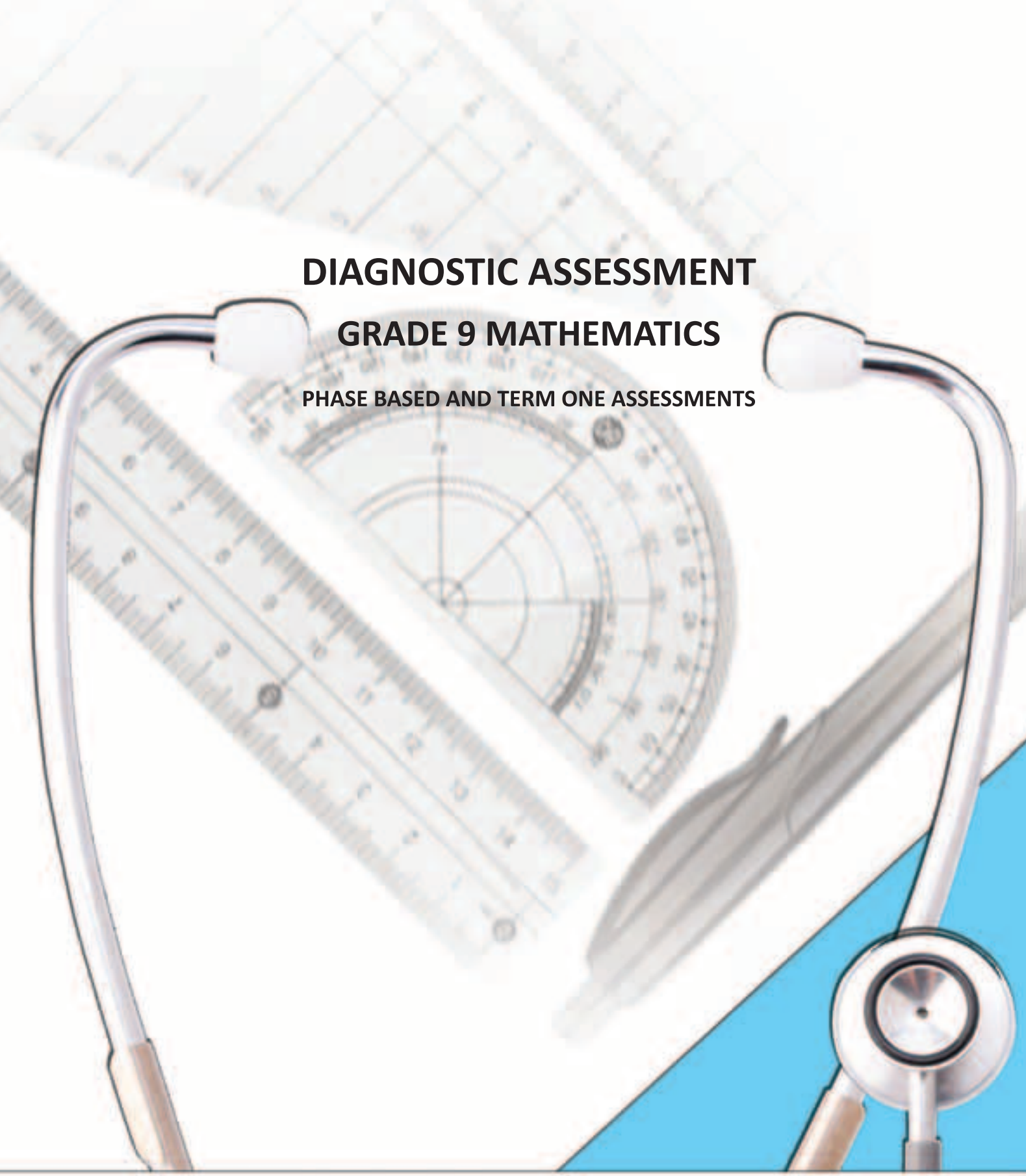
DIAGNOSTIC ASSESSMENT

GRADE 9 MATHEMATICS

PHASE BASED AND TERM ONE ASSESSMENTS



basic education
Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

Read to Lead
A Reading Nation is a Leading Nation

2030 NDP

CONTENTS

PART ONE
UNDERSTANDING DIAGNOSTIC ASSESSMENTS

1. INTRODUCTION

The diagnostic resource bank aims to improve the relationship between assessment and classroom instruction. Assessment for learning is the process of gathering information about a learner's learning from a variety of sources, using a variety of approaches, or 'assessment tools', and interpreting that evidence to enable both the teacher and the learner to determine where the learner is in his or her learning; where the learner needs to go; and how best to get there. Teachers can adjust instructional strategies, resources, and environments effectively to help all learners achieve grade specific outcomes only if they have accurate and reliable information about what their learners know and are able to do at a given time.

When findings of assessment results are used to improve classroom practice, learner performance in general can improve. The diagnostic assessment tests/questions are designed to fulfil three purposes of assessment: namely to,

- reveal the misconceptions learners bring as prior knowledge to a class;
- measure the conceptual gains of a class as a whole; and
- identify concepts that are weak areas of understanding for the individual learner or as a class/grade.

A traditional multiple choice question (MCQ) provides little information about the learner's understanding of the concept/skill tested. The DBE has embarked on the design of diagnostic assessments using MCQs and assessment rubrics (for Languages) that are designed to assist teachers to diagnose learner misconceptions using the Pearson distractor rationale model as a basis for the classification of learner misconceptions. The diagnosis is also linked to the CAPS learning outcomes and skill acquisition.

MCQs designed for the diagnostic questions included in this package, include a breakdown of learners' understanding through the incorrect responses. All distractors are written not only to focus the attention of the teacher on those learners who are able to identify the correct response, but also to assist the teacher in identifying and understanding the misconceptions captured in the incorrect responses.

2. PURPOSE OF THE DIAGNOSTIC TEST ITEMS

This diagnostic resource should be used in conjunction with the requirements as stipulated in the CAPS document. It therefore does not replace the curriculum or the Annual Teaching Plan (ATP). The content therefore includes coverage from terms one to four. However, teachers may include questions from the resource bank into the ATP to facilitate assessment for learning.
These diagnostic assessments/questions are a phase based assessment. It also includes questions from four grades.

There are questions set on the critical skillsfrom the two earlier grades, the current grade and the next grade. The selection of questions from the four grades was done by looking at those concepts that were taught in the two earlier grades and were then extended in the next two grades as well. This would enable the teacher to identify at which specific grade the knowledge gap is.

The assessment guidelines per subject and grade have a detailed explanation of the topics/skills that are in this category. The spread of questions in the composite assessment is weighted to facilitate a phase based assessment and is broken down into the four composite grades as illustrated below:

Table 1: Percentage spread of questions (Languages and Mathematics)

Spread of Questions			
Weighting	±10%	±20%	70%
Grade 9	7	8	9

The purpose of including the content of the other grades is to diagnose the skill/concept acquisition at the earlier grade, the current grade as well as to ascertain whether the learner is ready to make the transition to the next grade. Once the teacher has identified the gaps in the conceptual knowledge/ skill acquisition it would be easier to design targeted intervention programmes to bring learners on par for the transition to subsequent grades/ topics.

These diagnostic questions should be used as a tool for teachers to assess the strengths and weaknesses of learners for the purpose of designing teaching and learning strategies that will address the individual needs of the learner.

This assessment should not be used for grading a learner; as the intended purpose is to facilitate learning.

3. THE STRUCTURE OF THE DIAGNOSTIC TEST ITEMS

The diagnostic resource is divided into sections or questions. Questions are framed to direct teachers to possible misconceptions which could be as a result of an earlier grade knowledge deficit, erroneous conceptual knowledge or lack of comprehension. Each paper has a spread of the content areas and skills that span the entire phase and is extended into the next phase.

The texts/topics that have been selected for the Languages questions indicate the concept/skill progression from one grade to the next. The Mathematics questions are clustered according to content areas.

MCQs are constructed in such a way that each distractor provides information on whether the learner has mastered the skill/concept or whether there is a misconception. The distractors are graded according to four levels of understanding. Levels one, two and three enlighten the teacher about the nature of the misconception. Level four is the correct response, see Table 3 for further clarity.

Short questions are constructed to assess writing skills, mental computations, knowledge recall and application of rules or theorems.

Longer responses are constructed so that thought process, writing skills and consolidation and application of content areas and concepts across the subject are consolidated to arrive at the intended response.

4. PROPOSED USE OF THE MATHEMATICS ITEMS/QUESTIONS

4.1 Parts of the paper may be used independently at different intervals i.e. as a revision activity, formative task, etc.

4.2 Certain questions per topic or skill assessed may be selected from each section to compile a shorter testlet.

4.3 Questions may be selected according to levels of difficulty and can be used to support learning according to different cognitive demands or be used to support progressed learners. E.g. Levels of difficulty (easy, moderate & difficult)

Table 2: Levels of difficulty using the Bloom's taxonomy

Level of difficulty	**Blooms Taxonomy**	**Descriptors** (These are not limited to the ones listed below)
Easy	Remembering and Understanding	Complete, list, name, identify; recall, repeat, state, classify, re-group/group, rearrange/arrange, collect, categorise, select, recognize, supply, separate, isolate, draw etc.
Moderate	Application and Analysis	Predict, infer, interpret, understand, rewrite in a certain order, apply, demonstrate, illustrate, investigate, facto-rise, differentiate, similarities, solve etc.
Difficult	Evaluating and Creating	Analyse, evaluate, justify, provide a reason, criticize, judge, derive, combine, construct, synthesise; proof; etc.

4.4 Questions may also be used as a baseline assessment if administered prior to teaching a particular lesson. A teacher may want to establish whether learners meet the basic skills and knowledge acquired from the lower grades. This will assist the teacher to know learners' level of proficiency.

