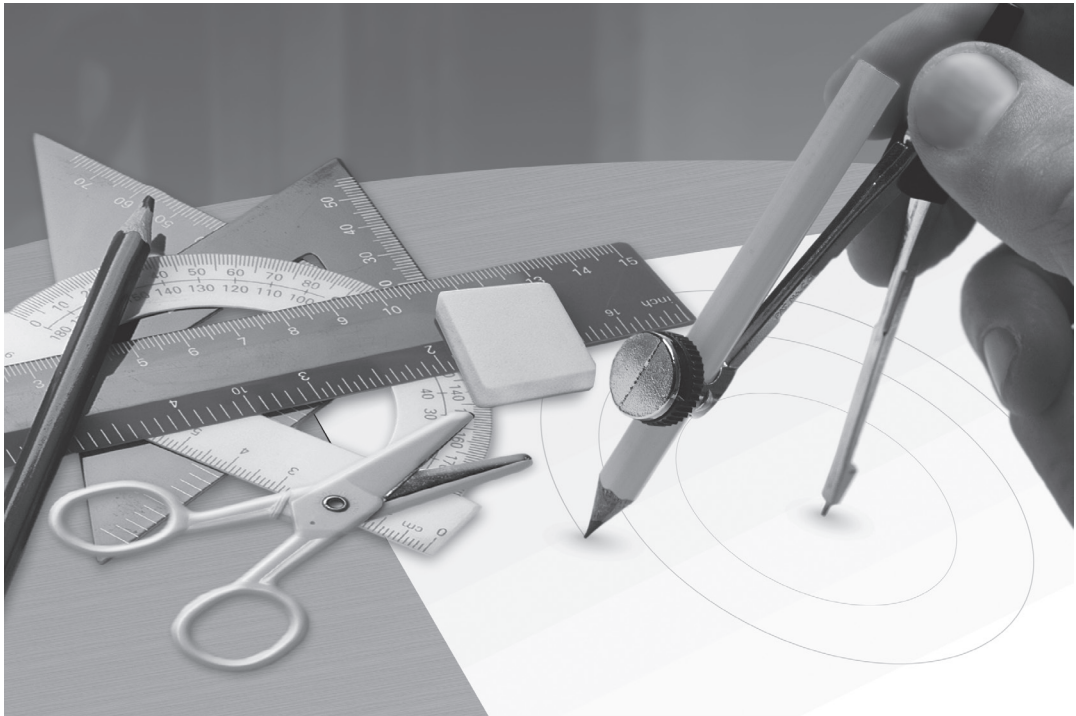


Teaching Guide
Second Edition with lesson plans

4

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, and 3 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. Teachers of *Maths Wise* Books 1, 2, and 3 may also find this useful.

B. Teaching Guide for Maths Wise 4

Maths Wise 4, 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 4* 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 4*, 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 3, 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 classes 4 and 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. $\frac{24}{3}$ and 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 4

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

REVIEW AND ASSESS 1

Teaching Objectives

- to revise concepts and skills learnt during the previous year

Learning outcomes

Students should be able to:

- work with the concepts learnt during the previous year
- work out sums based on the concepts taught without any help
- work out independantly sums based on these concepts

Teaching materials:

- additional worksheets

Learning activity:

Lesson 1:

40 minutes

As mentioned in the Teaching Guide for Maths Wise 3, at the beginning of the year it is important to revise and work with the concepts that were covered during the previous year. The students are more relaxed when revising old topics in an informal, fun way, than when they are using that extra energy to battle with new concepts. In that more relaxed atmosphere it is easier for them to bond better with each other, and with the teacher.

This period of revision will give you greater scope to plan future lessons and activities to 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 on these as a team, as well as individually. It is easy to make more work sheets and make copies to distribute amongst the children.

The sheets should be easy, but should be aimed at using lateral thinking rather than repetition of straight forward mathematical concepts. The students should have scope to demonstrate their thinking and analytical skills, and simultaneously recall the concepts learnt.

Revision of previously-learnt concepts can be done on a lighter note, through oral work or a small quiz. The students will enjoy the lesson and the purpose will be served too. While conducting a quiz, if you find any of the concepts to be a problem for many students in the class, you should plan to revise it with the class as a whole.

Some suggestion for the types of questions have been given in the worksheets which could be used in the quiz. You could improvise on these and build a question bank of your own. This bank of questions can also be easily used at any time during the year for any unplanned revision work.

Task: Students should attempt pages 2 to 6.

Additional resources:

At the end of the guide are additional worksheets 1 and 2. Use them for reinforcement.

UNIT 2

NUMBERS AND ARITHMETIC OPERATIONS

Teaching objectives

- to revise 6 digit numbers
- to introduce the Pakistan system of numbering
- to introduce place value up to 9-digit numbers
- to compare and order large numbers
- to explain addition of large numbers and the properties of addition
- to explain subtraction of large numbers and the properties of subtraction
- to explain multiplication of large numbers and the multiplication properties
- to explain division of large numbers and the properties of division

Learning outcomes

Students should be able to:

- Compare the international place value names and the Pakistani system
- identify 9-digit numbers
- add, subtract, multiply, and divide large numbers
- explain the properties of the binary operations listed above
- apply binary operations to real life situations

Teaching materials:

- place value charts of both international and Pakistan systems
- counters
- alphabet blocks

Learning activity

Lesson 1:

40 minutes

Step by step, 5-digit numbers were introduced in MW 3 based on the students' previous knowledge of smaller numbers. Comparison of place value was done pictorially.

It must be emphasized here that, if a student is working well with 4-digit numbers, going on to 5-or 6-digit numbers will be quite simple. The language used, the methodology and the techniques are the same. The same terminology should be used, as for the

lessons for the houses of hundreds and thousands: terms include groups of 10, carry over, borrowing, and others.

This is the first time the students will be introduced to the concept of the international system of writing numbers. It is a good idea to compare the same number in both writing styles. Take enough time to explain to the student that the same number may be written in 2 different styles. This does not change the value of the number. It is just 2 different ways of representing the same quantity.

Task: Students attempt pages 8 and 10.

Lesson 2:

40 minutes

Divide the students into 2 groups. One group writes a 6-digit number using the international number system on a slate, and holds it up for the other group to see. The second group reads it out aloud. This group writes the same number using Pakistani system and holds it up for the first group to read out.

Then the second group writes another 6-digit number using the international system and holds it up for the first group, who reads it out aloud, and writes it using the Pakistani system.

Task: Students attempt page 10.

Lesson 3:

40 minutes

The students worked with the four number operations, +, −, × and ÷, with 4- and 5-digit numbers in MW 3. Handling larger numbers will not be difficult. Explain terms such as 'sum', 'difference', 'product', and 'quotient' before starting on the problems. Revisit the associative, commutative, and distributive properties as you take them through the exercises. Remember, this topic requires a lot of practice.

Team games are always an excellent way to present problems involving the large numbers in expanded form, ascending and descending orders, identifying number sequences, and skip counting.

When you start this topic, it is a good idea to revise the place values of numbers up to a million. Where do we use millions?

...999,999 1,000,000, 1,000,001...

1



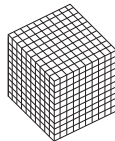
10



100

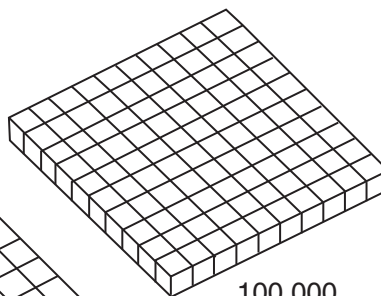
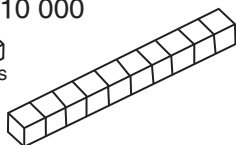


1000



10 000

each
represents
1000



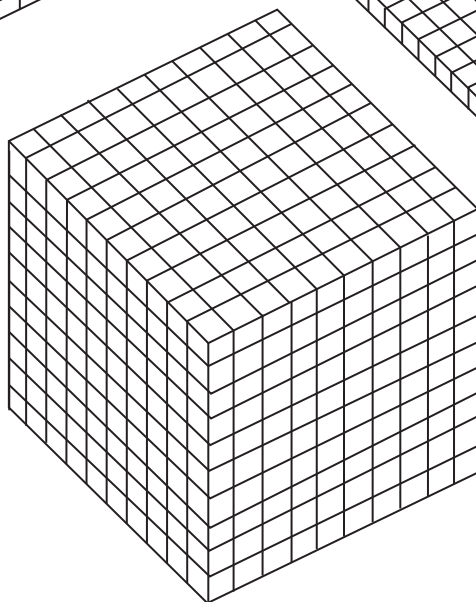
100 000

each
represents
1000



1 000 000

each
represents
1000



| M | H Th | T Th | Th | H | T | U |
|---|------|------|----|---|---|---|
| 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 | 1 |

Paper dots, lines, squares, cubes, a row of 10 cubes, and so on, can be formed or cut out from paper and hung by a rod on the wall, with Units, Tens, Hundreds, and Thousands ...written above them, as shown above.

If students are working well with 7-digit numbers, going up to 8- or 9-digit numbers will be simple. Keep the language used, the methodology, and the techniques the same. Use the same terminology: houses of tens, hundreds, thousands, carry over, grouping, borrowing, and so on and, there should be no problems with larger numbers. If some students wish to use their fingers to start with it is not a problem.

One half of the class could collect statistical data containing large numbers, such as populations of countries, heights of mountain peaks, sales figures of MNCs, depths below sea level at which various life forms exist, the distances between the different cities in the world. These figures are written on the board. The other group reads them out aloud using the Pakistani and the international systems. Alternatively each student can look up the statistics and take turns to write and read out the numbers.

Task: Students attempt pages 11–14.

Lesson 4:

40 minutes

Write on the board the letters of the alphabets and assign different values to each letter, according to its place in the alphabet.

| | | | | | |
|-------|---|--------|---|--------|---|
| A (1) | 1 | J (10) | 1 | S (19) | 1 |
| B (2) | 2 | K (11) | 2 | T (20) | 2 |
| C (3) | 3 | L (12) | 3 | U (21) | 3 |
| D (4) | 4 | M (13) | 4 | V (22) | 4 |
| E (5) | 5 | N (14) | 5 | W (23) | 5 |
| F (6) | 6 | O (15) | 6 | X (24) | 6 |
| G (7) | 7 | P (16) | 7 | Y (25) | 7 |
| H (8) | 8 | Q (17) | 8 | Z (26) | 8 |
| I (9) | 9 | R (18) | 9 | | |

Ask students to form words using the letters and find the value for each word.

For example: CAT= 312, or three hundred and twelve.

FLOWER = 6,36,559

Six lakhs, thirty six-thousand, five hundred and fifty-nine

OR

FLOWER = 636,559,

Six hundred and thirty-six thousand, five hundred and fifty-nine

The same code can be used for addition, subtraction, multiplication, and division.

For example:

1. Arrange the following words in ascending order according to the coded values:

DREAM, FUDGE, DROWN, FREEZE, APPLE

2. Work out the following:

- Add OCTOPUS and FATHER
- Take away BASKET from TWELVE
- Multiply PILLOW by BE
- Divide REFUSE by OF
- Add ZERO and NOUGHT

Make sure that addition, subtraction, multiplication, and division start with the units, and carries on to tens, hundreds and so on, as happens with all number operations.

Ask the students to find 2 words with the same number value such as, **GAG** and **SAD**.

SAD and **CAT** have the same value...find the reason for this.

Encourage the students to find 2 or 3 words with the same number value, using words with 3-letters, 4-letters or more.

Letters can be used with their original values, such as

A = 1, B = 2, K = 11, L = 12, M = 13, X = 24, Y = 25, Z = 26

SKY has the value of $19 + 11 + 25 = 55$

To form words with the same value, letters will need to be found from the lower end of the alphabet.

For a bit of fun:

Using only one of each letter in the alphabet (without looking at the value), what are the smallest and the largest numbers you can spell?

Answer:

ZERO or NOUGHT

FIVE THOUSAND

Task: Students attempt pages 15 to 22.

Additional resources:

At the end of the guide are additional worksheets 3 and 4. Use them for reinforcement.

UNIT 3

FACTORS AND MULTIPLES

Teaching objectives

- to introduce the use of divisibility tests with different numbers
- to explain prime and composite numbers
- to explain the concept of factors of numbers
- to explain the concept of multiples of numbers
- to explain prime factorization of numbers, using the listing method, tree method and short division
- to explain how to find the HCF by Venn diagram
- to explain how to find the LCM of 2 or more numbers by listing common multiples, prime factorization and short division

Learning outcomes

Students should be able to:

- use the rules of divisibility for different numbers
- differentiate between prime and composite numbers, using their properties
- identify the factors and multiples of a number
- calculate the factor and multiple of any given number
- apply the above concepts to real life situations

Teaching materials:

- board and charts
- Cuisenaire rods

Learning Activity

Lesson 1:

40 minutes

What is 'divisibility'?

Children's Cuisenaire rods illustrate divisibility very well:

| | | | | | |
|---------------|---------------|---------------|---------------|---------------|---------------|
| 1 | | | | | |
| $\frac{1}{2}$ | | | $\frac{1}{2}$ | | |
| $\frac{1}{3}$ | | $\frac{1}{3}$ | | $\frac{1}{3}$ | |
| $\frac{1}{6}$ | $\frac{1}{6}$ | $\frac{1}{6}$ | $\frac{1}{6}$ | $\frac{1}{6}$ | $\frac{1}{6}$ |

Working with these rods, the students can actually see that:

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

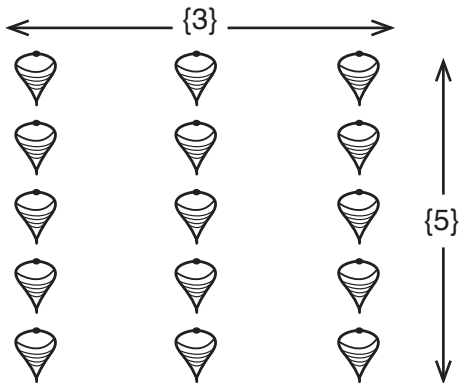
$$1 = \frac{3}{3}$$

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

$$6 \div 2 = 3, \text{ and } 6 \div 3 = 2$$

All numbers are divisible by 1

6 is divisible by 1, 2, and 3



15 tops

$$15 \div 3 = 5 \text{ and } 15 \div 5 = 3$$

This shows that 15 is divisible by 5 and 3

Work with other numbers such as 10, 12, and 15. The factors will be quite obvious, and the concept of divisibility will become clear.

Divisibility rules: Despite the use of calculators and mobile calculators, it is very important for the students to know their tables and work out multiplication, division, and factorization mentally as far as possible. Mental arithmetic adds to mental discipline and flexibility in reasoning.

Divisibility rules are important concepts that will be very useful in carrying out the LCM and factorization. What might seem minor steps in comparison to the speed of computers, are actually useful in the later stages of learning. Understanding of factorization and divisibility will add to the learning capability towards a higher level.

Therefore, it is advisable to spend sufficient time on every new concept, mentioned in this chapter (and later).

Go back to 2, 3, 4, 6, and 10 times tables.

| | | | | |
|--------------------|--------------------|--------------------|--------------------|----------------------|
| $2 \times 1 = 2$ | $3 \times 1 = 3$ | $4 \times 1 = 4$ | $6 \times 1 = 6$ | $10 \times 1 = 10$ |
| $2 \times 2 = 4$ | $3 \times 2 = 6$ | $4 \times 2 = 8$ | $6 \times 2 = 12$ | $10 \times 2 = 20$ |
| $2 \times 3 = 6$ | $3 \times 3 = 9$ | $4 \times 3 = 12$ | $6 \times 3 = 18$ | $10 \times 3 = 30$ |
| $2 \times 4 = 8$ | $3 \times 4 = 12$ | $4 \times 4 = 16$ | $6 \times 4 = 24$ | $10 \times 4 = 40$ |
| $2 \times 5 = 10$ | $3 \times 5 = 15$ | $4 \times 5 = 20$ | $6 \times 5 = 30$ | $10 \times 5 = 50$ |
| $2 \times 6 = 12$ | $3 \times 6 = 18$ | $4 \times 6 = 24$ | $6 \times 6 = 36$ | $10 \times 6 = 60$ |
| $2 \times 7 = 14$ | $3 \times 7 = 21$ | $4 \times 7 = 28$ | $6 \times 7 = 42$ | $10 \times 7 = 70$ |
| $2 \times 8 = 16$ | $3 \times 8 = 24$ | $4 \times 8 = 32$ | $6 \times 8 = 48$ | $10 \times 8 = 80$ |
| $2 \times 9 = 18$ | $3 \times 9 = 27$ | $4 \times 9 = 36$ | $6 \times 9 = 54$ | $10 \times 9 = 90$ |
| $2 \times 10 = 20$ | $3 \times 10 = 30$ | $4 \times 10 = 40$ | $6 \times 10 = 60$ | $10 \times 10 = 100$ |

In which tables do you see 6, 12, and 18? Ans: 2, 3, and 6

This means the common multiples of 2, 3, and 6 are 6, 12, and 18.

The lowest common multiple of 2, 3, and 6 is 6.

In which tables do you see 12, 24, and 36? Ans: 2, 3, 4, and 6
The lowest common multiple of 2, 3, 4 and 6 is 12.

Factors of 12 are 2, 3, 4, and 6

Factors of 8 are 2 and 4

Common factors of 12 and 8 are 2 and 4

The highest common factor of 12 and 8 is 4

Factors of 24 are 2, 3, 4, 6, 8, 12 and 24

Factors of 18 are 2, 3, 6, and 9

Common factors of 24 and 18 are 2, 3, 6

Highest Common Factor of 24 and 18 is 6

Ask the students to note the similarities between the multiples in the tables. Then explain the rules of divisibility, one rule at a time. Consolidate the concept through a great deal of board work and oral activity.

Task: Students attempt page 25.

Lesson 2:

40 minutes

In the series of natural numbers, an even number always alternates with an odd number (and an odd number alternates with an even number). For example:

...6, 7, 8, 9...311, 312, 314, 315...1256, 1257, 1258, 1259, 1260...

- Every number ending with 0, 2, 4, 6, or 8 is an even number. For example, 24, 26, 220, 222, 566, 568, and so on.

Therefore, numbers such as 18, 112, 3752, 7930...are all even.

The reason? 10, 100, 1000...are all divisible by 2.

- Every number ending with 1, 3, 5, 7, or 9 is an odd number.
For example: 25, 221, 567 and so on.
- There are rules for divisibility of several other numbers such as 3, 4, 5, 6, 7, 9, 10, 11, and 13

Write tables of 3, 4, 5, 7, 9, and 11 in bold numbers on a chart, ready for reference.

On a 1 to 100 chart, ask student volunteers to mark multiples of 3, 4, 5, 7, and 11 in different colours.

Explain each rule of divisibility.

ZERO IS AN EVEN NUMBER

Reasons: 0 is a multiple of 2.

$$2 \times 0 = 0$$

$$2 \times 1 = 2$$

$$2 \times 2 = 4$$

- An even number + an even number = an even number:
Examples: $4 + 12 = 16$; $8 + 10 = 18$
This applies to 0 too.
 $4 + 0 = 4$ (an even number)
 $62 + 0 = 64$ (an even number)
- An even number – an even number = an even number.
Examples: $14 - 2 = 12$, $22 - 2 = 20$
This applies to 0 too.
 $16 - 0 = 16$ (an even number)
 $8 - 0 = 8$ (an even number)
- An even number + an odd number = an odd number
Examples: $2 + 3 = 5$; $14 + 25 = 39$

This does not apply to 0:

$$8 + 0 = 8 \text{ (an even number)}$$

$$482 + 0 = 482 \text{ (an even number)}$$

SO, 0 IS AN EVEN NUMBER.

MULTIPLES OF 3:

The sum of all digits in the number must be divisible by 3.

Examples: A few multiples of 3 are 81, 72, 123, 3234

$$81 \text{ (} 8 + 1 = 9 \text{)}$$

$$72 \text{ (} 7 + 2 = 9 \text{)}$$

$$123 \text{ (} 1 + 2 + 3 = 6 \text{)}$$

$$3234 \text{ (} 3 + 2 + 3 + 4 = 12 \text{)}$$

MULTIPLES OF 4:

The number formed by U and T, must be a multiple of 4.

Examples: 912, 304, 5716

12 is divisible by 4

04 is divisible by 4

16 is divisible by 4

Reason: 100 is divisible by 4.

MULTIPLES OF 5:

The unit digit must be either 0 or 5.

The reason:

All 10's are divisible by 5, and the unit digit being 5 makes the whole number a multiple of 5.

MULTIPLES OF 6:

The number must be even and divisible by 3.

MULTIPLE OF 7:

Double the units digit, subtract it from the rest of the number: the difference must be a multiple of 7.

Examples:

175: Double 5, gives 10. Subtract 10 from 17; gives 7.

3682: Double 2, gives 4. Subtract 4 from 368; gives 364.

Double 4, gives 8. Subtract from 36; gives 28 (multiple of 7)

MULTIPLES OF 9

As in the case of multiples of 3, the sum of the digits must be a multiple of 9.

