NEW CONCEPT

MATHEMATICS

for Senior Secondary Schools

Teacher's Guide

3

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Contents

Chapter 1 Surds

Objectives

At the end of this chapter, students should be able to:

1 differentiate between rational and irrational numbers;
2 apply the rules of addition and subtraction of surds in simplifying surds problems;
3 apply the rules of multiplication and division of surds in simplifying surds problems;
4 explain the concept of conjugate binomial surds in simplifying fractions;
5 apply the concepts of surds to solving problems involving trigonometrical ratios of angles 30º, 45º and 60º; and
6 evaluate expressions involving surds.

Rational and irrational numbers leading to surds (Page 15)

Explain clearly the meanings of rational numbers (Q) and irrational numbers (as decimal that never repeats nor terminates). Then, the teacher should define and explain surds.

Rules of surds (Page 16)

Explain the multiplication, division, addition and subtraction rules with Example 1 (Page 16) and emphasise basic surd form.

Exercise 1.1 (Page 17)

Solve Questions 1(a) and 3(a) to explain both the basic surd form and the single surd form. Then, give Questions 1(c), (d), (g), 2(a), (c), (j), 3(c) and (h) as classwork. The teacher should also explain rationalising the denominator of a surdic fraction using Questions 5(a), (e) and (h).

Give Questions 4 (a), (b), (e) 5 (b), (c), (d), (f), (g), (i) and (j) as assignment.

Addition and subtraction of surds (Page 17)

Explain that only surds in the same basic form can either be added or subtracted and explain by solving Example 2 (page 17).

Exercise 1.2 (Page 17)

Questions 1, 3, 5 and 7 should be given as classwork and the remaining questions should be given as assignment.

Multiplication of surds (Page 18)
Teacher should explain with Example 3.

Exercise 1.3 (Page 18)
Questions 1 – 5 should be given as classwork and Questions 6 – 14 should be given as assignment.

Division of surds (Page 18)
Explain division of surds, using Example 4 (Page 19).

Exercise 1.4 (Page 19)
Questions 1 – 5 should be given as classwork and Questions 6 – 15 should be given as assignment.

Multiplication of surds involving brackets (Page 19)
Explain and make the students understand that the same method of solving algebraic expressions involving brackets is used using Example 5 (Page 19).

Exercise 1.5 (Page 20)
Questions 1 – 5 should be given as classwork. Questions 6 – 15 should be given as assignment.

Conjugates of binomial surds, using the idea of difference of two squares (Page 20)
Explain the meaning of binomial surds and conjugate of a binomial surd from the knowledge of difference of two squares, using Example 6.

Also, the teacher must explain the idea of rationalising the denominators using Example 7 (Page 21).

Exercise 1.6 (Page 21)
Questions 1 – 5 should be given as classwork. Questions 6 – 15 should be given as assignment.

Exercise 1.7 (Page 22)
Questions 1 – 5 should be given as test.

Application of surds in solving triangles (Trigonometric ratios of special angles)
Teacher should revise how to get the values of sin, cos and tan of angles 30º, 45º, and 60º with the use of an equilateral triangle with 2 units on each side and an isosceles right-angled triangle with 1 unit on the equal sides.

Examples 8 and 9 (Page 22) should be treated in the classroom by the teacher.

Exercise 1.8 (Page 24)

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

Evaluation of expressions involving surds (Page 24)

Explain this with Example 12 and give all the questions in Exercise 1.9 (Page 26) as assignment.

Chapter 2 Matrices and determinants

Objectives

At the end of this chapter, students should be able to

1 define, state the order, and write a matrix in notation form;
2 state the different types of matrices;
3 add and subtract matrices;
4 carry out scalar multiplication and multiply two matrices;
5 carry out the transpose of a matrix;
6 calculate the determinant of a matrix;
7 find the inverse of a matrix; and
8 apply matrix method in solving simultaneous linear equations.

Introduction

Explain the meaning of matrices using real–life examples and the arrangement of numbers in rows and columns.

Definition, order and notation (Page 28)

Explain the meaning of rows and columns. The teacher should also include the order of a matrix, column matrix, row matrix and a square matrix in the explanation, using Examples 1 and 3 (Page 29).

Exercise 2.1 (Page 30)

Question 1 should be treated orally in the classroom.
Question 2 should be treated on the board by the students.
Questions 3 – 10 should be given as assignment.

Types of matrices (Page 30)

Explain Table 2.2 (page 31) to the students after taking them through the different types of matrices.

The negative or inverse matrix

Explain the meaning of a negative matrix and show the symbol for it, i.e. A^{-1} is the negative matrix of A.

Exercise 2.2 (Page 31)

This should be done orally in class.

Matrix addition and subtraction (Page 31)

Explain this using Tables 2.3 (Page 32), Examples 3 – 7 (Pages 32 and 34) should also be solved in the classroom.

Exercise 2.3 (Page 33)
Questions 1 and 2 should be given as classwork.
Questions 3 – 10 should be given as assignment.

Matrix multiplication (Page 34)
Explain this using Examples 8 – 10 (Pages 34 and 35).

Scalar multiplication (Page 35)
Explain the meaning of a scalar multiplication to a matrix and study Examples 11–14 in the classroom.

Exercise 2.4 (Page 37)
Questions 1 – 3 should be given as classwork, while Questions 4 – 9 should be given as assignment.

Transpose of a matrix (Page 37)
Explain the transpose of a 2×2 matrix and 3×3 matrix using Examples 15 and 16 (Pages 37 and 38). The teacher should also show the students the symbol for transpose of a matrix i.e. A^T for the transpose of a matrix A.

Exercise 2.5 (Page 38)
Questions 1 – 4 should be given as classwork and Questions 5 – 10 should be given as assignment.

Determinant of a matrix (Page 38)
Teacher should explain this using Example 17.

Exercise 2.6 (Pages 40 and 41)
Questions 1, 2, and 6 should be given as classwork while Questions 7, 8, 9 and 10 should be given as assignment.

Inverse of a matrix (Page 41)
Explain the inverse of a matrix and treat Examples 18, 19 and 20 (pages 42 and 43). The teacher should also show the students symbol for inverse i.e. A^{-1} is the inverse of a matrix A.

Exercise 2.7 (Page 43)
Give Questions 1 – 8 as classwork and the rest as assignment.

Application of matrices to solving simultaneous equations (Crammer's rule) (Page 44)
Explain how to arrange simultaneous equations in matrix form and show how to solve it in this form using Examples 21 and 22 (Pages 44 and 45).

