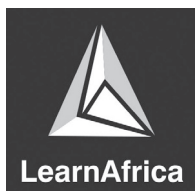# NEW CONCEPT
MATHEMATICS 1
for Junior Secondary Schools

Teacher's Guide

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Contents

Chapter 1 Development of numbers and numerals

Objectives
By the end of this chapter, the students will be able to:

1. explain how counting started;
2. highlight how early men recorded numbers;
3. write numbers in some of the early number system and identify how place-value has developed;
4. state the place values of digits in whole numbers;
5. count, read and write in millions, billions and trillions;
6. apply the counting, reading and writing of large numbers to everyday life; and
7. solve quantitative aptitude reasoning problems involving large numbers.

History of development of numbers (Pages 7–9)
Narrate briefly the story of how counting began with the early man.

Early number systems
You should explain the early number systems used by the Egyptians, the Babylonians, the Romans, the Hindus and the Arabs.

Egyptian number system
You should teach the Egyptian number system in detail. Also explain Examples 1 and 2 following Table 1.1.

Exercise 1.1 (Page 9)
Questions 1–4 should be given as classwork, Questions 5–8 should be written on the board and treated orally, while Questions 9–12 should be given as an assignment.

Roman number system (Page 9)
Explain the seven (7) basic symbols used to form other numbers in the Roman number system.

Solve Example 3 on the board. Then write Example 4 on the board and call the students out one after the other to solve it on the board.

Exercise 1.2 (Page 11)
Questions 1–4 should be given as classwork, Questions 5-8 should be treated orally, and Questions 9–11 given as assignment.

Hindu-Arabic number system (Page 11)

Explain the symbols for digits one to nine in the Hindu-Arabic number system using Table 1.3 and make it clear that it was later that the symbol for zero was developed, which is a dot (•). Briefly explain place value and show the students that it is embedded in the Hindu-Arabic number system.

Example 5 should be solved/treated by the teacher. Example 6 should be written on the board and students called out one after the other by you to attempt it on the board.

Exercise 1.3 (Page 12)

Questions 1–4 should be given as classwork, Questions 5–8 should be treated orally, and Questions 9–12 should be given as an assignment.

Counting boards (Page 12)

Describe a typical counting board and its usage. Example 7 should be clearly illustrated by the use of a counting board.

Project

Allow students to make their personal paper counting boards and use them during the lesson to add and subtract.

Number names in Nigeria (Page 14)

Use Table 1.4 to explain number names in the three major languages in Nigeria (Yoruba, Igbo, and Hausa).

Activity 1.1

Guide the students through this activity. Let them answer the questions orally.

Number code(Page 15)

Explain number codes to the students using Table 1.5. Example 8 and 9 should be used to explain the table.

Exercise 1.4

Question 1(a-f) should be given as classwork. Question 3 should be done in class by asking the students to answer the question one after the other, while Question 2 (a-e) should be given as homework.

Place-value (Page 17)

Explain the terms natural numbers and whole numbers (integers) and differentiate between the two terms. Also explain that the value of each digit in any whole number depends on its position in the number using Example 10

Identifying counting numbers and whole numbers (Page 17)
Explain counting numbers and whole numbers. Use example 11 to further explain while Exercise 1.6 should be done orally , make sure all the students participate in the oral exercise.

Exercise 1.7 (Page 20)
Questions 1 and 2 should be given as classwork.

Identifying the place-value of a digit (Page 21)
Explain how counting is done in millions and billions, use Tables 1.6 and 1.7 to explain to the students.

Activity 1.2
Guide the students to perform this activity.

Exercise 1.8 (Page 23)
Questions 1–3 should be done orally while Questions 4 and 5 should be given as classwork.

Example 12 (Page 24).
This should be done on the board by you.

Counting, reading and writing in trillions
Use Table 1.7 to explain the difference between the American billion and the British billion. Also use the table to differentiate between American trillion and British trillion.

Exercise 1.9 (Page 26)
Questions 1–5 should be given as classwork while the rest should be given as an assignment.

Application of counting, reading and writing large numbers to everyday life situations
Explain the use of counting, reading and writing large numbers in population, budget and stock market. Intensify the teaching of the topic using Examples 16 and 17.

Exercise 1.10
Question 1 should be given as classwork while Question 2 should be given as assignment.

Activity
Divide the whole class into three or four groups and give each group an assignment on counting, reading and writing of numbers of objects, e.g. tiles laid on the wall or floor of a very large room and the celling boards in classrooms. The students should assemble in a class and give written reports.

Exercise 1.11 (Page 28)
Questions 1, 2 and 3 should be done orally, while the rest should be given as classwork.
Example 18 should be treated in the class by you.

Quantitative reasoning   (Page 29)
Explain the samples to the students. Questions 1–4 should be given as classwork while Questions 5–8 should be given as an assignment.

Fraction (1)

Objectives
By the end of this chapter, the students will be able to:
1   explain what a fraction is;
2   identify equivalent fractions of any given fraction;
3   explain what improper fractions and mixed numbers are;
4   convert improper fractions to mixed numbers and vice versa;
5   find equivalents of any given fraction;
6   reduce fractions to their lowest terms; and
7   apply equivalent fractions to everyday life.

Introduction to fractions (Pages 32)
Use Figs 2.1, 2.2 and 2.3 to explain division into two equal parts, i.e., a half. Explain a quarter using Figs 2.4 and 2.5.
Also explain the numerator and the denominator.

Exercise 2.1 (Page 33)
Questions 1–5 (Page 33) should be treated orally in the class. Questions 6 and 7 should be given as classwork, and Questions 8–12 given as an assignment.

Equivalent fractions (Page 34)

Activity 2.1
Guide the students to carry out this activity in the classroom. Then, explain the equivalent fraction through this activity and teach the students how to obtain an equivalent fraction.

Exercise 2.2 (Page 35)
Questions 1–6 should be given as classwork and Example 3 will help in solving them. Questions 7–12 should be given as an assignment.

Puzzle (Page 35)
Use this puzzle to stimulate the students' interest in fractions.

Improper fractions and mixed numbers
Explain improper fractions (i.e., give the definition) and give examples. Also define, explain and give examples of mixed numbers. Explain how to convert improper fractions to mixed fractions and vice

versa using Examples 5 and 6. Also take them through the alternate method.

Exercise 2.3
Example 6 will be of help in solving Questions 1–6, while Example 5 will help in solving Questions 7–12.

Fractions in lowest terms
Explain how to express a fraction in its lowest term or in the simplest form.

Exercise 2.4 (Page 38)
Assist in solving Questions 1–8. Questions 1–5 should be treated in the class while Questions 6–12 should be given as an assignment.

Ordering fractions (Page 38)
Explain and guide students on how to arrange fractions in ascending and descending orders using Examples 8 and 9 (Pages 38 and 39).

Exercise 2.5
Questions 1, 4, 6, 8 and 12 should be treated in the class while the remaining questions should be given as an assignment.

Application of equivalent fractions in sharing commodities (Page 40)
Explain the application of equivalent fractions in sharing commodities such as food, clothes, oil etc. using Examples 10 and 11.

Exercise 2.6 (Page 41)
Questions 1–10 should be solved orally while others should be given as an assignment.

Quantitative reasoning (Page 42)
Explain the samples to the students. Questions 1–5 should be given as classwork while Questions 6–12 should be given as an assignment.

Chapter 3 — Decimals, fractions and percentages

Objectives
By the end of this chapter, the students will be able to:
1. establish the relationship between fractions and decimal fractions;
2. identify the place-values of digits of decimals;
3. convert fractions to decimals and vice versa;
4. explain the term percentages;
5. establish the relationship between fractions, decimals, and percentages;
6. convert decimals to percentages; and
7. perform basic operations on decimals and percentages.

