CHAPTER 3

LEARNING OUTCOMES, ASSESSMENT STANDARDS, CONTENT AND CONTEXTS

In the Learning Outcomes that follow, the bulleted items are the Assessment Standards. The alphabetical points that follow (e.g. a, b, c) introduce the sub-skills, knowledge and attitudes of which each Assessment Standard is constituted.

### Grade 10

#### Learning Outcome 1 MAT.LO1 (FET)

**Number and Number Relationships**

*When solving problems, the learner is able to recognise, describe, represent and work confidently with numbers and their relationships to estimate, calculate and check solutions.*

#### Assessment Standards

We know this when the learner is able to:

10.1.1 Identify rational numbers and convert between terminating or recurring decimals and the form:

\[ \frac{a}{b} ; \quad a, b, \in \mathbb{Z} ; \quad b \neq 0. \]

10.1.2 (a) Simplify expressions using the laws of exponents for integral exponents.

(b) Establish between which two integers any simple surd lies.

(c) Round rational and irrational numbers to an appropriate degree of accuracy.
Grade 11

Assessment Standards

We know this when the learner is able to:

11.1.1 Understand that not all numbers are real. (This requires the recognition but not the study of non-real numbers.)

11.1.2 (a) Simplify expressions using the laws of exponents for rational exponents.

(b) Add, subtract, multiply and divide simple surds

\( \sqrt{3} + \sqrt{12} = 3\sqrt{3} \text{ and } \frac{\sqrt{2}}{2} = \frac{1}{\sqrt{2}} \)

(c) Demonstrate an understanding of error margins.

Grade 12

Assessment Standards

We know this when the learner is able to:

12.1.2 Demonstrate an understanding of the definition of a logarithm and any laws needed to solve real-life problems (e.g. growth and decay see 12.1.4(a)).
Learning Outcome 1
Continued

Number and Number Relationships

When solving problems, the learner is able to recognise, describe, represent and work confidently with numbers and their relationships to estimate, calculate and check solutions.

Grade 10

Assessment Standards

We know this when the learner is able to:

10.1.3 Investigate number patterns (including but not limited to those where there is a constant difference between consecutive terms in a number pattern, and the general term is therefore linear) and hence:
(a) make conjectures and generalisations;
(b) provide explanations and justifications and attempt to prove conjectures.

10.1.4 Use simple and compound growth formulae \( A = P(1+ni) \) and \( A = P(1+i)^n \) to solve problems, including interest, hire-purchase, inflation, population growth and other real-life problems.
Grade 11

Assessment Standards

We know this when the learner is able to:

11.1.3 Investigate number patterns (including but not limited to those where there is a constant second difference between consecutive terms in a number pattern, and the general term is therefore quadratic) and hence:
(a) make conjectures and generalisations;
(b) provide explanations and justifications and attempt to prove conjectures.

11.1.4 Use simple and compound decay formulae ($A = P(1 - ni)$ and $A = P(1 - i)^n$) to solve problems (including straight line depreciation and depreciation on a reducing balance) (link to Learning Outcome 2).

Grade 12

Assessment Standards

We know this when the learner is able to:

12.1.3 (a) Identify and solve problems involving number patterns, including but not limited to arithmetic and geometric sequences and series.
(b) Correctly interpret sigma notation.
(c) Prove and correctly select the formula for and calculate the sum of series, including:

$$\sum_{i=1}^{n} 1 = n$$
$$\sum_{i=1}^{n} i = \frac{n(n+1)}{2}$$
$$\sum_{i=1}^{n} a + (i - 1)d = \frac{n}{2} [2a + (n - 1)d]$$
$$\sum_{i=1}^{n} a r^{i-1} = \frac{a (r^n - 1)}{r - 1}; r \neq 1$$
$$\sum_{i=1}^{n} a r^{i-1} = \frac{a (1 - r^n)}{1 - r} \text{ for } -1 < r < 1$$

(d) Correctly interpret recursive formulae:
(e.g. $T_{n+1} = T_n + T_{n-1}$)

12.1.4 (a) Calculate the value of $n$ in the formula $A = P(1 \pm i)^n$
(b) Apply knowledge of geometric series to solving annuity, bond repayment and sinking fund problems, with or without the use of the formulae:

$$F = \frac{x[(1+i)^n-1]}{i} \text{ and}$$
$$P = \frac{x[1-(1+i)^{-n}]}{i}$$
Learning Outcome 1
Continued

Number and Number Relationships

When solving problems, the learner is able to recognise, describe, represent and work confidently with numbers and their relationships to estimate, calculate and check solutions.