MULTIPLE OF 10:

The unit digit is always 0.

MULTIPLES OF 11:

The sums of alternate digits must HAVE A DIFFERENCE OF 0, 11, 22, 33 and so on.

Examples:

i) 3 9 8 7 6 5 4

$$(9 + 7 + 5) - (3 + 8 + 6 + 4) = 21 - 21 = 0$$

So, 3 9 8 7 6 5 4 is divisible by 11

$$3\ 9\ 8\ 7\ 6\ 5\ 4 \div 11 = 3\ 6\ 2\ 5\ 1\ 4$$

ii) 7 2 3 1 4 $\div 11 = 6574$

$$(7 + 3 + 4) - (2 + 1) = 14 - 3 = 11$$

So, 7 2 3 1 4 is divisible by 11.

$$7\ 2\ 3\ 1\ 4 \div 11 = 6\ 5\ 7\ 4$$

The following game will be fun:

Form two groups of students. Let them have a fake Snowball fight – Instruct students to write numbers on post-it notes according to the following directions:

- On TWO post-it notes, write a 2-digit number greater than 50.
- On TWO post-it notes, write a 3-digit number.
- On ONE post-it note, write a 4-digit number.

The students crumple up the post-it notes and have a fake snowball fight, by throwing each post-it note only once.

Ask the students to pick up 5 post-it notes and go back to their seats. Students open the 5 notes and test the divisibility of each number (using rules for 2, 3, 4, 5, 6, 7, 9, and 10).

On a sheet of paper, students test each number to see if it's divisible by 2, 3, 4, 5, 6, 7, 9, and 10.

Then they share their findings with the rest of the class.

Task: Students attempt page 26.

Lesson 3:

40 minutes

Prime and composite numbers:

Work with several charts showing numbers from 1 to 100.

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

Ask two students at a time to go mark multiples of different numbers with different coloured pencils.

Multiples of 2: 2, 4, 6, 8, 10, 12,...100 (red)

Multiples of 3: 3, 6, 9, 12, 15, 18,...99 (blue)

Multiples of 5: 5, 10, 15, 20,... 95,...100 (green)

Multiples of 7: 7, 14, 21,...98 (yellow)

Multiples of 11: 11, 22, 33,...99 (black)

Eventually, the numbers left without any markings are the prime numbers. 2, 3, 5, 7, 11, 13, 17, 19...are prime numbers. There will be 25 prime numbers left uncoloured on the chart.

These the prime numbers:

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

Explain the meaning of prime and composite numbers. A natural number greater than 1 that is not a prime number is called a composite number.

2 is a multiple of 2 (2×1), but is a prime number.

3 is a multiple of 3 (3×1), but is a prime number.

5 is a multiple of 5 (5×1), but is a prime number.

Listed below are the first 100 composite numbers:

4, 6, 8, 9, 10, 12, 14, 15, 16, 18, 20, 21, 22, 24, 25, 26, 27, 28, 30, 32, 33, 34, 35, 36, 38, 39, 40, 42, 44, 45, 46, 48, 49, 50, 51, 52, 54, 55, 56, 57, 58, 60, 62, 63, 64, 65, 66, 68, 69, 70, 72, 74, 75, 76, 77, 78, 80, 81, 82, 84, 85, 86, 87, 88, 90, 91, 92, 93, 94, 95, 96, 98, 99, 100, 102, 104, 105, 106, 108, 110, 111, 112, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 128, 129, 130, 132, 133

The chart showing prime numbers is called the Sieve of Eratosthenes. Eratosthenes was a Greek scholar...a mathematician, an astronomer, a geographer, a poet and a musician ...who created the concept of the Sieve.

It is important to remember what a prime number is. It is a number which is divisible by no other numbers except 1 and itself. A prime number has 2 factors, 1 and the number itself. *1 is not considered to be a prime number.*

The students work with numbers from 1 to 20, dividing each number by the prime numbers given above.



$$14 = 7 \times 2$$

14 is not a prime number



$$3 \times 4 + 1 = 13$$

13 is a prime number



$$2 \times 6 + 1 = 13$$

They discuss among themselves and, with your help, find answers to the following questions:

- How many natural numbers are there?
- Which is an even prime number? Why is it the only even prime number?
- What are composite numbers?

List the differences between prime and composite numbers. (Remember, apart from the number 2, no other prime number has 0 or an even number as the units digit.)

No prime number greater than 5 ends in 5. Why?

Which is the smallest prime number? Can you find the greatest prime number?

How many prime numbers are there?

Task: Students attempt page 27.

Lesson 4:

40 minutes

Factors and multiples:

Look at number 6:

$$6 = 2 \times 3$$

2 and 3 are factors of 6

6, the product of 2 and 3, is a multiple of 2 and 3.

$$6 \div 1 = 6$$

$$6 \div 2 = 3$$

$$6 \div 3 = 2$$

$$6 \div 6 = 1$$

Factors of 6 are 1, 2, 3 and 6.

Look at the number 48:

$$48 \div 1 = 48$$

$$48 \div 2 = 24$$

$$48 \div 3 = 16$$

$$48 \div 4 = 12$$

$$48 \div 6 = 8$$

$$48 \div 8 = 6$$

$$48 \div 12 = 4$$

$$48 \div 16 = 3$$

$$48 \div 24 = 2$$

$$48 \div 48 = 1$$

Factors of 48 are: 1, 2, 3, 4, 6, 8, 12, 16, 24, and 48.

Factors of any number are numbers which will divide into that number without leaving a remainder.

Every number has at least two factors, 1 and the number itself. Look at these numbers:

$$2 = 1 \times 2$$

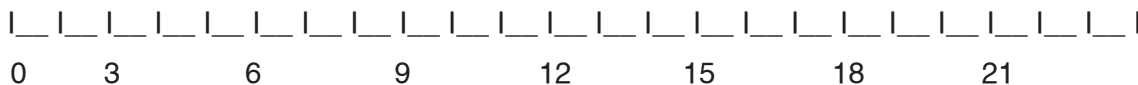
$$3 = 1 \times 3$$

$$5 = 1 \times 5$$

Such numbers with only two factors: such 2, 3, 5,...are called prime numbers. This is a concept that has been taught earlier.

On the other hand, multiples are numbers where the same number is repeated, as if you were counting by that number. For example, the multiples of 2 start with 2 and are: 2, 4, 6, 8, 10...and so on. Each additional number is a multiple of 2. Multiples of 3 are: 3, 6, 9, 12, 15 and so on.

This can be illustrated on a number line:



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

Task: Students attempt pages 29 and 30.

Lesson 5:

40 minutes

Ask the students to play the following game for better understanding of the concepts. You already have a grid of numbers from 1 to 100. Work with the number 24.

The first player chooses a positive number which is either a factor or a multiple of 24, and crosses the number out on the number grid.

The second player also chooses a different number, which is a factor or a multiple of 24 and crosses that out.

Players continue to take it in turns to cross out a number (either a factor or a multiple) at each stage. The first student unable to cross out a number on the grid loses.

This guessing game may also be of interest:

‘I think of a number. Its factor is 2.’

‘Write down the possible answers: 2, 4, 6, 8, 10, ..., 312, ..., 596...’

‘What are these number called?’

‘Can you guess the number conclusively? Why not?’

‘Is there a largest possible answer? Why not?’

Then, give them another clue:

‘It is a factor of 24.’

Ask them for the possible answers: 4, 6, 8, 12. Can they come to a conclusion?

Then, give them a third hint: ‘It is between 10 and 15.’

The answer is 12. The students work out the answer themselves.

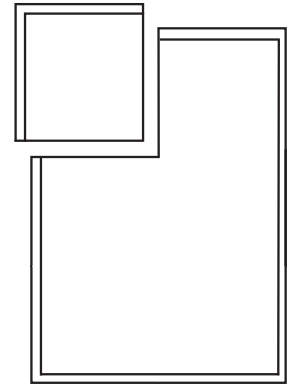
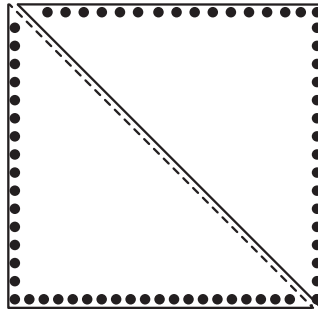
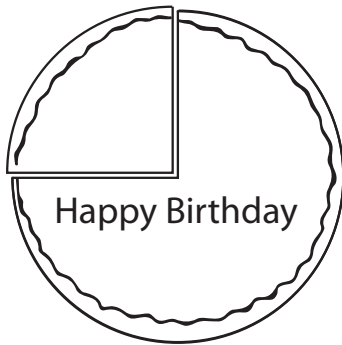
Lesson 6:

40 minutes

Prime Factorization, LCM and HCF

It is important for students to work with LCM of two or more numbers, so that fractions can be added or subtracted, and compared as ‘greater than’ or ‘less than’.

For example, there are 3 cakes of the same weight, but different shapes. One is circular, one is rectangular, and the third is a square.



Alim takes $\frac{1}{4}$ of the circular cake

Shahana takes $\frac{1}{2}$ of the square cake

Ameeri takes $\frac{1}{6}$ of the rectangular cake

Who gets the biggest piece and who gets the smallest piece? It is impossible to tell by looking at the pieces.

REMEMBER: ALL THE CAKES WEIGH THE SAME

If $\frac{1}{4}$, $\frac{1}{2}$, and $\frac{1}{6}$ can be changed into fractions with the same denominator, by using LCM of the three denominators, it is possible to compare the portions of the cakes.

$$\frac{1}{4} = \frac{1}{4} \times \frac{3}{3} = \frac{3}{12}$$

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

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

'Now, which is the biggest piece and which is the smallest?'

Shahana gets $\frac{6}{12}$ or $\frac{1}{2}$, which is the biggest piece.

Alim gets $\frac{1}{4}$ or $\frac{3}{12}$, which is the second biggest.

Ameeri gets $\frac{1}{6}$ or $\frac{2}{12}$, which is the smallest piece.

More such examples can be worked out: taking a drink out of a bottle OR savings in a box.

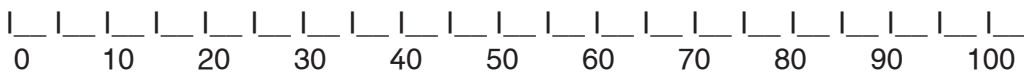
It is easy to add or subtract fractions with different denominators once the students know how to compare fractions with the same denominator.

It becomes easy to find out when two events happening at different time intervals will coincide. This can be related to aircraft leaving Karachi airport, OR different buses leaving a bus stand.

For example, a Pakistan Airlines aircraft leaves the airport every 30 minutes, and a British Airways plane leaves every 45 minutes. If the aeroplanes leave together at 6 am, when will two next leave together?

It would be worthwhile to use real-life story problems to find the LCM; this helps students answer the question ‘What use is LCM?’

Fatima and Rahman run around a garden. Fatima takes 10 minutes to go around and Rahman takes 12 minutes. They start together at 5 p.m., and run round the garden several times. At what time will they come to the starting point together again? This can be shown on a number line as well.



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

Step 1: Students need to define, in their own words, each word in this mathematical term. ‘What does Lowest mean?’ Students may define it as smallest in terms such as quantity, and little. Record the students’ ideas on the board. ‘What does common mean?’ ‘What does multiple mean?’ Students will come up with different meanings. Record their ideas on board. The answers appear as a result of skip counting. Ask students to provide examples.

Multiples of 3 are: 3, 6, 9, 12, 15...

Multiples of 2 are: 2, 4, 6, 8, 10, 12

Again, indicate multiples of numbers on number lines or on the 1 to 100 number square. (Multiples of 2 and 3...OR 4 and 5...in different colours...6, 12, 18 have both colours.)

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

Step 2: Give the students a real-life example, and ask them to solve it. Jassal has a soccer game every 4th day and karate classes every 6th day. When will he have both classes on the same day? Ask students to share their thinking. If students do not have an organized way of expressing their thinking, 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 number chart to find the LCM.

Step 3: Give students real-life problems to solve, as in the earlier pages. Be certain to get students to share their thoughts.

Find the highest common factor (HCF) of 48 and 54. Mark out the factors of numbers of 48 and 54 in different colours.

$$48 = 1 \times 48 = 2 \times 24 = 3 \times 16 = 4 \times 12 = 6 \times 8$$

The divisors of 48 are 1, 2, 3, 4, 6, 8, 12, 16, 48

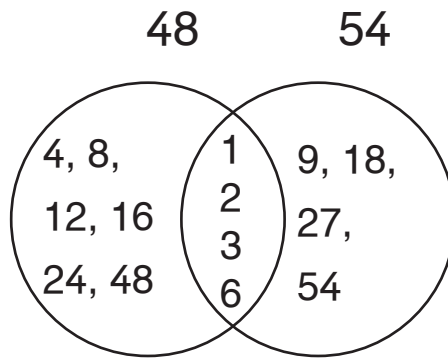
$$54 = 1 \times 54 = 2 \times 27 = 3 \times 18 = 6 \times 9$$

The divisors of 54 are 1, 2, 3, 6, 9, 18, 27, 54

The common factors (or divisors) of 48 and 54 are: 1, 2, 3, 6

The biggest number that divides into 48 and 54 (without leaving a remainder) OR the highest common factor (HCF) of 48 and 54 is 6.

Here is a Venn diagram showing factors of 48 and 54:



Lowest Common Multiple is: $(2 \times 2 \times 2) \times (2 \times 3) \times (3 \times 3)$

Highest Common Factor 48 and 54 is $2 \times 3 = 6$

Task: Students attempt pages 33–40.

Additional resources:

At the end of the guide are additional worksheets 5 and 6. Use them for reinforcement.

UNIT 4

FRACTIONS

Teaching objectives

- to introduce proper, improper, and mixed fraction
- to introduce equivalent fractions
- to compare fractions
- to introduce addition, subtraction, multiplication, and division of fractions

Learning outcomes

Students should be able to:

- identify correctly the different types of fractions
- generate a series of equivalent fractions
- compare and arrange fractions in order
- perform number operations using fractions

Teaching materials:

- rangometry pieces
- sand and some containers
- board and markers or chalk

Learning activity

Lesson 1:

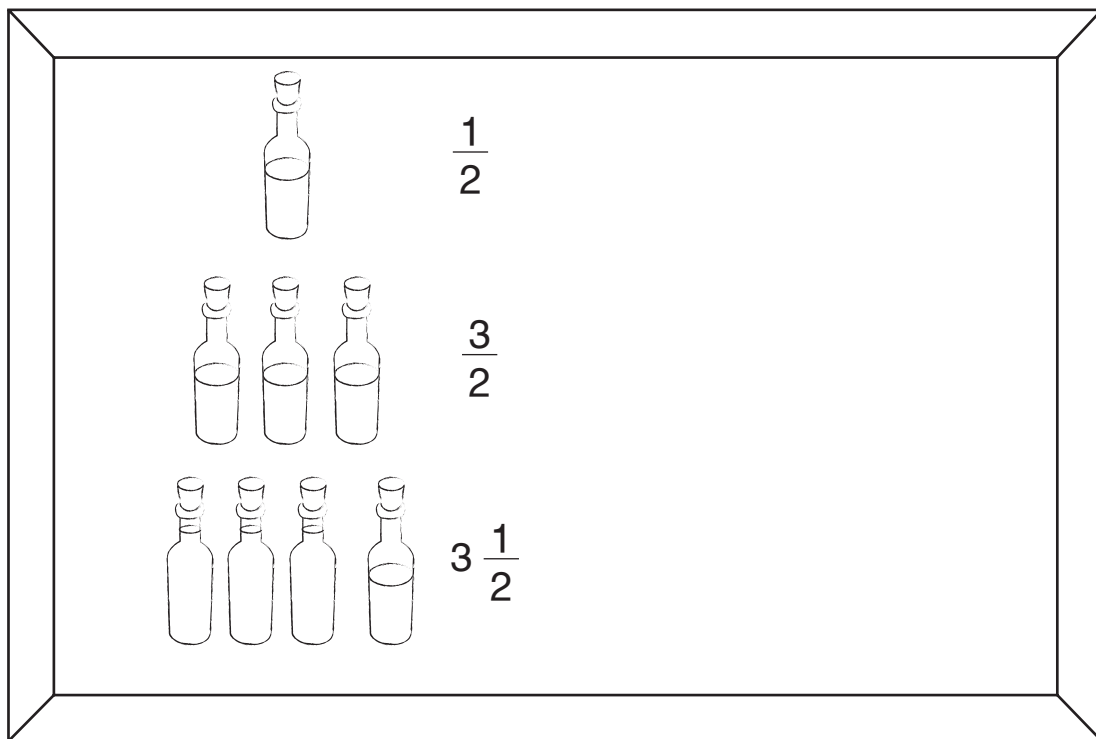
40 minutes

The students worked with fractions in the previous year. Begin the lesson by revising the concepts of fractions learned earlier. A fraction chart may be helpful, too. In this book the concepts are expanded and the students are introduced to a wider variety of fractions. It is important at this stage that the students understand the concepts clearly. Involve a lot of hands-on-activity to facilitate understanding, and help them develop the required skills.

Improper fractions: Shehla made strawberry jam and poured it into a jar. The jar was full, and there was some jam left. She poured the remaining jam into a similar jar. The second jar was half full. How many jars of jam did Shehla have? One-and-a-half.

Referring to the previous year's work, talk about the idea of one whole, parts of a whole, and more than a whole. Give them some sand and a couple of containers of the same shape and size.

Illustrate each activity on the board:



One group of students fills half a bottle with sand: $\frac{1}{2}$

$\frac{1}{2}$... This is a proper fraction; the numerator is smaller than the denominator

(draw on the board: three bottles, each $\frac{1}{2}$ full of sand: write $\frac{3}{2}$)

Another group fills up 3 halves of bottles with sand: $\frac{3}{2}$

$\frac{3}{2}$ is an improper fraction; the numerator is bigger than the denominator.

(Draw on the board 3 full bottles and one half full: write $3\frac{1}{2}$)

The 3rd group of students fills 3 whole bottles and one half a bottle

$3\frac{1}{2}$... This is a mixed number.

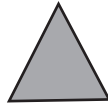
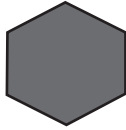
After a few more practical examples, the students write down proper and improper fractions and mixed numbers.

Task: Students attempt pages 42–45.

Lesson 2:

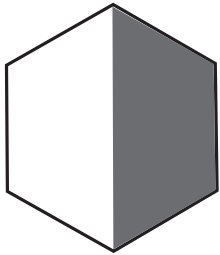
40 minutes

Rangometry blocks are excellent tools for explaining fractions.



Start with the hexagon. 2 congruent trapeziums will make up the hexagon. So, each trapezium represents $\frac{1}{2}$ of the hexagon. Here, the hexagon is the whole and the trapezium is a fraction of it.

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



Now 6 triangles make up the hexagon. So the triangle is $\frac{1}{6}$ of the hexagon. Here the trapezium is half, and the triangles are expressed as parts of the hexagon.

Again, 3 triangles make up a trapezium. Here the trapezium is the whole and the triangles are parts of the whole trapezium. At this point, reiterate the fact that the whole may be written differently, according to the number of parts that the whole has been divided into.



So, a triangle is $\frac{1}{3}$ of the trapezium, which is again half of the hexagon. There are 6 triangles in the whole hexagon; each triangle is $\frac{1}{6}$ of the hexagon.

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

Divide the students into groups; give each group a few rangometry tiles. Ask them to represent different fractions in as many ways as possible. Discuss the concepts of equivalent fractions with this break of a hexagon.

A trapezium in a hexagon is $\frac{1}{2}$ or $\frac{3}{6}$ of the hexagon.

Add another triangle to the trapezium.

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

Task: Students attempt pages 45–51.

Lesson 3:

40 minutes

Why is it necessary to convert fractions to the same base before addition or subtraction? The exercise in the previous lesson explains the method of adding fractions. Repeat the exercises several times till the concepts are understood.

Further practical examples with tiles of different shapes such as squares, rectangles, and octagons need to be worked out.

Some students encounter a problem in multiplication and division of fractions. A great deal of confusion can be overcome by paying close attention to the language in which the concepts are introduced. When the students start multiplication it is essential that they understand what exactly is happening.

What is half of a hexagon (or a square)?

What is $\frac{1}{3}$ of $\frac{1}{2}$ of a hexagon?



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

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

‘ \times ’ translates into the same operation as ‘of’.

Rules are to be looked at after each student has understood the concept clearly. Here,

Task: Students attempt pages 52–58.