Chapter 3 Logarithms

Objectives

At the end of this chapter, students should be able to:

1 solve exercises involving the laws of indices;
2 state and apply the laws of logarithms in solving problems;
3 solve problems on logarithms of numbers using tables; and
4 calculate the logarithms of numbers.

Relations between indices and logarithms (Page 47)

Explain briefly, the meaning of the base and index or exponent in the symbol x^n and revise the basic laws of indices using Examples 1 and 2 (Page 47 and 48).

Exercise 3.1 a and b (Page 48)

Give Questions 1 – 10 of Exercise 3.1a as classwork and the rest should be given as assignment. Give all questions in Exercise 3.1b as class test.

Theory of logarithms (Page 48)

Explain how logarithms can be expressed in bases other than 10 and the index form and the logarithmic form should also be shown to the students.

The teacher should explain that for every logarithmic equation, there must be a corresponding index equation.

Use examples 3 and 4 to explain further.

Exercise 3.2 (Pages 49 and 50)

Questions 1, 2, 8, 14 and 16 should be given as class work and Questions 3, 4, 6, 10, 13, 19 and 20 should be given as assignment.

Laws of logarithms (Page 50)

Explain the following using Examples 5 – 13 (pages 50 - 53)

1 Product rule
2 Quotient rule
3 Power rule
4 Logarithms to its own base
5 Power of the base
6 Inverse rule

7 Reciprocal law
8 Change of base
9 Logarithm of 1
10 Logarithm of zero

Exercise 3.3 (Page 51)

Questions 1, 2, 7 and 8 should be treated orally in the classroom.
Questions 3, 6, 9, 10 and 21 should be given as classwork.
Questions 4, 5, 11, 12 and 23 should be given as assignment.

Exercise 3.5 and 3.6 (Pages 55 and 56)

Give Exercise 3.5 as classwork and 3.6 as assignment.

Chapter 4 Arithmetics of finance

Objectives

At the end of this chapter, students should be able to;

1 solve problems involving simple interest;
2 calculate compound interest on given loan data;
3 determine the depreciation value of an item; and
4 compute the annuity of a given problem.

Simple interest (Page 57)

Explain the meaning of interest, principal and simple interest and give the formula for calculating simple interest. show the students how to apply the formula using Examples 1 and 2 (Page 57).

Exercise 4.1 (Page 58)

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

Compound interest (Page 58)

Define and explain compound interest and solve Examples 3, 4 and 5 for the students (Pages 58 and 59).

Exercise 4.2 (Pages 59 and 60)

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

Depreciation (Page 60)

Define and explain depreciation and treat Examples 6 - 11 (Pages 60 - 63) with the students.

Exercise 4.3 (Page 64)

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

Annuity (Page 64)

Define, explain and give the formula for calculating an annuity and also treat Examples 12 – 14 (Pages 64 and 65) with the students.

Exercise 4.4 (Page 66)
Questions 1, 4, and 8 should be given as classwork and Questions 2, 3, 5, 6, 7 and 10 should be given as assignment.

Amortisation (Page 66)
Make the students understand that amortization is the amount of principal and interest paid regularly over the course of a loan term, using Examples 15 – 17 (Pages 67 and 68) to explain further.

Exercise 4.5 (Page 66)
Give students Questions 1 – 6 as assignment.

Chapter 5 Linear and quadratic equations

Objectives

At the end of this chapter, students should be able to:

1 solve linear equations, including word problems;
2 solve simultaneous linear equations;
3 solve word problems on linear simultaneous equations;
4 solve word problems on quadratic equations; and
5 solve word problems leading to simultaneous linear and quadratic equations.

Linear equations (Revision) (Page 70)

Define and explain linear equations and revise how to solve it with Examples 1 – 5 (Pages 70 and 71)

Exercise 5.1 (Page 71)

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

Word problems leading to linear equations (Page 71)

Explain the steps involved in solving word problems leading to linear equations and illustrates these with Examples 6 – 8 (Pages 71 and 72).

Exercise 5.2 (Pages 72 and 73)

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

Simultaneous equations (Page 73)

Define and explain simultaneous equations and the different types of simultaneous equations i.e.

i) both linear and
ii) one linear, one quadratic

The teacher should also explain different methods that can be used to solve case i); both linear, with Examples 9 – 12 (Pages 73 – 75).

Exercise 5.3 (Page 75)

Questions 1 – 3 should be given as classwork. Questions 4 – 10 should be given as assignment.

Exercise 5.4 (Page 80)
Questions 1, 2 and 7 should be given as classwork.
Questions 3 – 6 and 8 – 10 should be given as assignment. The rest can be given as test.

Quadratic equations
Define and explain quadratic equations and give the general form of quadratic equations i.e. $ax^2 + bx + c = 0$, $a \neq 0$.

The teacher should explain the four different methods of solving quadratic equations (i.e. factorisation, completing the square, quadratic formula and graphical methods) and how to construct a quadratic equation with given roots using Examples 13 – 19 (Pages 75 – 80).

Simultaneous equations: One linear and one quadratic (Page 81)
Explain how to solve the 3 different forms of this with Examples 20 - 22 (page 81 - 82).

Exercise 5.5 (Page 82)
Questions 2, 5 and 10 should be given as classwork. Questions 3, 4, 6, 7, 8 and 9 should be given as assignment.

Word problems leading to simultaneous and quadratic equations (Page 82)
Explain this using Examples 23 and 24 (Page 82 and 83).

Exercise 5.6 (Page 86)
Questions 1 – 4 should be given as classwork. Questions 5 – 10 should be given as assignment.

Chapter 6 Graphs of trigonometrical ratios

Objectives

At the end of this chapter, students should be able to:

1 sketch and draw graphs of the sine function;

2 sketch and draw graphs of the cosine function;

3 sketch and draw graphs of the tangent function; and

4 sketch and draw further graphs of trigonometrical functions and apply same in the solution of quadratic equations.

Trigonometrical ratios (Page 84)

Briefly define and revise the trigonometrical ratios (i.e, sin θ, cos θ, tan θ, cosec θ, sec θ and cot θ) and summarise the signs and magnitude of the functions between 0° and 360° in the four quadrants of the Cartesian plane. Also explain how to get the trigonometrical ratios when the angle is greater than 360° and the values of negative angles.

Treat Examples 1 – 3 (Pages 85 and 86) with the students.

Exercise 6.1 (Page 86)

Questions 1(c), (d), 2(a), (c), 3 (b), (d), 5(c), (e) and 7(a) (i) should be given as classwork. Questions 6, 7 and 8 should be given as assignment.