Relationship between fractions and decimals (Pages 45–47)
Explain decimals from fractions using Figs 3.1, 3.2 and 3.3. The teacher should also explain decimal notation, tens, units, tenths, hundredths and thousandths.

Exercise 3.1 (Page 42)
Questions 1–10 may be treated using Example 1 in the (Page 46). Questions 1–5 should be solved on the board by the students, while Questions 6–10 should be given as classwork.
Based on the knowledge the students had gained from Example 2, they should be given Questions 11–22 as an assignment.

Place-values of decimal fractions
Explain place values of decimal fractions using Example 3.

Exercise 3.2 (Page 48)
Questions 1–12 should be given as classwork.

Exercise 3.3 (Page 48)
Questions 1–12 should be given as an assignment.

Converting fractions to decimals (Pages 48 and 49)
Explain how to convert fractions to decimals by:
1. using known facts;
2. making the denominator 10, 100 or 1 000, etc; and
3. dividing the numerator by the denominator.

Also explain the terminating decimals, recurring decimals and repeated pattern of a decimal using Examples 4 and 5 in their Pupil's Book (Page 49).

Exercise 3.4 (Page 50)
Questions 1–5 should be given as classwork while Questions 6–10 should be given as assignment.

Conversion of decimals to fractions (Page 50)
Explain how to convert decimals to fractions by writing the decimals with denominators of 10, 100, 1000 or other powers of 10 using Examples 6, 7 and 8.

Exercise 3.5 (Page 50)
Questions 1–5 should be done on the board by the students with the teacher's guidance, Questions 6–10 should be given as classwork while Questions 10–20 should be given as an assignment.

Percentages (Page 51)
Explain the term percentages using Table 3.1 as an illustration guide.

Activity 3.1
Guide students to carry out this activity.

Conversion of fractions to percentages (Page 52)
Explain the process of converting fractions to percentages by multiplying the fractions by 100 using Example 9.

Example 3.6 (Page 52)
Questions 1–5 should be given as classwork, while Questions 6–10 should be given as an assignment.

Conversion of percentages to fractions (Page 52)
Explain this concept using Example 10 in the textbook.

Exercise 3.7 (Page 52)
Questions 1–5 should be given as classwork while the rest should be given as an assignment.

Conversion of decimals to percentages (Page 53)
Explain this concept using Example 11.

Exercise 3.8 (Page 53)
Questions 1–5 should be given as classwork while Questions 6–10 should be given as an assignment.

Conversion of percentages to decimal (Page 53)
Explain this using Example 12 (Page 53).

Exercise 3.9 (Page 54)

Questions 1–5 should be given as classwork while Questions 6–10 be given as an assignment.

Puzzle (Page 54)

Explain the puzzle and ask students to match each decimal with the appropriate letter.

Problems involving percentages (Page 54)

Explain this using Example 13 (Page 54).

Exercise 3.10 (Pages 54 and 55)

Questions 4–8 should be done orally; Questions 11–15 should be given as classwork while Questions 1, 2, 3, 9 and 10 should be given as assignment.

Quantitative reasoning (Page 55)

Guide the students through the sample. Questions 1–6 should be given as classwork while Questions 7–12 be given as an assignment.

Revision exercise 3 (Page 56)

You should conduct this as a class test

Chapter 4   Factors and multiples

Objectives

By the end of this chapter, the students will be able to:

1.   define and identify prime and composite numbers;
2.   obtain the factors of a given whole number;
3.   express a given whole number as a product of its factors;
4.   find the highest common factor (HCF) of two or more whole numbers;
5.   find the lowest common multiple (LCM) of two or more whole numbers;
6.   identify the difference between LCM and HCF; and
7.   solve problems in quantitative reasoning involving LCM and HCF.

Factors (Page 58)

Define and explain the meaning of factors using suitable examples.

Exercise 4.1

Questions 1–6 (Page 58) should be given as classwork, while Questions 7–16 should be given as an assignment.

Prime numbers and prime factors (Page 59)

Define and explain prime numbers and composite numbers.

Activity 4.1

Guide the students to draw Table 4.1 and follow the steps below it. Also explain the sieve of Eratosthenes. Also explain prime factors by the use of Example 1. Then, explain the index form.

Exercise 4.2 (Page 61)

Questions 1–3 should be solved orally in class. Questions 4–6 should be treated in the class while Questions 7–10 given as an assignment.

Highest common factor (HCF) (Page 61)

Activity 4.2

Guide the students to carry out the task in this activity to arrive at Table 4.2. Explain how to obtain or find the HCF of two or more numbers using this table. Then, Examples 3 and 4 should be treated to enhance learning.

Activity 4.3 (Page 62)
Guide students on the use of index notation to obtain the HCF.

Exercise 4.3 (Page 62)
Questions 1–4 should be given as classwork, while Questions 5–16 should be given as an assignment.

Lowest common multiples (LCM) (Pages 62 and 63)

Activity 4.4 (Page 62)
Guide the students to learn how to obtain the multiples of numbers using Table 4.3, thereby getting the LCM. Examples 5, 6 and 7 should be treated or solved in class.

Exercise 4.4 (Page 63)
Questions 1–5 should be given as classwork, while Questions 6–14 should be given as an assignment.

Establishing the difference between LCM and HCF (Page 64)
Guide the students to learn the difference between the LCM and HCF of the same set of numbers. Also guide the students to learn how to represent this in a loop using Examples 8 and 9.

Exercise 4.5 (Page 64)
Questions 1–5 should be given as classwork while the remaining questions should be given as assignment.

Quantitative reasoning (Page 65)
Guide the students through the samples and give them Questions 1–5 as classwork while Revision exercise 4 is given as an assignment.

Chapter 5 Number base system

Objectives
By the end of this chapter, the students should be able to:
1   write numbers in various bases in expanded form;
2   count numbers in groups of twos;
3   convert numbers in base 10 to base 2 and vice versa;
4   convert numbers in other number bases less than ten to binary numbers; and
5   convert numbers in one base to another other than base ten.

Introduction of number bases (Pages 67 and 68)
Explain the concept of number bases and that our usual way of counting is done in groups of 10, i.e. base 10 which is a number system that has ten digits: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9. It is also called the **decimal number base.** However, counting can also be done in groups of 2, 3, 4, 5 etc. which is referred to counting in base 2, 3, 4, 5 etc.

Also explain how numbers can be expanded in the powers of their bases using Example 1 (Page 63).

Exercise 5.1 (Page 68)
Questions 1 and 2 to be practised on the board by the students, Questions 3–7 should be given as classwork while Questions 16–20 are given as assignment.

Counting in groups of two (Page 69)
Explain the binary number system, which is the process of counting in groups of two; show the students the place values of the digits in binary numbers; and how binary numbers can be written in expanded notation.

Activity 5.1
Students should carry out this activity under the supervision of the teacher.

Exercise 5.2 (Page 70)
Questions 1 to be done orally in the class, Questions 2(a)–(e) to be given as classwork while the remaining questions should be given as assignment.

Conversion of numbers in base 10 to base 2 (Page 70)
Explain the process of converting numbers in base 10 to base 2 using Example 2 and Table 5.2 (Page 71).

Exercise 5.3 (Page 71)
Questions 1–5 should be given as classwork while Questions 16–20 be given as an assignment.

Alternate method (Pages 71 and 72)
Using Example 3, the teacher should explain the alternative method of converting numbers in base 10 to base 2 which is a repeated division method.

Exercise 5.4 (Page 73)
Questions (1a), (d), (e), and 2(a)–(e) should be given as classwork while the remaining questions should be given as an assignment.

Conversion of binary numbers to base 10 (Page 73)
Explain the process of converting binary numbers to base 10 using Example 4.

Exercise 5.5 (Pages 73 and 74)
Questions 1(a)–(e), 2(a)–(c) should be given as classwork while Questions 1(g)–(n), 2(d)–(f), 3(a)–(f) and 4 should be given as an assignment.