4.5 Diagnostic questions can also be selected according to cognitive levels.

4.6 The teacher should decide when, where and how the assessment may be used to enhance teaching and learning.

4.7 The questions may be used at the beginning of a phase to establish whether learners meet the conceptual knowledge for the new grade/phase.

5. DESIGN

The table below lists and describes the types of errors that correspond to each of the four levels of understanding encapsulated in the Mathematics MCQs. The distractor rationale as advocated by Pearson, 2004, forms the basis for diagnosing misconceptions. The taxonomies and cognitive levels as stipulated in CAPS (for Grades 4-9) are incorporated into the levels of understandings to provide the teacher with holistic information about the level of performance. The cognitive levels are now introduced in the Foundation Phase CAPS.

A more detailed unpacking of the nature of the misconceptions is addressed in the marking guidelines of each diagnostic question.

Table 3: Levels of understanding (thought process)

Levels of understanding	Descriptors for the levels of understanding.
Level 1	Learners demonstrate (i.e. a combination but may not be all of the following) that they: - have no understanding of the question or a conceptual misunderstanding; - are unfamiliar with operational procedures but can compute basic straight forward operations; - are not able to implement (un)related strategies to solve a problem; - excessive depend on the information that is provided in the question and is incorrectly used/duplicated; - utilise unrelated vocabulary to the question. - Etc.
Level 2	Learners demonstrate (i.e. a combination but may not be all of the following) that they: - can apply some computational ability that may not necessarily relate to the question or that demonstrate inadequate conceptual knowledge and flawed reasoning to support conclusions/inferences; - can apply basic mathematical knowledge in straight forward situations; - demonstrate a limited knowledge of some concepts and some procedures; - Etc.
Level 3	Learners demonstrate (i.e. a combination but may not be all of the following) that they can: - apply some conceptual knowledge and ability to analyse but is inconsistent in computational and reasoning skills; - apply their knowledge and understanding to solve problems. - solve word problems involving operations with whole numbers and use division in a variety of problem solving situations. - interpret and use data to solve problems with minimal error of judgement; - use given information to complete various graphs; - Etc.

Level 4	Correct response. Learners demonstrate (i.e. a combination but may not be all of the following) that they: - consistently apply/demonstrate correct computational and reasoning skills required in the question; - apply their understanding and knowledge in a variety of relatively complex situations and explain their reasoning; - solve a variety of multi-step word problems; - apply geometric knowledge of a range of two-and three-dimensional shapes in a variety of situations; - draw a conclusion from given data and justify their conclusion. - Etc.

Each level of understanding is captured in the distractors of all the multiple-choice questions. A question will include distractors that correspond to each level of understanding set out in the table above.

When learner responses are analysed the diagnostic distractors will reveal patterns in a learner's understanding of the content being tested. The teacher is thus guided towards instruction that specifically addresses a learner's understanding of a concept in the specific content.

6. MARKING GUIDELINES:

6.1 Multiple Choice Questions (MCQs): Marks are allocated according to the cognitive demand of the question. However, the focus of these assessments is not on scoring the learner, but rather on what the learner is able to do or not do.

6.2 Section A and B are allocated a mark each per answer. Marks for Section C are allocated according to the demand of the question.

6.3 The marking guideline has columns indicating the number for each question, the expected answer per question, the level of understanding/error analysis (for Section A), the cognitive level, the level of difficulty, the grade level at which a question and its answer are pitched. The mark allocation is merely a guide for the learner's response and should not be the focus of the task.

6.4 The levels of difficulty indicate the cognitive demands of the question which are: Easy (E), Moderate (M) and difficult (D).

6.5 The Cognitive levels are as prescribed in the CAPS for the Intermediate and Senior Phases and will now be introduced in the Foundation Phase. The cognitive levels, their descriptors and examples are indicated in Table 5.

Table 4: Example of the Marking Guideline (for Mathematics)

1. Complete: 2 + 2 + 2 + 2 =

No.		Expected answer	Level of understanding or error analysis		Cognitive level	Level of difficulty	Grade level
1	A	6	3	Added only the first 3 numbers	R	E	1
	B	4	2	Added the first two numbers only.			
	C	2	1	Thought it is a number pattern			
	D	8 ✓	4	Correct response			

In cases where learners are required to display multiple steps/procedures in order to solve a problem, apply the following techniques when marking:

a. Where there is clear evidence of a misread/misinterpretation, a penalty of 1 mark is generally appropriate. A learner should not be penalised for the same error throughout the assessment.
b. If a learner has knowledge of the method but could not get the final correct answer, award a method (M) mark but not an accuracy (A) mark. If the method is incorrect but the answer is correct, award a mark for the answer only.
c. Consistent Accuracy mark is applied when an answer is correctly followed through from an incorrect previous answer.

E.g. Grade 3 question
1. What is the number that is 5 more than 20?
1.1 Write the **number symbol** for the number.
1.2 Write the **number name** for the same number you wrote in 1.1 above.

Learner response

1.1 **205** (the answer is incorrect)
1.2 **Two hundred and five.** (The number name is correct according to the number symbol provided by the learner in number 1.1 even though it was not the expected answer.)

In this instance do not award a mark for the 1st answer (in 1.1) but do award a mark for the 2nd answer (in 1.2) because it was correctly followed through from an incorrect answer. This is how to apply **consistent accuracy** (CA) marking.

Table 5: Cognitive levels

LEVEL 1:	LEVEL 2:
KNOWLEDGE (K)	**ROUTINE PROCEDURES (R)**
• **Knowing** • **Remember/Recall**	• **Applying routine procedures in familiar contexts** • **Understanding**
• Straight recall • Identification of correct formula • Know and use formulae such as the area of a rectangle, a triangle and a circle where each of the required dimensions is readily available. • Read information directly from a table (e.g. the time that bus number 1 234 departs • Use of mathematical facts • Appropriate use of mathematical vocabulary • Know appropriate vocabulary such as equa tion, formula, bar graph, pie chart, Carte sian plane, table of values, mean, median and mode. • Write the next three numbers in the sequence: 103; 105; 107… • Determine the factors of 64 • Write the prime numbers that are factors of 36	• Perform well-known procedures. • Learners know what procedure is required from the way the problem is posed. • Simple applications and calculations using the basic operations including: o algorithms for +, -, ×, and ÷ o calculating a percentage of a given amount • Calculations which might involve many steps • Derivation from given information may be involved • All of the information required to solve the problem is immediately available to the stu dent and where each of the required dimen sions is readily available. • Estimation and appropriate rounding off of numbers • Measure dimensions such as length, weight and time using appropriate measuring in struments sensitive to levels of accuracy. • Draw data graphs from provided data. • Solve equations by means of trial and im provement or algebraic processes • Determine the value for if x + 4 = 10. • Use three different techniques of calculating 488 + 16 • Calculate: 115 + 31 012.

LEVEL 3:	LEVEL 4:
COMPLEX PROCEDURES (C)	**PROBLEM-SOLVING (P)**
• **Applying multi-step procedures in a variety of contexts (including word sums)**	• **Reasoning and reflecting**
• Problems involving complex calculations and/or higher order reasoning • The required procedure is not immediately obvious from the way the problem is posed. • Learners will have to decide on the most ap propriate procedure to solve the solution to the question and may have to perform one or more preliminary calculations before determining a solution. • Investigations to describe rules and relationships • There is often not an obvious route to the solution • Problems not based on a real world context - could involve making significant connections between different representations • Conceptual understanding • One or more preliminary calculations and/or higher order reasoning • Solve equations by means of trial and improve ment or algebraic processes • Select the most appropriate data from options in a table of values to solve a problem. • Decide on the best way to represent data to create a particular impression. • Betty is 4 years old and Jabu is 8 years old. • Determine the ratio between their ages. Write the ratio in simplest fractional form. • Investigate the properties rectangles and squares to identify similarities and differences. • There were 20 sweets in the packet. William and his friend ate 2/5 of the sweets. How many sweets are left	• Unseen, non-routine problems (which are not necessarily difficult) • Higher order understanding and processes are often involved • Might require the ability to break the problem down into its constituent parts • Generalise patterns observed in situations, • Make predictions based on these patterns and/or other evidence and determine conditions that will lead to desired out comes. • Pose and answer questions about what mathematics they require to solve a problem and then to select and use that mathematical content. • The sum of three consecutive whole numbers is 27. Find the numbers. • Sarah divided a certain number by 16. She found an answer of 246 with a remainder of 4. • What is the number? • Busi has a bag containing three coloured balls: 1 blue, 2 red ball and 3 yellow balls. • She puts her hand in the bag and draws a ball. • What is the chance that she will draw a red ball? • Write the answer in simplest fractional form.

7. MODERATION

Internal moderation is important in assuring that the marking criteria/guideline is consistently applied, and that there is a shared understanding of the academic standards learners are expected to achieve. There should be processes in place for assuring comparability of marks for alternative assessments. Schools may therefore determine the format for moderation as a standardisation and quality-assurance measure.

8. DATA ANALYSIS AND UTILISATION

The teacher would be able to collect data on an individual learner, a class, a grade or for the entire grade and report at each level. Further data can be collected per topic/skill/ content area. The teacher is also able to use the phase test and identify at which grade the knowledge deficit is. Since this is an exercise in assessment for learning targeted interventions can be designed to address strengths and weaknesses. Teachers would be able to give feedback to parents on learning gaps, deficits and strengths per learner.

8.1 Purpose of the data analysis

After administering a test the teacher can do own diagnostic analysis to identify:-

a) The overall level of performance of the class or school;
b) Individual learners or schools that need special intervention;
c) Groups of learners or schools who need special support and
d) Subject content areas that require priority attention in teaching and learning.