Graph of the sine function (Page 87)

Activity 1

Teacher should guide the students on how to prepare the table (i.e Table 6.1) and construct the graph in Fig. 6. 2 (Page 87).

The sine and unity circle (Page 87)

Guide the students to construct a unit circle and use it for Figs 6. 3(a) and 6.3(b). The teacher should also treat Examples 4 – 7 (Pages 87 –90) .

Exercise 6.2 (Page 90)

Questions 1(d), (e), 2(a), (b) and 5 should be given as classwork and Questions 6 – 9 should be given as assignment.

The graph of the cosine function (Page 91)

Explain the difference between the sine and cosine graph.

The cosine graph using the unit circle (Page 91)
Explain and guide the students to use unit circle to sketch cosine graph as in Fig. 6.8. The teacher should also treat Examples 8 – 10 (Pages 92 and 93) with the students.

Exercise 6.3 (Page 94)
Questions 1(b), (d), 2(b), (d) and 3 should be given as classwork while, Questions 4–7 should be given as assignment.

Graph of the tangent function (Page 94)
Explain the tan θ function as a discontinuous function and show where it is not defined. Also explain and guide the students on how to draw the graph using the unit circle. Also, the teacher should solve Example 11 on the board for the students.

Exercise 6.4 (Page 96)
Questions 1(a), (d), 2(a), (d) and 3(c) should be given as classwork. Questions 3 – 5 should be given as assignment.

Trigonometrical graphs (Page 96)
Explain Examples 12 and 13 (Pages 96 and 97) and guide the students to construct the graphs.

Exercise 6.5 (Page 98)
Give all questions as class test, mark and solve the corrections together with the students in class.

Chapter 7 Surface areas and volumes of solid shapes

Objectives

At the end of this chapter, students should be able to:

1 calculate surface areas and volumes of solid shapes (cube, cuboid, cylinder, cone, prism, pyramid and frustum of a cone); and

2 calculate the surface areas and volumes of spheres.

Surface areas and volumes of solid shapes (Revision) (Page 100)

Revise the formulae for cylinder (curved surface area, curved surface area with one end closed and curved surface area with two ends closed), cone (curved surface area and total surface area including the base), prison pyramid and frustum of a cone with the use of Examples 1 – 3 (Pages 102 – 103).

Exercise 7.1 (Page 103)

Questions 1, 4 and 6 should be given as classwork. Questions 2, 3, 5 and 7 - 10 should be given as assignment.

Surface areas and volumes of spheres and hemispheres (Page 104)

Give the formulae for surface areas and volumes of both spheres and hemispheres and solve Examples 4 – 6 (Page 104).

Exercise 7.2 (Pages 104 and 105)

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

Chapter 8 Longitude and latitude

Objectives

At the end of this chapter, students should be able to:

1. describe the shape of the Earth;
2. identify different hemispheres on the axes;
3. differentiate between lines of longitude and lines of latitude;
4. distinguish between great circles and small circles on a spherical surface;
5. locate points on the Earth's surface;
6. calculate the distance between two points on the Earth's surface;
7. calculate the speed travelled from a point of the earth's surface due to the Earth's rotation; and
8. identify the nautical mile and the time variation on the Earth's surface.

The earth as a sphere (Page 106)

Explain and illustrate the shape of the Earth using Figs 8.1 (a) and (b) (page 106).

The North and South poles (Page 106)

Explain the two major axes on the earth, the polar axis and the Earth's rotation.

The East-West axis (Page 107)

Explain this and how it divides the whole globe into two hemispheres (i.e, Northern hemisphere and Southern hemisphere) using a skeletal globe as in Fig. 8.2..

Lines of Longitudes and Latitudes (Page 107)

Explain these and their use on the Earth's surface.

Longitude (Page 107)

Explain lines of longitude, great circles and Greenwich meridian (prime meridian).

Lines of Latitude (Page 108)

Explain this, the equator and the location of points on the Earth's surface using Example 1 and Figs 8.5 and 8.6.

Angles of latitude and longitude (Page 109)
Use Examples 2 and 3 (Pages 110 and 111) to explain angular differences; on the same meridian and on the same latitude.

The teacher should also explain the suitable method to locate points on the earth's surface with Example 4 (Pages 111 and 112).

Exercise 8.1 (Page 112)
Guide the students to carry out Questions 1 and 2 as class activity.
Questions 3, 4(a) and (d) should be given as classwork. Questions 5 – 10 should be given as assignment.

Radius of parallels of latitudes and radius of the Earth's surface (Page 113)
Guide the students to carry out Activity 8.1 to determine the relationship between radius of the parallels of latitude and the radius of the Earth.

Length of an arc of a circle and a curve (Revision) (Page 113)
Revise how to calculate the length of an arc and a curve of a circle using Examples 5 and 6 (Page 114).

Excerise 8.2 (Page 114 and 115)
Questions 1 – 3 should be given as classwork and Questions 4 – 10 should be given as assignment.

Distance between two points on the Earth (Page 115)
Teacher should explain how to find this with the formula for length of an arc.

The distance along the great circle (Page 115)
Teacher should explain this with Examples 7 and 8 (Pages 115 and 116).

Exercise 8.3 (Page 116)
Questions 1 - 3 should be given as classwork and Questions 4 - 10 should be given as assignment.

Distances along parallel of latitude (Page 117)
Explain this and write the formula for r (i.e $r = R \cos \theta$) using Example 9 (Page 117).

Exercise 8.4 (Page 118)
Questions 4 – 6 should be given as classwork. Questions 7 – 10 should be given as assignment.

Shortest distance on the Earth's surface (Page 119)
Guide students through this using Examples 10 and 11 (Page 120 – 122).

Chapter 9 Coordinate geometry of straight lines

Objectives

At the end of this chapter, students should be able to:

1 define the Cartesian coordinate system;

2 plot points on the Cartesian coordinate system; and

3 calculate the mid-point and distance of a line segment with given end-points.

The Cartesian rectangular coordinate (Page 125)

Explain this to the students and use Example 1 to explain how to plot points.

Example 9.1 (Page 126)

Question 1 should be treated orally. Question 3 – 10 should be given as assignment.

Plotting a linear graph (Page 126)

Teacher should explain this with Examples 2 – 5 (Pages 126 – 128).

Exercise 9.2 (Page 128)

Question 1 – 4 should be given as classwork.

Questions 5 – 10 should be given as assignment.

Distance between two points (Page 128)

Explain and give the formula for this i.e

$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ and solve Example 6 (Page 128) with the students.