Conversion of numbers in other bases to base 2 (Pages 74 and 75)
Explain how this is done by first converting the number to base ten and then convert it back to base 2 using Example 5.

Exercise 5.6 (Page 75)
Questions 1(a)–(c), 2(a) and 3(b) should be given as classwork while the remaining questions should be given as an assignment.

Conversion from one base to another base other than base 10 (Pages 75 and 76)
Explain to students that this follows the same steps as that of converting numbers in other bases to base 2 by using Example 6 and 7.

Exercise 5.7 (Page 77)
Questions 1 and 2 should be given as classwork while Questions 3–5 should be given as an assignment.

Revision exercise 5 (Page 78)
These questions could be used as a class test.

Chapter 6 Basic operations on whole numbers and decimals

Objectives

By the end of this chapter, the students will be able to:

1 add and subtract whole numbers;
2 multiply and divide whole numbers;
3 add and subtract decimals;
4 multiply and divide decimals; and
5 apply the rule of BODMAS in solving problems involving mixed operations.

Addition and subtraction of whole numbers (Page 79)

Define the term arithmetic to the students and guide them to the steps taken when adding or subtracting whole numbers using Examples 1–4.

Exercise 6.1 (Page 80)

Example 1 would be useful for Questions 1–10, Example 2 for Questions 11–20, Examples 3 and 4 would be useful for Questions 21–24. Hence, Questions 1–5 and 11–15 should be given as classwork while Questions 6–10, 17–20, 23 and 24 should be given as an assignment.

Multiplication and division (Pages 81–84)

Multiplication

Explain the terms factors, multiples and product and also the relationship between the three terms. Using Examples 5 and 6, the teacher should guide the students through the steps taken when multiplying numbers.

Division

Use Examples 7 and 8 to explain division of numbers.

Exercise 6.2 (Page 84)

Questions 1–3, 13–15 and 22 should be given as classwork while Questions 10–12, 18–20, 24–25 should be given as an assignment.

Addition and subtraction of decimals (Page 85)

Explain that this follows the same process with that of whole numbers but that the decimal points in the decimal numbers should be arranged such that the decimal points line up vertically. Use Examples 9, 10 and 11 to explain this.

Exercise 6.3 (Page 85)
Questions 1, 3, 5 and 12 should be given as classwork while Questions 5, 6, 7, 8, 10, and 14 should be given as an assignment.

Multiplication and division of decimals (Pages 86 and 87)
With the aid of Examples 13 and 14, explain the multiplication of decimals that it is done the same way as that of whole numbers and then place the decimal point after counting the number of decimal places in the question.

Exercise 6.4 (Page 87)
Question 1-10 should be given as classwork while the rest should be give as an assignment.

Multiplication and division using the power of 10 (Page 87)
Explain multiplication and division using the power of 10 by digit movement, i.e. when multiplying by the power of 10, the digits in the number move to the left when the power of 10 increases. But when dividing by the power of 10, the digits in the number move to the right as the power of 10 increases.

Exercise 6.5 (Page 88)
Questions 1, 2, 8, 14 should be given as classwork while Questions 4, 6, 12, 19, 20 should be given as an assignment.

Rule of BODMAS (Page 88)
Discuss what each letter in BODMAS stands for and show the application of BODMAS using Example 15.

Exercise 6.6 (Mental sums)
Questions 1(a)–(f) should be done orally while Questions 2(a)–(e) should be given as classwork and 2(f)–(j) to be given as an assignment.

Quantitative reasoning (Page 89)
Explain the given examples or illustrations very well. Then, give Questions A: 1, 2, 6 and 7; B: 1 an 2; C: 1 and 2; D: 1 and 2 as classwork and the remaining questions should be given as an assignment.

Revision exercise 6 (Page 89)
These questions could be used as a class test.

Chapter 7 — Fractions (2): Basic operations involving fractions

Objectives

By the end of this chapter, students will be able to:

1   add and subtract fractions;
2   multiply and divide fractions;
3   add, subtract, multiply and divide fractions using the rule of BODMAS; and
4   solve simple word problems and quantitative reasoning questions involving basic operations on fractions.

Basic operations on fractions (Pages 91–104)

Addition of fractions with the same denominator (Page 91)

Explain this topic using Examples 1 and 2.

Subtraction of fractions with the same denominator (Page 91)

Explain this using Examples 3 and 4.

Addition and subtraction of fractions with different denominators (Page 92)

Explain how to add or subtract fractions of different denominators using Examples 5, 6, 7, 8 and 9.

Exercise 7.1 (Page 94)

Questions 1, 4, 6, 8 and 12 should be given as classwork, while the remaining questions should be given as an assignment.

Puzzle 1 and 2 (Page 95)

Guide the students to obtain the right values.

Exercise 7.2 (Page 95)

Questions 1, 4, 5, 7 and 11 should be given as classwork, while Questions 2, 3, 6, 8, 9, 10, 12 and 13 should be given as an assignment.

Multiplication of fractions (Page 96)

1)   **Multiplying a fraction by a whole number**
     Explain this topic with an example relating to Activity 7.1

2 Multiplying a fraction by a fraction

Explain this with the use of diagrams and 'of' in mathematics. He should also solve Example 10.

Exercise 7.3 (Page 97)

Questions 1–6 should be given as classwork, while Questions 7–18 be given as an assignment.

Division with fractions (Page 98–99)

Explain this topic using Example 11.

BODMAS (Page 99)

Explain what each letter in BODMAS stands for and show the application of BODMAS using Examples 13 and 14.

Exercise 7.4 (Page 100)

Questions 6, 10, 14 and 17 should be given as classwork and the remaining questions given as an assignment.

Puzzle (Page 101)

Draw the diagram on the board and guide the students to answer the questions that follow it.

Problems involving fractions

Explain this topic using Examples 15 and 16.

Exercise 7.5 (Page 102)

Questions 1, 4, 8, 11 and 15 should be given as classwork, while Questions 2, 3, 5, 6, 7, 9, 10, 12, 13 and 14 should be given as an assignment.

Quantitative reasoning (Page 104)

Explain the given examples or illustrations very well. Then he should give questions 1, 2, 6 and 7 as classwork and the remaining questions as an assignment.

8 **Integers**

Objectives

By the end of this chapter, the students will be able to:

1   define integers;

2   draw and use number lines to illustrate directed numbers;

3   interpret and relate positive and negative integers to everyday activities; and

4   add and subtract positive and negative integers correctly on the number line.

Meaning of integers (Page 107)

Define integers, and explain whole numbers, natural numbers (positive integers), negative integers and how to subtract bigger numbers from smaller ones.

Exercise 8.1   (Page 107)

Questions 1–10 should be solved orally, while Questions 11–20 should be given as an assignment.

The number line (Page 108)

Activity 8.1 (Page 108)

Guide the students to draw number lines. You should then make them know that integers are also called directed numbers.

Exercise 8.2 (Page 108)

Questions 1–5 should be given as classwork, while Questions 6–10 should be given as an assignment.

Everyday application of integers (Page 109)

Activity 8.2 (Page 109)

Supervise this activity (in the classroom) and ask the students the questions that follow in the textbook.

Activity 8.3 (Page 110)

Guide the students to carry out this activity with thermometres.

Exercise 8.3 (Page 110)

Questions 1–5 should be done orally in class, while Questions 6–10 should be given as an assignment.

Addition and subtraction of positive integers (Page 111)

Addition
Use Example 3 to explain the addition of positive integers based on number lines.

Subtraction
Also explain the subtraction of positive integers based on number lines using Example 4.

Exercise 8.4 (Page 111)
Questions 1–5 should be given as classwork, while Questions 6–10 should be given as assignment.

Addition and subtraction of negative integers (Page 112)

Addition
Use number lines to explain the addition of negative integers using Example 5.