Grade 10

Assessment Standards

We know this when the learner is able to:

10.1.5 Demonstrate an understanding of the implications of fluctuating foreign exchange rates (e.g. on the petrol price, imports, exports, overseas travel).

10.1.6 Solve non-routine, unseen problems.
Grade 11

Assessment Standards

We know this when the learner is able to:

11.1.5 Demonstrate an understanding of different periods of compounding growth and decay (including effective compounding growth and decay and including effective and nominal interest rates).

11.1.6 Solve non-routine, unseen problems.

Grade 12

Assessment Standards

We know this when the learner is able to:

12.1.5 Critically analyse investment and loan options and make informed decisions as to the best option(s) (including pyramid and micro-lenders’ schemes).

12.1.6 Solve non-routine, unseen problems.
Learning Outcome 2 MAT.LO2 (FET)

Functions and Algebra

The learner is able to investigate, analyse, describe and represent a wide range of functions and solve related problems.

Grade 10

Assessment Standards

We know this when the learner is able to:

10.2.1 (a) Demonstrate the ability to work with various types of functions, including those listed in the following Assessment Standard.

(b) Recognise relationships between variables in terms of numerical, graphical, verbal and symbolic representations and convert flexibly between these representations (tables, graphs, words and formulae).

10.2.2 Generate as many graphs as necessary, initially by means of point-by-point plotting, supported by available technology, to make and test conjectures and hence to generalise the effects of the parameters \( a \) and \( q \) on the graphs of functions including:

\[ y = ax + q \]
\[ y = ax^2 + q \]
\[ y = \frac{a}{x} + q \]
\[ y = ab^x + q; \ b > 0 \]
\[ y = a \sin(x) + q \]
\[ y = a \cos(x) + q \]
\[ y = a \tan(x) + q \]
Mathematics

Grade 11

Assessment Standards

We know this when the learner is able to:

11.2.1 (a) Demonstrate the ability to work with various types of functions including those listed in the following Assessment Standard.

(b) Recognise relationships between variables in terms of numerical, graphical, verbal and symbolic representations and convert flexibly between these representations (tables, graphs, words and formulae).

11.2.2 Generate as many graphs as necessary, initially by means of point-by-point plotting, supported by available technology, to make and test conjectures about the effect of the parameters k, p, a and q for functions including:

\[ y = \sin(kx) \]
\[ y = \cos(kx) \]
\[ y = \tan(kx); \]
\[ y = \sin(x + p) \]
\[ y = \cos(x + p) \]
\[ y = \tan(x + p) \]
\[ y = a(x + p)^2 + q \]
\[ y = \frac{a}{x + p} + q \]
\[ y = ab^{x+p} + q; \ b > 0 \]

Grade 12

Assessment Standards

We know this when the learner is able to:

12.2.1 (a) Demonstrate the ability to work with various types of functions and relations including the inverses listed in the following Assessment Standard.

(b) Demonstrate knowledge of the formal definition of a function.

12.2.2 (a) Investigate and generate graphs of the inverse relations of functions, in particular the inverses of:

\[ y = ax + q \]
\[ y = ax^2 \]
\[ y = a^x; \ a>0 \]

(b) Determine which inverses are functions and how the domain of the original function needs to be restricted so that the inverse is also a function.
Learning Outcome 2
Continued

Functions and Algebra

The learner is able to investigate, analyse, describe and represent a wide range of functions and solve related problems.

Assessment Standards

We know this when the learner is able to:

10.2.3 Identify characteristics as listed below and hence use applicable characteristics to sketch graphs of functions including those listed in 10.2.2 above:
   (a) domain and range;
   (b) intercepts with the axes;
   (c) turning points, minima and maxima;
   (d) asymptotes;
   (e) shape and symmetry;
   (f) periodicity and amplitude;
   (g) average gradient (average rate of change);
   (h) intervals on which the function increases/decreases;
   (i) the discrete or continuous nature of the graph.