Exercise 9.3 (Page 129)

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

Mid-point of the line joining two points (Page 129)

Guide students through this using Fig. 9.8 (page 129) and give the formula for it

i.e $(\bar{x}, \bar{y}) = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$

The teacher should then solve Example 7.

Exercise 9.4 (Page 129)

Questions 1 – 3 should be given as classwork. Questions 4 – 10 should be given as assignment.

Practical application of coordinate geometry (Page 130)
Guide students through this using Examples 8 and 9 (Pages 130 and 131)

Exercise 9.5 (Page 131)
Questions 1 – 3 should be given as classwork while and Questions 4 – 10 should be given as assignment.

Chapter 10 Equation of a straight line

Objectives

At the end of this chapter, students should be able to:

1 define and determine the gradient and intercept of a line;
2 determine the equation of a line;
3 find the angle between two intersecting straight lines; and
4 apply linear graphs to real-life situations.

Gradient and intercept (Page 133)

Define the gradient in terms of the ratio of change in y with respect to x and solve Examples 1 and 2 (page 133 and 134).

Angle between two lines (Page 135)

Guide students through this and explain using Examples 3 and 4 (Pages 136 and 137).

Exercise 10.1 (Page 137)

Questions 1 – 5 should be given as classwork. Questions 6 – 20 should be given as assignment.

Determination of the equation of a straight line (Page 138)

Explain how to determine the equation of a straight line using Examples 5 and 6 (page 139).

Exercise 10.2 (Pages 139 and 140)

Questions 1 – 5 should be given as classwork and Questions 6 – 20 should be given as assignment.

One point-gradient form of the equation of a line (Page 140)

Guide the students through Example 7 (page 140) to explain this further.

The equation of a line through two points (Page 141)

Use Fig. 10.10 and Example 8 (Page 41) to explain this.

Exercise 10.3 (Pages 141 and 142)

Questions 1 – 5 should be solved using Example 8.

Exercise 10.4 (Page 145)

Students should revise Examples 9 – 13 to solve this exercise.

Chapter 11 Inequalities

Objectives

At the end of the chapter, students should be able to solve:

1 linear inequalities in one variable;
2 simultaneous linear inequalities;
3 quadratic inequalities;
4 graphical problems of different types of inequalities; and
5 word problems on inequalities.

Linear inequalities (Page 146)

Use Examples 1 – 5 (Page 146 – 148) to explain this to students.

Exercise 11.1 (Page 148)

Questions 1 – 4 should be given as assignment and the rest as class test.

Inequalities in two variables (Page 148)

Guide students through this and explain using Examples 6 – 8 (pages 148 and 149).

Exercise 11.2 (Page 149)

Questions 1 – 4 should be given as classwork. Questions 5 – 8 should be given as assignment.

Quadratic inequalities (Page 150)

Teacher should explain this with Examples 9 – 11.

Exercise 11.3 (Page 151)

Questions 1 and 2 should be given as classwork. Questions 3 – 5 should be given as assignment.

Word problems involving inequalities (Page 151)

Explain this using Examples 12 and 13 (page 151).

Exercise 11.4 (Page 151)

Questions 1 and 2 should be given as classwork. Questions 3 – 6 should be given as assignment.

Chapter 12 Differentiation of algebraic functions

Objectives:

At the end of this chapter, students should be able to:

1 differentiate the concept of derivatives (derived functions);
2 differentiate from the first principle;
3 solve problems involving the standard derivatives of some basic functions;
4 apply the rules of differentiation in solving functions; and
5 apply the concept of differentiation to real life situation.

Concept of derivatives (Page 153)

Guide students through this concept using Tables 12.1 and 12.2 (Page 153).

The gradient of a curve (Page 153)

Explain that the gradient of a curve at a point is equal to the gradient of the tangent at that point. Explain further using Example 1 (Pages 154 and 155).

Exercise 12.1 (Page 155)

Give Questions 1 – 7 as classwork and the rest as assignment.

Differentiation from first principle (Page 155)

Make students understand that the first principle generally referred to as Delta method. Guide them through the use of function notation using Examples 2, 3 and 4 (Pages 156 and 157).

Exercise 12.2 (Page 157)

Give all questions as classwork, go round to students. Solve the corrections together in class. Use Examples 5 and 6 (Pages 157 and 158) to explain further.

Exercise 12.3 (Page 158 and 159)

This exercise should be given as classwork and assignment.

Rules of differentiation (Page 159)

Guide students through all the rules using Example 7 (Pages 159 and 160)

Exercise 12.4 (Pages 160 and 161)

Give Questions 1 – 10 as classwork and 11 – 18 as assignment.
Explain the meaning of Explicit differentiation and guide them through Example 8 (Pages 161 and 162).

Exercise 12.5 (Page 162)

Give Questions 1 – 5 as classwork and the rest as assignment.

Applications of differentiation (Page 162)

Teacher should explain the different applications of differentiation listed below:

1 Rate of change with time.
2 Population density, velocity and density approximation.
3 Maximum, minimum and turning point.
4 Production, cost minimisation and profit maximisation.
5 Guide them through Examples 9 and 10 (pages 163-166)
6 Revenue generation.

Exercise 12.6 (Page 156)

Give this exercise as class test. Mark and solve the corrections with students in class.

Velocity, acceleration and rate of change (Page 166)

The rate of change of velocity with time is known as acceleration. Velocity is the rate of change of distance moved with time. $v = \frac{ds}{dt}$

Guide students through Examples 11 – 23 (Pages 167 – 173).
Give Exercise 12.7 (Pages 170 and 171) as classwork, Exercise 12.8 (Page 173) as assignment and Exercise 12.9 (Pages 173 and 174) as class test.

Chapter 13 Integration of simple algebraic functions

Objectives

At the end of this chapter, students should be able to:

1 recognise integration as the reverse of differentiation;
2 recognise some standard integrals of polynomials and algebraic functions;
3 apply some techniques of integration such as integration by substitution, by parts and by partial fraction; and
4 apply integration to real-life situations.

Introduction

Students should be made to know that integration is the reverse of differentiation. The mathematical symbol of integration is $\int$. It is got from the elongation of the first letter of sum. $\int$ is used for indefinite integral while $\int_a^b$ is used for definite integral.

Exercise 13.1 (Page 175)

This exercise should be given to students to do as class work and assignment.