Lesson 4:

40 minutes

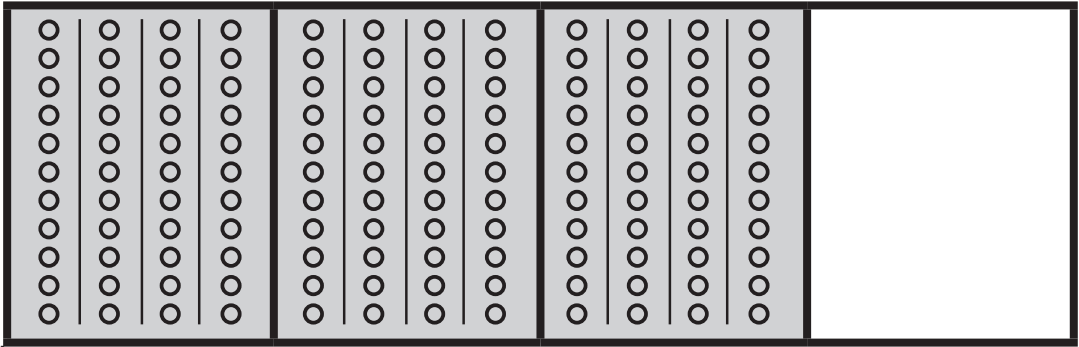
Recap the previous lesson. Give further examples.

$$\frac{1}{2} \text{ of } \frac{3}{4} \text{ and } \frac{2}{3} \text{ of } \frac{5}{7}$$

Work the following out on A (below), or have a chart ready.

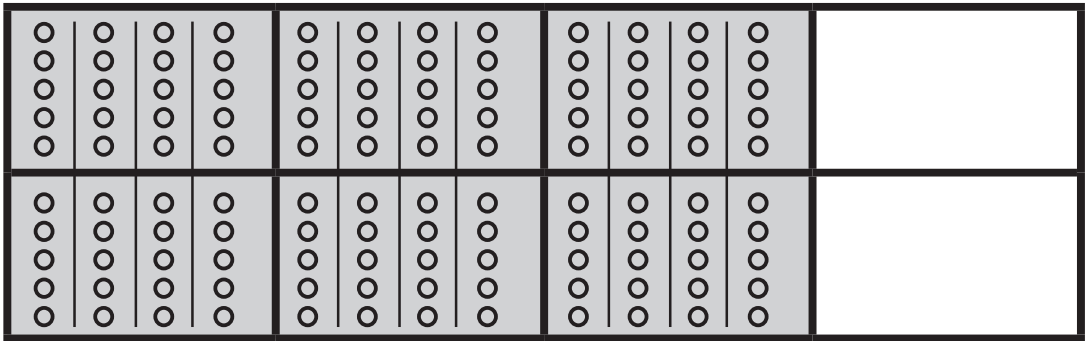
1. Rectangle A is divided into 4 quarters. 3 quarters ($\frac{3}{4}$) of the rectangle are dotted and striped.

A.



2. Rectangle B is divided into 8 eighths.

B.



$\frac{3}{4}$ or $\frac{6}{8}$ (6 of the eighths) of the rectangle are dotted and striped.

How many quarters of the whole are dotted and striped?

3 of 4 quarters OR $\frac{3}{4}$ are dotted and striped.

OR

6 of the eighths OR $\frac{6}{8}$ of the rectangle is dotted and striped.

Therefore:

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

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

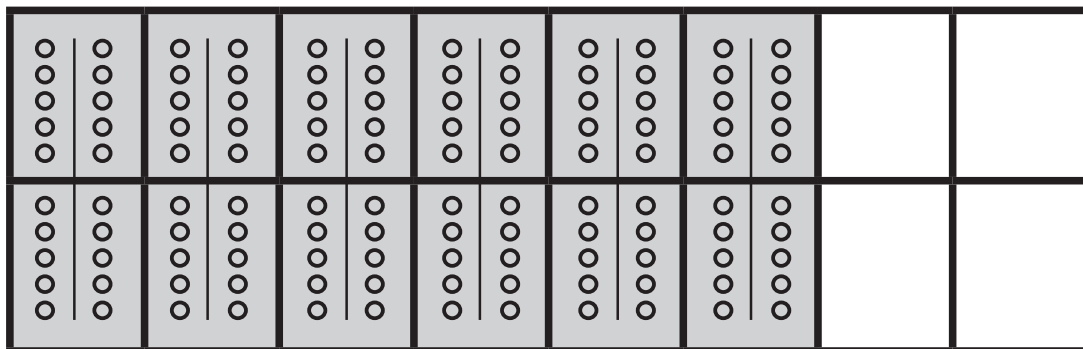
3. Now, look at the following (Rectangle C):

The rectangle is divided into 4 quarters, each quarter is further divided into quarters: 16 parts in all.

12 of the sixteenths are dotted and striped.

Rectangle

C.



16 parts, 12 dotted and striped

In rectangle B each quarter of Rectangle A is further halved, i.e. 8 pieces of the whole rectangle. 6 parts are dotted and striped as well. The dotted ones represent 6 out of 8 rectangles.

Hence,

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

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

Task: Students attempt pages 58–64.

Additional resources:

At the end of the guide are additional worksheets 7–10. Use them for reinforcement.

UNIT 5

DECIMAL FRACTIONS

Teaching objectives

- to introduce the concept of decimals: another way of writing fractions
- to introduce addition and subtraction of decimals
- to introduce multiplication of decimals
- to introduce division of decimals

Learning outcomes

Students should be able to

- explain clearly that decimals are a different form of fractions
- perform addition and subtraction of decimals with correct use of place value
- perform multiplication of decimal numbers
- perform division of decimal numbers

Teaching materials:

- square grid paper (10 by 10)
- different objects that can be sliced easily (loaf of bread, cheese, cake, cucumber, etc.)
- cubes ($10 \times 10 \times 10$) divided into 1,000 smaller cubes ($1 \times 1 \times 1$), which can be put together to make 1 cube

Learning activity

Lesson 1:

40 minutes

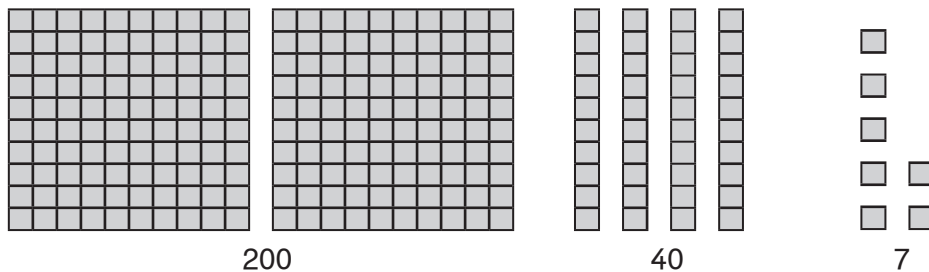
Decimals are a very important concept which the students will have to use in every sphere through out their lives. To use decimals confidently, the students have to be familiar with decimal notation, what each position signifies, its implications, vulgar equivalences and the place value of each number in decimal representation.

Start the lesson by talking about the significance of the fact that the decimal number system is based on 10. Also, expose them to the idea that this is not the only system used by man, there is the binary system (base of 2) used by computers, hexadecimal system (base of 6), octal system (base of 8), etc. The Mayans used the base of 20 as there are 20 toes and fingers. The Yuki language has an 8 base counting system as the speakers count by using the gaps between the fingers instead of the fingers themselves.

Talk about the reason for using the base of 10. The most significant aspect of 10 is the 0. All other numbers were displayed in nature in some form or another. Man found a way to form a symbol for 'nothing' or 'nil'. Then followed 10 and the place values of units, tens, hundreds and so on, before going into decimal fractions.

Once the place value of 0 was established, the concept of 10 came very naturally to men, as they had 10 fingers to count on.

To revise whole numbers, ask 'What number does this diagram illustrate?'



The answer, of course, is 247

Start the lesson about decimals, by dividing the students into groups of 3 or 4 each. Give group an object (such as slabs of chocolate with 10 pieces in each, or bracelets with 10 beads each, or packets of biscuits with 10 biscuits in each, or strips of clips each with 10 clips on it) that can easily be divided into 10. Ask them to divide each item into 10 parts. Then ask each group to hold up different portions of the whole. For example, 3 tenths of a whole strip of clips written as $\frac{3}{10}$. Students are familiar with the fact that each of the parts is $\frac{1}{10}$ or one-tenth of the whole.

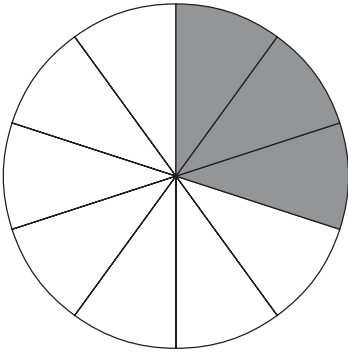
Explain that another method of writing the same fraction $\frac{1}{10}$ is known as the decimal numeral system (or base 10, or denary). $\frac{1}{10}$ is written as 0.1.

A decimal fraction is a form of writing fractions where the denominator of the fraction is a multiple of 10, such as 100, 1000...i.e. the fraction is written in the form of $\frac{3}{10}$, $\frac{7}{100}$ or $\frac{9}{1000}$.

It is an extension of the number system (where we count in tens) to the right, getting $\frac{1}{10}$, $\frac{1}{100}$, $\frac{1}{1000}$, of the number as you move to the right of the decimal point.

REMEMBER: The number on the left of the decimal point shows whole numbers with which the students are familiar. The first number on the right side of the decimal points signifies tenths, the next digit is hundredths, the next digit is thousandths and so on.

thousands hundreds tens units . tenths hundredths thousandths
 1000 100 10 1 . 10 100 1000



$$\frac{3}{10}$$

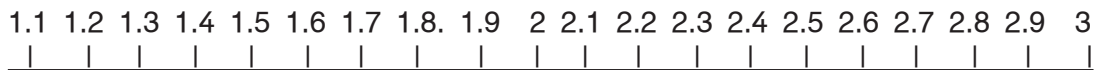
As the students hold up different parts of the whole, such as $\frac{9}{10}$, write the decimal representation of the vulgar fraction on the board: 0.9. As you write the decimal fraction, explain the significance of the *DOT*. A dot is used to separate the decimal fractions from the whole numbers.

Also, explain and practise the correct method of reading a decimal number.

One-tenth or $\frac{1}{10}$ is written as 0.1 and read as 'zero point one'. The place value of 1 as the 1st digit to the right of the decimal point signifies '1 divided by 10' or $\frac{1}{10}$.

Similarly, $\frac{2}{10}$ signifies two-tenths, and can be written as 0.2 and said as 'zero point two'. The place value of 2 is tenths, i.e. 2 parts of 10 parts of the whole. The prefix deci-stands for 10.

For example: 2.5 is read as two point five; 2 wholes and 5 tenths. It means 2 wholes and 5 parts out of 10. Similarly, $\frac{10}{10}$ is one whole and the decimal representation would be 1.0.



| | | | | | | | |
|----|---|---|---|---|---|---|----|
| Th | H | T | U | . | t | h | th |
| | | 1 | 0 | | 1 | | 1 |
| | | | 1 | . | 2 | | |

Draw a diagram like this on the board, and ask the students to call out the value of the positions as you point to each one.

Remember: The decimal point goes between units and tenths.

Another example: Twenty three and six tenths

23.6 has 2 tens, 3 units and 6 tenths, like this:

23.6

Decimal Number

$$= 20 + 3 + \frac{6}{10}$$

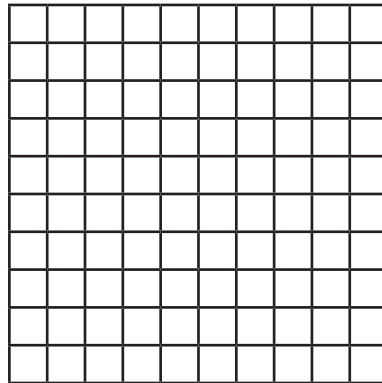
Work with sheets of a grid paper with 100 small squares, marked in strips. Students colour 1 strip and write 0.1 on the strip; or 2 strips and write 0.2 on it; or 3 strips and so on.

0.34

$$= 0 + \frac{3}{10} + \frac{4}{100}$$

Then, extend the idea to a base of 100. Give each child a similar grid, with 100 small boxes, and ask them to colour any number of boxes.

3 tenths and 4 hundredths

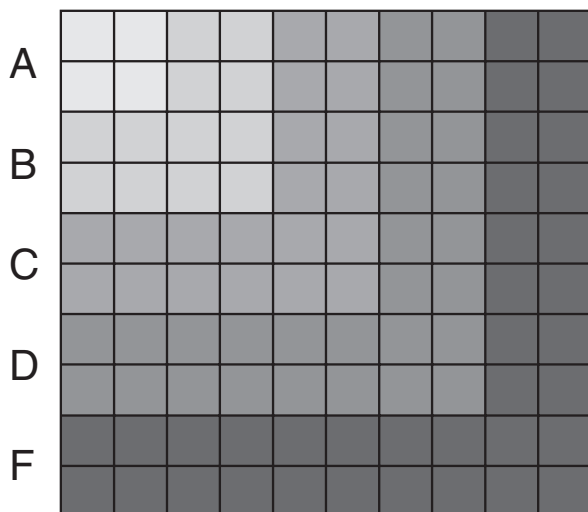


Ask Ramila to hold up her paper and tell the class how many boxes are coloured. She is likely to say that she has coloured 34 boxes out of the 100. You say that she has coloured the following fraction of the grid:

3 tenths and 4 hundredths = 30 hundredths and 4 hundredths = 0.34

Similarly, if Zain has coloured 4 boxes, he has coloured $\frac{4}{100}$ th of the grid. The decimal form of the fraction is 0.04, and the place value of 4 is hundredths.

A chart like this is useful. Students call out the value of the A, B and so on.



What fractions are each portion of the square?

A is 0.04

B is 0.12

C is 0.20

D is 0.28

E is 0.36

Show the students a few squares with different areas coloured, ask them to compare and say which fraction is greater.

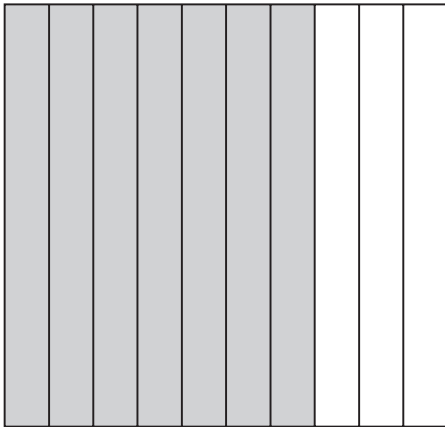
As they continue with the exercise, they should realise that they can compare the decimal forms to arrive at the conclusion. The student with a higher value in the tenths place has coloured more boxes.

For example, $0.52 > 0.49$

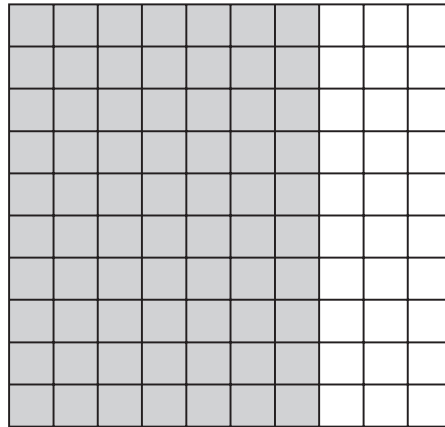
They should soon realise that if the number in the tenths place is the same they will have to consider the number in the hundredths place to compare the numbers. A few repeat exercises help. $4.3 > 4.28$

| units | | tenths | | hundredths | | thousandths |
|-------|---|--------|--|------------|--|-------------|
| 0 | . | 4 | | 5 | | 9 |
| 0 | . | 4 | | 9 | | 5 |

$$0.495 > 0.459$$



0.7
seven tenths



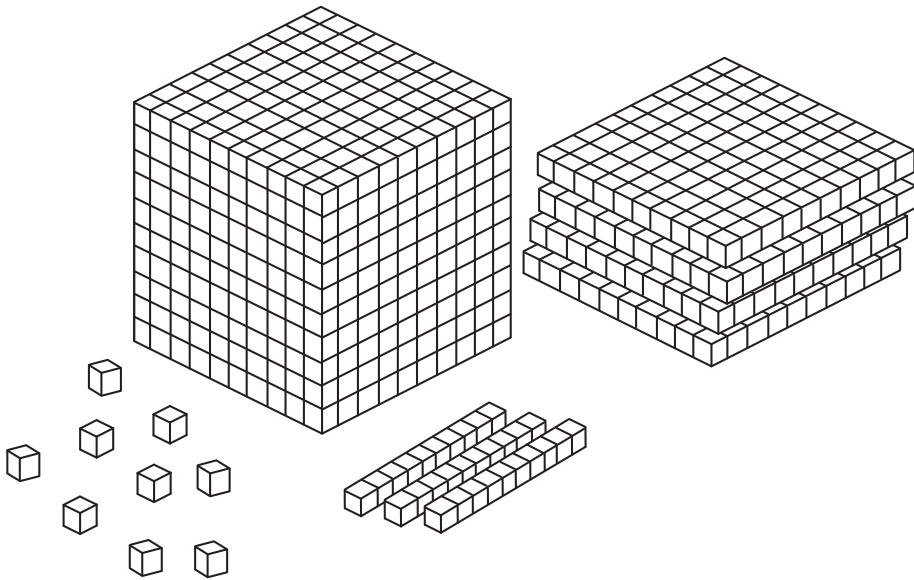
0.70
seventy hundredths

Now give the students a cube and ask them to mark each face into a 10×10 grid. How many small squares have they made on ONE face? 100.

Cut the cube along each marking, there will be 10 slabs. Each slab will represent $\frac{1}{10}$ th of the cube, and is written as 0.1.

1 whole

4 tenths = 0.4



9 thousandths

3 hundredths

0.009

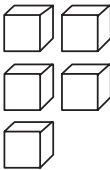



0.03

Mark each slab into 10 equal parts. Cut each slab along each marking. There will be 10 bars. Each bar will represent $\frac{1}{100}$ th of the cube, and is written as 0.01.

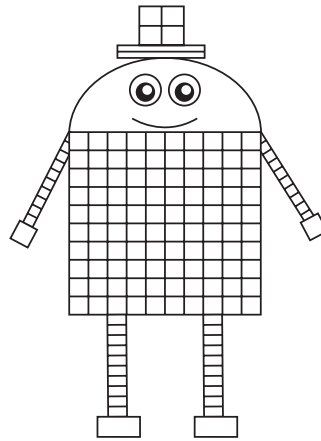
Mark each bar into 10 equal parts. Cut each bar along each marking. There will be 10 small cubes. Each cube will represent $\frac{1}{1000}$ th of the BIG cube, and is written as 0.001.

4th and 5th decimal places can also be shown practically, but is not necessary at this level.

To sum up, ask the students to write out 3 places of decimals and ask them to represent the numbers using grids or cubes drawn on the board. They might enjoy drawing fun figures using the grid or cubes. An example is illustrated below.

| ones | tenths | hundredths | thousandths |
|---|---|---|---|
|  |  |  |  |
| 5 | 4 | 8 | 1 |

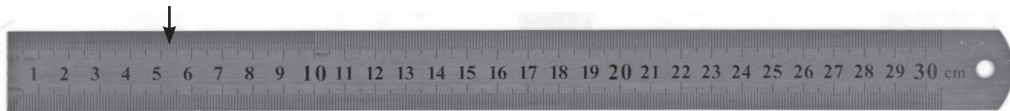
5.481



However, understanding the mathematical concept of decimals is not enough: the students need to know where they will have to apply the concept, and how it is an extension of what they already know: the number system.

Ask them to name some measures which may not be whole numbers. For example, the height of a child, the weight of a watermelon at the market, the time margin by which Schumacher may win a race, or the amount of water a bottle can hold.

Each student has a geometry box; ask them to look at the ruler carefully. Each centimetre is divided into 10 smaller parts. Each part is called a millimetre. So a millimetre is $\frac{1}{10}$ of a centimetre. Hence, the length of a line 5 cm and 3 mm will be written as 5.3 cm.



Once the value of each position is clearly understood, addition and subtraction should not be a problem.

Which number is bigger: 0.459 or 0.495? Can you subtract 0.395 from 0.359? Can you add the 2 numbers?

Multiplication is a little more complex.

If 4 children eat 1.5 bars of chocolates each, how many bars of chocolates were eaten?

This means:

$$4 \times 1.5 = 4 \text{ times } 15 \text{ tenths} = 60 \text{ tenths} = 6 \text{ whole bars}$$

OR

$4 \times 1.5 = 4 \text{ times } 1 \text{ whole} + 4 \text{ times } 5 \text{ tenths} = 4 \text{ wholes and } 2 \text{ wholes} = 6 \text{ whole bars}$

Written vertically:

$$\begin{array}{r} 1.5 \\ \times 4 \\ \hline \end{array}$$

The decimal point in the multiplicand and the product must be placed one below the other. This will be explained more clearly with more than 1 place of decimal later.

Conversely, if 6 bars of chocolates were to be divided amongst 10, or 4 children, how much chocolate would each child get?

Practical work like this helps.

6 whole bars = 60 tenths

For 10 children:

$$\frac{60}{10} = 6 \text{ tenths} = 0.6 \text{ bar for each child}$$

For 4 children:

$$\frac{60}{4} = 15 \text{ tenths} = 1.5 \text{ bars for each child}$$

$$\frac{6}{4} = \frac{60 \text{ tenths}}{4} = 15 \text{ tenths} = 1.5 \text{ bars.}$$

REMEMBER: At this level: ONLY the multiplicand has a decimal point
(NOT THE MULTIPLIER)

$$\begin{array}{r} 20.5 \\ \times 4 \\ \hline \end{array}$$

ONLY the dividend has a decimal point (NOT THE DIVISOR)

$$\frac{36.55}{10}$$

Task: Students attempt pages 67 to 78.