8.2 Use of basic statistics for analysis

Basic statistics that can be used to summarize the data from a test include the following:-

i. Mean (often called average) – calculated by adding the scores of all the learners and dividing the sum by the number of learners. The mean is one score that is used to summarize all the scores obtained by learners in a test. A high mean score represents high performance and a low mean score represents low performance. However, the mean score does not indicate how learner scores are spread from the highest to the lowest and thus is not adequate for identifying individuals who either over-perform or under-perform.

ii. Median (or middle score) – calculated by first arranging the scores from the highest to the lowest and then determining the score that divides the data into two equal halves. Half of the learners who wrote a test will have scores above the median score and the other half will have scores below the median score. If the number of learners is an odd number the median will be a real score that sits half-way between the extreme scores, e.g. 76, 57, 49, 45 and 39 have 49 as the median score. However, if the number of learners is an even number the median will be a score that may not belong to any of the learners calculated by adding the two adjacent scores that are half-way between the extremes and dividing their sum by two (2), e.g. the median of 76, 57, 49 and 45 is calculated by adding 57 and 49 and dividing the sum by two, i.e. (57 + 49)/2 = 106/2 = 52. As can be observed, 52 is not one of the four given scores but it is the median score that sits half-way between the extreme scores, viz. 76 and 45.

The median does not show what the extreme scores, i.e. the highest and the lowest scores, are.

iii. Maximum is the highest score obtained by a learner in a test.
iv. Minimum is the lowest score obtained by a learner in a test.
v. Range is the difference between the Maximum and the Minimum scores. The larger the range, the more diverse the ability levels of the test takers while a relatively small range indicates that the class of test takers has a relatively homogeneous ability profile.

8.3 Available tools for data analysis

Tools that are available for analysis of data include pre-programmed computer software such as the SA-SAMS in schools, the Microsoft Excel programme and even hand calculators. The Microsoft Excel programme, which comes with almost every computer software, is a reasonably easy-to-use tool for performing item-level diagnostic analysis of test data. An Excel spreadsheet is arranged in columns and rows.

8.4 Preparing data for analysis on Excel

Excel makes available useful formulae to calculate basic statistics. To prepare for analysis of data from an administered test, do the following:-

i. Mark the test and write the scores obtained by each learner next to the relevant question/ item number in their books or scripts;
ii. Enter learner names and other particulars (e.g. the gender of each learner) in the rows, one after another;
iii. Enter test item numbers in the columns, one after another;
iv. Enter the score of each learner on each item in the correct cell (i.e. where the relevant column and row meet);
v. Check if all data has been entered correctly (i.e. do thorough data cleaning);
vi. Use correct formulae to calculate the statistics that you want to use to summarize and analyse the test data; and
vii. Interpret the statistics in terms of what they suggest about performance of individuals in your class, performance of identifiable groups of learners (e.g. boys and girls) and performance in specific content areas.

8.5 Analysis and interpretation

To summarise the data calculate the average percentage score, the median, maximum and minimum score percentages and you may do this separately for boys and girls. To make sense of the analysis it is recommended that different colour codes be used to mark specific observations (Excel provides a wide range of colour codes) and also represent findings with appropriate graphs to enhance visual impressions to aid decision-making on where to focus improvement interventions. For instance, the following observations can be made from the analysis that has been done:

a) Overall performance

Overall performance in this class, measured through the mean score, may be e.g. 54,4% which is relatively acceptable but still leaves room for improvement. The median score for the class may be 56% which means that half of the learners obtained scores above 56% and another half obtained scores below 56%.

b) Performance spread

Although the mean and median scores were both above 50%, learner scores may range between eight percent (8%) and 100% which is a fairly wide range that suggests diverse abilities in this class. This implies that intervention strategies will have to be diversified in order to meet the learning needs of different learners, i.e. a one-size-fits-all improvement strategy will not work in this class.

c) Individual learner differences in performance

Individual learners who were identified to be particularly at risk have been indicated with e.g. red colour coding. They obtained scores below 40% and thus fall within the “Not achieved” and “Elementary achievement” levels. They require special attention in terms of teaching strategies and learning opportunities.

d) Group differences in performance

Analysis was done at two group levels, viz. boys and girls. All the summary statistics indicate that the boys performed much lower than the girls. Their mean score was 49,3% against the 60% mean score obtained by girls. The median score for the boys was four percent (4%) lower than of the girls, viz. 52% as against 56%. Boys’ scores ranged between eight percent (8%) and 88% while the lowest score for the girls was 32% and the highest was 100%. It is evident that in this class boys require a different or more focused intervention than the girls.

e) Performance in specific topics or skills

The percentage scores per item indicate the items and, therefore, the topic or skill where interventions must focus. The analysis and diagnosis (from ‘a’ to ‘e’ above) identifies:-

i. Which learners need special attention?; and
ii. Which content areas require special focus?

The analysis also suggests what materials will be required to improve on the identified areas, what extra support the teacher will need (if necessary), whether additional time will be required, who else should be involved in the interventions and a host of other possibilities that the data analyser may see fit in their context.

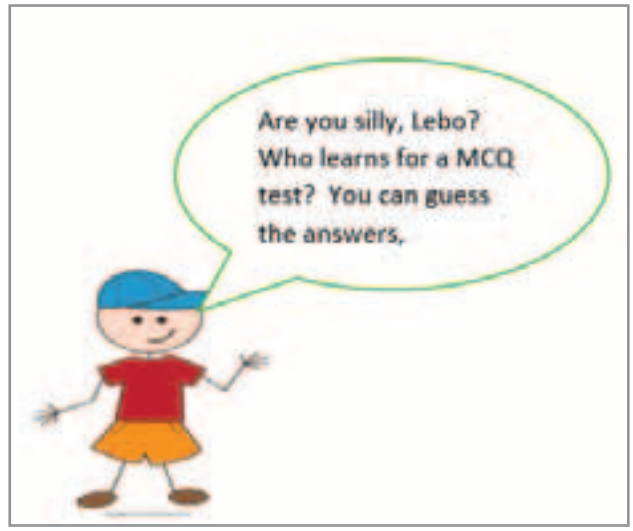
8.6 Diagnostic or error analysis

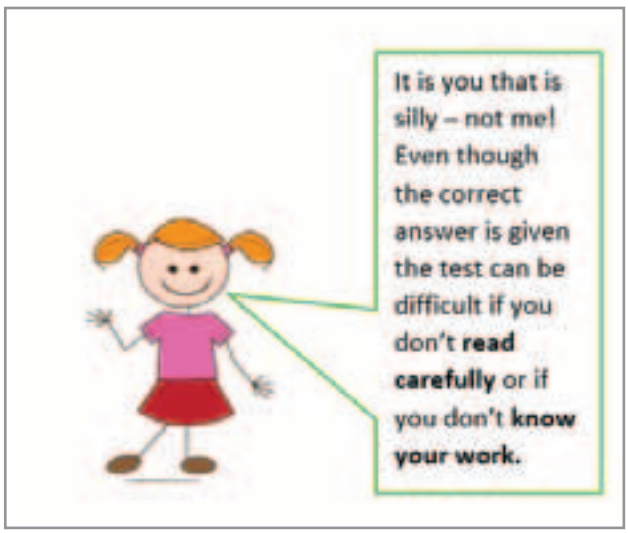
Error analysis is the study of errors in learners’ responses with a view to look for possible explanations for these errors. It provides specific information about the relative skill proficiency or misconception a learner has in his/her response, in order to understand what the learner can or cannot do. It is a multifaceted activity, for the teacher, because it involves analysis of the correct, partially correct and incorrect thought processes of the learners’ individual responses and thinking about possible remediating interventions that might work well.

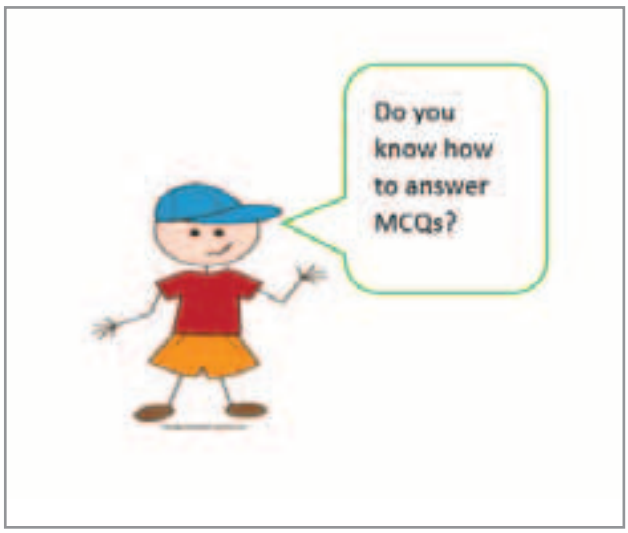
Understanding the errors a learner or a group of learners make will determine how learners are grouped in a certain subjects to enhance effective teaching.

PART TWO
ANSWERING MULTIPLE CHOICE QUESTIONS

ANSWERING MULTIPLE CHOICE QUESTIONS (MCQ'S)







HOW TO ANSWER MULTIPLE CHOICE QUESTIONS (MCQs)

NOTE TO THE TEACHER:

1. The Structure of a MCQ
   Example:

   What is the number symbol for six hundred and ninety-eight? STEM

A	60 098	DISTRACTORS
B	6 098	
C	968	
D	698	KEY

EXPLANATION:	
STEM	QUESTION
DISTRACTORS	INCORRECT OPTIONS
KEY	ANSWER

2. Strategies for answering MCQs

2.1 Read the question carefully. Understand the question and be sure of what is expected of you. Underline the key words in the question. You may need to read the question more than once.

2.2 Try to answer the question before you check out the options. You may be required to work out the answer before you are able to choose the correct option.

2.3 Read each option cautiously. Delete the options that you are sure is incorrect, until you are left with the correct option.

2.4 Make sure that the option you have chosen matches what the question requires.

2.5 Most often there will be an option that will be obviously wrong.
Eliminate this option.

2.6 Two options may sound alike. However, one of the options may be partially correct; it may be a partial answer to the question. Reread the question to make sure that the option fully answers the question.