Integration and evaluation of definite algebraic functions (Page 176)

The basic rules of integration of algebraic functions are as stated below:

a) $\int x^n\,dx = \frac{x^{n+1}}{n+1}c(n \neq -1)$ where c is a constant of integration.

e.g. $\int x^3\,dx = \frac{x^4}{4} + c$

b) $\int ax^n\,dx = a\int x^n\,dx = \frac{ax^{n+1}}{n+1} + c$

c) $\int (ax+b)^n\,dx = \frac{(ax+b)^{n+1}}{a(n+1)} + c$

d) $\int (ax^n + bx^m + cx^p)dx$

$= a\int x^n\,dx + b\int x^m\,dx + c\int x^P\,dx$

$= \frac{ax^{n+1}}{n+1} + \frac{bx^{m+1}}{m+1} + \frac{Cx^{P+1}}{P+1} + K$

Standard integrals (Page 177)

An integral is called an anti-derivative of a given function, e.g. $\frac{d}{dx}\cos x = -\sin x$,

$\therefore \int -\sin x\,dx = \cos x + c$. This shows that any derivative written in reverse gives us an integral. Going by this, we observe that standard derivatives give rise to the basis of the following list of standard integrals. Teacher should explain to students some basic derivatives and the basic integral that go with them.

1 $\frac{d}{dx}(x^n) = nx^{n-1}$

$\therefore \int x^2\,dx = \frac{x^2}{n+1} + c$ where $n \neq -1$

2 $\frac{d}{dx}(ln\ x) = \frac{1}{x}$,

$\therefore \int \frac{1}{x} = (ln\ x) + c$

3 $\frac{d}{dx}(e^{x)} = e^x$,

$\therefore \int e^x = e^x + c$

4 $\frac{d}{dx}(e^{kx}) = ke^{kx}$

$\therefore \int ke^{kx} = \frac{e^{kx}}{k} + c$

5 $\frac{d}{dx}(a^2) = a^2\ ln\ a$

$\therefore \int a^2\,dx = \frac{a^2}{ln\ a} + c$

6 $\frac{d}{dx}(\cos x) = -\sin x$

$\therefore \int \cos x\,dx = \sin x + c$

7 $\frac{d}{dx}(\sin x) = \cos x$

$\therefore \int \cos x\,dx = \sin x + c$

8 $\frac{d}{dx}(\tan x) = \sec^2 x$

$\therefore \int \sec^2 x\,dx = \tan x + c$

9 $\frac{d}{dx}(\sin^{-1} x) = \frac{1}{\sqrt{1-x^2}}$

$\therefore \int \frac{1}{\sqrt{1-x^2}} dx = \sin^{-1} x + c$

10 $\frac{d}{dx}(\cos^{-1} x) = \int \frac{-1}{\sqrt{1-x^2}}$

$\therefore \int \frac{-1}{\sqrt{1-x^2}} dx = \cos^{-1} x + c$

11 $\frac{d}{dx}(\tan^{-1} x) = \frac{1}{1+x^2}$

$\therefore \int \frac{1}{1+x^2} dx = \tan^{-1} x + c$

Guide the students through Example 1 (Page 178) to explain further.

Integrating a sum or difference of functions (Page 178)

Explain to students that the integral of a function consisting of the sum or difference of a number of terms is given by the integral of each term.

Thus, $\int (f(x) + g(x) - h(x))dx$

$\int f(x)dx + \int g(x)dx - \int h(x)dx$

This result can be used generally for any finite number of functions. Study Example 2 in class.

Exercise 13.2 (Page 179)

This can be given to students as classwork and assignment.

Integration of simple trigonometry functions (Page 179)

Guide students through the following standard integrals:

1 $\int \cos x dx = \sin x + c$

2 $\int \sin x dx = -\cos x + c$

3 $\int \sec^2 x dx = \tan x + c$

4 $\int \text{cosec}^2 x dx = \cot x + c$

5 $\int \sec x \tan x dx = \sec x + c$

6 $\int \text{cosec } x \cos x dx = -\text{cosec } x + c$

Use Example 3 (page 180) to explain further.

Exercise 13.3 (Page 181)

This can be given as classwork and assignment.

Definite integrals (Page 182)

Students should be told that definite integrals are those in which the limits are applied. The definite integral from *a* to *b* of $\int(x)$ is given by

$$\int_a^b \int(x)dx = \left[f(x)\right]_a^b$$

$$= \int(b) - \int(a)$$

$$= \int f(x)dx$$

This implies that the value of the integral of $\int(x)$ with respect to x when $x = b$ minus the value of this integral when $x = a$. The terms a and b are called the lower and upper limits of integration respectively. Since their exact values are found, such integrals are called definite integrals.

In definite integrals, the arbitrary constant does not show up in the integral since the limits are already known and applied. Guide them through Example 4 (page 182).

Exercise 13.4 (Page 182)

This exercise from Questions 1–3 can be taken as classwork while Questions 4–7 can be as assignment.

Integration by substitution (Page 182)

These are integrals of the forms

$$lc\int f^1(x)\left[f(x)\right]^n dx \text{ or } k\int \frac{f^1(x)}{\left[f(x)\right]^n}$$

In these forms we can substitute U for $f(x)$ such that $f(x)dx$ is a standard integral.

Solve Example 5 (Pages 183 and 184) with the students.

Integration by trigonometric substitution (Page 184)

Students should note that there are integrals that require some trigonometric substitutions. These include the following:

a) $\sqrt{a^2 - x^2}$ or $\frac{1}{\sqrt{a^2 - x^2}}$

b) $\frac{1}{a^2 + x^2}$

c) Powers of sin x and cos x or combination of both.

If $\sqrt{a^2 - x^2}$ or $\frac{1}{\sqrt{a^2 - x^2}}$ is present in an integral, we can use the substitution

$a \sin \theta = x$

$$\sin \theta = \frac{x}{a}$$

$$\therefore \theta = \sin^{-1}\left(\frac{x}{a}\right)$$

$$\frac{dx}{d\theta} = a\cos\theta$$

$$\therefore dx = a\cos\theta\, d\theta$$

$$a^2 - x^2 = a^2 - a^2\sin^2\theta$$

$$= a^2(1 - \sin^2\theta)$$

$$= a^2\cos^2\theta$$

$$\therefore \sqrt{a^2 - x^2} = \sqrt{a^2\cos^2\theta}$$

$$= a\cos\theta$$

Explain further using Examples 6 – 10 (Pages 184 – 186).

Integration by parts (Page 186)

Students should be made to know when to use integration by parts. Let U and V be functions of x. Product rule in differentiation has it that

$$f'(uv) = U\frac{dv}{dx} + V\frac{du}{dx}$$

$$\therefore \int \frac{d}{dx}(UV)dx = \int U\frac{dv}{dx} + \int V\frac{du}{dx}$$

$$\therefore uv = \int u\,dv + \int v\,du$$

$$\therefore \int v\,du = uv - \int u\,dv$$

Integration by partial fraction (Page 187)

Students should note the following when dealing with integration of this type:

1 The degree of the numerator should be lower than that of the denominator. In cases where it is otherwise, we need to divide the numerator by the denominator by long division and eventually get the factors which will determine the kind of partial fraction that we have.