10.2.4 Manipulate algebraic expressions:
   (a) multiplying a binomial by a trinomial;
   (b) factorising trinomials;
   (c) factorising by grouping in pairs;
   (d) simplifying algebraic fractions with monomial denominators.
Grade 11

Assessment Standards

We know this when the learner is able to:

11.2.3 Identify characteristics as listed below and hence use applicable characteristics to sketch graphs of functions including those listed above:
   (a) domain and range;
   (b) intercepts with the axes;
   (c) turning points, minima and maxima;
   (d) asymptotes;
   (e) shape and symmetry;
   (f) periodicity and amplitude;
   (g) average gradient (average rate of change);
   (h) intervals on which the function increases/decreases;
   (i) the discrete or continuous nature of the graph.

11.2.4 Manipulate algebraic expressions:
   (a) by completing the square;
   (b) simplifying algebraic fractions with binomial denominators.

Grade 12

Assessment Standards

We know this when the learner is able to:

12.2.3 Identify characteristics as listed below and hence use applicable characteristics to sketch graphs of the inverses of the functions listed above:
   (a) domain and range;
   (b) intercepts with the axes;
   (c) turning points, minima and maxima;
   (d) asymptotes;
   (e) shape and symmetry;
   (f) average gradient (average rate of change);
   (g) intervals on which the function increases/decreases.

12.2.4 Factorise third degree polynomials (including examples which require the factor theorem).
Learning Outcome 2
Continued

Functions and Algebra

The learner is able to investigate, analyse, describe and represent a wide range of functions and solve related problems.

Grade 10

Assessment Standards

We know this when the learner is able to:

10.2.5 Solve:

(a) linear equations;
(b) quadratic equations by factorisation;
(c) exponential equations of the form $ka^{x+p} = m$
   (including examples solved by trial and error);
(d) linear inequalities in one variable and illustrate the solution graphically;
(e) linear equations in two variables simultaneously (numerically, algebraically and graphically).

10.2.6 Use mathematical models to investigate problems that arise in real-life contexts:
(a) making conjectures, demonstrating and explaining their validity;
(b) expressing and justifying mathematical generalisations of situations;
(c) using the various representations to interpolate and extrapolate;
(d) describing a situation by interpreting graphs, or drawing graphs from a description of a situation, with special focus on trends and features.
(Examples should include issues related to health, social, economic, cultural, political and environmental matters.)
Assessment Standards

We know this when the learner is able to:

11.2.5 Solve:
(a) quadratic equations (by factorisation, by completing the square, and by using the quadratic formula) and quadratic inequalities in one variable and interpret the solution graphically;
(b) equations in two unknowns, one of which is linear and one of which is quadratic, algebraically or graphically.

11.2.6 Use mathematical models to investigate problems that arise in real-life contexts:
(a) making conjectures, demonstrating and explaining their validity;
(b) expressing and justifying mathematical generalisations of situations;
(c) using various representations to interpolate and extrapolate;
(d) describing a situation by interpreting graphs, or drawing graphs from a description of a situation, with special focus on trends and pertinent features.
(Examples should include issues related to health, social, economic, cultural, political and environmental matters.)
Learning Outcome 2
Continued

Functions and Algebra

The learner is able to investigate, analyse, describe and represent a wide range of functions and solve related problems.

Grade 10

Assessment Standards

We know this when the learner is able to:

10.2.7 Investigate the average rate of change of a function between two values of the independent variable, demonstrating an intuitive understanding of average rate of change over different intervals (e.g. investigate water consumption by calculating the average rate of change over different time intervals and compare results with the graph of the relationship).
Assessment Standards

We know this when the learner is able to:

11.2.7 Investigate numerically the average gradient between two points on a curve and develop an intuitive understanding of the concept of the gradient of a curve at a point.

12.2.7 (a) Investigate and use instantaneous rate of change of a variable when interpreting models of situations:

- demonstrating an intuitive understanding of the limit concept in the context of approximating the rate of change or gradient of a function at a point;
- establishing the derivatives of the following functions from first principles:
  \[ f(x) = b \]
  \[ f(x) = x \]
  \[ f(x) = x^2 \]
  \[ f(x) = x^3 \]
  \[ f(x) = \frac{1}{x} \]
  and then generalise to the derivative of \[ f(x) = x^n \]

(b) Use the following rules of differentiation:

\[
\frac{d}{dx}[f(x) \pm g(x)] = \frac{df}{dx} \pm \frac{dg}{dx}
\]

\[
\frac{d}{dx}[k\cdot f(x)] = k \cdot \frac{df}{dx}
\]

(c) Determine the equations of tangents to graphs.

(d) Generate sketch graphs of cubic functions using differentiation to determine the stationary points (maxima, minima and points of inflection) and the factor theorem and other techniques to determine the intercepts with the \(x\)-axis.