Subtraction
Employ Example 6 to explain the subtraction of negative integers based on number lines.

Exercise 8.5 (Page 112)
Questions 1–5 should be given as classwork, while Questions 6–10 should be given as an assignment.

Quantitative reasoning (Page 113)
Question A (1-5) should be given as classwork. Explain the sample or illustrations very well and
Question B (1-4) as an assignment.

Chapter 9 Estimation and approximation

Objectives

By the end of this chapter, the students will be able to:

1   explain the meaning of estimation;
2   estimate length, area, mass and capacity of quantities;
3   explain the meaning of approximation;
4   round off numbers to significant figures and decimal places;
5   approximate answers to addition, subtraction, multiplication and division problems to a specified degree of accuracy; and
6   solve problems on estimation and approximation in everyday activities.

Estimation (Pages 115 and 116)

Define the term estimation, and explain the meaning of estimation using our day-to-day activities. Also explain rounding-off of numbers to *friendly numbers*, and solve Examples 1 and 2.

Exercise 9.1 (Page 115)

This exercise should be solved orally.

Activity 9.1 (Page 115)

Assist the students to carry out this activity.

Exercise 9.2 (Page 116)

This exercise should be given as classwork.

Estimating length, area, mass and capacity (Pages 116–126)

Explain Examples 3, 4 and 5 and give examples of units of measurement.

Exercise 9.3 (Pages 117 and 118)

Questions 1–5 should be given as classwork, while Questions 6–12 should be given as assignment.

Activity 9.2 (Page 119)

Guide the students to work in groups to take mesurements of things around the class with their hand span and foot length using Table 9.2 and 9.3.

Activity 9.3 (Page 121)
Assist the students to carry out this activity using Table 9.4 and 9.5.

Exercise 9.4 (Page 123)
Give this exercise as classwork and get the students to do the correction as appropriate. Then give Exercise 9.5 and Exercise 9.6 as an assignment.

Exercise 9.7 (Page 126)
Treat this exercise orally in class with the students.

Estimation of cost (Pages 126 and 127)
Describe the estimation of cost using Activity 9.7. Give Exercise 9.9 as an assignment.

Exercise 9.9 (Page 127)
Questions 11, 12, 13, 14 should be given as classwork, while Questions 1–10 should be given as an assignment.

Rounding off numbers (Pages 127–129)
Explain this by guiding students to carry out Activity 9.8 using Examples 6, 7, 8 and 9.

Exercise 9.10 (Page 129)
Questions 1 and 2 should be given as classwork, while the remaining questions should be given as an assignment.

Approximation (Pages 130–133)
Define approximation and explain the different forms of approximation such as decimal places, nearest ten, hundred, thousand, tenth, hundredth, thousandth etc.

Approximation processes (Page 130)
Explain the two vital steps needed to consider when approximating numbers by using Examples 10 and 11.

Exercise 9.11 (Page 130)
Questions 1–3 and 11–12 should be given as classwork, while Questions 4, 5 and 13–20 should be given as an assignment.

Approximation involving basic operations (Page 131)
Explain how approximation can be applied to problems involving addition, subtraction, multiplication and division.

Approximating values of addition and subtraction

Explain this using Examples 12 and 13 (Pages 131 and 132).

Approximating values of multiplication and division

Use Examples 14, 15 and 16 to explain this.

Exercise 9.12 (Page 133)

Questions 1(a)–(d), 2(a)–(d), 3(a), (b) and 4(a)–(d) should be given as classwork, while the remaining questions should be given as an assignment.

Everyday activities involving approximation (Page 134)

Explain this by using Examples 17 and 18.

Exercise 9.13 (Page 134)

Questions 1–5 should be given as classwork, while Questions 6-20 should be given as an assignment.

Puzzle (Page 135)

The teacher should solve the puzzle and explain it to the students.

Quantitative reasoning (Pages 135–136)

Explain the given samples and ask students to answer the questions under them.

Revision exercise 9 (Pages 136–137)

Use these questions as a class test.

10 Basic operations involving the binary system

Objectives
By the end of this chapter, the students will be able to:

1. add two or (three) 3-digit binary numbers;
2. subtract a 2-digit or 3-digit binary number from another;
3. multiply two 2-digit binary numbers and
4. divide 3-digit or 4-digit by 2-digit or 3-digit binary numbers.

Basic operations with binary numbers (Page 138)

Addition of binary numbers (Page 138)
Use Tables 10.3 and 10.4 to explain the addition of binary numbers in Example 1.

Subtraction of binary numbers (Page 139)
Explain this step by step using Examples 2, 3 and 4.

Multiplication of binary numbers (Page 140)
Revise the rules of long multiplication in the decimal system, and then explain multiplication of binary numbers using Examples 5 and 6.

Division of binary numbers (Page 140)
Revise the long division method in the decimal system before explaining the two methods on division of binary numbers by the use of Example 7.

Exercise 10.1 (Page 141)
Questions 1, 4, 6, 14, 18 and 25 should be given as classwork, while the remaining questions should be given as an assignment.

Quantitative reasoning (Pages 142 and 143)
Study and explain the given illustrations carefully to the students. Then give them Questions 1, 5, 6 and 10 as classwork, and Questions 2, 3, 4, 7, 8, 9 and 11 as an assignment.

Revision exercise 10 (Pages 143 and 144)
Questions 9, 16, and 17 should be given as class test, while Questions 18–23 should be given as an assignment. The remaining questions should be treated in the class.

Chapter 11   Use of symbols

Objectives
By the end of this chapter, the students will be able to:
1   define and solve problems involving open sentences;
2   distinguish between closed and open mathematical sentences;
3   use letters to represent symbols or shapes in open sentences;
4   solve word problems involving open sentences; and
5   solve quantitative aptitude problems on the use of symbols.

Closed and open sentences (Pages 145–147)
Define and explain an open sentence with illustrations using Example 1 (Page 145).

Exercise 11.1 (Page 146)
Questions A (1–10) should be given as classwork, while Questions B (1–10) should be given as an assignment.

Activity 11.1 (Page 147)
This activity should be treated on the board by the students with the teacher's guidance.

Exercise 11.2 (Page 146)
Questions 1–5 should be given as classwork, while Questions 6–20 should be given as an assignment.

Exercise 11.3 (Page 147)
Questions 1–12 should be given as classwork, while Questions 13–22 should be given as an assignment.

Exercise 11.4 (Page 147)
Questions 1–10 should be given as classwork, while Questions 11–20 should be given as an assignment.

Use of letters to represent symbols (Page 148)
Explain the replacement of symbols in open sentences by letters and solve Example 2.

Exercise 11.5 (Page 148)
Questions 1–10 should be given as classwork, while Questions 11–15 should be given as an assignment.

Word problems involving the use of symbols (Page 149)

Explain this topic using Questions a–e of Example 3 by solving the questions on the board. Also, Questions 16 and 18 of Exercise 11.5 should be treated on the board.

Exercise 11.6 (Page 149)

Questions 1–10 should be given as an assignment.

Exercise 11.7 (Page 150)

Questions 1–5 should be given as classwork, while Questions 6-20 should be given as an assignment.

Quantitative reasoning (Page 151)

Questions 1 and 5 should be solved in the classroom by the teacher and the remaining questions should be given as a classwork.

Revision exercise 11 (Page 152)

Use these questions as a class test.

Objectives

By the end of this chapter, the students will be able to:

1   identify and state the coefficient of algebraic term;
2   perform basic arithmetic operations on algebraic expressions having similar terms;
3   collect like and unlike terms and simplify the resulting expressions;
4   simplify expressions involving brackets; and
5   solve word problems involving algebraic expression.

Exercise 12.1 (Page 153)

Get the students to attempt Questions 1–5 on the board. Then give them Questions 6–10 as classwork and Questions 11–20 as an assignment.