2.7 If you are unsure of which options are incorrect, leave the question and move to the questions you are sure of. However, make sure that you come back to the question. Don't leave blanks. CHOOSE AN OPTION FOR EVERY QUESTION.

2.8 There will be only ONE correct option.

NOTE TO THE LEARNER:

1. There is no pattern in which the answers are arranged.
2. Check your work. If you make a mistake, strike out the incorrect option and circle the correct answer.
3. Do not leave any question unanswered.

PART THREE
PHASED BASED DIAGNOSTIC ITEMS

Please note the following keys:

Explanation		Levels of dificulty	Cognitive levels
NOR	1. Numbers, Operations and Relation ships	E: easy	K: knowledge
PFA	2. Patterns, Functions and Algebra	M: moderate	R: routine procedure
SS	3. Space and Shape (Geometry)	D: difficult	C: complex procedure
M	4. Measurement		P: problem solving
DH	5. Data Handling		
G(3)	Grade 3		

Please note that the tag above each question, as shown below, provides the following information in this order: content area, topic, grade level of the question, cognitive level and difficulty level e.g.:

Content area	Topic	Grade level	Cognitive level	Level of difficulty
NOR	repeated addition	G1 (Grade one)	R	E

It is thereafter written above each question in the format:

NOR/repeated addition/G1/R/E

SECTION A: (one mark per answer)

Circle the letter of the correct answer from Question 1 to Question 50.

NOR/common fractions/G7/R/E

1. What does $\frac{3}{10} + \frac{5}{8}$ equal to?

A $\frac{8}{18}$

B $\frac{37}{40}$

C $\frac{8}{40}$

D $\frac{15}{80}$ (1)

NOR/decimal fractions/G8/K/E

2. Write the value of $\sqrt[3]{0{,}008}$.

A $0{,}024$

B $0{,}002$

C $0{,}24$

D $0{,}2$ (1)

NOR/whole numbers/G8/R/E

3. Decrease R126,00 in the ratio $3 : 7$.

A R37,80

B R12,60

C R294

D R54 (1)

NOR/common fractions/G9/R/M

4. Calculate $\frac{3}{5} - \frac{1}{2} \times \frac{1}{3}$.

A $\frac{13}{30}$

B $\frac{2}{30}$

C $\frac{1}{10}$

D $\frac{2}{9}$

(1)

NOR/common fractions/G9/R/M

5. Calculate: $\sqrt{\frac{9}{16}} \div \sqrt{\frac{1}{4}}$.

A $\frac{9}{4}$

B $\frac{3}{2}$

C $\frac{2}{3}$

D $\frac{3}{8}$

(1)

NOR/exponents/G9/K/E

6. What is the product of $3^3 \; and \; 3^{-1}$

A 3^{-3}

B 9^{-3}

C 3^2

D 9^2

(1)

NOR/decimal fractions/G9/K/E

7. What kind of number is $-0,\dot{2}$?

A A natural number

B A whole number

C A rational number

D An integer

(1)

NOR/exponents/G9/K/E

8. Write $0,00578$ in scientific notation.

A $57{,}8 \times 10^{-3}$

B $5{,}78 \times 10^{-3}$

C $5{,}78 \times 10^{-4}$

D $5{,}78 \times 10^{3}$

(1)

NOR/whole numbers/G10/R/M

9. Complete: $\sqrt{\sqrt{400} + \sqrt{100} + 6} = \ldots$

A 506

B 416

C 126

D 6

(1)

NOR/common fractions/G7/K/E

10. Write $\frac{2}{5}$ as a percentage.

A $20\ \%$

B $40\ \%$

C $50\ \%$

D $70\ \%$

(1)

NOR/whole numbers/G7/R/M

11. A cell phone which cost R1 200 is sold at a loss of 20%.

Calculate the selling price of the cell phone.

A R60

B R240

C R960

D R1 440

(1)

NOR/whole numbers/G8/C/M

12. Mary bought a dress for R395,00 and sold it for R250,00.
Calculate the percentage loss correct to one decimal place.

A 169,3 %
B 145,0 %
C 36,7 %
D 58 %

(1)

NOR/whole numbers/G7/R/E

13. Janet travelled a total distance of 540 km at an average speed of 120 km/h.
How long did she travel?

A 13,3 hours
B 11 hours
C 7 hours
D 4,5 hours

(1)

NOR/whole numbers/G8/C/M

14. If it takes 4 hours to travel 380 km, how long will it take to travel 570 km at the same average speed?

A 1,5 hours
B 2,4 hours
C 2,7 hours
D 6 hours

(1)

NOR/whole numbers/G9/C/M

15. A bus driver covers a certain distance in 3 hours at an average speed of 80 km/h.
How long will the journey take at an average speed of 50 km/h?

A 0,2 hours
B 0,6 hours
C 1,9 hours
D 4,8 hours

(1)

NOR/whole numbers/G8/R/M

16. Calculate the interest earned on an investment of R3 200 at 12,5 % simple interest after 3 years.

A R 40 000
B R 9 600
C R 1 200
D R 400 (1)

NOR/whole numbers/G8/R/E

17. What will R4 500,00 amount to if it is invested for 4 years at 13 % per annum simple interest?

A R6 840,00
B R6 660,00
C R4 499,48
D R2 340,00 (1)

NOR/whole numbers/G9/C/M

18. Calculate how long it will take for an investment of R4 000 at 3 % per annum simple interest to earn an interest of R840.

A 14,3 years
B 7 years
C 63 years
D 1,59 years (1)

NOR/whole numbers/G9/R/M

19. Calculate the final amount that I will have in my savings account if I invest R600 for 2 years at a rate of 6% per annum compound interest.

A R72,00
B R530,16
C R674,16
D R1 272,00 (1)

PFA/algebraic equations/G8/R/E

20. Calculate the value of x if $2(3-x)=8$.

A -7

B -3

C -2

D -1

(1)

PFA/algebraic equations/G7/K/E

21. Complete: In the expression $2x-4$ the variable and constant are … respectively:

A 2 and -4

B x and -4

C x and 4

D 2 and 4

(1)

PFA/numeric patterns/G7R/M

22. Complete: The rule for the sequence $4\,;7\,;10\,;13$ is …

A $3n-1$, where n is the position of the term.

B $n+3$, where n is the position of the term.

C add three to the previous term.

D $3n+3$, where n is the position of the term.

(1)

PFA/exponents/G8/K/E

23. Complete: $(a+b)^0=$

A $a+b$

B 2

C 1

D 0

(1)

PFA/functions and relationships/G8/R/M

24. What is the relationship between p and t in the table below?

x	1	2	3	4
y	1	5	9	13

A $y = 4x - 3$

B $y = 3x - 2$

C $y = 2x - 1$

D $y = x + 4$

(1)

PFA/algebraic expressions/G7/R/E

25. Complete: If $x = 3$ the value of y in the equation $y = 4x - 3$ is …

A 40

B 9

C 4

D 0

(1)

PFA/algebraic expressions/G8/K/E

26. What is the coefficient of c in the expression $7a + 6b - c$?

A 3

B 1

C 0

D -1

(1)

PFA/algebraic expressions/G8/R/M

27. Write the algebraic expression which matches the statement:

The sum of half a number and another number.

A $\frac{1}{2}(x + y)$

B $\frac{1}{2}x + y$

C $\frac{1}{2} + x$

D $\frac{1}{2}xy$

(1)

PFA/algebraic equations/G9/R/M

28. Complete: The values of x in the equation $(x+1)(2x-1)=0$ are …

A $-1\ or\ -\frac{1}{2}$

B $-1\ or\ \frac{1}{2}$

C $-1\ or\ 2$

D $1\ or\ \frac{1}{2}$ (1)

PFA/algebraic equations/G9/R/M

29. What is the value of x if $3^x=\frac{1}{9}$?

A -3

B -2

C 2

D 3 (1)

PFA/algebraic equations/G9/C/M

30. Complete: $\frac{x}{y}-1=$

A $x-y$

B $\frac{y-x}{y}$

C $\frac{x-y}{y}$

D $\frac{x-1}{y}$ (1)

PFA/algebraic equations/G9/C/M

31. Complete: If $x=3$ in the equation $x^2+x+t=0$, then the value of t is …

A -12

B -9

C 12

D 9 (1)

PFA/graphs/G9/R/M

32. What is the y-intercept of the graph defined by $4x + 2y = 12$?

A -6

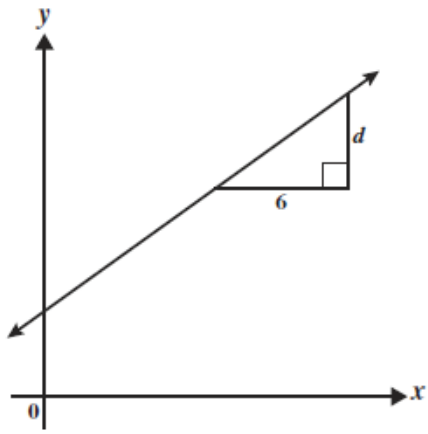
B 12

C 6

D 3

(1)

33.



The gradient of the line shown above is $\frac{2}{3}$. What is the value of d?

A 9

B 4

C 3

D $\frac{1}{9}$

(1)

SS/geometry of 2-D shapes/G7/K/E

34. Complete: A … is a quadrilateral where all the angles are right angles.

A rectangle

B trapezium

C rhombus

D kite

(1)

SS/geometry of 2-D shapes/G7/K/E

35. Complete: The line segment that divides a circle into 2 equal parts is called a …

A radius.

B circumference.

C diameter.

D chord. (1)

SS/geometry of 3-D objects/G8/K/M

36. A platonic solid with 8 faces is ...

A a dodecahedron.