(e) Solve practical problems involving optimisation and rates of change.
Learning Outcome 2
Continued

Functions and Algebra

The learner is able to investigate, analyse, describe and represent a wide range of functions and solve related problems.
Assessment Standards

We know this when the learner is able to:

11.2.8 (a) Solve linear programming problems by optimising a function in two variables, subject to one or more linear constraints, by numerical search along the boundary of the feasible region.

(b) Solve a system of linear equations to find the co-ordinates of the vertices of the feasible region.

Grade 12

Assessment Standards

We know this when the learner is able to:

12.2.8 Solve linear programming problems by optimising a function in two variables, subject to one or more linear constraints, by establishing optima by means of a search line and further comparing the gradients of the objective function and linear constraint boundary lines.
Learning Outcome 3 MAT.LO3 (FET)

Space, Shape and Measurement

The learner is able to describe, represent, analyse and explain properties of shapes in 2-dimensional and 3-dimensional space with justification.

Grade 10

Assessment Standards

We know this when the learner is able to:

10.3.1 Understand and determine the effect on the volume and surface area of right prisms and cylinders, of multiplying any dimension by a constant factor $k$.

10.3.2 (a) Through investigations, produce conjectures and generalisations related to triangles, quadrilaterals and other polygons, and attempt to validate, justify, explain or prove them, using any logical method (Euclidean, co-ordinate and/or transformation).

(b) Disprove false conjectures by producing counter-examples.

(c) Investigate alternative definitions of various polygons (including the isosceles, equilateral and right-angled triangle, the kite, parallelogram, rectangle, rhombus and square).
Grade 11

Assessment Standards

We know this when the learner is able to:

11.3.1 Use the formulae for surface area and volume of right pyramids, right cones, spheres and combinations of these geometric objects.

11.3.2 (a) Investigate necessary and sufficient conditions for polygons to be similar.
(b) Prove and use (accepting results established in earlier grades):
   • that a line drawn parallel to one side of a triangle divides the other two sides proportionally (the Mid-point Theorem as a special case of this theorem);
   • that equiangular triangles are similar;
   • that triangles with sides in proportion are similar;
   • the Pythagorean Theorem by similar triangles.

Grade 12

Assessment Standards

We know this when the learner is able to:

12.3.2 (a) Accept the following as axioms:
   • results established in earlier grades;
   • a tangent is perpendicular to the radius, drawn at the point of contact with the circle, and then investigate and prove the theorems of the geometry of circles:
     • the line drawn from the centre of a circle, perpendicular to a chord, bisects the chord and its converse;
     • the perpendicular bisector of a chord passes through the centre of the circle;
     • the angle subtended by an arc at the centre of a circle is double the size of the angle subtended by the same arc at the circle;
     • angles subtended by a chord at the circle on the same side of the chord are equal and its converse;
     • the opposite angles of a cyclic quadrilateral are supplementary and its converse;
     • two tangents drawn to a circle from the same point outside the circle are equal in length;
     • the angles between a tangent and a chord, drawn to the point of contact of the chord, are equal to the angles which the chord subtends in the alternate chord segments and its converse.
   (b) Use the theorems listed above to:
     • make and prove or disprove conjectures;
     • prove riders.
Learning Outcome 3 Continued

Space, Shape and Measurement

The learner is able to describe, represent, analyse and explain properties of shapes in 2-dimensional and 3-dimensional space with justification.

Grade 10

Assessment Standards

We know this when the learner is able to:

10.3.3 Represent geometric figures on a Cartesian co-ordinate system, and derive and apply, for any two points \((x_1 ; y_1)\) and \((x_2 ; y_2)\), a formula for calculating:
   (a) the distance between the two points;
   (b) the gradient of the line segment joining the points;
   (c) the co-ordinates of the mid-point of the line segment joining the points.

10.3.4 Investigate, generalise and apply the effect of the following transformations of the point \((x ; y)\):
   (a) a translation of \(p\) units horizontally and \(q\) units vertically;
   (b) a reflection in the \(x\)-axis, the \(y\)-axis or the line \(y = x\).

10.3.5 Understand that the similarity of triangles is fundamental to the trigonometric functions \(\sin \theta\), \(\cos \theta\) and \(\tan \theta\), and is able to define and use the functions.
Grade 11

Assessment Standards

We know this when the learner is able to:

11.3.3 Use a Cartesian co-ordinate system to derive and apply:
(a) the equation of a line through two given points;
(b) the equation of a line through one point and parallel or perpendicular to a given line;
(c) the inclination of a line.