2 The denominator should be factorised into prime factors to decide the kind of parts or fraction.

3 A linear factor of $ax + b$, gives a partial fraction of the form $\frac{A}{ax+b}$.

4 Factors of the form $(ax^2 + b^2)$ have the partial fractions $\frac{A}{ax+b} + \frac{B}{(ax+b)^2}$.

5 Factors of $(ax + b)^3$ give rise to the partial fractions $\frac{A}{ax+b} + \frac{B}{(ax+b)^2} + \frac{C}{(ax+b)^3}$.

6 A quadratic equation ($ax^2 + bx + c$) gives partial fraction $\frac{Ax + B}{ax^2 + bx + c}$.

The students should be told to learn all these by heart.

Explain further using Examples 14 – 17 (Pages 187 – 189).

Exercise 13.5 (Page 189)

This exercise can be given as classwork and as assignment.

Equation of a curve, given the gradient functions (Page 190)

When the gradient function of a curve $\frac{dy}{dx}$ is given, we can find the equation of the curve. Thus, given $\frac{dy}{dx} = \int(x) \Rightarrow y = \int f(x)dx$, when $\int(x)$ is a known function of x.

Guide them through Examples 18 and 19 (page 190).

Areas under and between curves (Page 190)

Given $y = f(x)$ as the equation of a curve, and we are required to find the area enclosed by the curve, x-axis and the lines $x = a$ and $x = b$. Then, the area bounded by the curve $y = f(x)$, the x-axis and lines $x = a$ and $x = b$ is given by $A = \int_a^b ydx$.

Area between a curve and y-axis (Page 192)

The area bounded by the curve $x = g(y)$, the y–axis and the lines $y = e$ and $y = d$ is given by $A = \int_a^b xdy$.

Area between curves (Page 192)

The area enclosed between two curves $y = \int_1(x)$ and $\int_2(x)$ is given by the shaded area as: $\int_a^b f_1(x)dx - \int_a^b f_1(x)dx$

Guide the students through Examples 22 – 24 (Pages 192 – 194)

The trapezoidal rule (Page 194)

This rule states that area under the curve $= \int_a^b ydx$. Use Example 25 (Pages 194 and 195).

Simpson's rule (Page 195)

This rule simplifies the rigorous steps of the trapezoidal approach in a more convenient form. Study the rule using Example 26 (Page 195).

Exercise 13.6 (Page 196)

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

Chapter 14 Binary operations

Objectives

At the end of this chapter, students should be able to:

1 recall the types of numbers and their notation;
2 define an operand in binary operation;
3 explain with examples what binary operation is;
4 state the properties of binary operations and solve related problems; and
5 apply the properties of binary operations to real life activities.

Types of numbers (Page 198)

Guide students through the types of numbers

1 Natural numbers
2 Integers
3 Rational numbers
4 Irrational numbers
5 Real numbers

Operands in binary operations (Page 198)

Binary stands for two (2). It is an operation that requires two inputs. These inputs are known as operands; which is a number or quantity that has something to it in calculation.
Further explain the meaning and examples of binary operations using Examples 1 – 8 (Pages 200 and 201).

Exercise 14.1 (Page 202)

Give Questions 1 – 10 as classwork and Questions 11 – 20 as assignment.

Properties of binary operations (Page 202)

Guide the students through the various properties of binary operations which include the following:

1 **Commutative property:** A binary operation $*$ is commutative on the A, if $m * n = n * m$.
Addition and multiplication are commutative binary operations, but subtraction and division are not.
$4 + 5 = 9 = 5 + 4$
$4 \times 5 = 20 = 5 \times 4$

2 **Associative property:** A binary operation $*$ is associative on the set A, if for every a, b, and c $\in$ A. Addition and multiplication are associative binary operations but subtraction and division are not.
$(6 + 5) + 7 = 11 + 7 = 18$
$6 \times (5 \times 7) = 6 \times 35 = 210$

3 **Distributive property:** A binary operation $*$ is distributive, if $a * (b \text{ o } c) = (a * b) \text{ o } (a * c)$

4 **Closure property:** An operation $*$ on a non-empty set x has closure property, if $a \in x, b \in x \Rightarrow a * b \in x$. This property of a whole number says that when two numbers are added, the result will also be a whole number.

5 **Identity element:** An element e is an identity element of $x \in X$, if $x * e = x = e * x \; \forall \; x \in X$. There is no identity for subtraction and division operations on R. An identity element of a binary operation is an element that leaves unchanged every element when the operation is applied.

6 **Inverse:** An element a^{-1} is an inverse of the element a, if $a * a^{-1} = a^{-1} * a = e$ (a^{-1} is the inverse of a, and e is the identity element). Guide the students through Examples 9 – 17 (pages 202 – 207).

Exercise 14.2 (Pages 207 – 209)
Give question 1 – 6 as classwork and the rest as assignment

Exercise 14.3 (Pages 209 and 210)
Give all questions in this exercise as class test.

Chapter 15 Functions (Mappings)

Objectives

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

1 explain what is meant by:
   a) functions and describe its notation;
   b) solve problems using the functions notations;
2 explain with examples, what is meant by:
   a) one-to-one functions;
   b) onto function;
   c) many-to-one function;
3 explain and solve problems on simple functions;
4 explain and solve problems on composite functions; and
5 explain and solve problems on inverse of functions.

Functions (Page 211)

Guide the students through and make them understand that a function is a rule that receives an input and produces an output. A function (f) is a rule that maps an input onto just on output.

Notations used for functions (Page 212)

The input (domain), the output (co-domain or range) and the function are usually denoted by letters or symbol. x for input, y for output and f for function.
Guide the students through Examples 1 – 10 (pages 212 – 214)

Exercise 15.1 (Pages 214 – 216)

Give question A – E as classwork and the rest as assignment.

Types of functions (Mapping) (Page 216)

1 **One-to-one:** This is a special function that maps every element of the co-domain to exactly one element of its domain. Use Example 11 (Page 217) to explain further.
2 **Onto:** In an onto mapping, every element in the co-domain will have at least one image in the domain. Use Example 12 (Page 218) to explain.