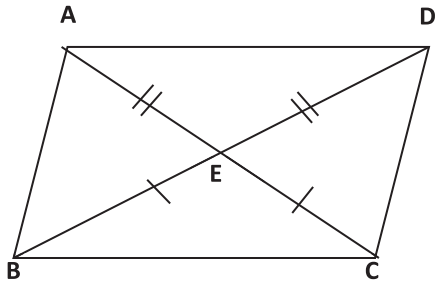
B an octahedron.

C a hexahedron.

D a tetrahedron. (1)

SS/geometry of 2-D shapes/G9/R/M

37. Complete: In quadrilateral $ABCD$, $AE = ED \; and \; BE = EC$, therefore …



A ΔAEB ||| ΔCED.

B ΔAED ||| ΔBEC.

C ΔAEB≡ΔDEC.

D ΔAED≡ΔBEC. (1)

SS/geometry of 3-D objects/G9/K/M

38. What is the size of each angle in a regular hexagon?

A $120°$

B $108°$

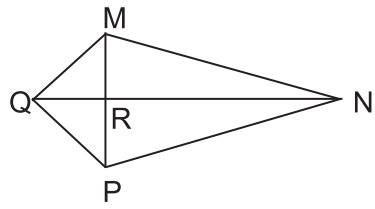
C $100°$

D $90°$ (1)

SS/geometry of 2-D shapes/G9/C/M

39. Complete: In kite $MNPQ$, $MQ = PQ$, $MN = PN$ and $M\hat{Q}P = 30°$,

means $Q\hat{M}R = \ldots$



A $90°$

B $75°$

C $30°$

D $15°$

(1)

SS/geometry of 2-D shapes/G7/K/E

40. A 3-D object which ONLY has all faces of a square is called a …

A cylinder.

B pyramid.

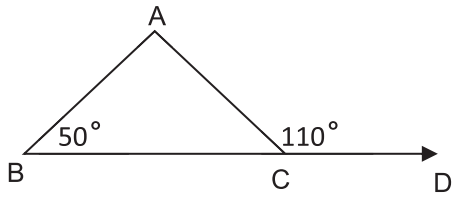
C sphere.

D cube.

(1)

SS/geometry of straight lines/G8/C/E

41. In the figure below, $\hat{B} = 50°$ and $A\hat{C}D = 110°$.



Complete: The size of $\hat{A}$ is …

A $160°$

B $110°$

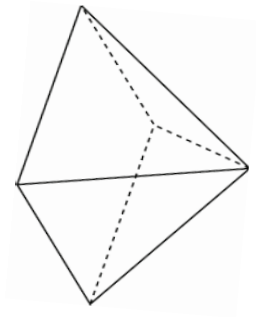
C $80°$

D $60°$

(1)

SS/geometry of 3-D objects/G7/K/E

42. Identify the 3-D object shown in the diagram.



A A rectangular prism
B A triangular prism
C A pyramid
D A cube

(1)

SS/geometry of 3-D objects/G7/K/E

43. How many vertices does a hexagonal prism have?

A 6
B 8
C 12
D 18

(1)

SS/transformation geometry/G9/R/M

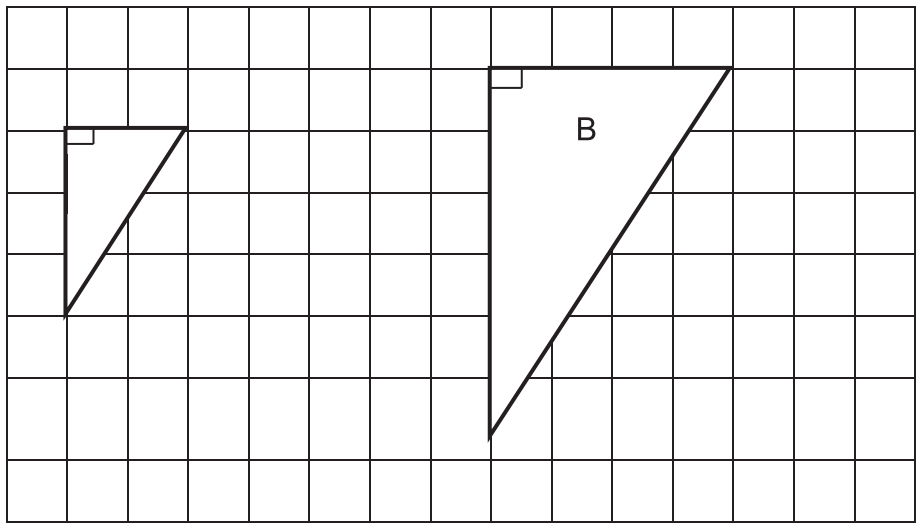
44. Point $B(-2; 3)$ is translated 3 units to the right and 4 units down.
The co-ordinates of its image B' are …

A $B'(-2; -3)$
B $B'(1; -1)$
C $B'(-5; 7)$
D $B'(2; 3)$

(1)

SS/transformation geometry/G7/K/E

45. Complete: The transformation of figure A to figure B is called …



A a reflection.

B a reduction.

C an enlargement

D a rotation

(1)

DH/analyse data/G7/R/M

46. Calculate the mean of the following test scores.

11 12 12 12 13 15 17 18 25

A 14

B 13

C 15

D 12

(1)

DH/analyse data/G8/K/M

47. Calculate the median of the following test scores.

18 11 12 13 15 17 12 25 12

A 14

B 13

C 15

D 12

(1)

DH/probability/G7/R/E

48. What is the probability of drawing a red ACE from a pack of playing cards?

A $\frac{13}{52} = \frac{1}{4}$

B $\frac{2}{52} = \frac{1}{26}$

C $\frac{4}{52} = \frac{1}{13}$

D $\frac{26}{52} = \frac{1}{2}$ (1)

DH/probability/G8/K/M

49. Determine the probability of getting an odd square number when throwing a dice once.

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

B 1

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

D $\frac{1}{6}$ (1)

DH/probability/G9/P/M

50. There are 4 kings in a deck of 52 playing cards. A king is taken out and is not replaced before taking out another card. What is the probability of drawing another king?

A $\frac{3}{51}$

B $\frac{4}{52}$

C $\frac{3}{52}$

D $\frac{4}{51}$ (1)

SECTION B

One mark per answer.

NOR/common fractions/G7/K/E

1. Write the ratio $\frac{4}{13} : \frac{7}{13}$ in the simplest form. (1)

NOR/whole numbers/G7/R/E

2. Two numbers are given in factorised form as follows:

   $2 \times 2 \times 3 \times 5 \times 7$ and $2 \times 3 \times 7 \times 7$.

   What is the HCF of the two numbers? (1)

NOR/exponents/G8/K/E

3. Write $7\,530\,000$ in scientific notation. (1)

NOR/common fractions/G8/R/E

4. Complete: $0{,}01 \times 10^2 \times \frac{1}{3} =$ (1)

NOR/whole numbers/G7/R/E

5. Complete : The HCF of 24 and 32 is … (1)

NOR/whole numbers/G7/R/E

6. Simplify the ratio $\mathrm{R}250 : \mathrm{R}150 : \mathrm{R}100$. (1)

NOR/whole numbers/G8/C/M

7. What is 100% of a mass if 35% of the mass is 140 g? (1)

NOR/common fractions/G9/R/M

8. Calculate $8\left(\frac{1}{8} - \sqrt{\frac{1}{16}}\right)$ (1)

NOR/exponents/G9/R/E

9. Write $6{,}7 \times 10^{-3}$ in the standard form. (1)

NOR/whole numbers/G9/K/E

10. Which one of the given numbers is irrational?

    $\sqrt{25}$, $\sqrt{5}$, 3,15, $\frac{2}{3}$

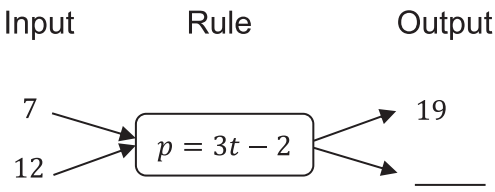
    (1)

NOR/exponents/G10/R/M

11. Complete: $\left(6^{2/3}\right)^3 =$ (1)

PFA/flow diagram-rule/G8/R/E

12. Complete the flow diagram by using the given rule.



(1)

PFA/algebraic expressions/G7/R/E

13. Solve the following equation by inspection: $7x = 91$ (1)

PFA/algebraic expressions/G7/R/E

14. Calculate the value of $a + 12$, if a = 13. (1)

PFA/algebraic expressions/G8/K/E

15. Write the coefficient of x in the expression $-6x + 4$. (1)

PFA/algebraic expressions/G8/K/E

16. Complete: $2x^2 + 3x^2 =$ (1)

PFA/algebraic expressions/G8/C/M

17. Complete: $(7x)^2 + 11x^2 =$ (1)

PFA/exponents/G8/K/E

18. Complete: $x^3 \times x^2 =$ (1)

PFA/exponents/G9/K/E

19. Complete: $4^x \times 4^x =$ (1)

PFA/numeric patterns/G8/R/E

20. Complete the following number sequence.

$1\ ;\ -3\ ;\ 9\ ;\ -27\ ;$ __ . (1)

PFA/graphs/G8/K/E

21. State whether the following statement is true or false.

The point A$(-1; -2)$ lies in the 3rd quadrant. (1)

PFA/numeric patterns/G8/R/E

22. Complete the following number sequence.

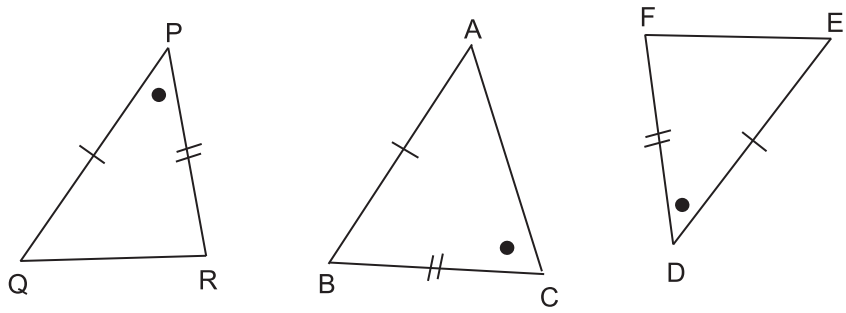
3; 9; 27; 81; __. (1)

SS/geometry of 2-D shapes/G8/K/E

23. Complete: The sum of the interior angles of a triangle is equal to … (1)

SS/geometry of 2-D shapes/G7/K/E

24.