11.3.4 Investigate, generalise and apply the effect on the co-ordinates of:
(a) the point \((x ; y)\) after rotation around the origin through an angle of 90˚ or 180˚;
(b) the vertices \((x_1 ; y_1), (x_2 ; y_2), \ldots, (x_n ; y_n)\) of a polygon after enlargement through the origin, by a constant factor \(k\).

11.3.5 (a) Derive and use the values of the trigonometric functions (in surd form where applicable) of 30˚, 45˚ and 60˚.
(b) Derive and use the following identities:
- \(\tan \theta = \frac{\sin \theta}{\cos \theta}\)
- \(\sin^2 \theta + \cos^2 \theta = 1\)
(c) Derive the reduction formulae for \(\sin(90^\circ \pm \theta), \cos(90^\circ \pm \theta), \sin(180^\circ \pm \theta), \cos(180^\circ \pm \theta), \tan(180^\circ \pm \theta), \sin(360^\circ \pm \theta), \cos(360^\circ \pm \theta), \tan(360^\circ \pm \theta), \sin(-\theta), \cos(-\theta)\) and \(\tan(-\theta)\).
(d) Determine the general solution of trigonometric equations.
(e) Establish and apply the sine, cosine and area rules.

Grade 12

Assessment Standards

We know this when the learner is able to:

12.3.3 Use a two-dimensional Cartesian co-ordinate system to derive and apply:
(a) the equation of a circle (any centre);
(b) the equation of a tangent to a circle given a point on the circle.

12.3.4 (a) Use the compound angle identities to generalise the effect on the co-ordinates of the point \((x ; y)\) after rotation about the origin through an angle \(\theta\).
(b) Demonstrate the knowledge that rigid transformations (translations, reflections, rotations and glide reflections) preserve shape and size, and that enlargement preserves shape but not size.

12.3.5 Derive and use the following compound angle identities:
(a) \(\sin(\alpha \pm \beta) = \sin \alpha \cos \beta \pm \cos \alpha \sin \beta\)
(b) \(\cos(\alpha \pm \beta) = \cos \alpha \cos \beta \mp \sin \alpha \sin \beta\)
(c) \(\sin 2\alpha = 2 \sin \alpha \cos \alpha\)
(d) \(\cos 2\alpha = \cos^2 \alpha - \sin^2 \alpha\)
\[= 2 \cos^2 \alpha - 1\]
\[= 1 - 2 \sin^2 \alpha\]
Learning Outcome 3
Continued

Space, Shape and Measurement

The learner is able to describe, represent, analyse and explain properties of shapes in 2-dimensional and 3-dimensional space with justification.

Grade 10

Assessment Standards

We know this when the learner is able to:

10.3.6 Solve problems in two dimensions by using the trigonometric functions (sin θ, cos θ and tan θ) in right-angled triangles and by constructing and interpreting geometric and trigonometric models (examples to include scale drawings, maps and building plans).

10.3.7 Demonstrate an appreciation of the contributions to the history of the development and use of geometry and trigonometry by various cultures through a project.
Grade 11

Assessment Standards

We know this when the learner is able to:

11.3.6 Solve problems in two dimensions by using the sine, cosine and area rules; and by constructing and interpreting geometric and trigonometric models.

11.3.7 Demonstrate an appreciation of the contributions to the history of the development and use of geometry and trigonometry by various cultures through educative forms of assessment (e.g. an investigative project).

Grade 12

Assessment Standards

We know this when the learner is able to:

12.3.6 Solve problems in two and three dimensions by constructing and interpreting geometric and trigonometric models.

12.3.7 Demonstrate a basic understanding of the development and uses of geometry through history and some familiarity with other geometries (e.g. spherical geometry, taxi-cab geometry, and fractals).
Learning Outcome 4  MAT.LO4 (FET)

Data Handling and Probability

The learner is able to collect, organise, analyse and interpret data to establish statistical and probability models to solve related problems.

Assessment Standards

We know this when the learner is able to:

10.4.1 (a) Collect, organise and interpret univariate numerical data in order to determine:
   - measures of central tendency (mean, median, mode) of grouped and ungrouped data, and know which is the most appropriate under given conditions;
   - measures of dispersion: range, percentiles, quartiles, interquartile and semi-inter-quartile range.