Additional resources:

At the end of the guide is an additional worksheet 11. Use it for reinforcement.

UNIT 6

MEASUREMENT: LENGTH, WEIGHT, AND CAPACITY

Teaching objectives

- to introduce standard units of measurement
- to explain conversion of units of length, weight, and capacity

Learning outcomes

Students should be able to:

- identify the standard units of measurement of length, weight, and capacity
- apply the correct units of measurement
- convert one unit to another
- apply conversion of units to real life problems

Teaching materials:

- 5 articles of daily use
- measuring tape/metre ruler/cm ruler
- measuring cylinders of various capacities
- different weights
- balance

Learning activity

Lesson 1:

40 minutes

The concepts of length, weight, and capacity, have already been introduced in the earlier books.

In this book the idea is formalized and the students are introduced to the units of measurement and inter-conversion of units. Choosing the right measuring unit for a particular object has already been dealt with in the previous book. The students have learnt how to convert a given measurement to a suitable unit.

To start the lesson, revise the various units of measurements with the class. Make it into a fun quiz. Bring 10 objects of daily use to the class, such as a plastic spoon, a plastic fork, a large bottle, a 10 to 12 cm stone, a brick, a book, a metal cup, a greetings card, a thimble, a small nail, a guitar, and so on. Number them 1 to 10. Place them on the teacher's desk and cover them with a piece of cloth. Ask the students to write down numbers 1 to 10 in their exercise books.

Remove the objects from under the cover one by one, and ask the students to write down the particular unit of measurement that they think is suitable to measure the length, weight, or volume of each object.

Points to talk about are:

- | | |
|------------------------------------|-------------------------------|
| 1. A brick will have a weight. | kilogram |
| 2. A thimble will have volume. | millilitres |
| 3. A bottle has volume and length. | litre and metre or centimetre |
| 4. A plastic fork has length. | centimetres |
| 5. A nail has length. | millimetres |
| 6. A guitar has length and width. | metre |

As the students work on the assignment, write on the board the various units of measurement. Ask each student to call out their answer and encourage the class to participate in a discussion; do they agree or disagree with the answer and the reason for it? Once the class reaches a consensus, strike out the unit from the board. For the units that remain on the board at the end of the exercise, ask the class to suggest objects that could be measured using them.

Introduce the idea of conversion with a brain-teaser:

You go to the market to buy a carton of juice. The carton has 1 l marked on it, but you want to buy 1000 ml of juice. How many cartons do you buy?

Shamim jogged for 1 km and Rahim jogged for 2000 m. Which distance was longer?

These problems explain the need for conversion of litres into millilitres and vice versa. This arouses students' interest in the various objects around them, and they gradually learn to compare and find alternatives. This makes the job of the teacher much easier, and retention is better.

Introduce the prefixes along with their mathematical significance and meaning. These prefixes are commonly used in units of measurement in the metric system. Since thousandths and hundredths were introduced in the previous chapter, converting the units should not pose a problem.

| PREFIX | MEANING | SYMBOL | MULTIPLE |
|--------|------------|--------|---------------|
| kilo- | thousand | k | $\times 1000$ |
| centi- | hundredth | c | $\div 100$ |
| milli- | thousandth | m | $\div 1000$ |
| | | | |

Although the students will gradually become familiar with the numerical part of the concepts, most of them have no idea as to how long a kilometre or a centimetre is, how

heavy a gram or a kilogram is or what the capacity of a bottle is. Ensure that the students are exposed to both the mathematical and the practical aspect of the concept. You may try the following activities:

- take the class for a 1km walk
- have a long jump competition of 1m
- have them jump over obstacles of height 25 cm
- measure the length of their fingers nails
- find the volume of a medicine dropper
- find the weight of a pair of glasses
- measure the thickness of a piece of cardboard
- count the number of grains of *kabuli channa* in 100 gm
- compare the weights of rubber slippers and heavy walking shoes

Discuss other objects which the students may come across in their homes and discuss the units of measurement useful for those.

Task: Students attempt pages 80–82.

Lesson 2:

40 minutes

Students easily become familiar with cm and mm as they can see these lengths on a ruler. Give them different objects and scales. Let them experiment and get an idea of kg, g, and mg. Similarly, give them measuring cylinders of various capacities and ask them to measure a l and ml. It is interesting to guess first, and then find the actual measurement.

Task: Students attempt pages 83-86.

Additional resources:

At the end of the guide is an additional worksheet 12. Use it for reinforcement.

UNIT 7

TIME

Teaching objective

- to explain conversion of units of time
- to introduce addition, subtraction, and comparison of units of time

Learning outcomes

Students should be able to:

- inter-convert seconds to minutes and to hours
- inter-convert hours to days and to weeks
- add and subtract different units of time

Teaching materials:

- a clock face with movable hands
- an actual clock
- a calendar
- time-tables of flight or railway schedules
- a TV guide

Learning activity:

Lesson 1:

40 minutes

Time is a concept that the students are exposed to right from childhood.

There is a time for waking up in the morning, time for breakfast, time for lunch, time to play, and time to go to bed. They are allowed to play for 2 hours in the evening, they go to school for 5 to 6 hours every day, they have to do their homework for an hour each day, and so on.

They are also aware of the different activities they undertake on different days of the week. For example, they go to school from Monday to Friday, music lessons are on Saturdays, and family outings on Sundays. They are used to different events in various months of the year. For example, summer break is during June and July, their birthday occurs in the same month every year, and Christmas is always in December.



The students are familiar with the 24-hour clock: 24 hours in a day, 12 hours from midnight to noon, and 12 hours from noon to midnight. 'a.m.' refers to the hours between midnight and noon, and 'p.m.' refers to the hours between noon and midnight.

Revisit the concept of the 24-hour clock, so that there is no confusion between 'a.m.' and 'p.m.'

The students should understand that every new day starts at midnight...at 00:00 hours (not at 6.00 a.m., when they wake up). The number on the left of the colon indicates hours, and that on the right of the colon indicates minutes.

- 'a.m.' after any given time, such as 7 a.m. or 10 a.m. indicates that the time is between midnight and noon.
- 'p.m.' after any given time, such as 9 p.m. or 11 p.m., indicates that the time is between noon and midnight.
- The hours 00:00 hours and 12:00 are referred to as midnight and noon respectively.

7 in the morning may be written as 7:00 a.m. or 07:00 hours

8 at night may be written as 8:00 p.m. or 20:00 hours

For times from 1:00 a.m. —12:00 noon the number on the left of the colon can vary from 1 to 12 and the number on the right of the colon can vary from 1 to 60

07:00 hours: the number on the left can vary from 0 to 23

7:00 a.m. the number on the right can vary from 0 to 59

7:00 a.m. is the same as 07:00 hours

8:00 p.m. the number on the left can vary from 0 to 12

the number on the right can vary from 0 to 59

20:00 hours the number on the left can vary from 0 to 23

the number on the right can vary from 0 to 59

8:00 p.m. is the same as 20:00 hours

Reiterate the fact that 60 seconds make a minute and 60 minutes make an hour.

Display a digital clock to actually show the students how the digits change with every passing minute or hour. It would be interesting to see how they come up with the idea that at the end of every 59 seconds, the minute-count changes, and at the end of every 59 minutes, the hour-count changes.

Go over the other conversions like: 24 hours make a day, 7 days in a week, 30 or 31 days in a month, 28 or 29 days in February, 12 months in a year. 10 years make a decade, and 10 decades make a century.

Task: Students attempt pages 89–90.

Lesson 2:

40 minutes

Try the following activity with the class. Divide the students into groups of 5 or 6. Give each group a timetable of railways, airlines, TV programmes, or films. Ask each group questions that which will require addition or subtraction of time.

- Mr. Bean starts at 12:00 noon; the show runs for 45 min. What time does it end?
- The flight from Karachi to Lahore takes off at 23:30 hours. The flight takes 1 hour 20 minutes. When does the flight land?
- An express train leaves Rawalpindi at 14:13 hours. It travels for 5 hours 30 minutes to reach Lahore. What time does it arrive?
- X-Men starts at a theatre at 4:40 p.m. The film has a 2 hours 46 minutes running time. When does it end?
- A carousel (or a merry-go-round) takes 2 minutes to go around once. A ticket for one ride entitles you to 6 rounds. How long does one ride take?

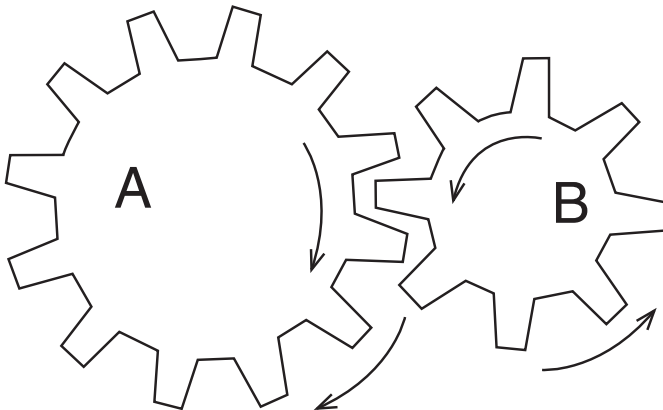
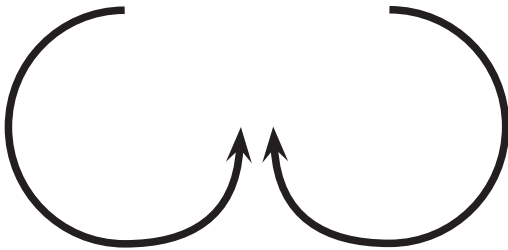
Each unit has a different conversion factor. The students must be very familiar and confident about the conversion factors before they move on to the operations.

Lesson 3:

40 minutes

Anticlockwise

Clockwise



Clockwise

Anticlockwise

An interesting point to bring to the notice of the students here is the reason behind the hands of the clock moving in the direction they do...from the left to the right. It might be worthwhile for children to find out the direction of movement (clockwise or anticlockwise) in the following:

- blades of ceiling fans and pedestal fans
- the door knob (does the door knob need to be moved in the clockwise or anticlockwise direction to open the door)
- hot and cold water taps
- merry-go-round or carousel
- the London Eye
- the Earth's rotation
- the Earth's revolution
- the blowing wind

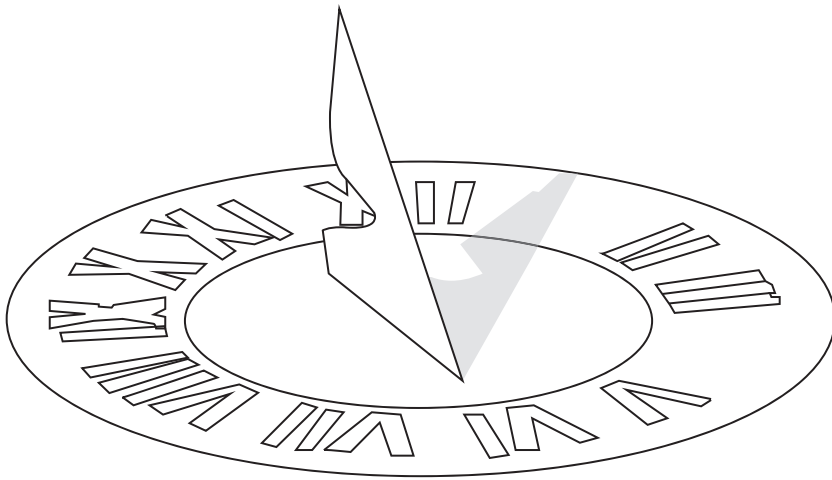
The London Eye moves in a clockwise direction when looked at from the north bank of River Thames. If you look at the ceiling fan from below, it moves in a clockwise direction, but look at the fan from above the blades: it will appear to move in the anticlockwise direction.

Look at a sundial: in which direction does the shadow move?

The Earth rotates on its axis in an anticlockwise (or counterclockwise) direction...hands of the clock move in a clockwise direction: why? What made man decide the direction for the hands of the clock to move in?

Scientists chose the clockwise (left to right, as you are looking at it) direction of the movement for a specific reason. The clocks were invented on the northern hemisphere, and the hands were built to move in the same direction as the shadow of the sundial, which is the same direction as the Sun moves in the sky. The reason the Sun *appears* to go round the way it does is because the Earth goes round *anticlockwise* when viewed from space looking at the North Pole.'

When you look at this entire from the southern hemisphere, it appears to go in the opposite direction (counterclockwise or anti-clockwise)



Task: Students attempt pages 91–94.

Additional resources:

At the end of the guide are additional worksheets 13 and 14. Use them for reinforcement.

UNIT 8

GEOMETRY

Teaching objectives

- to introduce angles and their components
- to introduce different types of angles
- to explain the use of a protractor
- to demonstrate how to draw an angles using angle flippers or protractor
- to explain the parts of a circle
- to demonstrate how to draw a circle using a ruler and a pair of compasses
- to explain the properties of quadrilaterals
- to explain different terms connected to quadrilaterals
- to introduce types of quadrilaterals
- to demonstrate how to construct a square and rectangle using a ruler and set-squares

Learning outcomes

Students should be able to:

- identify an angle and its different parts
- state the different types of angles with their properties
- use a protractor to draw angles
- identify a circle and its different parts
- draw a circle of a given radius accurately using a pair of compasses
- recognize a quadrilateral by its properties
- use terms connected to quadrilaterals correctly
- recognize the different types of quadrilaterals and differentiate between them
- construct a quadrilateral when its sides are given

Teaching materials:

- flippers, japanese fans, clock face
- a pair of sticks
- a string with a sponge attached to its end
- geo-board
- geometry box with its instruments

Learning activities

Lesson 1:

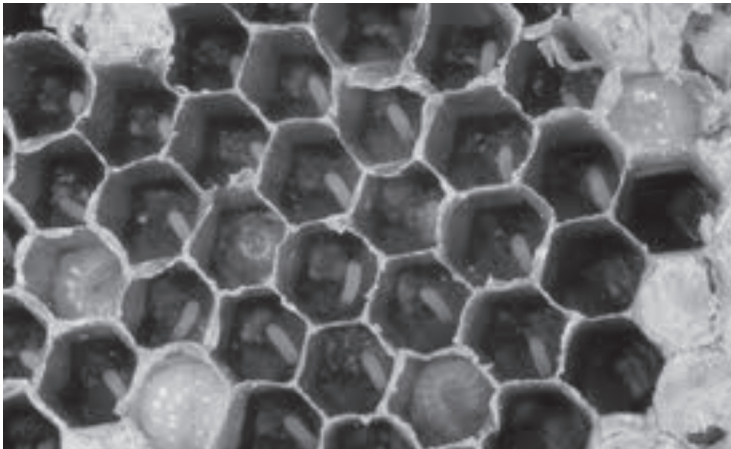
40 minutes

Start the lesson by asking the students to open their geometry boxes. Identify all the instruments. Discuss straight and wavy lines. Only straight lines can be measured accurately with a ruler.

Introduce parallel and non-parallel lines. Identify parallel and intersecting lines from objects and pictures in the classroom. Help the students draw parallel lines...for example, two lines along the edges of the ruler, a book, a geometry box or a pencil.

Man knew parallel lines from nature...

- the two 'sides' of some tree trunks run parallel for a distance
- the edges of a river in some places are parallel
- the stripes on the backs of a squirrel or a tiger in some areas are parallel
- the opposite edges of a hexagon in a beehive
- the ripples in a pond (when you throw a stone)
- the colour bands in a rainbow



Talk about different planes. The four walls of a room, the ceiling and the floor are 6 different planes. The walls are vertical; the floor and the ceiling are horizontal.

The following are parallel planes, which will not meet:

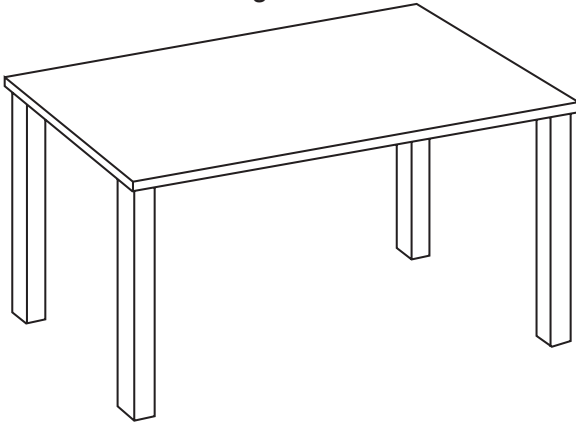
- the front and the back covers of a book
- the lid and the base of a geometry box
- the ceiling and the floor OR the two opposite walls of a room

The ceiling and the floor, or the floor and the wall are intersecting planes, perpendicular to each other.

Discuss horizontal and vertical lines. Remember, if a horizontal line and a vertical line are on the same plane, they cross at right angles.

Not all vertical and horizontal lines intersect. Give plenty of examples; they should be able to identify the lines from the objects around them. Look at the picture of this table.

None of the four legs of the table will cross each other because they are parallel. The front edge of a bed (a line) and the vertical edges of the back (lines) of the bed are perpendicular to each other, but will never cross each other.



Task: Students attempt pages 99–108.

Lesson 2: 40 minutes

Take the board to be a plane, like a wall, a ceiling or a floor. Draw various lines on it...some parallel, others not parallel. All non-parallel lines on a plane will always intersect when extended.

Explain that two straight lines on different planes will not intersect, even if they are not parallel. Try drawing different (erasable) lines on opposite walls of the classroom. These lines will never cross.

Now, introduce the formation of angles.

Take 2 sticks and tie them together at the middle (at any convenient angle) with a piece of string. Keep the sticks one on top of the other.

When the two sticks of are one on top of another, the angle formed is 0° .

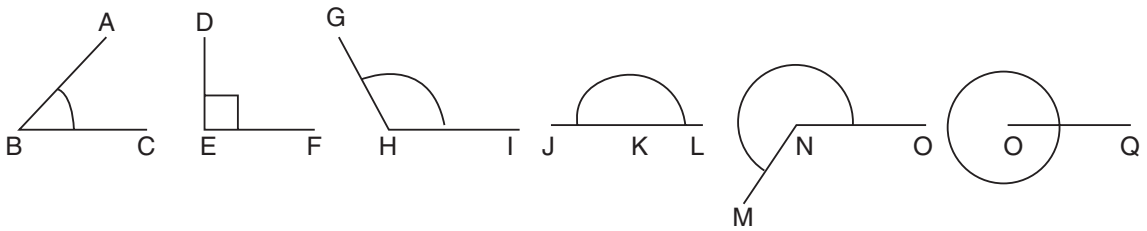


Now, turn one stick in an anti-clockwise direction.

Name of angle

Size of angle

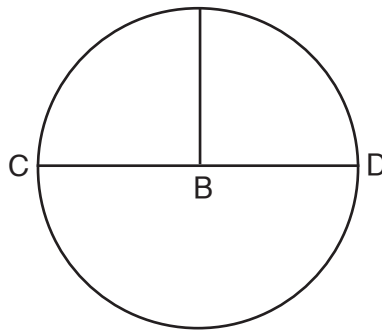
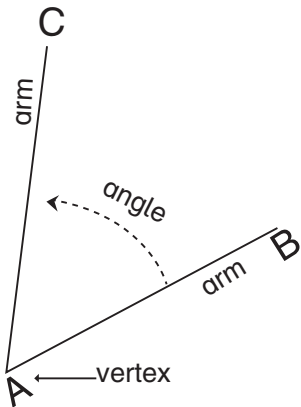
| | | |
|----------------|-------------------|---|
| acute angle | $\angle ABC\dots$ | less than 90° |
| right angle | $\angle DEF\dots$ | 90° |
| obtuse angle | $\angle GHI\dots$ | more than 90° but less than 180° |
| straight angle | $\angle JKL\dots$ | 180° |
| reflex angle | $\angle MNO\dots$ | more than 180° , but less than 360° |
| full circle | | 360° (full rotation) |



Continue the lesson by demonstrating and explaining different types of angles. A Japanese fan is ideal for showing 0° to 360° ; a closed fan to a fully open fan.

A clock face or 2 sticks attached at one end are also useful. Keep one arm fixed and turn the other arm to trace out different angles.

Students see that when 2 straight lines intersect, they form 2 pairs of angles. Introduce the term arms and vertex of an angle. Also, explain how angles are labelled. Give each student a pair of sticks, graduating in size from toothpicks to metre rulers and let them repeat the process. They compare each other's work.



Special mention must be made of a right angle and a straight angle CBD (2 right angles). A full rotation is equal to 4 right angles.

Make several angles by folding a sheet of paper, or use a pair of lollipop sticks tied at one end.

Keep a right angle for reference. If the angle is smaller than a right angle, it is

an acute angle. Compare the acute angles with the right angle and show the students that they are smaller than right angles.

Angles greater than a right angle but smaller than a straight angle are obtuse angles. Similarly, compare obtuse angles to the size of a right angle and show students an obtuse, larger than a right angle, being formed when one of the lollipop sticks moves to a position of 'more than a right angle'. Reflex angles are greater than 2 right angles.