Complete: The triangle congruent to ΔPQR is … (1)

SS/geometry of 2-D shapes/G8/K/E

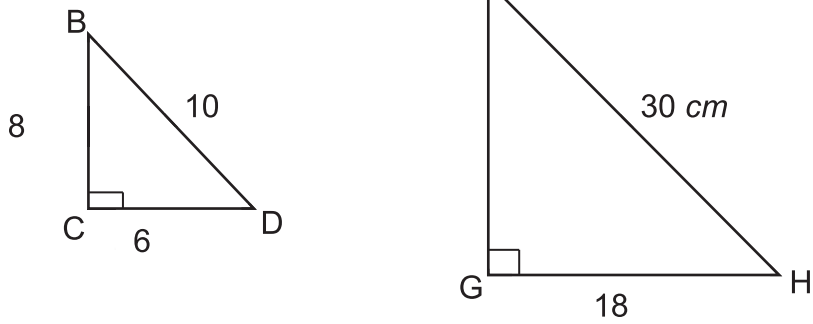
25. Complete: In ΔABC, $AB = AC$ means that $\hat{B} = \ldots$ (1)

SS/geometry of 2-D shapes/G8/K/E

26. *Complete: In* ΔABC, $\hat{A} = 40°$ *and* $\hat{C} = 30°$ *means that* $\hat{B} = \ldots$ (1)

SS/geometry of 2-D shapes/G9/K/E

27. In ΔBCD and ΔFGH, $BC = 8$ cm, $CD = 6$ cm, $BD = 10$ cm, $GH = 18$ cm and $FH = 30$ cm.



Are the triangles congruent or similar? (1)

M/area of 2-D shapes/G7/K/E

28. What is the area of a rectangle if the length $= 17$ cm and the breadth $= 12$ cm? (1)

M/perimeter of 2-D shapes/G9/K/E

29. The length of the sides of a square is doubled. Write the value of k if the perimeter of the enlarged square $= k \times$ the perimeter of the original square. (1)

DH/probability/G8/K/E

30. A box contains 3 blue, 4 white and 5 green marbles of the same size. What is the probability that one can randomly pick a green marble? (1)

SECTION C

NOR/whole numbers/G8/C/M

1. Calculate without using a calculator. Show the calculation steps.

$4^3 \div \sqrt{64}$ (3)

NOR/exponents/G9/R/M

2. Calculate without using a calculator. Show your calculation steps.

$\frac{2\times3^2\times5^4}{5^3\times8^0}$ (3)

NOR/exponents/G10/R/E

3. Calculate: $3^{\frac{1}{2}} \times 3^{\frac{1}{2}} \times 3^0$. (2)

PFA/algebraic expressions/G10/R/M

4. Calculate the product of $2x - 1$ and $x^2 + 2x - 3$. (3)

PFA/algebraic expressions/G9/R/M

5. Factorise fully:

5.1 $10t^2 - 5t$ (2)

5.2 $81 - 100a^2$ (2)

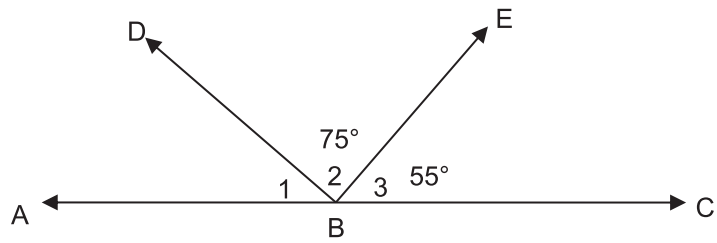
5.3 $x^2 + 5x + 6$ (2)

PFA/graphs/G9/R/M

6. On the same set of axes, draw and label the graphs defined by $y = -\frac{2}{3}x + 1$ and $y = \frac{3}{2}x - 1$. Clearly mark the points where each graph cuts the X-axis and the Y-axis. (7)

SS/geometry of straight lines/G8/R/E

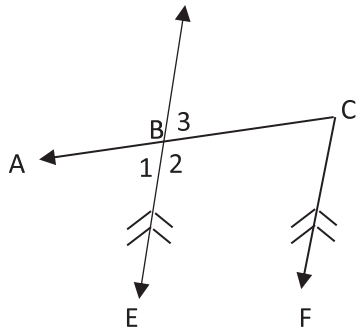
7. In the diagram below, ABC is a straight line, $\hat{B}_2 = 75°$ and $\hat{B}_3 = 55°$.



Determine, with reasons, the size of $\hat{B}_1$. (3)

SS/geometry of straight lines/G8/K/E

8. In the figure, $\hat{B}_3 = 35°$ and $BE \parallel CF$.



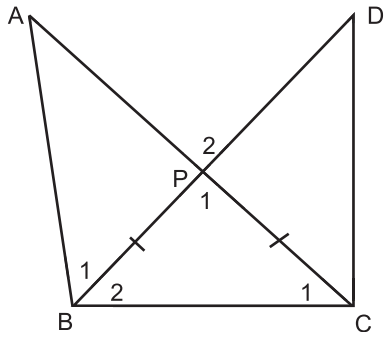
Calculate the size of:

8.1 $\hat{B}_1$ (2)

8.2 $\hat{C}$ (2)

SS/geometry of 2-D shapes/G9/C/M

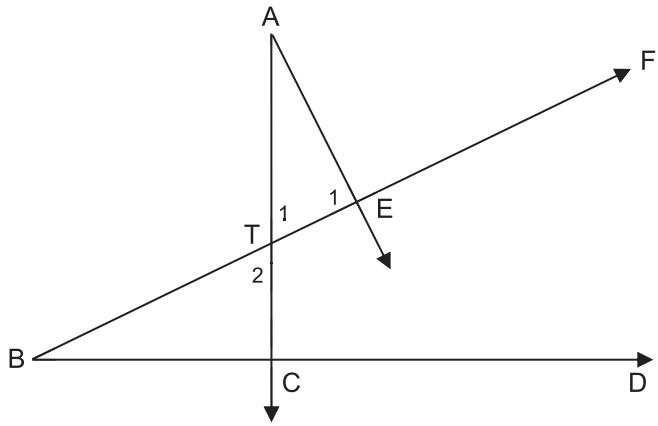
9. In the figure, $BP = PC$ and $\hat{P}_2 = 80°$.



Calculate, with reasons, the size of $\hat{B}_2$. (6)

SS/geometry of 2-D shapes/G9/P/M

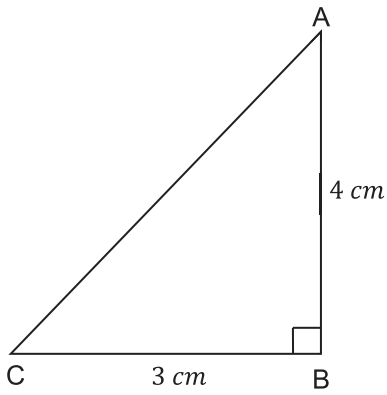
10. In the figure below, $AE \perp BTF$, $ATC \perp BD$ and $BC = AE$.



Prove, with reasons, that $\Delta BCT \equiv \Delta AET$. (5)

M/Theorem of Pythagoras/G8/R/M

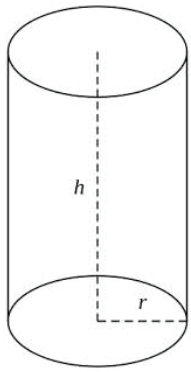
11. In ΔABC, $\hat{B} = 90°$, $AB = 4$ cm and $BC = 3$ cm.



Calculate the length of AC. (3)

M/surface area and volume of 3-D objects/G9/R/M

12. A solid cylinder has a base with the radius$= 7\ cm$, the height $= 16\ cm$ and $\pi = \frac{22}{7}$.



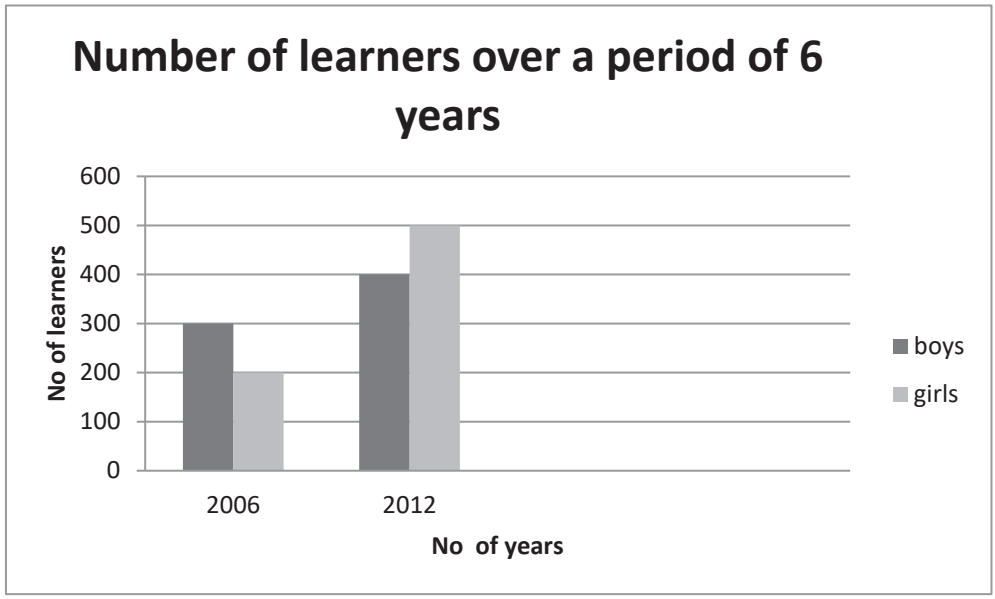
Calculate the surface area of the cylinder. (4)