Positive and negative coefficients (Pages 153 and 154)

Explain this topic using Table 12.1.

Exercise 12.2 (Page 154)

Questions 1–5 should be given as classwork, while Questions 6–14 should be given as an assignment.

Basic operations on expressions with similar terms (Page 154)

Explain addition and subtraction of algebraic expressions with similar terms using Examples 1, 2, 3 and 4.

Exercise 12.3 (Page 156)

Questions 1–5 should be given as assignment while Questions 6–10 should be given as an assignment.

Simplifying algebraic expressions by grouping like terms (Page 156)

Explain like and unlike terms by using Example 5 in the textbook.

Multiplication and division of algebraic expressions with similar terms (Pages 156 and 157)

Explain this by using Example 6.

Exercise 12.4 (Page 157)
Questions 1, 8, 14 and 31 should be given as classwork, while Questions 6, 25, 30, 40 should be given as an assignment.

Collection and simplification of algebraic expressions   (Page 157)
Explain collection of like terms in simplifying algebraic expressions using Example 7 (Page 157).

Exercise 12.5 (Page 158)
Questions 1–6 should be given as classwork, while the remaining questions should be given as an assignment.

Simplifying algebraic expressions with brackets (Page 158)
Explain that when opening a bracket, a negative sign in front of the bracket changes the sign of every term inside the bracket, while a positive sign in front of a bracket does not change the sign in front of every term when the bracket is removed.

Simplifying algebraic expressions involving brackets (Page 158)
Explain the rule of BODMAS and removing brackets using Examples 8, 9 and 10.

Exercise 12.6 (Page 160)
Questions 1, 3, 14, and 15 should be given as classwork, while the remaining questions should be given as an assignment.

Word problems on simplification of algebraic expressions
Explain this using Examples 11 and 12 (Pages 160 and 161).

Puzzle (Page 161)
Explain the puzzle and guide students to answer the given questions.

Quantitative reasoning   (Page 161)
Explain the given example and ask students to answer the questions below it.

Revision exercise 12 (Page 162)
Questions 1 and 2 should be treated orally in the class, while Questions 3(a)–(e) should be given aclass-work. The remaining questions be given as an assignment.

Chapter 13 Simple equations

Objectives
By the end of this chapter, the students will be able to:
1. define a simple equation and identify its components;
2. translate word problems into mathematical statements;
3. use mathematical equations to represent word problems;
4. use the balancing method to solve simple equations;
5. solve simple equation problems by collecting like terms; and
6. interpret and solve word problems involving simple equation.

Meaning of an equation (Page 163)
Define simple equation, and explain the difference between equation and an expression before considering balanced equations. Ask the students to give five similar equations using Example 1.

Translation of word problems into mathematical statements (Page 164)
Explain common mathematical signs or terms and try to establish some common skills directly connected to this concept by the use of Examples 2 and 3.

Exercise 13.1 (Page 164)
Questions 1–5 should be done orally in class, Questions 6–10 should be given as classwork, while Questions 11–20 should be given as assignment.

Translating algebraic sentences to words (Page 165)
Explain this using Example 4.

Exercise 13.2 (Page 165)
Questions 1–5 should be done orally in the class. Questions 6–10 should be given as classwork while Questions 11–18 should be given as an assignment.

Solving simple equations (Page 166)

Method of balancing equation (Page 166)
Explain the different methods of solving simple equations which are: method of balancing equation and collecting the like terms method. Explain like and unlike terms and then treat Examples 5, 6 and 7. Also explain how to solve equations with brackets.

Exercise 13.3 (Page 168)

Questions A: 1–5; B: 1, 4 and 12 should be give as classwork, while Questions A: 8–12; B: 9, 14 and 15 should be given as an assignment.

Exercise 13.4 (Page 169)

Questions 1–5 should be given as classwork, while Questions 14–18 should be given as an assignment.

Solution to equations by collecting like terms (Pages 170 and 171)

Explain this using Example 8.

Exercise 13.5 (Page 171)

Questions 1–5 and 11 should be given as classwork, while the remaining questions should be given as an assignment.

Word problems involving simple equations (Page 171)

This could be explained by using Examples 9 and 10.

Exercise 13.6 (Page 172)

Questions 1 and 2 should be given as classwork, while the remaining questions should be given as an assignment.

Quantitative reasoning   (Page 173)

Explain the samples or illustrations to students and give Questions 1-12 as an assignment.

Revision exercise 13   (Pages 173and 174)

Conduct this as a class test.

Chapter 14 Plane shapes

Objectives
By the end of this chapter, the students will be able to:
1   identify lines and angles;
2   identify and draw regular and irregular plane shapes;
3   discover and list the properties of plane shapes;
4   recognise the similarities and differences between various plane shapes; and
5   define a polygon and list the types.

Identifying lines and angles (Page 175)
Explain a point (•) or (×), a line and a line segment using Fig. 14.1.

Parallel lines (Page 175)
Explain this using Fig. 14.3.

Angles (Page 175)
Explain angles and show the students a vertex and the symbols or signs for representing angles. Also discuss and explain the different types of angles (i.e., acute, obtuse and reflex) and show them the mathematical instrument for measuring an angle (i.e., a protractor).

Perpendicular lines (Page 176)
Explain an angle (i.e., when two or more straight lines meet, angles are formed), right angle (i.e., when two lines meet at 90°), and perpendicular lines using Fig. 14.4.

Exercise 14.1 (Page 176)
Questions 1–4 should be given as classwork, while Questions 5–9 should be treated orally.

Identifying plane shapes (Page 176)
Explain the meaning of a plane, plane shapes, as well as regular and irregular shapes using examples and Fig. 14.6.

Rectangle (Page 176)

Activity 14.1
Guide the students to draw and identify the shape drawn in this activity, i.e., a rectangle.

Square (Page 177)

Activity 14.2
Guide the students to perform this activity, observe and identify the shape drawn (i.e., a square) in this activity.

Triangle (Page 177)
Define and explain a triangle and the different types of triangles, i.e., equilateral triangle, isosceles triangle, scalene triangle, acute-angled triangle, obtuse-angled triangle, and right-angled triangle using Figs 14.9–14.12.

Circle (Page 178)

Activity 14.3
Guide the students to carry out this activity and show them the mathematical instruments used to draw a circle (i.e., a pair of compasses).

Exercise 14.2 (Page 178)
Questions 1–7 should be given as classwork, while Questions 8–13 should be given as an assignment.

Properties of plane shapes (Page 179–182)

Properties of a rectangle (Page 179)
Explain these properties.

Activity 14.4

Rectangle
Guide the students to perform this activity and observe diagonals and lines of symmetry with understanding.

Properties of a square (Page 180)
Explain each of these properties.

Activity 14.5

Square
Guide the students to carry out this activity and observe the diagonals and the lines of symmetry with understanding.

Properties of an isosceles triangle (Page 180)
State and explain each of these properties.

Activity 14.6

Isosceles triangle
Guide the students to perform this activity and show them base angles and how to use the protractor to measure an angle.

Properties of an equilateral triangle (Page 181)
State and explain these properties.

Activity 14.7

Equilateral triangle
Guide students to carry out this activity and observe the line of symmetry.

Puzzle
Get a student to attempt Nos 1 and 2 on the board. Then explain Table 14.1 in details and get the students to complete it.

Properties of a parallelogram (Page 181)
State and explain these properties.

Properties of trapezium (Page 181)
State and explain these properties.

Circle (Page 182)

Activity 14.8
Guide the students and label all the parts of a circle, i.e., circumference, arc, radii, semi-circles, diametre, chord, sector and segment.
Guide the students to draw, cut out a circle and fold along many lines of diameter to discover that it has an infinite number of lines of symmetry.