A full rotation is 4 right angles, which is achieved when one of the arms rotates and comes back to its original starting position. Students form angles using their own flippers and call out the names of the different angles. They could stick the different positions made from lollipop sticks or folded paper angles onto chart papers and display them on the board.

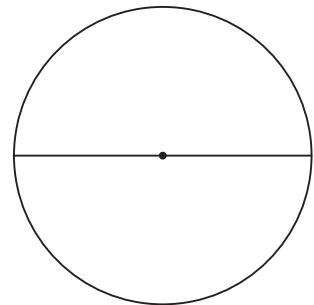
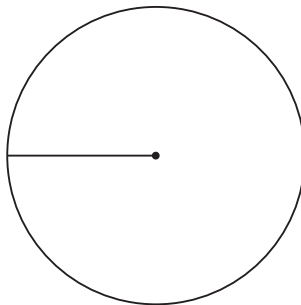
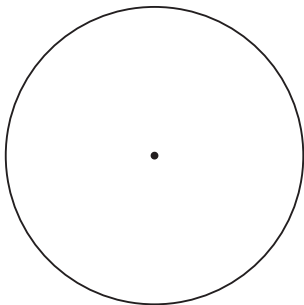
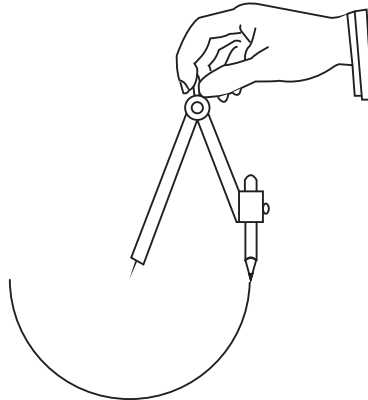
Ask a student to stand in front of the class, and rotate his or her arms to display zero degrees, an acute angle, a right angle, an obtuse angle, and a reflex angle. (A complete rotation is possible when the student turns a full circle on his/her feet).

Task: Students attempt pages 109-120.

Lesson 3:

40 minutes

Take the students out into the playground or courtyard. Attach a piece of chalk to the end of a length of a string and demonstrate how to trace a circle on the ground. Explain how a circle is drawn and identify the different parts of the circle. Then let the students draw their own colourful circles on the floor. It can make a wonderful original art work! Back in the classroom demonstrate how to use a compass. A large compass can be used on the board to repeat the above exercise. Then, different words related to a circle are explained... centre, radius, diameter, circumference, and arc.



Centre: the central point from which a circle is drawn

Radius: distance from the centre to the circumference

Diameter: twice the radius; starts from one point on the circumference, goes through the centre to the point on the circumference opposite the starting point

Circumference: starting at one point on the circle, the distance around the edge of the circle

Students use their own compasses to draw a circle in their books and measure the radius. It must be emphasized here that, a compass can be a dangerous instrument... all caution must be exercised.

Task: Students attempt pages 121-125.

Lesson 4:

40 minutes

By now students should recognize quadrilaterals: closed shapes with 4 sides and 4 corners (vertices). The next step is for them to associate the corners (or vertices) with angles. Two straight lines (in this case, two adjacent sides) cross each other and an angle is formed. This can be illustrated with quadrilaterals cut out from sheets of paper, or from the seats of school chairs, or tables.

The four angles from the paper quadrilaterals are torn and put together at a point so that it becomes obvious that the angles at the 4 vertices of a quadrilateral add up to 360° .

Student can practice measuring angles of a quadrilateral on the board, using a large protractor, and then, draw angles in their exercise books using their own protractors.

By working with the four angles at a point drawn on the board, measured with a protractor and a rotating lollipop stick, they arrive at the fact that the four angles of a quadrilateral add up to 360° .

Students work with geo boards, in groups, in the maths lab. Give them rubber bands and let them form quadrilaterals themselves. Then call up each group to show their boards and ask them questions about the properties of the quadrilateral. Talk about the special properties of squares and rectangles. If none of the groups have made a square or a rectangle, make one and let the students observe the properties for themselves.

Task: Students attempt pages 126-130.

Additional resources:

At the end of the guide are additional worksheets 15–17. Use them for reinforcement.

UNIT 9

INFORMATION HANDLING

Teaching objectives

- to introduce the parts of a graph and its labels
- to draw and interpret a bar graph
- to draw and interpret a line graph
- to draw and interpret pictograms
- to draw and interpret a pie chart

Learning outcomes

Students should be able to:

- identify a graphical representation of data
- label all the required parts of a graph
- draw a bar graph/line/pictogram/pie from data given
- draw conclusions from a bar/pictogram/line/pie

Teaching material:

- sample graphs from newspapers, Internet, and magazines
- charts attached here with excel sheets

Learning activity

Lesson 1:

40 minutes

The students worked with pictograms in the previous year. They already have some idea about the different parts of a graph and how to represent information on a graph and to draw conclusions from them.

Students come across graphs in every sphere of their daily life, be it in the supermarket (comparison of sales of different objects and choices of different products), in school (board results of the last few years, number of students admitted to the school in the last few years), on TV (comparison of cricket scores or run rates), in magazines, on advertisement hoardings.

Start the lesson by discussing the importance of graphs and why they are necessary and more convenient than actual numerical data. Talk to them about the uses of graphs in various sectors of life. Then show them a sample graph, maybe from a newspaper about temperatures for a week, or the Internet, and explain the different parts of a graph.

Draw two perpendicular lines (axes) on the board. Label them the X-axis (horizontal) and the Y-axis (vertical).

Explain that the different quantities are usually marked on the X-axis and their corresponding frequencies along the Y-axis. Show them the scale and how it is important for proper representation of the information. If there are any symbols used in the graph, there must be a key explaining the meanings of the symbols.

Once you have discussed and revised the basics, give the students an interesting topic and ask them to conduct a small survey on it.

For example 'The months in which students were born'.

Below is a sample set of data for the topic.

Birth months of children in class 4 (all sections)

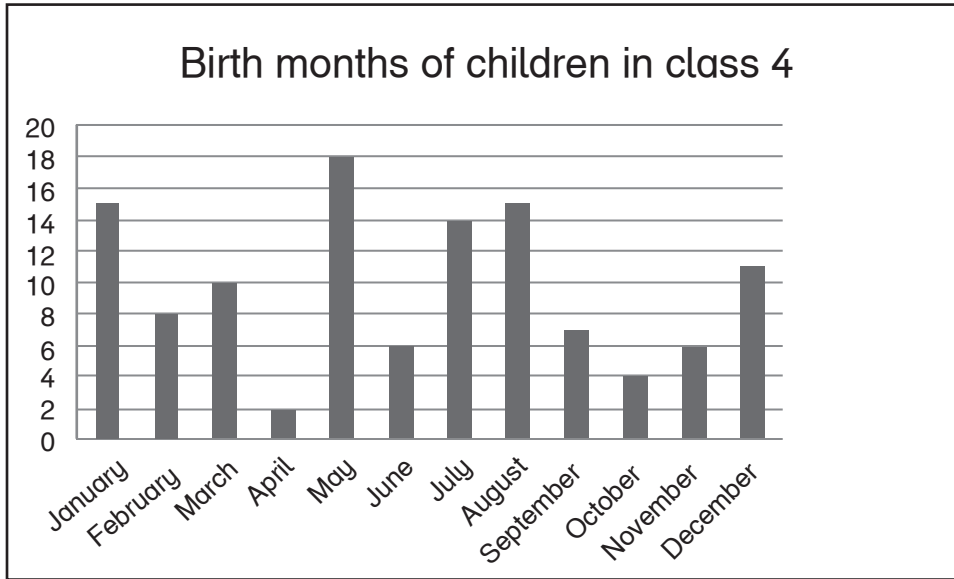
| Data/month | frequency of births |
|------------|---------------------|
| January | 15 |
| February | 8 |
| March | 10 |
| April | 2 |
| May | 18 |
| June | 6 |
| July | 14 |
| August | 15 |
| September | 7 |
| October | 4 |
| November | 6 |
| December | 11 |

Now ask the students to represent this information on the various types of graphs:

1. BAR GRAPHS

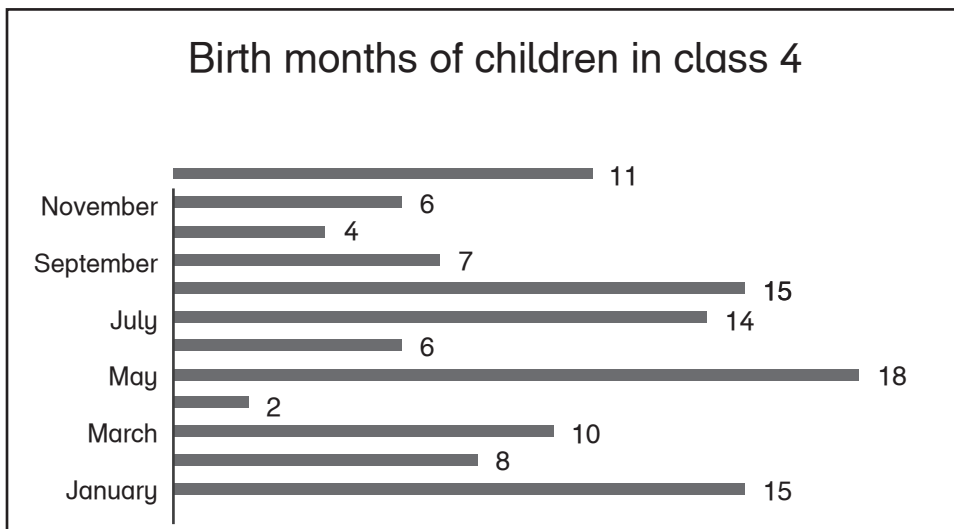
A bar graph representing the above data set is given below. The length of each bar is proportional to the raw data. Show the class a template and ask them to follow it.

a) VERTICAL BAR GRAPH



b) HORIZONTAL BAR GRAPH:

The bars may also be draw horizontally.



c) COMPARATIVE BAR GRAPHS

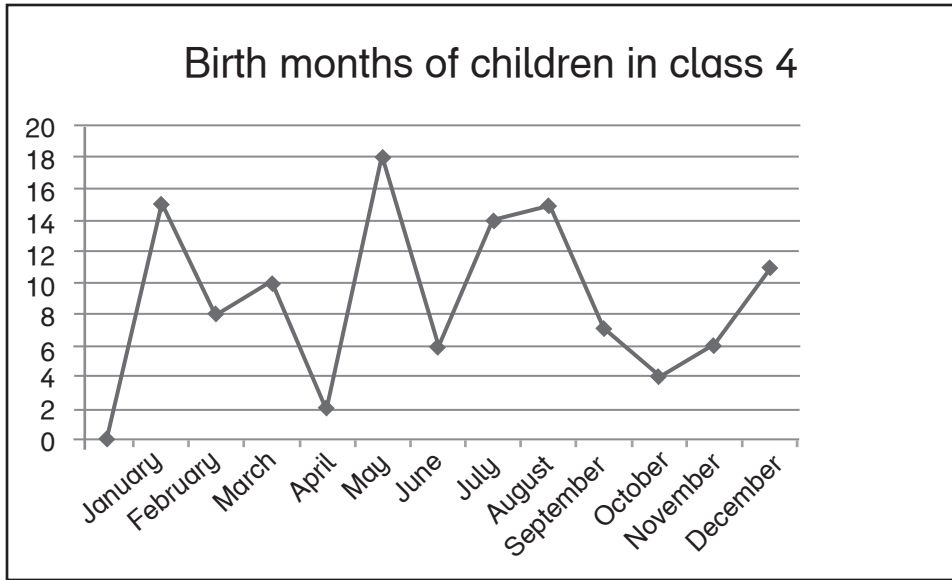
Now let them collect the same information from another class and tabulate it as shown below. They will now draw a comparative bar graph for the 2 sets of data.

| Month | Class 4 | Class 5 |
|-----------|---------|---------|
| January | 15 | 12 |
| February | 8 | 3 |
| March | 10 | 11 |
| April | 2 | 14 |
| May | 18 | 8 |
| June | 6 | 2 |
| July | 14 | 10 |
| August | 15 | 5 |
| September | 7 | 20 |
| October | 4 | 15 |
| November | 6 | 7 |
| December | 11 | 9 |
| Total | 116 | 116 |

Remember that the scale of the graph should be compatible for both sets of data and should be the same for each of them. Ask them questions for which they will have to compare the 2 sets.

2. LINE GRAPHS

The same information can be plotted on a line graph.



3. PIE CHARTS

A pie chart, as the name suggests, is a circular chart divided into sectors. The information is represented as sectors of the circle. A pie chart has been named for its resemblance to a pie, with slices cut from it.

A pie chart is not as simple to draw as the bar graph or a line graph. Here, every piece of information has to be converted into a percentage. Look at a simple pie chart:

In a girls' school in Lahore, there are 60 girls in Class VI. Extra curricular activities are undertaken by various girls, as per the table below:

- 12 girls do music
- 3 girls play football
- 8 girls play basketball
- 7 girls learn skating
- 11 girls play tennis
- 9 girls do swimming
- 10 girls learn cooking

Each of these figures needs to be converted into a percentage:

12 girls do music

$$12 \text{ out of } 60 \text{ of } 360^\circ = 72^\circ$$

3 girls play football

$$3 \text{ out of } 60 \text{ of } 360^\circ = 18^\circ$$

8 girls play basketball

$$8 \text{ out of } 60 \text{ of } 360^\circ = 48^\circ$$

7 girls do skating

$$7 \text{ out of } 60 \text{ of } 360^\circ = 42^\circ$$

11 girls play tennis

$$11 \text{ out of } 60 \text{ of } 360^\circ = 66^\circ$$

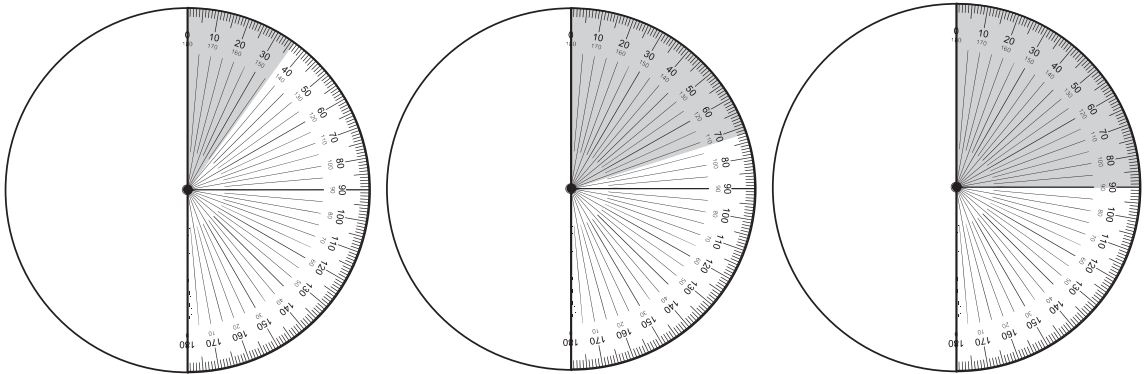
9 girls do swimming

$$9 \text{ out of } 60 \text{ of } 360^\circ = 54^\circ$$

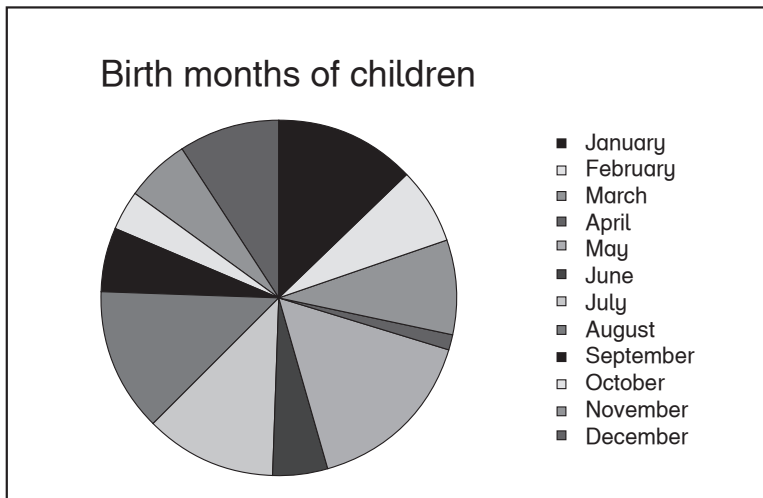
10 girls learn cooking


$$10 \text{ out of } 60 \text{ of } 360^\circ = 60^\circ$$

Start drawing on the board with a wooden protractor:



As an example, this pie chart below represents birthdays (the figures for the data are not given here).





Take up several topics of interest to the students, such as comparison of runs scored by various cricketers of repute, populations of different countries, numbers of children playing different sports are good examples which can be represented by pie charts.

REMEMBER: In cases of random data, the number of degrees for the section of the pie chart may not be whole numbers work out in decimals. You need to work on figures in advance, before presenting it to the class.

Task: Students attempt pages 134–138.

Additional resources:

At the end of the guide are additional worksheets 18 and 19. Use them for reinforcement.

Teaching objectives

- to review place value
- to review decimal fractions
- to revise measurements of length, weight, and capacity
- to identify different types of angles
- to measure different angles
- to draw graphs and interpret data

Learning outcomes

Students should be able to:

- identify the place value of a given number
- solve problems and write answers as decimal fractions
- identify units of measurements
- name and draw angles
- identify a graphical representation of data
- draw conclusions from a bar/pictogram/line/pie

Teaching materials:

- worksheets

Learning Activity**Lesson:****40 minutes**

The review and assessment can take place over a couple of days. If required, several lessons can be spent on revision. Worksheets and interactive games can be used for assessment.

An interesting point can be brought up with the students: calendars repeat themselves every now and again.

1. Recycling old calendars:

The year 1947 repeated itself in 2014. 14 August, 1947, the day Pakistan came into being, was a Thursday. In 2014, 14 August was also a Thursday.

It is useful to recycle old calendars. 2014 is a good year - there are three relatively recent years that will work again for this year.

1985, 1991, 2002, 2013

| Current Year | Old Matching Calendar Years |
|--------------|------------------------------|
| 2012 | 1928, 1956, 1984 (leap year) |
| 2013 | 1985, 1991, 2002 |
| 2014 | 1986, 1997, 2003 |
| 2015 | 1987, 1998, 2009 |
| 2016 | 1932, 1960, 1988 (leap year) |
| 2017 | 1989, 1985, 2006 |

2. NUMBER GAME:

Remember, the place value of the letters of the alphabet:

| | | | |
|-------|--------|--------|--------|
| A = 1 | G = 7 | M = 13 | S = 19 |
| B = 2 | H = 8 | N = 14 | T = 20 |
| C = 3 | I = 9 | O = 15 | U = 21 |
| D = 4 | J = 10 | P = 16 | V = 22 |
| E = 5 | K = 11 | Q = 17 | W = 23 |
| F = 6 | L = 12 | R = 19 | X = 24 |
| | Y = 24 | Z = 26 | |

Find the value of:

HARDWORK, KNOWLEDGE and LOVE OF GOD

Answers:

H-A-R-D-W-O-R-K

$$8 + 1 + 18 + 4 + 23 + 15 + 18 + 11 = 98\%$$

K-N-O-W-L-E-D-G-E

$$11 + 14 + 15 + 23 + 12 + 5 + 4 + 7 + 5 = 96\%$$

L-O-V-E-O-F-G-O-D

$$12 + 15 + 22 + 5 + 15 + 6 + 7 + 15 + 4 = 101\%$$

3. UNUSUAL MULTIPLICATION

Ask the students to find out the answers to the multiplications. REMEMBER, MULTIPLY first, and then ADD:

$$9 \times 9 + 7 = 88$$

$$98 \times 9 + 6 = 888$$

$$987 \times 9 + 5 = 8888$$

$$9876 \times 9 + 4 = 88888$$

$$98765 \times 9 + 3 = 888888$$

$$987654 \times 9 + 2 = 8888888$$

$$9876543 \times 9 + 1 = 88888888$$

$$98765432 \times 9 + 0 = 888888888$$

Do the worksheets to review the concepts taught throughout the year.

Task: Students attempt pages 140 and 145.

Additional resources:

At the end of the guide are additional worksheets 20–25. Use them for reinforcement.

Worksheet 1

Complete the table.

| HTh | TTh | Th | H | T | O | EXPANDED FORM | NUMBER NAMES |
|-----|-----|----|---|---|---|--------------------------|---|
| 3 | 1 | 4 | 5 | 7 | 2 | | |
| | | | | | | 600,000 + 40,000 + 3000 | Six hundred and forty three thousand |
| 9 | 6 | 6 | 8 | 5 | 0 | | |
| | | | | | | | Three hundred and thirty seven thousand and sixty two |
| | | | | | | 7000 + 600 + 40 + 3 | |
| 6 | 5 | 9 | 6 | 0 | 2 | | |
| | | | | | | 60,000 + 4000 + 900 + 10 | |

Worksheet 2

Solve.