(b) Represent data effectively, choosing appropriately from:
   - bar and compound bar graphs;
   - histograms (grouped data);
   - frequency polygons;
   - pie charts;
   - line and broken line graphs.
We know this when the learner is able to:

11.4.1 (a) Calculate and represent measures of central tendency and dispersion in univariate numerical data by:
- five number summary (maximum, minimum and quartiles);
- box and whisker diagrams;
- ogives;
- calculating the variance and standard deviation of sets of data manually (for small sets of data) and using available technology (for larger sets of data), and representing results graphically using histograms and frequency polygons.

(b) Represent bivariate numerical data as a scatter plot and suggest intuitively whether a linear, quadratic or exponential function would best fit the data (problems should include issues related to health, social, economic, cultural, political and environmental issues).

12.4.1 (a) Demonstrate the ability to draw a suitable sample from a population and understand the importance of sample size in predicting the mean and standard deviation of a population.

(b) Use available technology to calculate the regression function which best fits a given set of bivariate numerical data.

(c) Use available technology to calculate the correlation co-efficient of a set of bivariate numerical data to make relevant deductions.
Grade 10

Assessment Standards

We know this when the learner is able to:

10.4.2  (a) Use probability models for comparing the relative frequency of an outcome with the probability of an outcome (understanding, for example, that it takes a very large number of trials before the relative frequency of throwing a head approaches the probability of throwing a head).

(b) Use Venn diagrams as an aid to solving probability problems, appreciating and correctly identifying:

• the sample space of a random experiment;
• an event of the random experiment as a subset of the sample space;
• the union and intersection of two or more subsets of the sample space;
• \(P(S) = 1\) (where \(S\) is the sample space);
• \(P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)\) (where \(A\) and \(B\) are events within a sample space);
• disjoint (mutually exclusive) events, and is therefore able to calculate the probability of either of the events occurring by applying the addition rule for disjoint events: \(P(A \text{ or } B) = P(A) + P(B)\);
• complementary events, and is therefore able to calculate the probability of an event not occurring: \(P(\text{not } A) = 1 - P(A)\).
Grade 11

Assessment Standards

We know this when the learner is able to:

11.4.2 (a) Correctly identify dependent and independent events (e.g. from two-way contingency tables or Venn diagrams) and therefore appreciate when it is appropriate to calculate the probability of two independent events occurring by applying the product rule for independent events:

\[ P(A \text{ and } B) = P(A).P(B). \]

(b) Use tree and Venn diagrams to solve probability problems (where events are not necessarily independent).

Grade 12

Assessment Standards

We know this when the learner is able to:

12.4.2 Generalise the fundamental counting principle (successive choices from \( m_1 \) then \( m_2 \) then \( m_3 \) … options create \( m_1.m_2.m_3 \) … different combined options) and solve problems using the fundamental counting principle.
Learning Outcome 4
Continued

Data Handling and Probability

The learner is able to collect, organise, analyse and interpret data to establish statistical and probability models to solve related problems.

Grade 10

Assessment Standards

We know this when the learner is able to:

10.4.3 (a) Identify potential sources of bias, errors in measurement, and potential uses and misuses of statistics and charts and their effects (a critical analysis of misleading graphs and claims made by persons or groups trying to influence the public is implied here).

(b) Effectively communicate conclusions and predictions that can be made from the analysis of data.

10.4.5 Use theory learned in this grade in an authentic integrated form of assessment (e.g. in an investigative project).
Assessment Standards

We know this when the learner is able to:

11.4.3 (a) Identify potential sources of bias, errors in measurement, and potential uses and misuses of statistics and charts and their effects (a critical analysis of misleading graphs and claims made by persons or groups trying to influence the public is implied here).

(b) Effectively communicate conclusions and predictions that can be made from the analysis of data.

11.4.4 Differentiate between symmetric and skewed data and make relevant deductions.

11.4.5 Use theory learned in this grade in an authentic integrated form of assessment (e.g. in an investigative project).

12.4.3 (a) Identify potential sources of bias, errors in measurement, and potential uses and misuses of statistics and charts and their effects (a critical analysis of misleading graphs and claims made by persons or groups trying to influence the public is implied here).

(b) Effectively communicate conclusions and predictions that can be made from the analysis of data.

12.4.4 Identify data which is normally distributed about a mean by investigating appropriate histograms and frequency polygons.

12.4.5 Use theory learned in this grade in an authentic integrated form of assessment (e.g. in an investigative project).