Exercise 14.3 (Page 182)
Question 1 should be treated orally, while Questions 2–10 should be given as an assignment.
Polygon (Page 183)
Define and explain a polygon and, using Table 14.3, show the class the different types of polygons, i.e., regular and irregular polygons. Also give their names, i.e., triangles, quadrilateral, pentagon, etc.

Exercise 14.4 (Page 184)

Treat Questions 1–6 orally, while Questions 7 and 8 should be given as a classwork.

Quantitative reasoning   (Page 184)

Treat all questions oraiiy in clsss.

Revision exercise 14 (Pages 185 and 186)

This should be done as a class test.

15 Perimeters of plane shapes

Objectives

By the end of this chapter, the students will be able to:

1 identify the basic units of length, and convert between different units of length;
2 find the perimeters of regular shapes by measurement and direct calculation;
3 derive the formula for calculating the circumference of a circle;
4 find the perimeters of irregular shapes by measurement; and
5 relate perimeters to real-life situations.

Units of length   (Pages 187)

Explain the basic units of length and the most common units for measuring lengths and distances using Table 15.1.

Explain conversion to different units as in Example 1.

Exercise 15.1 (Page 188)

Question 1 should be treated orally, while Questions 2–9 should be given as classwork i.e., Table 15.2 (Page 188). Questions 10–16 should be given as an assignment.

Perimeter of a plane shape (Page 188)

Define and explain the perimeter.

Activity 15.1

Guide the students to carry out this activity successfully and describe regular and irregular plane shapes.

Perimeters of regular shapes   (Pages 189–192)

Explain how to find the perimeter of a regular shape by:

a) measurement; and
b) using formulae.

By measurement (Page 189)

Square

Briefly describe a square and form one using toothpicks while the students watch and show them how to measure the perimeter.

Rectangle

Explain a rectangle and guide the students to take the measurement of their classroom (i.e. the floor), the cover of *New Concept Mathematics* for JSS 1 and the classroom board. Ask them to find the perimeter of each of these objects.

Exercise 15.2 (Page 190)

These should be given as an assignment.

By using formulae (Page 191)

Give the formulae for finding the perimeter of a square, rectangle/parallelogram and triangle as follows:

Plane shape	Perimeter
Square	$4\,l$
Rectangle/parallelogram	$2(l + b)$
Triangle	$a + b + c$ (Sum of all its sides.)

Solve Examples 2 and 3 for better understanding.

Exercise 15.3 (Page 192)

Questions 1–12 should be given as classwork, while Questions 13–26 should be given as an assignment.

Circumference of a circle (Page 194)

Explain circumference and let the students realise that it is the perimeter of the circle.

Activity 15.2 (Page 194)

Guide the students to perform this activity and should solve Example 4.

Exercise 15.4 (Page 195)

Questions 1–5 should be given as classwork, while Questions 6–26 should be given as an assignment.

Perimeters of irregular plane shapes (Page 196)

Explain how to find the perimeters of irregular shapes by the use of a thread.

Exercise 15.5 (Page 196)

This should be given as a classwork.

Word problems involving perimeters of plane shapes   (Page 197)

Explain this topic using Examples 5 and 6.

Exercise 15.6 (Page 198)

Questions 1–5 should be given as classwork, while Questions 6–10 should be given as an assignment.

Revision exercise 15 (Page 199)

Conduct this as a class test.

Chapter 16 Areas of plane shapes

Objectives
By the end of this chapter, the students will be able to:
1   discover the meaning of arcs, the basic unit of arcs, and convert between different units of area;
2   discover the area of irregular shapes by counting the unit squares;
3   calculate the areas of regular shapes by:
   a)   counting the unit squares;
   b)   direct calculations using formula and
4   relate areas to real-life activities.

Areas of irregular and regular shapes (Pages 201 and 202)
Explain area as the amount of space bounded by the sides of a plane shape, as well as the different units of area i.e., cm^2, m^2, km^2 and hectare.
Also, use Table 16.1 (Page 201) to explain the conversion of some units for the area.

Activity 16.1 (Page 202)
Discuss this orally with the students and then solve Example 1 to explain how to convert from one unit to another.

Exercise 16.1 (Page 202)
Questions 1–5 should be given as classwork, while Questions 6–10 should be given as an assignment.

Areas of irregular shapes (Page 203)

Exercise 16.2 (Page 203)
Questions 1 and 2 should be solved on the board by you to explain the topic. Questions 3–12 should be administered as classwork.

Areas of regular shapes (Page 204)

Exercise 16.3 (Page 204)
This should be given as an assignment.

Areas of regular plane shapes by calculation (Pages 205–206)

Rectangle and square (Page 205)
Activity 16.2
Guide the students to use Fig. 16.4(a) and (b) to answer Questions (a) and (b), and explain that the

area of a rectangle from Fig. 16.4(a) is equal to length × breadth = $l \times b$, and the area of a square from Fig. 16.4(b) is equal to $l \times l$.

Parallelogram (Page 205)

Explain by diagrams, a parallelogram and the distances between its parallel sides.

Activity 16.3 (Page 206)

Guide the students to perform the activity and ask them questions in item (c) in order to explain the area of a parallelogram, i.e.,

Area of parallelogram = base × height = bh

Solve Examples 2, 3 and 4 and show the students how to find the square root of a number from the four-figure tables (through Example 3).

Exercise 16.4 (Pages 207 and 208)

Questions 1–7 should be given as classwork, while Questions 8–18 should be given as an assignment.

Area of a triangle (Page 208)

Derive the area of a triangle from the area of a parallelogram, i.e., from Fig. 16.7.

Area of a triangle = $\frac{1}{2}$ base × height = $\frac{1}{2} bh$

Area of a trapezium (Page 208)

Derive the area of a trapezium from the areas of a rectangle and triangle as in Fig. 16.8(a) and (b).

Area of trapezium = $\frac{1}{2} (a + b) h$ where a and b are the unequal parallel sides of the trapezium.

Show the application of this formula using Examples 5 and 6.

Exercise 16.5 (Page 211)

Questions 1(b), (c), (d), (e), (g), (h) and (k) should be given as classwork, while Questions 2, 3, 4, 5 and 6 should be given as an assignment.

Area of a circle (Page 212)

Guide the students to cut out a circle, the sector of 30° and arrange the sectors to form a figure similar to a parallelogram as in Fig. 16.12(b).

Explain how the opposite sides are half of the circumference of the circle, i.e., the circle is cut into twelve sectors of 30° each, and by the arrangement six (6) sectors, are on the opposite sides, thereby making half of the circumference, i.e.,

Circumference = $2\pi r$

Half of circumference = $\frac{1}{2}$ of $2\pi r$

= πr

Also, explain that the radius of the circle is the height in Fig. 16.12(b).

Area of a parallelogram = base × height = $\pi r \times r$

∴ area of a circle with radius r = πr^2

Examples 7 and 8 should also be explained and treated.

Exercise 16.6 (Page 213)

Question 2 should be given as classwork, while Questions 3–10 should be given as an assignment.

Area of a composite shape (Page 214)

Define and explain a composite shape as in Fig. 16.15. He should also explain how to find the area of composite shapes using Examples 9 and 10.

Exercise 16.7 (Page 216)

Questions 1–4 should be given as classwork, while Questions 5–16 should be given as assignment.

Application to real-life activities (Page 217)

Explain that farmland, estates, the school compound, etc. are measured in hectares. That is, large areas are measured in hectares. He should then explain Example 11.

Exercise 16.8 (Page 218)

Questions 1–4 should be given as classwork, while Questions 5–10 should be given as an assignment.

Quantitative reasoning   (Page 218)

Guide the students through the samples and Questions A (1-6) and B (1-12) in class. Engage the students in solving the questions on the board.

Revision exercise 16 (Page 219)

This exercise should be administered as a class test.

17 **Three-dimensional shapes (Solids)**

Objectives
By the end of this chapter, the students will be able to:
1   identify three-dimensional shapes;
2   discover and list the basic properties of solids; and
3   draw and make the nets of solids.