M/surface area and volume of 3-D objects/G9/R/M

13. The volume of a rectangular tank is $7000\ \text{mm}^3$, the length $= 25\ \text{mm}$ and the breadth $= 80\ \text{mm}$. Calculate the height. (3)

DH/interpretation/G7/K/E

14. Study the following graph.



14.1 What was the total number of learners in 2006? (1)

14.2 What was the increase in the number of girls between 2006 and 2012? (1)

14.3 What was the difference between the number of boys and girls in 2012? (1)

15. The stem-and-leaf display below represents ages, in years, of a group of teachers.

Stem	Leaves
2	5 8
3	4 5 5 5
4	0 0 2 7 9
5	0 0 0 0 5 5 8

15.1 Determine the average age represented. (3)

15.2 What is the mode of the ages represented? (1)

15.3 Determine the median of the ages represented (2)

basic education
Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

DIAGNOSTIC TEST ITEMS: MARKING GUIDELINE
MATHEMATICS: ENGLISH
GRADE 9

This memorandum consists of 15 pages.

Sections	Levels of difficulty	Cognitive levels
A: multiple-choice questions	E: easy	K: knowledge
B: short answer questions	M: moderate	R: routine procedure
C: multiple step questions	D: difficult	C: complex procedure
		P: problem solving

Levels of understanding (number and explanation)
1. There are unrelated strategies or excessive dependence on the given information in the question which is incorrectly used or is duplicated.
2. There are some computational ability that mat not relate to the question/topic.
3. There are some conceptual knowledge and ability to analyse but it is inconsistent in computational and/reasoning skills.
4. Correct response. The learner is able to apply/demonstrate correct computational and reasoning skills required in the question.

SECTION A

One mark per answer.

No.		Expected answer	Level of understanding or error analysis		Cognitive level	Level of difficulty	Grade
1.	A	$\frac{8}{18}$	1	Added numerators and denominators together.	R	E	7
	B	$\frac{37}{40}$ ✓	4	Correct response: $\frac{3}{10}\times\frac{4}{4}+\frac{5}{8}\times\frac{4}{4}=\frac{12}{40}+\frac{25}{40}=\frac{37}{40}$			
	C	$\frac{8}{40}$	2	Correct LCM but added numerators.			
	D	$\frac{15}{80}$	2	Multiplied 3 by 5 and 10 by 8			
2.	A	$0{,}024$	1	Multiplied $0{,}008$ by 3	K	E	8
	B	$0{,}002$	2	$\sqrt[3]{8}=2,\therefore\ \sqrt[3]{0{,}008}=0{,}002$			
	C	$0{,}24$	1	$8\times3=24$ but incorrect place value.			
	D	$0{,}2$ ✓	4	Correct response: $\sqrt[3]{\frac{8}{1000}}=\frac{2}{10}=0{,}2$			
3.	A	$R37{,}80$	1	Added 3 and 7 and decreased by $3:10$	R	E	8
	B	$R12{,}60$	1	Added 3 and 7 and divided $R126{,}00$ by 10			
	C	$R294$	2	Increased in the ratio $7:3$			
	D	$R54$ ✓	4	Correct response			

No.		Expected answer	Level of understanding or error analysis		Cognitive level	Level of difficulty	Grade
4.	A	$\frac{13}{30}$ ✓	4	Correct response: $\frac{3}{5}-\frac{1}{2}\times\frac{1}{3}=\frac{3}{5}-\frac{1}{6}=\frac{18-5}{30}$	R	M	9
	B	$\frac{2}{30}$	1	$\frac{3-1}{5\times2\times3}=\frac{2}{30}$			
	C	$\frac{1}{10}$	1	$\frac{3}{5}-\frac{1}{2}\times\frac{1}{3}=\frac{1\times1}{5\times2}=\frac{1}{10}$			
	D	$\frac{2}{9}$	1	$\frac{3-1}{5-2\times3}\neq\frac{2}{3\times3}=\frac{2}{9}$			
5.	A	$\frac{9}{4}$	1	Ignored the square root sign: $\frac{1}{9}\div\frac{1}{4}=\frac{1}{9}\times\frac{4}{1}=\frac{4}{9}$	K	E	9
	B	$\frac{3}{2}$ ✓	4	Correct response: $\frac{3}{4}\div\frac{1}{2}=\frac{3}{4}\times\frac{2}{1}=\frac{3}{2}$			
	C	$\frac{2}{3}$	2	$\frac{1}{2}\div\frac{3}{4}=\frac{1}{2}\times\frac{4}{3}=\frac{2}{3}$			
	D	$\frac{3}{8}$	2	$\frac{3}{4}\div\frac{1}{2}=\frac{3}{4}\times\frac{1}{2}=\frac{3}{8}$			
6.	A	3^{-3}	1	Multiplied the exponents	R	E	9
	B	9^{-3}	1	Multiplied the bases and the exponents			
	C	3^2 ✓	4	Correct response.			
	D	9^2	2	Multiplied the bases			
7.	A	A natural number	1	No understanding	K	E	9
	B	A whole number	2	Zero led to incorrect answer			
	C	A rational number ✓	4	Correct response			
	D	An integer	2	Negative led to incorrect answer			
8.	A	$57{,}8\times10^{-3}$	1	Not 1 digit before decimal comma	R	E	9
	B	$5{,}78\times10^{-3}$ ✓	4	Correct response			
	C	$5{,}78\times10^{-4}$	2	Exponent incorrect			
	D	$5{,}78\times10^{3}$	2	Incorrect sign of exponent			
9.	A	506	1	Added 400, 100 and 6	R	D	10
	B	416	2	Added 400, 10 and 6			
	C	126	2	Added 20, 100 and 6			
	D	6 ✓	4	Correct response: $\sqrt{20+10+6}=\sqrt{36}=6$			
10.	A	20 %	1	Used the numerator 2	R	E	7
	B	40 % ✓	4	Correct response			
	C	50 %	1	Used the denominator 5			
	D	70 %	1	Used the sum of numerator and denominator			

No.		Expected answer	Level of understanding or error analysis		Cognitive level	Level of difficulty	Grade
11.	A	$R60$	1	Divided R1 200 by 20	R	M	8
	B	$R240$	2	Calculated 20 % of R1 200			
	C	$R960$ ✓	4	Correct response			
	D	$R1\ 440$	2	Calculated the profit instead of loss			
12.	A	169,3 %	1	Calculated the profit instead of loss	C	M	7
	B	145,0 %	2	Calculated the difference			
	C	36,7 % ✓	4	Correct response			
	D	58 %	1	$\frac{145}{250} \times 100$			
13.	A	13,3 hours	2	Calculated: $\frac{120 \times 60}{540}$	R	M	7
	B	11 hours	1	Calculated: $\frac{540+120}{60}$			
	C	7 hours	1	Calculated: $\frac{540-120}{60}$			
	D	4,5 hours ✓	4	Correct response			
14.	A	1,5 hours	1	Divided 570 by 380	P	M	8
	B	2,4 hours	2	Calculated: $\frac{570}{4 \times 60}$			
	C	2,7 hours	2	Calculated: $\frac{380 \times 4}{570}$			
	D	6 hours ✓	4	Correct response			
15.	A	0,2 hours	1	Calculated: $50 \div 240$	C	M	9
	B	0,6 hours	2	Calculated: $50 \div 80$			
	C	1,9 hours	3	Calculated: $(3 \times 50) \div 80$			
	D	4,8 hours ✓	4	Correct response			
16.	A	R 40 000	1	Calculated: $R3\ 200 \times 12{,}5$	R	M	8
	B	R 9 600	3	Calculated: $R3\ 200 \times 3$			
	C	R 1 200 ✓	4	Correct response			
	D	R 400	1	Calculated: $R3\ 200 \times 12{,}5\ \%$			
17.	A	R 6 840,00 ✓	4	Correct response. 4 500 + $\frac{13}{100} \times 4\ 500 \times 4$	R	E	8
	B	R 5 085,00	2	$\frac{13}{100} \times 4\ 500 + 4\ 500$			
	C	R 4 499,48	2	Used incorrect formula $A = P(1 - ni)$			
	D	R 2 340	3	Calculated interest only and did not add R4 500			
18.	A	14,3 years	1	Used: $\frac{4000 \times 3}{840}$	R	M	9
	B	7 years ✓	4	Correct response			
	C	63 years	2	Used: $\frac{840 \times 3}{4000} \times 100$			