1. Mr. Jackson wrote a book on adventures and had 50,675 copies published. Because the book was popular he had 40,325 more copies published. Find the total number of copies published.
2. In a school library there are 398,475 books. The school decided to add 50,000 more books. How many books will there be in the library?
3. Mr Rafiq bought a car for Rs 700,656. He sold his old car for Rs 459,675. How much more did he pay for the car?
4. Work out the following.
 - a) $65,963 + 153 - 29,600$
 - b) 396×12
 - c) $3905 \div 5$
 - d) $56 + 30,985 - 2245$
 - e) $494 \div 7$
5. Write equivalent fractions for the following.
 - a) $\frac{6}{4}$
 - b) $\frac{1}{2}$
 - c) $\frac{5}{7}$

Worksheet 3

Solve.

1. In a musical show 12,212 men and 10,565 women participated. What is the total numbers of participants?
2. Mr Kamal donated Rs 3599 to his favourite charity. The amount in his account is Rs 108,458. What will be the balance in his account after the money is given?
3. What should be added to 56,960 to get 85,200?
4. Salman saved Rs 20,560 in one year. If he saves the same amount every year. How much will he save in 6 years?
5. Sara works on the computer for 12 hours. If the computer uses 299 watts of power per hour, how much power does Sara use?

Worksheet 4

Find the product.

1. $47,943 \times 560 =$ _____

2. $76,200 \times 300 =$ _____

3. $78,651 \times 295 =$ _____

4. $56,860 \times 700 =$ _____

5. $29,630 \times 460 =$ _____

Find the quotient and remainder if any.

1. $6408 \div 12 =$ _____

2. $6780 \div 23 =$ _____

3. $7806 \div 35 =$ _____

4. $1565 \div 15 =$ _____

5. $1980 \div 10 =$ _____

Worksheet 5

Match the sets of multiples to the correct numbers.

- | | | |
|----|----------------------|---|
| 1. | 2, 4, 6, 8, 10, 12 | 5 |
| 2. | 5, 15, 25, 45, 65 | 7 |
| 3. | 27, 54, 63, 45, 65 | 2 |
| 4. | 3, 6, 18, 21, 30, 27 | 3 |
| 5. | 21, 28, 42, 56, 70 | 9 |

Worksheet 6

List the multiples and find the LCM.

Example:

4, 2 and 6

Multiples of 4 = 4, 8, 12...

Multiples of 2 = 2, 4, 6, 8, 10, 12...

Multiples of 6 = 6, 12...

LCM of 2, 4, and 6 = 12

3, 6 and 9

5, 10 and 15

LCM of 3, 6 and 9 = _____

LCM of 5, 10 and 15 = _____

4, 12 and 24

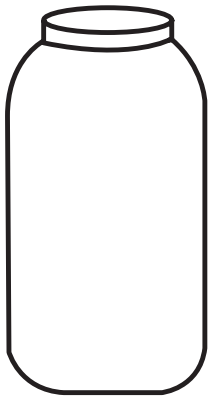
3, 7 and 21

LCM of 8, 12 and 24 = _____

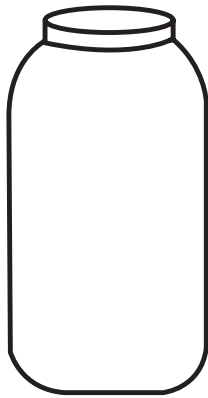
LCM of 6, 7 and 21 = _____

Worksheet 7

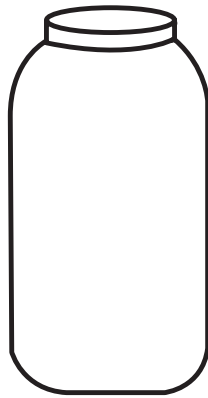
Match the fraction to the correct jar.



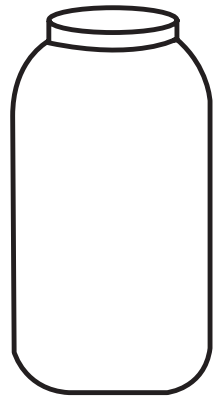
Proper fraction



Improper fraction



Mixed fraction



Unit fraction

$$\frac{5}{3}$$

$$\frac{3}{6}$$

$$\frac{4}{4}$$

$$\frac{8}{5}$$

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

$$6\frac{5}{8}$$

$$\frac{7}{2}$$

$$\frac{6}{8}$$

$$\frac{2}{5}$$

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

$$\frac{7}{7}$$

Worksheet 8

Write the equivalent fractions.

$\frac{3}{4}$ $\frac{\quad}{8}$ $\frac{12}{\quad}$ $\frac{\quad}{32}$ $\frac{\quad}{36}$

$\frac{1}{5}$ $\frac{2}{\quad}$ $\frac{\quad}{15}$ $\frac{\quad}{20}$ $\frac{10}{\quad}$

$\frac{2}{10}$ $\frac{4}{\quad}$ $\frac{8}{\quad}$ $\frac{\quad}{100}$ $\frac{\quad}{60}$

$\frac{6}{8}$ $\frac{12}{\quad}$ $\frac{\quad}{24}$ $\frac{18}{\quad}$ $\frac{24}{\quad}$

Worksheet 9

Solve.

1. Sana cuts a 4 metre rope into two pieces. The length of one piece is $2\frac{1}{2}$ metres. What is the length of the other $\frac{1}{2}$ piece?
2. Zain walks for $3\frac{2}{7}$ kilometres and jogs for $2\frac{5}{7}$ km. Find the total distance covered by him.
3. A shopkeeper spent $6\frac{2}{5}$ minutes to clean two racks of books and $4\frac{2}{5}$ minutes to clean one rack of stationery. Find the total time spent to clean the three racks.
4. In a school $\frac{6}{8}$ of an hour is spent on explaining a lesson and $\frac{5}{8}$ of an hour to do written work.
How much times is spent
a) explaining? b) written work?

Worksheet 10

Solve.

1. What is $\frac{2}{5}$ of 50?

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

3. $\frac{8}{9} \times \frac{1}{8} =$

4. Find the product of $\frac{1}{4}$ and $\frac{4}{5}$.

5. $\frac{7}{8} \div \frac{14}{24} =$

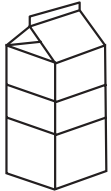




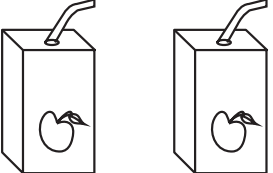

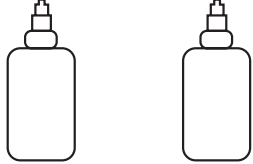

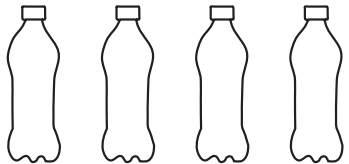
Worksheet 11

Decimals addition word problems.

| | Workspace |
|--|-----------|
| <p>Raheel bought 3 bags which cost Rs 12.30, Rs 34.23 and Rs 23.19 respectively. How much did he need to pay?</p> <p>Answer</p> | |
| <p>Sana spends 1.25 hours for English reading, 1.40 hours for Math and 0.45 hours for Science. How many hours does she spend studying?</p> <p>Answer</p> | |
| <p>Mikail measures a triangular plate whose sides are 12.3 cm, 9.45 cm and 10.35 cm respectively. What is the perimeter of a triangular plate?</p> <p>Answer</p> | |
| <p>Nadia bought tomatoes, a chicken and onions. The respective weights of these items were 2.20 kg, 1.45 kg and 3.65 kg. What is the total weight of the items bought?</p> <p>Answer</p> | |

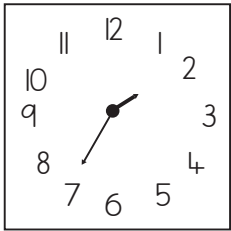
Worksheet 12

Write $<$, $>$ or $=$ in the box.

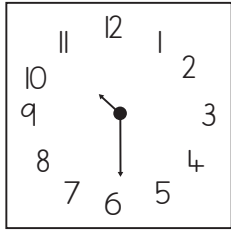
| | | |
|---|--------------------------|--|
|  3 litres | <input type="checkbox"/> |  2 l 2 l 2 l 2 l |
|  5 litres | <input type="checkbox"/> |  1 l 1 l 1 l |
|  3 litres | <input type="checkbox"/> |  1.5 l 1.5 l |
|  0.5 litres | <input type="checkbox"/> |  0.5 l 0.5 l |
|  4 litres | <input type="checkbox"/> |  1 l 1 l 1 l 1 l |

Worksheet 13

Time



Clock A

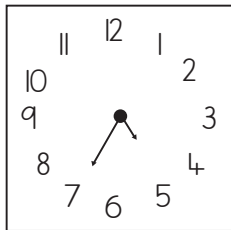


Clock B

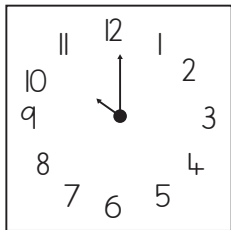
What time is it on Clock A? _____

What time is it on Clock B? _____

How much time has elapsed
between Clock A and B? _____



Clock A

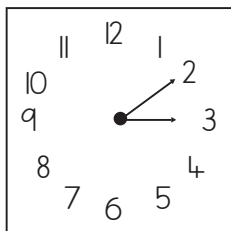


Clock B

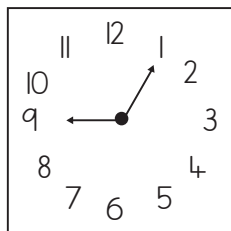
What time is it on Clock A? _____

What time is it on Clock B? _____

How much time has elapsed
between Clock A and B? _____



Clock A



Clock B

What time is it on Clock A? _____

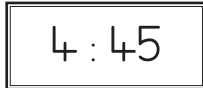
What time is it on Clock B? _____

How much time has elapsed
between Clock A and B? _____

Worksheet 14

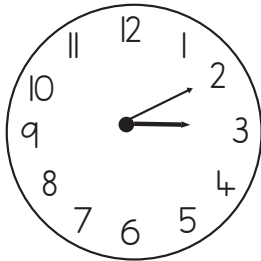
Tick (✓) the correct answer.

1. What time is shown on the clock?



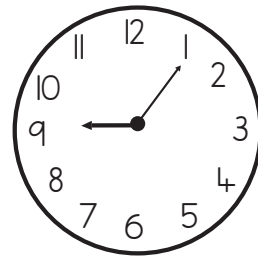
- A. quarter after 3
- B. quarter to 4
- C. quarter after 4
- D. quarter to 5

2. What time is shown on the clock?



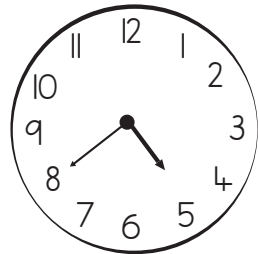
- A. 2:15
- B. 2:50
- C. 3:10
- D. 3:15

3. Mark's class went on a field trip. They rode the bus for one and a half hours and arrived at a park at 9:05. What time did Mark's class leave school?



- A. 8:35 a.m.
- B. 7:35 a.m.
- C. 8:05 a.m.
- D. 7:05 a.m.

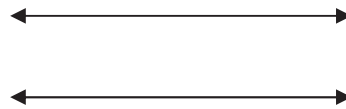
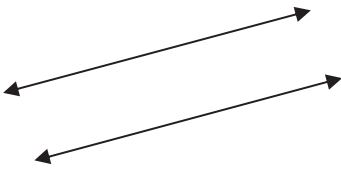
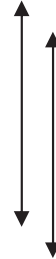
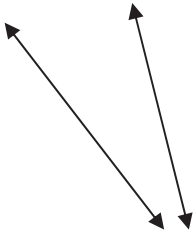
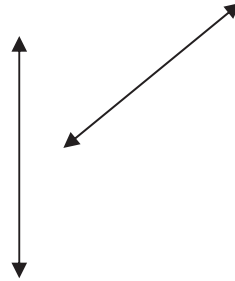
4. What time will it be in 45 minutes?



- A. 3:45
- B. 4:00
- C. 4:15
- D. 4:30

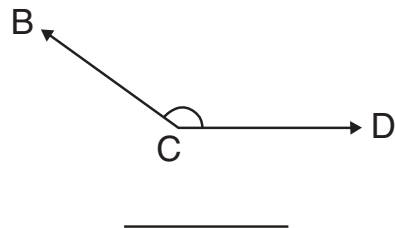
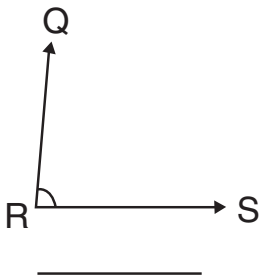
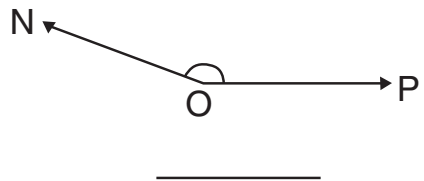
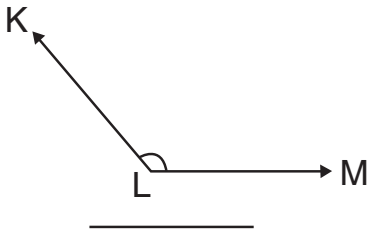
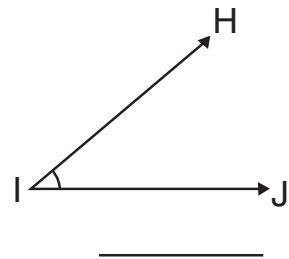
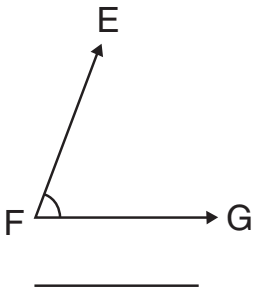
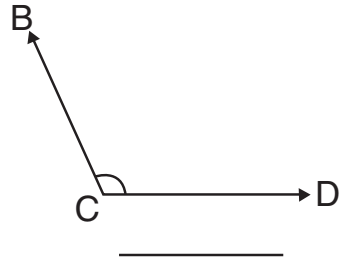
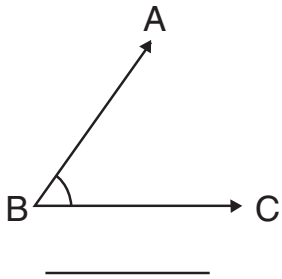
Worksheet 15

Put a tick (✓) against each set of the parallel lines.



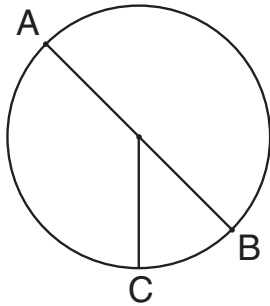
Worksheet 16

Measure each angle using a protractor.

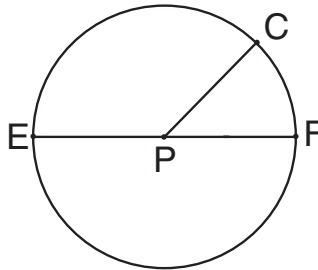


Worksheet 17

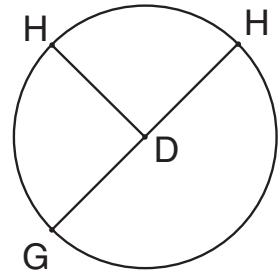
Identify the radius (R) and the diameter (D) in the given circles.



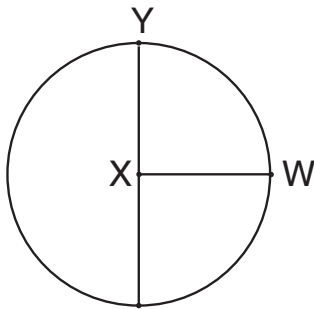
Radius _____
Diameter _____



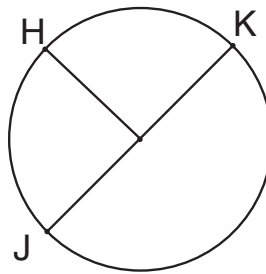
R _____
D _____



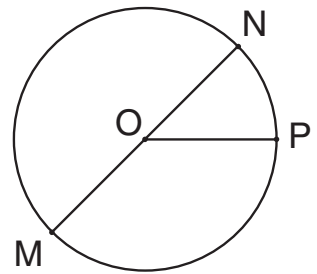
R _____
D _____



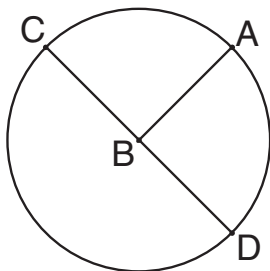
Radius _____
Diameter _____



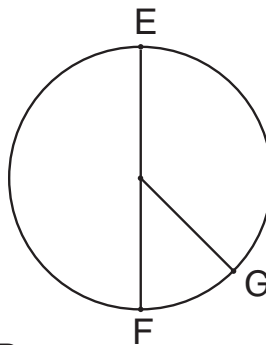
R _____
D _____



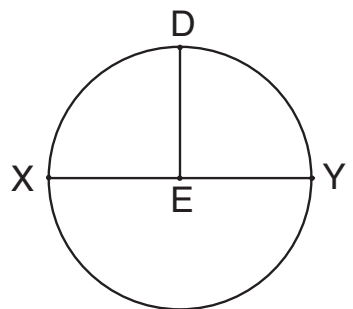
R _____
D _____



Radius _____
Diameter _____





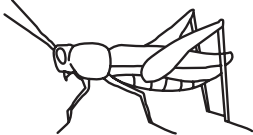
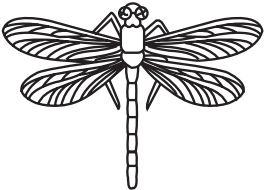
R _____
D _____



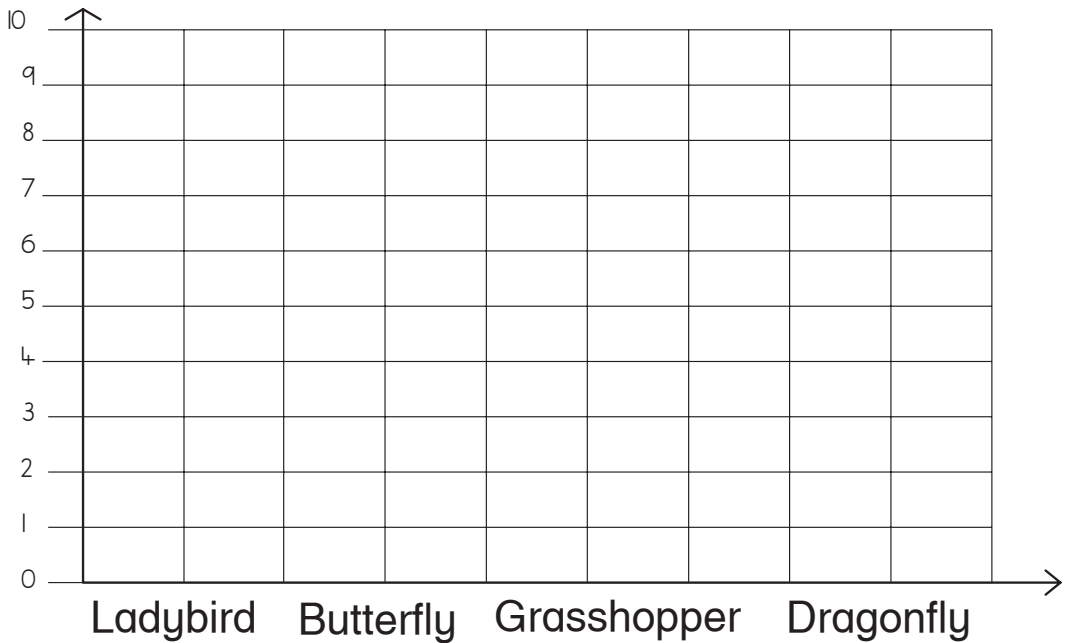
R _____
D _____

Worksheet 18

In the garden there are:

| Ladybird | Butterfly | Grasshopper | Dragonfly |
|---|---|---|--|
|  |  |  |  |
| 7 | 3 | 5 | 9 |

Make a bar graph to show the data for division.



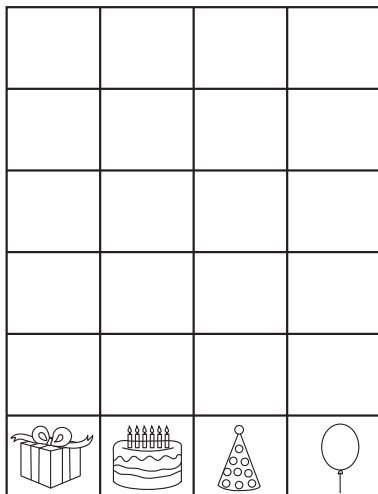
1. How many grasshoppers are there? _____
2. Are there more Ladybirds or dragonflies? _____
3. Which insect is the least in number? _____

Worksheet 19

Count and answer the questions.



Colour the graph to show the count of each picture.



Which is the most?



Which is the fewest?



Which is fewer?