Identifying three-dimensional shapes (Pages 221 and 222)
Explain three-dimensional shapes with objects in the classroom or at home. Also, make the students understand that three-dimensional solids can be measured in terms of their length, breadth and height, and that they can be regular or irregular (i.e. explain regular and irregular shapes).

Activity 17.1 (Page 222)
Allow the students to classify the objects in Fig. 17.1 in their textbook, into regular and irregular solids as in Table 17.1.

Exercise 17.1 (Page 222)
Questions 1–4 should be treated orally, while Questions 5–8 should be given as an assignment.

Basic properties of solids   (Pages 222–226)

Cubes and cuboids (Page 222)
Show these using appropriate objects and free-hand drawing.

Activity 17.2   (Page 223)
Guide the students to observe this activity and show them the face, surface, edge and the vertex. Explain the properties of cubes and cuboids using Table 17.2.

Cylinder (Page 223)
Show a cylinder using an appropriate object and free-hand drawing before explaining its properties.

Prism (Page 223)
Explain what prisms are with examples of prisms (i.e., cylinders, cubes, cuboids, triangular prism and hexagonal prisms) and their diagrams.
Also explain the facts (properties) of a prism with n-sided ends.

Cones and pyramids (Page 224)

Draw or sketch diagrams of a cone, crayon and a mound of groundnuts.

Activity 17.3 (Page 225)

Guide the students to carry out this activity.

Properties of a cone

Draw a cone and label its parts, i.e., vertex, curved surface and the circular flat face (the base). Also explain and list its properties.

Properties of pyramids

Draw or sketch both rectangular-based and square-based pyramids and show their vertices.
Explain their properties based on the shapes of their bases, number of faces and number of edges.

Frustum (Page 222)

Define, sketch and explain what frustum looks like.

Tetrahedron (Page 226)

Define, sketch and explain properties of a tetrahedron.

Sphere (Page 226)

Define and draw or sketch sphere.

Exercise 17.2 (Page 226)

Questions 1–10 should be treated orally, while Questions 11–40 should be given as an assignment.

Drawing and making the models of solids   (Pages 228–230)

Explain the different methods of drawing and making models (i.e., isometric projection, skeleton view, plan and elevation and net method) using Figs 17.14 to 17.25, and guide the students to make models.

Exercise 17.3 (Page 230)

Questions 1–10 should be given as classwork, while Questions 11–15 should be given as an assignment.

Revision exercise 17   (Pages 232 and 233)

Conduct this exercise as a class test.

18 Volume

Objectives
By the end of this chapter, the students will be able to:

1. identify the basic unit of volume and convert between different units of volume;
2. calculate the volume of cuboids and cubes by counting the unit cubes and by direct calculation;
3. calculate the capacity of containers; and
4. calculate the volume of a right-angled triangular prism.

Units of measuring volume   (Page 234)
Explain the different units of measurement (i.e., m^3, cm^3, mm^3, dm^3, etc.) for volume, and conversion from $1\ m^3$ to cm^3, $1\ cm^3$ to mm^3 and $1\ dm^3$ to cm^3.

Volume of a cuboid and a cube (By counting the unit cubes) (Page 234)
Use Example 1 (Pages 234 and 235) to explain this topic clearly.

Exercise 18.1 (Page 235)
Questions 1, 3 and 6 should be given as a classwork.

Volume of a cuboid and a cube (by calculation) (Page 235)
Explain this topic by using Figs 18.3 and 18.4 to arrive at the formula for volume of a cuboid and a cube, i.e.,

   volume (V) = length × breadth × height,
   base area = length × breadth
∴ volume (V) = base area × height

Activity 18.1   (Page 236)
Guide the students to do this activity, and then explain Examples 2 and 3.

Exercise 18.2 (Page 237)
Questions 1(a), (c) and (f), and 2(a)–(e) should be given as classwork, while Questions 3–14 should be given as an assignment.

Capacity (Page 238)

Define and explain capacity and the standard unit for measuring capacity, i.e., litres. The teacher should show that:

1 litre = 1 000 cm^3

1 ml = 1 cm^3

1 m^3 = 1 000 litres

and solve Examples 4 and 5.

Exercise 18.3 (Page 239)

Questions 1(a), 2(a), 3(a) and 4(a) and 4(b) should be given as classwork, while Questions 5–12 should be given as an assignment.

Volume of a right-angled triangular prism   (Page 240)

Explain the right-angled triangular prism and its volume using Figs 18.7, 18.8 and 18.9, to show that generally:

Volume of a prism = area of end face × height

= area of cross-section × height

Also show the application of this formula using Examples 6 and 7.

Exercise 18.4 (Page 241)

Questions 1, 2, 3, 6 should be given as a classwork, while Questions 4, 5, 7–15 should be given as an assignment.

Quantitative reasoning   (Page 242)

Guide the students through the samples and give Questions 1-10 as classwork.

Revision exercise 18 (Page 243)

Questions 1–6 should be conducted as a class test, while Questions 7–10 should be given as an assignment.

Chapter 19 Construction

Objectives
By the end of this chapter, the students will be able to:
1   identify all the instruments required in construction, and how to use them;
2   construct parallel and perpendicular lines using the ruler, set squares and a pair of compasses;
3   bisect a given line segment; and
4   construct angles 90° and 60°.

Hints for drawing (Construction)   (Page 244)
Explain and emphasise these hints for they are very important.

Mathematical instruments (Pages 244–246)
Explain the difference between sketching and accurate geometrical construction and name the instruments one by one as in Fig. 19.1(a)– (h).

Also, explain the use of the ruler, pair of compasses and dividers, the protractor and setsquares by displaying them for the class to see.

Activity 19.1 (Page 245)
Guide the students to carry out this activity and answer the questions involved.

Exercise 19.1 (Page 246)
Question 1(a)–(e) should be treated orally, while Questions 2–5 should be given as classwork.

Construction of parallel and perpendicular lines (Page 247)

Parallel lines
Explain what parallel lines are, and that they can never meet. Also, explain and guide the students on the two methods by which parallel lines can be constructed, i.e.,
1   Method 1 (using a ruler and a setsquare); and
2   Method 2 (using a ruler and a pair of compasses).

Perpendicular lines (Page 248)
Explain the meaning of perpendicular and show the students perpendicular lines. The students should also be guided on how to construct perpendicular lines by the teacher.

Exercise 19.2   (Page 249)

Questions 2, 3 and 4 should be given as classwork, while Questions 1 and 5 should be given as an assignment.

Bisecting a straight line segment (Page 250)

Explain the meaning of bisection. Also, explain and guide the students on how to construct the midpoint and perpendicular bisector of a line segment.

Perpendicular from a point to a line

Explain and guide the students on how to draw a perpendicular from a point to a line segment.

Exercise 19.3 (Page 251)

Questions 1, and 2 should be given as classwork, while Questions 3, 4, 5 should be given as an assignment.

Construction of angles 90° and 60°   (Page 252)

Construction of angle 90°

Explain and guide the students how to construct an angle 90°.

Construction of angle 60°

Explain and guide the students how to construct an angle 60°.

Revision exercise 19 (Page 253)

Conduct this exercise as a class test.

20 Angles

Objectives
By the end of this chapter, the students will be able to:
1   define an angle, and correctly name any given angle;
2   classify angles by name and type;
3   measure and draw angles using the protractor;
4   identify the properties of angles; and
5   classify triangles according to the sizes of their angles.

Meaning of an angle   (Page 254)
Define and explain the meaning of an angle, vertex and arms of the angle. Also explain how to measure an angle both clockwise and anticlockwise, and name an angle (i.e., using the vertex only and using three letters), as in Figs 20.1–20.3 (Page 254).

Exercise 20.1   (Page 255)
Questions 1–5 should be given as a classwork, while Questions 6–10 should be given as an assignment.