3 **Many-to-one mapping:** This function maps two or more elements of A to the same elements of set B. This type of function connects two or more elements of the domain set to a single element in the co-domain. Use Example 13 (Pages 218 and 219) to explain further.

4 **Piece wise function:** Sometimes a function uses different rules on different intervals. Use Example 14 (Page 219) to explain further.

5 **Simple function:** This is a function that takes on finitely many values in its range. e.g. $f(x) = x^2$. Guide students through Examples 15 and 16 (page 220).

6 **Composite function:** More than one function can be applied, sometimes, one after the other. The output of one function becomes the input of the next function. Study Examples 17 – 20 (pages 221 and 222) with the students.

7 **Inverse function:** This refers to a function whereby the output becomes the input and the input becomes the output. It is a reverse of a regular function. Use Examples 20 – 22 (Pages 223 and 224) to explain further.

Give Exercises 15.2 (Pages 219 and 220) and 15.3 (Pages 220 and 221) as class work. Give Exercise 15.4 (Page 222) as assignment and give Exercise 15.5 (Page 224) as class test.

Chapter 16 Numbers and numeration

Objectives

At the end of this chapter, students should be able to:

1 revise and solve problems on indices and logarithms;
2 solve problems on fractions, decimals and percentages;
3 solve problems on number bases;
4 solve problems on algebraic processes; and
5 solve problems on sequences and series.

Indices and logarithms (Page 226)

Teacher should remind students of the laws of indices listed below:

1 $x^a \times x^b = x^{a+b}$

2 $x^a \div x^b = x^{a-b}$

3 $x^0 = 1$

4 $x^{-a} = \frac{1}{x^a}$

5 $(x^a)^b = x^{ab}$

Laws of logarithms (Page 227)

1 $\log (MN) = \log M + \log N$

2 $\log \left(\frac{M}{N}\right) = \log M - \log N$

3 $\log (M^p) = P \log M$

Guide students through Examples 1 – 6 (Pages 226 – 228).

Exercise 16.1 (Page 228 and 229)

The exercise can be given to students as classwork and assignment.

Fractions, decimals, percentages and approximations (Page 229)

Use Examples 7 – 11 (Pages 229 – 231) to revise these.

Exercise 16.2 (Page 231)

Some of the questions in this exercise can be done orally by students.

Guide them through Example 12 – 15 (Pages 232 and 233) and solve them together.

Exercise 16.3 (Page 233)

Give Questions 1 – 4 as classwork and Questions 5 – 10 as assignment.

Algebraic processes (Page 233)

Explain to students, simplification of algebra by grouping.

Direct variation (Page 235)

Make students understand that a quantity y varies directly as another quantity x, when the ratio of y to x is constant.

Inverse variation (Page 235)

Students should be made to know that two quantities vary inversely if the product of the two quantities is constant. Explain further using Examples 26 – 30

Joint variation

Explain to students that joint variation involves a relationship that involves three or more variables.

Partial variation

Partial variation is a relationship that is expressed in terms of more than one term and constant. For example, $y = ax + \frac{b}{\sqrt{x}}$ and $s = av + bv^2$ are partial variations.

Exercise 16.4 (Pages 237 and 238)

Part of this exercise can be given as classwork and part as assignment.

Arithmetic progression (A.P) (Page 238)

An A.P is an arrangement of numbers in such a way that the difference between consecutive terms is constant.

Geometric progression (G.P) (Page 239)

This is an arrangement of numbers such that there is a common and constant ratio between any two consecutive terms.

Exercise 16.5 (Page 239 and 240)

Part of this exercise can be given as classwork and the rest assignment.

Chapter 17 Algebraic graphs

Objectives

At the end of this chapter, students should be able to:

1 draw linear graphs and calculate the gradients;
2 solve simultaneous linear equations by graphical method;
3 solve quadratic equations by graphical method; and
4 find the gradients of a quadratic curve at any given point.

Linear graphs (Page 241)

Guide students through Examples 1 – 4 (Pages 241 – 243), study the tables and graphs in the class.

Exercise 17.1 (Page 243)

Give Questions 1 – 6 as classwork and the rest as assignment.

Graphs of simultaneous linear equations (Page 243)

Explain how to solve simultaneous linear equations graphically by first and foremost making students understand the table of values.

Exercise 17.2 (Page 245)

Use examples 5 and 6 (Pages 243 and 244) to solve this. Give Questions 1 – 6 as assignment.

Quadratic graphs (Page 245)

Explain table of values for quadratic graphs and how to draw the graphs using Examples 7 and 8 (pages 245 and 246) as practice.

Graphical solution of simultaneous, quadratic and linear equations (Page 246)

Explain the graphs of one linear and one quadratic equation to students using Example 9 (Page 246).

Exercise 17.3 (Page 247)

Part of this exercise can be taken as classwork and the rest as assignment.

Chapter 18 Plane and solid shapes

Objectives

At the end of this chapter, students should be able to:

1 state properties of plane and solid shapes;
2 calculate areas and volumes of plane and solid shapes; and
3 calculate areas and volumes of compound shapes.

Plane shape: Summary of properties, areas and perimeters (Page 248)
Explain to students properties of plane shapes, their areas and perimeters. Guide them through Examples 1 and 2 (Page 248) as revision.

Exercise 18.1 (Pages 248 and 249)
Part of this exercise should be given to students as classwork and the rest as assignment.

Solid shapes: Summary of properties, surface areas and volumes (Page 249)
Explain to students, properties, surface areas and volumes of solid shapes using Examples 3 – 6 (Pages 249 and 250) to explain further.

Exercise 18.2 (Page 250)
Part of this can be given as classwork and the rest as assignment.

Compound composite shapes (Page 250)
These are shapes with more than one definite shape, examples include carpentry and mechanical tools. Solve Examples 7 and 8 (pages 250 and 251) with the students in class.

Exercise 18.3 (Pages 251 and 252)

Part of this exercise can be given as classwork and the rest as assignment.

Chapter 19 Constructions and geometric theorems

Objectives

At the end of this chapter, students should be able to:

1 construct lines, angles and plane shapes;
2 use the appropriate techniques to construct triangles, given relevant data;
3 define a locus and apply the methods of constructing loci;
4 identify theorems on triangles and polygons; and
5 identify circle theorems.

Construction of lines, angles and plane shapes (Page 253)

Construction could be defined simply as the drawing of lines, angles and figures with a ruler, as well sharpened pencil and a pair of compasses, showing all the construction lines like arcs without shading or painting.

To construct and bisect an angle (Page 254)

An angle is the space between two lines that meet at a point. Teacher should explain to students, the construction of angles such as 60°, 30°, 15°, 90°, 120°, 135° etc.