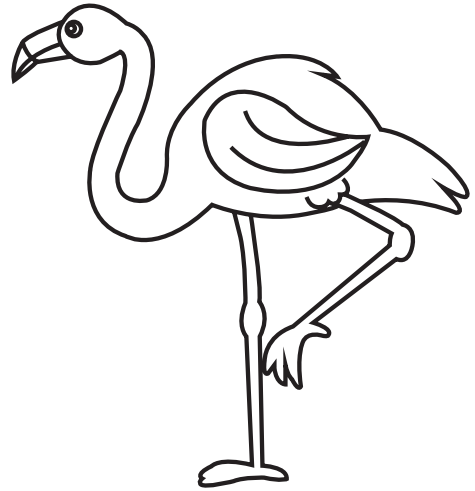


Worksheet 20

Addition

$$\begin{array}{r} 84511 \\ + 29189 \\ \hline \end{array}$$

$$\begin{array}{r} 45955 \\ + 32631 \\ \hline \end{array}$$



$$\begin{array}{r} 23556 \\ + 12302 \\ \hline \end{array}$$

$$\begin{array}{r} 88378 \\ + 42582 \\ \hline \end{array}$$

$$\begin{array}{r} 54546 \\ + 29306 \\ \hline \end{array}$$

$$\begin{array}{r} 89946 \\ + 82637 \\ \hline \end{array}$$





$$\begin{array}{r} 92605 \\ + 92952 \\ \hline \end{array}$$


$$\begin{array}{r} 18035 \\ + 53793 \\ \hline \end{array}$$

$$\begin{array}{r} 35370 \\ + 88459 \\ \hline \end{array}$$

$$\begin{array}{r} 42608 \\ + 59283 \\ \hline \end{array}$$

Worksheet 21

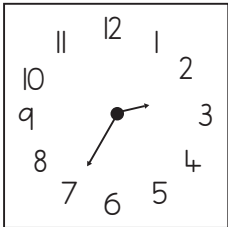
| | |
|------|--|
| Ali |  |
| Sara |  |
| Sana |  |
| Zain |  |

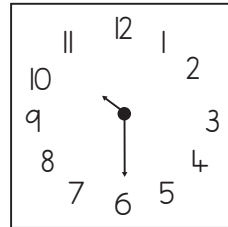
Key
 = 3 gifts

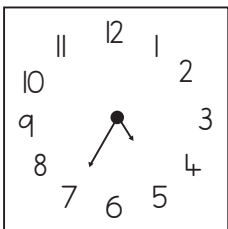
1. Who got the least gifts? _____
2. Who got more gifts, Ali or Zain? _____
3. How many gifts did Ali and Sara get altogether? _____
4. Who got 12 gifts? _____
5. How many more gifts did Sara get than Zain? _____

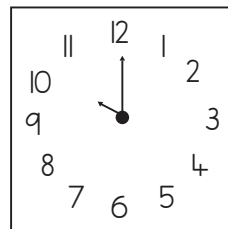
Worksheet 22

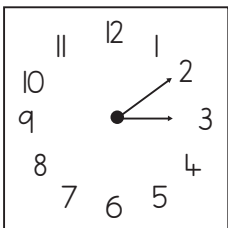
Find the angle formed between the pair of hands in each clock.

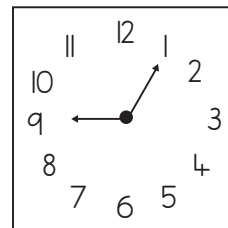






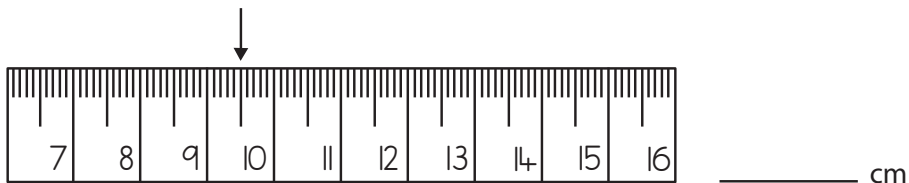
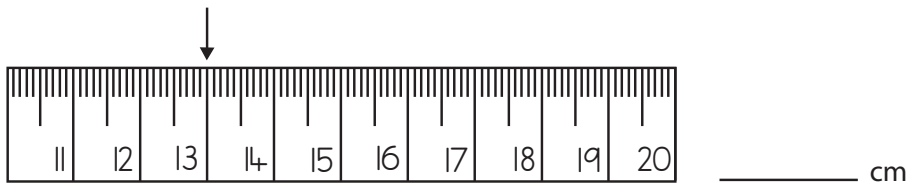
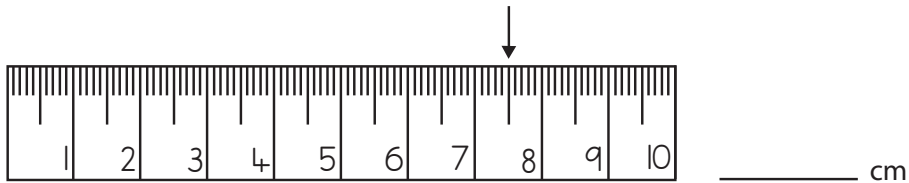






Worksheet 23

Write the reading shown by the arrow on each ruler.



Draw an arrow to show the reading on each ruler.

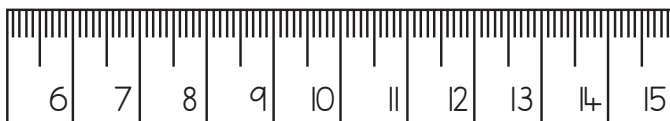
15 cm



$19\frac{1}{2}$ cm



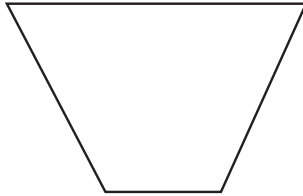
7 cm

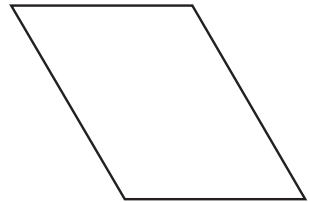


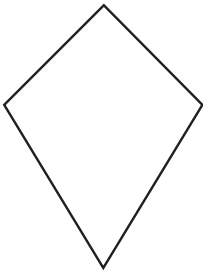
Worksheet 24

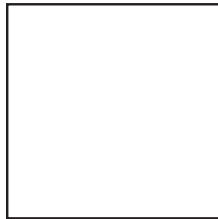
Write the name of each quadrilateral.

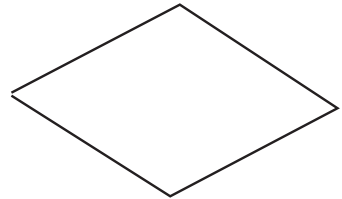






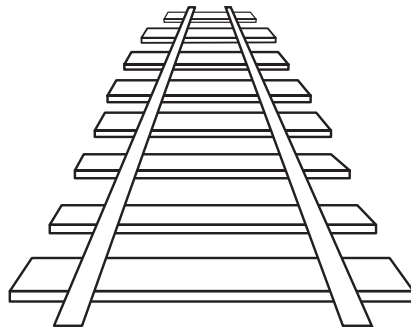
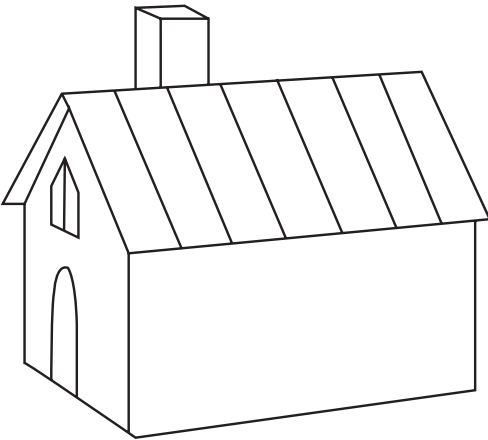
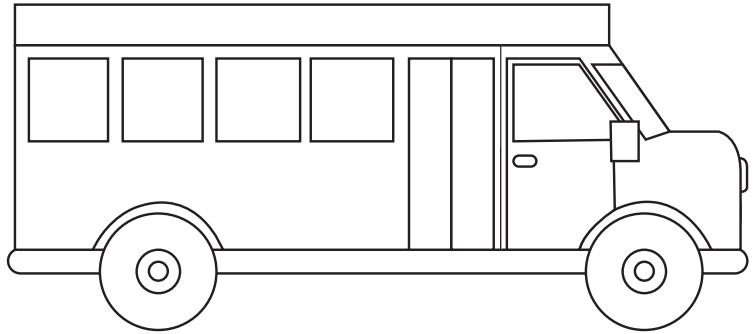
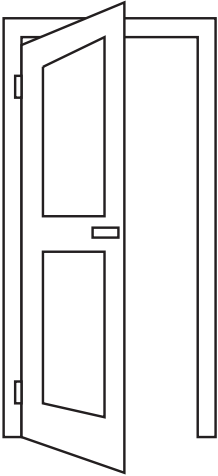






Worksheet 25

Mark the pairs of paralalled lines in the following pictures.



Answers to Book 4

Unit 1: Assess and Review 1

| HTh | TTh | Th | H | T | O | Expanded Form | Number Names |
|-----|-----|----|---|---|---|---------------------------------|--|
| 3 | 7 | 0 | 8 | 9 | 2 | $300000 + 70000 + 800 + 90 + 2$ | three hundred and seventy thousand eight hundred and ninety-five |
| | 3 | 0 | 2 | 1 | 1 | $30,000 + 200 + 10 + 1$ | thirty thousand two hundred and eleven |
| 3 | 0 | 0 | 0 | 4 | 6 | $300000 + 40 + 6$ | – |
| | | | | | | $800000 + 9000 + 10 + 2$ | eight hundred and nine thousand and twelve |
| | 4 | 0 | 1 | 2 | 3 | $40,000 + 100 + 20 + 3$ | – |
| | 2 | 4 | 0 | 0 | 7 | – | twenty-four thousand and seven |
| | | 5 | 9 | 8 | 6 | $5000 + 900 + 80 + 6$ | – |
| | | | | | | $60,000 + 6000 + 400 + 70 + 9$ | six hundred and six thousand, four hundred and seventy-nine |
| | 9 | 0 | 0 | 0 | 9 | – | ninety thousand and nine |
| 7 | 4 | 5 | 8 | 3 | 9 | – | seven hundred forty-five thousand eight hundred and thirty-nine |

Exercise 2

- 650,426; 650,522; 654,502; 655406; 655,506
- 300,390; 303,090; 309,030; 309,903; 330,090
- 77,777; 77,707; 70,777; 70,770; 7770
- 3320; 22,332; 23,232, 23,332; 230,222
- greatest 6D, greatest 5D, smallest 4D, greatest 3D, smallest 3D

Exercise 3

- | | | | |
|------------|---------------|---------------|--------------|
| 1. 19,104 | 2. 1,611 | 3. 4,620 | 4. 111 R = 1 |
| 5. 30,096 | 6. 8,454 | 7. 780, R = 4 | 8. 18,844 |
| 9. 78,040 | 10. 810 R = 2 | 11. 25,699 | 12. 18,716 |
| 13. 11,067 | 14. 167 R = 7 | | |

Exercise 4

- $\frac{4}{6}$
- $\frac{8}{14}$
- $\frac{22}{24}$
- $\frac{2}{39}$
- $\frac{24}{40}$

Exercise 5

- $\frac{5}{5}$ (unit)
- $\frac{9}{13}$ (P)
- $\frac{2}{19}$ (P)
- $\frac{9}{9}$ (unit)
- $\frac{3}{14}$ (P)
- $\frac{47}{56}$ (P)

Exercise 6

- $\frac{6}{7}, \frac{7}{7}$ and $\frac{2}{7}, \frac{3}{7}, \frac{4}{7}$
- $\frac{2}{2}, \frac{3}{3}$

Exercise 7

- 51
- 60
- 200
- 217
- 126

Exercise 8

- length
- straight line
- point
- two
- triangle
- sides/vertices
- square/rhombus
- opposite
- curved
- diameter
- four

Exercise 9

Check that the students mark the correct components of the circle.

Exercise 10

- 1289 km
- Rs 44,506, Rs 44,256
- 1,035Km, 9 p.m.
- 72 m, 360 m
- Rs 90, equal amounts were contributed by the boys and girls
- 1,600 kg
- 1,150 crates each, 20,200 cans
- $\frac{6}{15} = \frac{2}{5}$
- 50 ml, 16 pens, 2 ml left
- 9th June, Monday

Unit 2: Numbers

Exercise 1

- 645,762, 645,000
- $500,000 + 60,000 + 1000 + 90 + 7$
- four hundred and fifty-six thousand, eight hundred and seven
- thousands
- 682,511

Activity

999,999 place value: hundred thousand

Exercise 2

1. 123,453,298 2. 892,046,710 3. 40,097,012 4. 6,337,027

Exercise 3

- two million nine hundred and sixty-six thousand eight hundred and fifty
- three hundred and fifty million, nine hundred and seventy-six thousand, two hundred and twenty-five
- thirty-four million, eight hundred and seventy-three thousand, three hundred
- five million, eight thousand four hundred and fifty

Exercise 4

- 5,67,88,004 (five crore, sixty-seven lac, eighty-eight thousand and four)
- 6,75,43,098 (six crore, seventy-five lac, forty-three thousand and ninety eight)
- 4,67,63,005 (four crore, sixty-seven lac, sixty-three thousand and five)

Exercise 5

1. < 2. > 3. > 4. <

Exercise 6

- 8,014,300; 18,320,200; 81,630,450
- 1,573,694; 2,516,019; 4,532,481
- 9,208,751; 9,240,715; 9,248,517
- 4,035,812; 4,053,612; 4,530,216

Activity

The given activities require students to search for the figures on the internet or in the school library.

Exercise 7

- | | | |
|---------------|---------------|---------------|
| 1. 499,699 | 2. 533,577 | 3. 900,811 |
| 4. 761,911 | 5. 899,962 | 6. 998,959 |
| 7. 1,040,167 | 8. 189,085 | 9. 708,122 |
| 10. 1,108,008 | 11. 1,092,140 | 12. 1,174,053 |
| 13. 925,454 | 14. 3,646,121 | 15. 974,498 |

Exercise 8

- | | | |
|---------------|---------------|--------------|
| 1. Rs 152,000 | 2. 1,108,030 | 3. 1,031,347 |
| 4. 1,572,204 | 5. 1,071,500, | 6. 264,464 |
| 7. 322,200 | 8. 1,585,750 | 9. 513,328 |
| 10. 40,100 | | |

Exercise 9

- | | | |
|-------------|-------------|-------------|
| 1. 521,162 | 2. 696,994 | 3. 35,999 |
| 4. 397,985 | 5. 236,182 | 6. 407,949 |
| 7. 383,495 | 8. 153,434 | 9. 111,113 |
| 10. 135,177 | 11. 912,960 | 12. 530,299 |

Exercise 10

- | | | |
|------------|------------|------------|
| 1. 676,400 | 2. 853,200 | 3. 747,500 |
|------------|------------|------------|

Exercise 11

- | | |
|-----------|------------|
| 1. 64,319 | 2. 727,109 |
|-----------|------------|

Exercise 12

- | | | |
|---------------|------------|------------|
| 1. 127,765 | 2. 470,464 | 3. 120,778 |
| 4. 236,745 | 5. 175,049 | 6. 42,599 |
| 7. 88,690 | 8. 264,319 | 9. 48,834 |
| 10. 4,069,500 | | |

Exercise 13

- | | | |
|---------------|---------------|---------------|
| 1. 27,184,815 | 2. 33,316,650 | 3. 47,574,135 |
| 4. 22,756,000 | 5. 23,909,904 | |

Exercise 14

- | | | |
|-----------------|--------------|---------------------------|
| 1. 15,237,600 | 2. Rs 6500 | 3. 9,424,250 m or 9424 km |
| 4. 276,480 | 5. Rs 28,050 | 6. 127,020 |
| 7. Rs 9,088,625 | 8. 80,000 | 9. Rs 202,080 |
| 10. 4,657,500 | | |

Exercise 15

- | | | | |
|--------------|---------------|---------------|--------------|
| 1. 533 R = 9 | 2. 155 R = 41 | 3. 153, R = 6 | 4. 100 R = 9 |
|--------------|---------------|---------------|--------------|

Exercise 16

- | | | |
|-----------|----------------|------------|
| 2. Rs 494 | 3. 82 km | 4. 65 |
| 5. 1030 | 6. 73, 16 left | 7. 200, 15 |
| 8. Rs 205 | 9. 302 | |

Number Puzzle: a dozen

Unit 3: Factors and multiples

Exercise 1

- | | | | |
|--------|--------|--------|--------|
| 2. NYN | 3. NYN | 4. YYY | 5. YYY |
|--------|--------|--------|--------|

Exercise 2

1. 2,5,10 2. odd 3. remainder 4. 3 5. 10

Exercise 3

Solved table from the book

YNY, NYY, NNN, NYY, NNN, YYY, YNN, YNY

Exercise 4

- 2, 3, 5, 7
- 14 (40, 42, 44, 46, 48, 50, 51, 52, 54, 55, 56, 57, 58, 60)
- 83, 89
- $97 - 2 = 95$
- 101
- 2
- 28
- 2303
- 132
- No, it is divisible by 3

Exercise 5

- | | |
|----------------------|-----------------------|
| a. 3, 5, 1, 15 | b. 1, 20, 2, 10, 4, 5 |
| c. 1, 21, 3, 7 | d. 1, 35, 5, 7 |
| e. 1, 18, 2, 9, 3, 6 | |
- | | |
|---------------------------------|--------------------------|
| a. 1, 5 | b. 1, 12, 3, 4, 2, 6 |
| c. 1, 16, 2, 8, 4 | d. 1, 27, 3, 9 |
| e. 1, 30, 2, 15, 3, 5, 6 | f. 1, 32, 2, 16, 4, 8 |
| g. 1, 36, 2, 18, 9, 4, 6 | h. 1, 40, 2, 10, 8, 5, 4 |
| i. 1, 48, 2, 24, 6, 8, 3, 4, 12 | j. 1, 3, 7, 9, 21, 63 |
- yes 4. no 5. yes

Exercise 6

1. 3, 6, 9, 12, 15 2. 12, 18, 24, 30, 36, 42, 48 3. 196

Exercise 7

- multiples of 4
- multiples of 11
- multiples of 8
- multiples of 9

Exercise 8

1. a. 1, (2), (3), 6, 9, 18
b. 1, (2), (11), 22
c. 1, (2), (3), 4, 6, 9, 12, 18, 36
d. 1, (2), (3), 4, 6, 8, 12, 16, 24, 48
e. 1, (2), (5), 10, 25, 50
2. a. 1, 11 b. 2, 3 c. 2 d. 7, 5 e. 5, 2
3. a. 3, 5 b. 3, 2 c. 2, 3 d. 7 e. 2, 3, 5

Exercise 9

1. a. 3 b. 1, co-prime number
c. 2 d. 2 e. 5
2. a. 8 b. 2 c. 2
d. 1, co-prime number e. 2

Exercise 10

- 1 a. 20 l b. 9 times and 10 times
2. 8 3. 9 cm 4. 6 cm

Exercise 11

1. a. 20 b. 18 c. 36 d. 40 e. 55
2. a. 84 b. 60 c. 48 d. 48 e. 72
3. a. 30 b. 100 c. 72 d. 16 e. 300

Exercise 12

1. 9:00 a.m. 2. 60 3. 180 4. 90 sec

Activity

| Product of Numbers | HCF | LCM | HCF \times LCM |
|--------------------|-----|-----|---------------------|
| 54 | 3 | 18 | $3 \times 18 = 54$ |
| 50 | 5 | 10 | $5 \times 10 = 50$ |
| 24 | 2 | 12 | $2 \times 12 = 24$ |
| 36 | 3 | 12 | $3 \times 12 = 36$ |
| 108 | 3 | 36 | $3 \times 36 = 108$ |
| 168 | 2 | 84 | $2 \times 84 = 168$ |
| 80 | 2 | 40 | $2 \times 40 = 80$ |
| 28 | 1 | 28 | $1 \times 28 = 28$ |
| 48 | 2 | 24 | $2 \times 24 = 48$ |

Unit 4: Fractions

Exercise 1

1. $\frac{1}{4}$ 2. $\frac{5}{16}$ 3. $\frac{3}{8}$ 4. $\frac{3}{8}$ 5. $\frac{3}{4}$

Exercise 2

1. Colour 6 boxes 2. Colour 8 boxes
3. Colour 7 boxes 4. Colour 3 boxes
5. Colour 1 box

Exercise 3

1. unit fractions: $\frac{5}{5}$, $\frac{4}{4}$ proper fractions: $\frac{2}{4}$, $\frac{3}{4}$, $\frac{5}{7}$

improper fractions: $\frac{5}{4}$, $\frac{7}{3}$, $\frac{3}{2}$ mixed fractions: $1\frac{2}{3}$, $5\frac{7}{12}$, $2\frac{1}{2}$,