Units of angles and angular measurements on clock face (Page 256)
Explain the unit of an angle (i.e., the degree and its symbol), 1 rotation = 360º, 1 hour = 1º, 1º = 60 minutes = 60º using Figs 20.5 and 20.6. Also explain that angles can be measured in degrees and minutes, and solve Examples 1 and 2.

Exercise 20.2 (Pages 259 and 260)
Questions 1(a), (b), (c), and 2(e), (f) should be given as classwork and the remaining questions as an assignment.

Classification of angles   (Page 260)
Describe and explain the different classes of angles using Fig. 20.7, i.e., acute angle, right angle, obtuse angle, straight line angle, and reflex angle.

Exercise 20.3   (Page 261)
Questions 9–12 should be given as classwork, while the remaining questions should be given as an assignment.

Measuring and drawing angles (Pages 262–264)

Use Figs 20.11 and 20.12 to explain and show how to use the protractor.

Exercise 20.4 (Page 262)

Questions 1, 6, 8, 15 and 17–22 should be given as classwork, and Questions 23–25 given as an assignment.

Drawing angles (Page 264)

Guide the students to construct angle 65° as in Fig. 20.15.

Exercise 20.5 (Page 265)

Questions 1, 3, 8, 12, 14 and 15 should be given as a classwork and the remaining questions given as an assignment.

Properties of angles: Intersecting lines, parallel lines and triangles (Pages 265–274)

Intersecting lines

Utilise Figs 20.20–20.24 to explain vertically opposite angles, angles on a straight line, angles at a point, complementary and supplementary angles. Then solve Example 3.

Exercise 20.6 (Page 267)

Questions 2, 3, 4, 6 and 11 should be given as classwork, and Questions 1, 5, 7, 8, 9, 10 and 12–25 given as an assignment.

Parallel lines

Explain a transversal, corresponding angles, alternate angles and interior angles using Figs 20.29–20.32.

Activity 20.1

Guide the students to perform this activity and explain Examples 4 and 5.

Exercise 20.7 (Page 271)

Questions 1, 5, 10, 17 and 20 should be given as classwork, and the remaining questions given as an assignment.

Triangles

Explain and show the different types of triangles, i.e., acute-angled triangle, right-angled triangle, and the obtuse-angled triangle and that the sum of angles in a triangle is equal to 180°, using Fig. 20.39(a) and (b).

Activity 20.2 (Page 273)

Guide the students to perform this activity.

Activity 20.3 (Page 273)

Guide the students to draw any triangle and explain the exterior angle and interior opposite angles, using Fig. 20.41 and Example 6.

Exercise 20.8 (Pages 274 and 275)

Questions 1, 3, 4, 7 and 8 should be given as classwork, and Questions 2, 5, 6, 9–25 given as an assignment.

Puzzle (Page 275)

Guide the students to try this puzzle.

Quantitative reasoning   (Page 276)

Guide the students through these Questions and solve them orally.

Revision exercise 20 (Page 276)

This should be conducted as a class test.

Chapter	21	**Need for statistics**

Objectives

By the end of this chapter, the students will be able to:

1   define the term statistics;
2   list the purposes of statistics; and
3   state the uses of statistics.

Meaning and purpose of statistics (Page 278)

Meaning of statistics

Explain statistical data (or data), and its singular form i.e. datum should be mentioned. Explain the meaning of statistics, population, sample and analysis.

Purpose of statistics (Page 279)

Explain the purpose of statistics (i.e., educate and inform on the issue being investigated) and the extent of government's need for statistics, using Table 21.1 (Page 279) with the related question.

Exercise 21.1 (Page 280)

Treat this exercise orally using Table 21.2 (Page 280).

Activities 21.1 and 21.2 (Page 280)

Guide the students to carry out these activities.

Exercise 21.2 (Page 280)

This should be given as an assignment.

Reason for collecting data (Page 281)

Explain the need for collecting data and discuss some of the bodies in charge of data collection in Nigeria, such as the National Statistical Bureau, National Population Commission, Ministry of National Planning, Hospitals, Federal Road Safety Corps, Metrological Department, and intelligence units of the Armed Forces.

Collection of data for planning purposes (Page 281)

Use Example 1 and Table 21.3 to explain how statistical data can be used for planning purposes in schools, the spread of an epidemics, etc.

Collection of data for decision making (Page 282)

Utilise Example 2 to explain how the collection of data can be used in decision making.

Collection of data for prediction purposes (Page 282)

Begin by explaining the meaning of prediction, and use Table 21.5 to treat Questions (a)–(d).

Exercise 21.3 (Pages 283–285)

Question 1 should be given as classwork, and Questions 2–5 given as assignment.

Revision exercise 21 (Page 285)

This exercise should be conducted as a class test.

22 **Data collection and presentation**

Objectives
By the end of this chapter, the students will be able to:
1   arrange data collected in order of magnitude;
2   present data using a frequency table; and
3   represent data in form of pictographs, bar charts and pie charts.

Data collection (Page 287)
Emphasise the meaning of data and its usefulness.

Activities 22.1 and 22.2 (Page 287)
Guide the students to perform these activities and answer the questions after presenting the data in tabular form.
Explain the topic further using Examples 1 and 2 (Pages 287 and 288).

Exercise 22.1 (Pages 288–290)
Questions 1–5 should be given as classwork and Questions 6–15 given as an assignment.

Data presentation (Page 290)

Rank order list
Explain to the students how data can be arranged in increasing or decreasing order of magnitude i.e. rank order using Examples 3 and 4 (Pages 290 and 291).

Exercise 22.2   (Page 291)
Question 1 should be given as a classwork, while Questions 2 and 3 given as an assignment.

Frequency distribution table (Pages 291 and 292)
Explain to the students how data can be presented in frequency distribution table and use the table to answer questions.
Also guide the students through Example 5.

Exercise 22.3 (Pages 293 and 294)
Questions 1 and 3 should be given as a classwork, while the remaining questions should be given as an assignment.

Data presentation (graphical representation) (Pages 294–297)

Explain to the students the different ways by which data can be represented graphically. These include pictograph, bar chart, line graph, pie chart.

Pictographs (Page 294)

Use Example 7 to explain pictorial representation which is using symbols to represent data.

Bar chart (Page 295)

By means of Examples 8 and 9, explain the concept of representing data on a bar chart to the students.

Line graph (Page 297)

Explain how data can be represented on a line graph using Example 10 to the students.

Exercise 22.4 (Pages 297–300)

Questions 1 and 2 should be given as classwork, while Questions 3 to 7 given as assignment.

Revision exercise 22 (Pages 300–302)

This should be administered as a class test.

23 Averages

Objectives
By the end of this chapter, the students will be able to:
1. calculate the arithmetic mean;
2. calculate the median; and
3. calculate the mode of a discrete set of data.

Introduction
Explain the meaning of averages with special reference to the most commonly used ones, which are: the arithmetic mean, the median and the mode. These are referred to as measures of central tendency.

Arithmetic mean (Page 303)
Explain the concept of arithmetic mean using the Examples 1, 2 and 3.

Exercise 23.1 (Page 304)
Questions 1 and 2 should be given as classwork, while the rest should be given as an assignment.

Median and mode (Page 304)
Explain the concept of median and mode to the students.

Computing the median
Using Example 3, define the median as the $\frac{1}{2}(n+1)$th observation/data and explain how to obtain the median from a set of raw data.
Also utilise Example 4 to explain how to obtain the median when the number of terms or data is even.

Exercise 23.2 (Page 305)
Questions 1, 6 and 7 should be given as a classwork, while Questions 2–5 and 8–10 should be given as an assignment.

Quantitative reasoning (Page 306)
Treat questions as classwork using the given sample.

Revision exercise 23 (Pages 306 and 307)
This should be conducted as a class test.