Construction of a triangle with an included angle (Page 259)

This involves constructing a triangle with two given sides with an angle between the two given sides Guide students through Example 3.

Construction of triangle with the three sides given (Page 259)

This involves constructing a triangle with all the three sides given without any angle.

Construction of the inscribed circle of a triangle (Page 260)

This involves constructing a circle inside a given triangle.

Construction of the circum-circle of a trianglen (Page 260)

This involves constructing a triangle inside a circle.

Polygons (Page 260)

A polygon is a regular plane shape with a given number of sides. Study the different types of polygon and use Example 5 (Page 261) to explain further.

Exercise 19.1 (Page 261)

This exercise can be given as classwork and as assignment.

Loci (Page 261)

Explain this as the path traced by the point under specified conditions.
Guide students through Example 6 (page 262) to explain further

Application of locus (Page 263)

Take students through Examples 7 and 8 (Page 263) to understand the applications of locus

Exercise 19.2 (Page 264)

Part of this exercise can be given as classwork and part as assignment.

Geometric theorems (Page 265)

Study the theorems with the students and explain them with Examples 9 and 10 (Page 267).

Exercise 19.3 (Page 268)

Give this exercise as class test.

Chapter 20 Further mensuration

Objectives

At the end of this chapter, students should be able to:

1 identify and define circular arcs, sectors, chords and segments;

2 calculate surface areas and volumes of spheres, compound and composite shapes; and

3 calculate areas and volumes of irregular shapes.

Circular arcs, sectors, chords and segments (Page 269)

Explain to students, the definitions of arcs, sectors, chords and segments of a circle. Revise all the formulae using Examples 1 – 4 (Pages 269 – 271).

Exercise 20.1 (Pages 271 and 272)

Part of this can be given as classwork and the rest as assignment.

Surface areas and volumes of spheres and hemispheres (Page 272)

Explain the surface area and volume of a sphere in terms of its radius. Hemispheres should be defined as half of a sphere. Explain further using Examples 5 – 7 (Pages 272 and 273).

Exercise 20.2 (Page 273)

This exercise can be given as classwork and as assignment.

Addition and subtraction of areas and volumes (Page 273)

Explain to students, addition and subtraction of areas and volumes from the original shapes using Examples 8-10 (pages 273-275).

Exercise 20.3 (Page 275)

This should be given as classwork and as assignment.

Volumes and surface areas of irregular shapes, involving change of shapes (Page 276)

Explain this using Examples 11 – 14 (Pages 276 and 277) and guide the students through Activity 20.1 (Page 276).

Exercise 20.4 (Page 277 and 278)

This should be given as classwork.

Chapter 21 Statistics and probability

Objectives

At the end of this chapter, students should be able to:

1 engage in statistics data collection and presentation;

2 solve problems involving mode, median, range, standard deviation, for grouped and ungrouped data;

3 explain probability theorems; and

4 add and subtract according to the laws of probability.

Data collection and presentation for grouped and ungrouped data (Page 279)

Explain line graph as a line of points involving the frequencies and scores plotted on the Cartesian coordinate axis using Examples 1 and 2 (Page 279).

The bar chart (Page 280)

Explain bar graph or chart as bars of equal width and proportionate height, showing the frequencies of given data. Explain further using Examples 3 and 4 (pages 280 and 281).

The pie chart (Page 282)

Explain the pie chart as a graph which represents the items of the distribution as a sector of a circle. The sectors are proportional to the frequencies given. Study Example 5 and 6 (Page 282).

The histogram (Page 283)

Explain histogram as a special type of bar graph used to illustrate continuous data. The continuous data is distinguished with class boundaries and class intervals.

Frequency polygon and the cumulative frequency or ogive (Page 284)

Explain the frequency polygon as a graph of class frequencies against class marks and the points joined with straight lines. The frequency polygon is also an example of a line graph. Use Examples 9 and 10 (Page 284 and 285).

Exercise 21.1 (Page 285)

Part of this exercise can be taken as classwork and the rest as assignment.

Mean, mode and median (Page 286)

The mean of a distribution is the sum of the scores in the distribution divided by the numbers of scores. i.e. mean = $\frac{\sum x}{f} = \frac{\sum fx}{\sum f}$

The median score is the middle score after the scores have been re-arranged according to their sizes.

The mode is the score with the highest frequency.

Explain further using Examples 11 – 13 (pages 286 – 288).

Range, mean deviation and standard deviation (Page 288)

The range of a distribution is the difference between the highest and the lowest observations of the distribution.

The mean deviation is the average of the deviation from the mean scores i.e.

$\frac{\sum|x-\bar{x}|}{n}$ and for grouped data: $\frac{\sum f|x-\bar{x}|}{\sum f}$

The standard deviation is given by: $\frac{\sqrt{\sum f\left(x-\bar{x}\right)^2}}{\sum f}$

Solve in class with the students Examples 14 – 18 (Pages 288 – 292).

Exercise 21.2 (Pages 292–293)

Part of this can be given as classwork and the rest as assignment.

Axioms of probability (Page 293)

Probability is the belief that something or an event will occur; the chance that an event will occur from an experiment. Guide students through the axioms of probability and study Examples 19 and 20 (page 293).

Addition and multiplication laws (Page 293)

Mutually exclusive events are two or more events which have no points in common (i.e. they can not occur simultaneously).

Events A and B are mutually exclusive if $A \cap B = \varnothing$.

If A and B are two mutually exclusive events, then the probability that they will both occur is equal to the sum of their individual probabilities.

pr(A or B) = pr(A) + pr(B)

$\text{pr}(A \cup B) = \text{pr}(A) + \text{pr}(B)$
If $A \cap B = \varnothing$
Then, $\text{pr}(A \text{U} B) = \text{pr}(A) + \text{pr}(B)$
Use Examples 21 and 22 (page 294) to explain.

Multiplication law of probability (Page 294)

If two events A and B are independent, then the probability that they will both occur is equal to the product of their individual probabilities.

$\text{pr}(A \text{ and } B) = \text{pr}(A) \times \text{pr}(B)$

i.e. $\text{pr}(A \cap B) = \text{pr}(A) \times \text{pr}(B)$

Also, if the events A, B and C are independent, the probability of A and B and C is the product of their individual probabilities.

$\text{pr}(ABC) = \text{pr}(A) \times \text{pr}(B) \times \text{pr}(C)$

Tree diagram (Page 295)

A tree diagram is a set of connected lines with each line branching out. The branches represent the trials of an experiment.

Exercise 21.3

This can be given as classwork and as assignment.