2. a. $\frac{22}{2}$ b. $\frac{31}{3}$ c. $\frac{41}{2}$ d. $\frac{21}{5}$

- e. $\frac{14}{5}$ f. $\frac{42}{3}$ g. $\frac{33}{4}$ h. $\frac{32}{5}$

- i. $\frac{33}{3}$ j. $\frac{23}{5}$

3. a. $\frac{11}{3}$ b. $\frac{21}{4}$ c. $\frac{16}{3}$ d. $\frac{5}{2}$

- e. $\frac{19}{4}$ f. $\frac{4}{3}$ g. $\frac{17}{4}$ h. $\frac{13}{2}$

- i. $\frac{9}{4}$ j. $\frac{21}{5}$

Exercise 4

1. $\frac{3}{9}$ 2. $\frac{12}{16}$ 3. $\frac{27}{90}$ 4. $\frac{1}{1}$

5. $\frac{1}{2}$ 6. $\frac{3}{5}$ 7. $\frac{4}{5}$ 8. $\frac{10}{15}$

Exercise 5

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

5. $\frac{3}{5}$ 6. $\frac{1}{2}$ 7. $\frac{2}{3}$ 8. $\frac{8}{9}$

9. $\frac{2}{3}$ 10. $\frac{1}{2}$ 11. $\frac{3}{8}$

Exercise 6

- 1, 6, 30, 3, 2, 5
- 24, 4, 9, 24, 18, 60
- 30, 10, 12, 60, 6, 20
- 7, 36, 56, 9, 21, 54
- 16, 6, 24, 18, 6, 3

Activity

Sidra: $\frac{4}{6}$ Nadir: $\frac{2}{3}$

Exercise 7

- $\frac{7}{9} = \frac{63}{81}$, $\frac{4}{6} = \frac{2}{3}$, $\frac{90}{100} = \frac{9}{10}$, $\frac{2}{5} = \frac{10}{25}$, $\frac{6}{8} = \frac{3}{4}$
- Hammad
- a. $\frac{1}{4}$, $\frac{2}{5}$, $\frac{7}{10}$ b. $\frac{2}{7}$, $\frac{8}{14}$, $\frac{3}{4}$
- a. $\frac{5}{6}$, $\frac{2}{3}$, $\frac{5}{9}$ b. $\frac{4}{5}$, $\frac{7}{10}$, $\frac{2}{2}$

Exercise 8

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

Exercise 9

- $\frac{5}{6}$
- $\frac{11}{24}$
- $\frac{5}{18}$
- $\frac{11}{12}$
- $\frac{11}{12}$
- $\frac{19}{24}$
- $\frac{15}{12}$
- 1
- $\frac{111}{28}$
- $\frac{15}{16}$

Exercise 10

- $\frac{3}{5}$
- $\frac{23}{56}$
- $\frac{5}{7}$, $\frac{2}{7}$
- $\frac{6}{10}$
- $\frac{29}{30}$

Exercise 11

1. $\frac{1}{4}$

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

3. $\frac{2}{7}$

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

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

6. $\frac{2}{11}$

7. $\frac{1}{5}$

8. $\frac{5}{12}$

9. $\frac{9}{13}$

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

Exercise 12

1. $\frac{6}{11}$

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

3. $\frac{11}{24}$

4. $\frac{17}{60}$

5. $\frac{2}{20} = \frac{1}{10}$

6. $\frac{5}{18}$

7. $\frac{5}{18}$

8. $\frac{3}{20}$

9. $\frac{1}{6}$

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

Exercise 13

1. 1

2. $\frac{1}{10}$

3. $\frac{23}{60}$

4. $\frac{5}{7}$

6. $\frac{1}{6}$

Exercise 14

1. $\frac{1}{6}$

2. $\frac{7}{24}$

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

4. $\frac{1}{4}$

5. $\frac{5}{12}$

Challenge:

1.

| | | |
|---------------|---------------|---------------|
| $\frac{4}{4}$ | $\frac{3}{8}$ | $\frac{7}{8}$ |
| $\frac{1}{8}$ | $\frac{2}{8}$ | $\frac{3}{8}$ |
| $\frac{3}{8}$ | $\frac{1}{8}$ | $\frac{4}{8}$ |

2.

| | | |
|---------------|---------------|---------------|
| $\frac{1}{2}$ | $\frac{1}{3}$ | $\frac{5}{6}$ |
| $\frac{1}{6}$ | $\frac{1}{6}$ | $\frac{1}{3}$ |
| $\frac{2}{6}$ | $\frac{1}{6}$ | $\frac{3}{6}$ |

Exercise 15

1. $\frac{4}{35}$ (P)

2. $\frac{35}{12}$ (I)

3. $\frac{1}{21}$ (P)

4. $\frac{4}{24}$ (P)

5. $\frac{1}{6}$ (P)

6. $\frac{13}{77}$ (P)

7. $\frac{1}{10}$ (P)

8. $\frac{3}{40}$ (P)

9. $\frac{1}{3}$ (P)

10. $\frac{3}{4}$ (P)

11. $\frac{6}{35}$ (P)

12. $\frac{2}{21}$ (P)

13. $\frac{3}{28}$ (P)

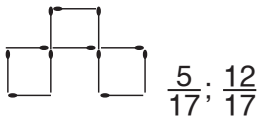
14. $\frac{10}{63}$ (P)

15. $\frac{3}{8}$ (P)

Exercise 16

1. 40, 60 2. 9 3. Rs $\frac{1}{6}$ 4. $\frac{1}{8}$ 5. $\frac{14}{5}$

Activity



Exercise 17

1. $\frac{3}{2}$ 2. 1 3. $\frac{1}{1}$ 4. $\frac{5}{1}$ 5. $\frac{14}{5}$

Exercise 18

1. $\frac{35}{36}$ 2. $\frac{1}{4}$ 3. $\frac{1}{21}$ 4. $\frac{6}{7}$
5. $\frac{5}{6}$ 6. $\frac{33}{4}$ 7. $\frac{12}{13}$ 8. $\frac{1}{6}$ 9. 4

Exercise 19

1. $\frac{8}{9}$ 2. $28\frac{2}{3}$ 3. $1\frac{6}{7}$ 4. $\frac{5}{7}$ 5. $\frac{2}{3}$

Activity

26 branches

Unit 5: Decimal Fractions

Exercise 1

1. $\frac{3}{10}, 0.3$ 2. $\frac{5}{10}, 0.5$ 3. $\frac{8}{10} = 0.8$ 4. $\frac{6}{10}, 0.60$

Exercise 2

1. 0.1 2. 0.4 3. 1.3 4. 5.9

Exercise 3

1. $\frac{2}{10}, 0.2$ cm 2. $\frac{6}{10}, 0.6$ cm 3. $\frac{7}{10}, 0.7$ cm 4. $\frac{3}{10}, 0.3$ cm

Exercise 4

0.3, 0.5, 0.8, 1.2, 1.5

Exercise 5

1. 0.34 2. 0.52 3. 0.79 4. 0.91

Exercise 6

1. 18 boxes shaded, 0.82 unshaded
2. 51 boxes shaded, 0.49 unshaded
3. 7 boxes shaded, 0.93 unshaded
4. 150 boxes shaded, $\frac{50}{200}$ unshaded
5. 217 boxes shaded, $\frac{83}{300}$ unshaded

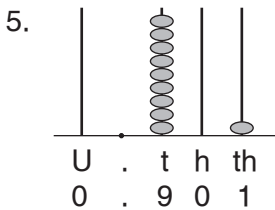
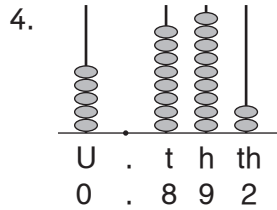
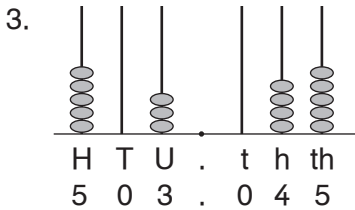
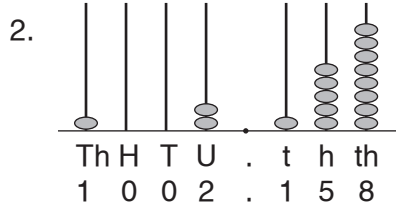
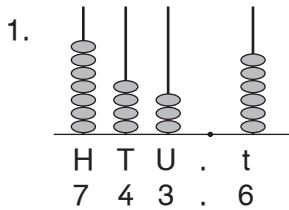
Exercise 7

2. 0.45 3. 1.33 4. 0.07 5. 2.45 6. 0.62

Exercise 8

1. $\frac{15}{100} = \frac{3}{20}$ 2. $\frac{5}{100} = \frac{1}{20}$ 3. $\frac{150}{100} = \frac{3}{2}$ 4. $\frac{2}{100} = \frac{1}{50}$ 5. $\frac{375}{100} = \frac{15}{4}$

Exercise 9



Exercise 10

1. < 2. < 3. < 4. < 5. <

Exercise 11

2. 1.4, 1.5, 1.6, 1.7
3. 8.81, 8.82, 8.83, 8.84, 8.85, 8.86
4. 3.010, 3.011, 3.012, 3.013, 3.014
5. 7.17, 7.18, 7.19
6. 100.09, 100.10, 100.11

Activity

Different solutions are possible.

Exercise 12

1. 0.845 2. 11.547 3. 57.845 4. 167.0225
5. 67.988 6. 654.899

Exercise 13

1. 2.78 2. 919.92 3. 16.778 4. 44.22
5. 51.155 6. 76.001

Exercise 14

1. 2.81 2. 4.269 3. 79.638 4. 12.842

Exercise 15

1. 472.993 2. 21.8 3. 26.544 4. Rs 2.88
5. Rs 113.57 6. 1.803 kg 7. 43.658 8. 3.278 km

Challenge

| | | |
|------|------|------|
| 0.56 | 0.3 | 0.59 |
| 0.76 | 0.84 | 1.60 |
| 1.32 | 1.14 | 2.46 |

| | | |
|------|------|------|
| 4.8 | 2.9 | 7.7 |
| 6.3 | 7.4 | 13.7 |
| 11.1 | 10.3 | 21.4 |

Exercise 16

1. 92.4 2. 1642.69 3. 3.174 4. 1.38 5. 0.294

Exercise 17

- 72.8
- 120.01
- 2.016
- 547.936
- 10.125

Exercise 18

- 348.76
- 193.7
- 0.98
- 345
- 0.1

Exercise 19

- 18.72 m
- Rs 3170
- 1088.36 MB
- Rs 26.04

Exercise 20

- 3.467
- 0.90678
- 0.48623
- 0.0034
- 0.001009

Exercise 21

- 0.4568 g
- 1.245 m
- 0.0235 mg
- 23.5 (Each friend gets 23 chocolates. Kabir keeps 5 chocolates for himself.)
- 0.25 kg

Unit 6: Measurements

Exercise 1

- cm
- m
- km
- m
- m

Exercise 2

- 1.55 m
- 2.5 m
- 13.04 m
- 1209 m
- 3569 m
- 0.034 km
- 5.679 km
- 0.283 km
- 8.006 km
- 29.109 km
- 3.4 cm
- 5.12 cm
- 6.1 cm
- 2372 cm
- 45601 cm
- 230 mm
- 7 mm
- 361 mm
- 128 mm
- 429 mm

Exercise 3

- 1.68 m
- 29.12 m
- 5.16 m
- 247.69 m

Exercise 4

home to city X to city Z to city D

Exercise 5

1. 680000 m, 2770 m, 51500 m
2. 2.77 km
3. 680 km
4. 734.27 km
5. same

Exercise 6

100.84 m

Exercise 7

1 m 62 cm

Exercise 8

1. a. 1.342 kg b. 34.742 kg c. 0.889 kg d. 2.067 kg
e. 67.005 kg
2. a. 5000 g b. 8341 g c. 4091 g d. 56725 g
e. 3005 g
3. a. 9.779 kg b. 1.152 kg c. 12.832 kg d. 0.1 kg
e. 8.024 kg

Exercise 9

1. 39.11 kg
2. 74.018 kg
3. 6.3 kg
4. 0.41 g
5. 42.482 kg
6. 1 kg 500 g + 750 g + 250 g

Exercise 10

1. a. 4900 ml b. 3834 ml c. 7035 ml d. 46400 ml
e. 7482 ml
2. a. 0.49 l b. 2.222 l c. 0.098 l d. 75.806 l
e. 126.004 l
3. a. 25.562 b. 2.456 l c. 8.376 l d. 43.594 l
e. 16.186 l

Exercise 11

1. 2.89 l
2. 446.5 l
3. 571.5 ml

Unit 7: Time

Exercise 1

1. 10:55
2. 4:25
3. 6:00
4. 2:15
5. 7:05
6. 12:40

Exercise 2

1. a. 180 sec b. 265 sec c. 1920 sec d. 402 sec
2. a. 5 min b. 240 min c. 9 min 2 sec d. 225 min
3. a. 9 hr b. 72 hr c. 119 hr d. 1 hr
4. a. 3 days b. 120 days c. 32 days d. 75 days

5. a. 2 months b. 3 months 18 days
c. 41 months d. 84 months
6. a. 3 years b. 7 years c. 1 year 2 months
d. 3 years 9 months

Exercise 3

Students' answers may vary; help them write the correct a.m. or p.m. times.

Exercise 4

1. 19 min 53 sec 2. 3 hr 22 min 3. 10 days 20 hrs
4. 8 min 8 sec 5. 52 hr 27 min 6. 2 days 11 hr
7. 8 week 3 days 8. 4 years 3 months

Exercise 5

1. 6:50 a.m. 2. 3:00 p.m. 3. 10:36 a.m. 4. 7:45 p.m.
5. 2:21 a.m.

Exercise 6

1. 11:20 a.m. in hall 2 2. 3 hr 40 min 3. 1 hr 15 min
4. 2 hrs 50 min 5. 7:40 p.m.

Exercise 7

1. 7:35 a.m. 2. 10 hr 52 min 3. 8:12 a.m.
4. 14 min 21 sec

Unit 8: Geometry

Exercise 1

1. 5.5 cm 2. 5.1 cm 3. 2.6 cm 4. 10.2 cm
5. 7.7 cm 6. 9.0 cm 7. 12.1 cm 8. 7.4 cm
9. 11.8 cm 10. 11 cm

Exercise 2

Help the students with this exercise and check their work.

Exercise 3

1. 9.7 cm 2. 6.3 cm 3. 7 cm 4. 13 cm
5. 9.9 (all approximate measures)

Exercises 4, 5, and 6

Help the students with these exercises and check their work.

Exercise 7

Parallel: 1, 4, 5, 8, 9; intersecting: 2, 3, 6, 7

Exercise 8 and 9

Help the students with these exercises and check their work.

Exercise 10

- | | | | |
|----------------|-------------|-----------|-------------|
| 1. right angle | 2. obtuse | 3. acute | 4. straight |
| 5. acute | 6. complete | 7. obtuse | 8. reflex |
| 9. obtuse | | | |

Exercise 11

- | | | | |
|----------------|---------------|---------------|----------------|
| 1. 55° | 2. 15° | 3. 80° | 4. 102° |
| 5. 146° | 6. 45° | | |

Exercise 12

- | | | | |
|---------------|----------------|----------------|---------------|
| 1. 45° | 2. 122° | 3. 140° | 4. 50° |
| 5. 25° | 6. 152° | | |

Exercise 13

- | | | | |
|-------------|-----------|-----------|-------------|
| 1. a. acute | b. obtuse | c. obtuse | d. right |
| e. acute | f. obtuse | g. obtuse | h. straight |
| i. acute | j. obtuse | | |
2. a. 80° /acute b. 110° /obtuse c. 90° /right
d. 145° /obtuse e. 10° /acute f. 170° /obtuse
3. a. 30° , 60° (acute, acute)
b. 75° , 150° (acute, obtuse)
c. 90° , 180° (right, straight)
4. a. 20° , 80° , 100° (obtuse)
b. 45° , 85° , 130° (obtuse)
c. 110° , 10° , 120° (obtuse)
d. 145° , 15° , 160° (obtuse)

Activity

1. a.



b.



c.



d.

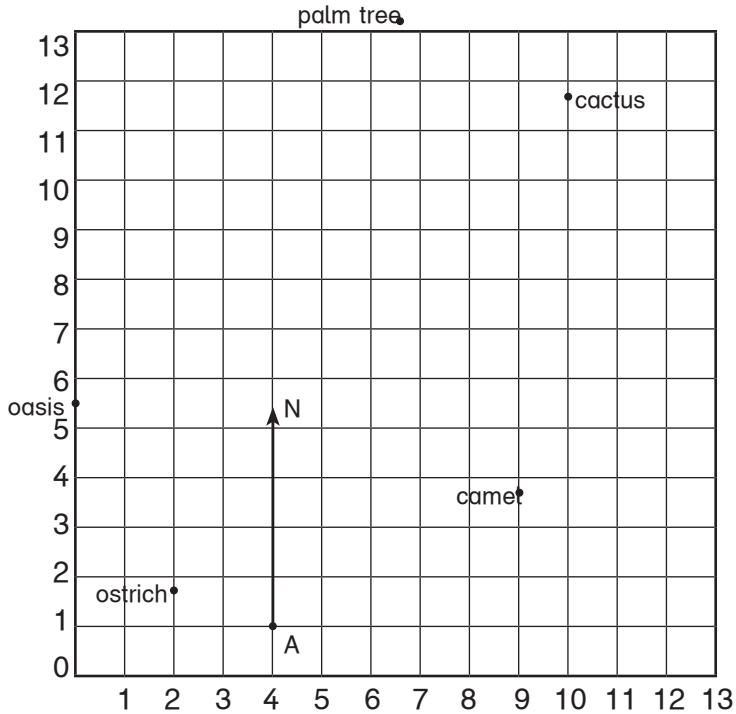


Help the students measure the angles the clock hands make.

2. 3 o'clock and 9 o'clock

3. 6 o'clock

Activity



Exercise 14

1. AE, EC, EB EW, EZ, EY, EX
2. DG CD, XY, AB
3. 1.8 cm 2 cm

Exercise 15

1. radius 2. circumference
3. diameter 4. circumference

Exercise 16

1. Check the circles that students draw.
2. a. 7.9 cm b. 15.3 mm c. 5.2 cm
3. a. 11.6 cm b. 7.4 cm c. 9.8 cm

Exercise 17

Check the students' work.

Unit 9: Information Handling

Exercise 1

1. There are 5 names, therefore 5 bars
2. Fluffy
3. Bobo
4. $5 + 8 + 6 + 2 + 1 = 22$
5. 1
6. 1
7. Roger

Exercise 2

1. a. cricket b. tennis
2. a. 12 b. 14 c. 6
3. hockey
4. 2
5. Favourite Sports of the Maths Class
y-axis: number of students
x-axis: favourite sports

Exercise 3

1. a. 14 b. 19 c. 14
2. a. science b. language
3. mathematics & social studies
4. 68
5. 3

Exercise 4

1. Jan, 20; Feb, 55; Mar, 30; Apr, 45; May, 10; Jun, 25
July, 30; Aug, 75; Sept, 60; Oct, 30
2. a. August b. May
3. July, 10
4. 380
5. 30
6. 15
7. 270

Unit 10: Assess and review 2

Exercise 1

1. 40 million
2. ten thousand
3. 48
4. 2
5. 97

Exercise 2

1. 891 2. 3003 3. 2004 4. 999,999

Exercise 3

1. $63024 + 34871 = 97895$
2. $87967 - 40300 = 47667$

Exercise 4

1. > 2. > 3. <

Exercise 5

1. 8 2. 0

Exercise 6

1. 397.6 2. 0.037875 3. 5.94 4. 4.324
5. 1.445 6. 4.249

Exercise 7

1. forty five point and zero nine six
2. three hundred and forty-four million, eight hundred and ninety-three thousand, nine hundred and eighty
3. zero point zero zero four
4. three hundred million, four thousand and ten

Exercise 8

- 1
- $\frac{3}{2}$
- $\frac{9}{2}$
- $\frac{4}{63}$
- $\frac{2}{7}$
- $3\frac{1}{3}$

Exercise 9

- 6.4
- 600.203
- 2004.07
- 45020.009

Exercise 10

- $\frac{345}{1000}$
- $23\frac{65}{100}$
- $\frac{25}{100}$
- $6\frac{1}{2}$

Exercise 11

19,000

Exercise 12

- 763,566
- 514,383

Exercise 13

79

Exercise 14

60

Exercise 15

19 jugs

Exercise 16

975,430

Exercise 17

- 17,089 ml
- 800 m
- 60 months
- 7.006 km
- 48
- 7
- 704 cm
- 25,050 g
- 0.75
- $\frac{15}{100}$

Exercise 18

$\angle AOD$, $\angle AOB$, $\angle BOC$, $\angle COD$, $\angle AOC$, $\angle BOD$

Exercise 19

- 67°
- 145°
- 35°
- 108°

Exercise 20

Check students' answers.

Exercise 21

1. 9:35 p.m.
2. 12:00 p.m.
3. 12:10 a.m.
4. 4:30 p.m.

Exercise 22

1. 3.059 km
2. 3.721 km

Exercise 23

24 litres

Exercise 24

Check the students' work.

Exercise 25

1. 2
2. 2
3. Tuesday & Saturday
4. cloudy
5. True



Notes