No.		Expected answer	Level of understanding or error analysis		Cognitive level	Level of difficulty	Grade
	D	1,59 years	1	Used: $\frac{4\,000}{840 \times 3}$			
19.	A	R 72,00	2	Used $A = \frac{Pnr}{100}$	R	M	9
	B	R 672,00	1	Added R600 to an incorrect formula, $A = \frac{Pnr}{100}$			
	C	R 674,16 ✓	4	Correct response. $A = 600(1 + 0{,}06)^{2}$			
	D	R 1 272,00	2	Used incorrect formula: $600 \times 2(1 + 0{,}06)$			
20.	A	-7	1	$6x - 2x = 8 \rightarrow -2x = 8 + 6 \rightarrow x = -7$	R	M	7
	B	-3	2	$2 + 3$ instead of 2×3: $5 - x = 8 \rightarrow x = -3$			
	C	-2	2	Multiplied 2 by 3 only $6 - x = 8 \rightarrow x = -2$			
	D	-1 ✓	4	Correct response. $6 - 2x = 8 \rightarrow -2x = 8 - 6 \rightarrow -2x = 2 \rightarrow x = -1$			
21.	A	2 and -4	2	Identified the variable incorrectly	K	E	7
	B	x and -4 ✓	4	Correct response			
	C	x and 4	2	Identified the constant incorrectly			
	D	2 and 4	1	Lacks basic knowledge			
22.	A	$3n - 1$, where n is the position of the term.	3	Subtracted 1 instead of adding 1	R	M	7
	B	$n + 3$, where n is the position of the term.	2	The rule must applies for all terms not just the first term			
	C	add three to the previous term. ✓	4	Correct response			
	D	$3n + 3$, Where n is the position of the term.	1	$7 - 4 = 3$ not 4 or $4 + 4 = 8$ and not 7			
23.	A	$a + b$	1	Handled 'to the power of zero' the same as 'to the power of 1'	K	E	8
	B	2	3	$a^0 + b^0 = 1 + 1 = 2$			
	C	1 ✓	4	Correct response			
	D	0	1	$(a + b) \times 0 = 0$			
24.	A	$y = 4x - 3$	2	Correct response	R	M	8
	B	$y = 3x - 2$	3	Lacks understanding that a pattern must be true for all values.			
	C	$y = 2x - 1$ ✓	4	Correct response			
	D	$y = x + 4$	1	Lacks understanding that a pattern must be true for all values.			
25.	A	40	1	$x = 3 \implies 4x = 43$	R	E	8
	B	9 ✓	4	Correct response $y = 4(3) - 3 = 9$			

No.		Expected answer	Level of understanding or error analysis		Cognitive level	Level of difficulty	Grade
	C	4	1	$4x = 4 + 3$			
	D	0	2	$y = 4(3 - 3) = 0$			
26.	A	3	3	The third term in the expression	K	E	8
	B	1	4	Might know the coefficient but not the sign.			
	C	0	2	Selected a zero because there is no number in front of c.			
	D	-1✓	1	Correct response			
27.	A	$\frac{1}{2}(x + y)$	1	Misread and wrote half the sum of the 2 numbers.	R	M	8
	B	$\frac{1}{2}x + y$ ✓	2	Correct response			
	C	$\frac{1}{2} + x$	3	Misread half a number as the number half.			
	D	$\frac{1}{2}$xy	4	Wrote half the product			
28.	A	-1 or $-\frac{1}{2}$	3	$2x - 1 = 0 \Rightarrow x = -\frac{1}{2}$	R	E	9
	B	-1 or $\frac{1}{2}$ ✓	4	Correct response $x + 1 = 0$ or $2x - 1 = 0$			
	C	-1 or 2	1	Calculated both values incorrectly			
	D	1 or $\frac{1}{2}$	3	$x + 1 = 0 \Rightarrow x = 1$			
29.	A	-3	1	$9 \neq 3^3$	C	M	9
	B	-2 ✓	4	Correct response $3^x = 3^{-2} \Rightarrow x = -2$			
	C	2	3	Incorrectly calculated 3^2			
	D	3	2	Multiplication by 3 is not the same as raising to the power of 3.			
30.	A	$x - y$	1	Learner multiplied the expression by the LCM	C	M	9
	B	$\frac{y-x}{y}$	3	Used the commutative property incorrectly			
	C	$\frac{x-y}{y}$ ✓	4	Correct response $\frac{x}{y} - \frac{y}{y} = \frac{x-y}{y}$			
	D	$\frac{x-1}{y}$	1	Lacks concept regarding different numerators			
31.	A	-12 ✓	4	Correct response $9 + 3 + t = 0 \Rightarrow t = -12$	C	M	9
	B	-9	2	$6 + 3 + t = 0 \Rightarrow t = -9$			
	C	12	3	$9 + 3 + t = 0 \Rightarrow t = 12$			
	D	9	1	$6 + 3 + t = 0 \Rightarrow t = 9$			

No.		Expected answer	Level of understanding or error analysis		Cognitive level	Level of difficulty	Grade
32.	A	-6	2	Changed the sign when dividing by 2.	R	E	9
	B	12	3	Selected the given constant as the intercept			
	C	6 ✓	4	Correct response $x = 0 \implies 2y = 12 \implies y = 6$			
	D	3	1	$y = 0 \implies 4x = 12 \implies x = 3$			
33.	A	9	3	Used incorrect formula for gradient	R	M	9
	B	4 ✓	4	Correct response			
	C	3	2	Incorrectly stated $\frac{3}{6}$ is equal to $\frac{2}{3}$			
	D	$\frac{1}{9}$	1	$6 \times d = \frac{2}{3}$			
34.	A	rectangle ✓	4	Correct response	K	E	7
	B	trapezium	1	Does not know the properties of quadrilaterals			
	C	rhombus					
	D	kite					
35.	A	radius	1	Does not know the properties of a circle	K	E	7
	B	circumference	1	Does not know the properties of a circle			
	C	diameter ✓	4	Correct response			
	D	chord	1	Does not know the properties of a circle			
36.	A	a dodecahedron	1	Lacks knowledge of platonic solids	K	E	8
	B	an octahedron ✓	4	Correct response			
	C	a hexahedron	1	Lacks knowledge of platonic solids			
	D	a tetrahedron	1				
37.	A	$\Delta AEB \text{ ||| } \Delta CED$	1	Does not know the difference between similarity and congruency	R	M	9
	B	$\Delta AED \text{ ||| } \Delta BEC$	1				
	C	$\Delta AEB \equiv \Delta DEC$ ✓	4	Correct response			
	D	$\Delta AED \equiv \Delta BEC$	2	Incorrect equal lines selected, $AE = BE$ and $DE = CE$			
38.	A	$120°$ ✓	4	Correct answer	K	E	9
	B	$108°$	1	Lacks knowledge, sum of angles of polygon with n sides = $(n - 2) \times 180°$			
	C	$100°$	1				
	D	$90°$	1				

No.		Expected answer	Level of understanding or error analysis		Cognitive level	Level of difficulty	Grade
39.	A	$90°$	1	Does not know the properties of sides and angles of a kite	C	M	9
	B	$75°$ ✓	4	Correct response, $Q\hat{M}R = Q\hat{P}M = 150° \div 2 = 75°$ or $90° - 15° = 75°$			
	C	$30°$	1	Does not know the properties of sides and angles of a kite			
	D	$15°$	1	$Q\hat{M}R = M\hat{Q}R = 15°$ (diagonal bisects angle)			
40.	A	cylinder	1	Lacks knowledge of the nets of 3-D objects	K	E	8
	B	pyramid	1				
	C	sphere ✓	4	Correct response			
	D	cube	1	Lacks knowledge of the nets of 3-D objects			
41.	A	$160°$	1	Added $50° + 110°$	R	E	9
	B	$110°$	1	$\hat{A} = 110°$ (used alternate angles)			
	C	$80°$	1	$\hat{A} + 50° + 50° = 180° \implies \hat{A} = 80°$			
	D	$60°$ ✓	4	Correct response, $\hat{A} = 110° - 50° = 60°$			
42.	A	a rectangular prism	1	Lacks knowledge of 3-D objects	K	E	7
	B	a triangular prism	1				
	C	a pyramid ✓	4	Correct response			
	D	a cube	1	Lacks knowledge of 3-D objects			
43.	A	6	4	Shows no understanding of a vertex.	R	E	8
	B	8	1	Number of faces			
	C	12✓	1	Correct response			
	D	18	1	Number of edges			
44.	A	$B'(-2;-3)$	1	Reflection in X -axis	R	M	9
	B	$B'(1;-1)$ ✓	4	Correct response			
	C	$B'(-5;7)$	1	Translate 3 units left and 4 units upwards			
	D	$B'(2;3)$	1	Reflection in Y-axis			
45.	A	a reflection	1	Lacks knowledge of transformation.	K	E	8
	B	a reduction	1				
	C	an enlargement ✓	4	Correct response			
	D	a rotation	1	Lacks knowledge of transformation.			

No.		Expected answer	Level of understanding or error analysis		Cognitive level	Level of difficulty	Grade
46.	A	14	1	Determined the range	R	E	7
	B	13	1	Determined the median			
	C	15 ✓	4	Correct response			
	D	12	1	Determined the mode			
47.	A	14	1	Calculated the range	K	M	8
	B	13 ✓	4	Correct response			
	C	15	2	Did not order the scores correctly			
	D	12	1	Selected the mode			
48.	A	$\frac{13}{52} = \frac{1}{4}$	1	Used only one red suit	R	E	7
	B	$\frac{2}{52} = \frac{1}{26}$ ✓	4	Correct response			
	C	$\frac{4}{52} = \frac{1}{13}$	1	Used all the Aces instead of only red ones			
	D	$\frac{26}{52} = \frac{1}{2}$	1	Used all the red cards			
49.	A	$\frac{2}{6} = \frac{1}{3}$	2	Used both square numbers	K	E	8
	B	1	1	Lacks knowledge of probability			
	C	$\frac{3}{6} = \frac{1}{2}$	2	Used the three odd numbers			
	D	$\frac{1}{6}$ ✓	4	Correct response			
50.	A	$\frac{3}{51}$ ✓	4	Correct response	C	D	9
	B	$\frac{4}{52}$	1	Did not realise that only 3 kings and 51 cards were left.			
	C	$\frac{3}{52}$	2	Did not realise that only 51 cards were left.			
	D	$\frac{4}{51}$	2	Did not realise that only 3 kings were left.			

SECTION B

One mark per answer.

- **Accept any alternative correct solution that may not be included in the memorandum.**
- **Penalise only once for the same error where applicable.**
- **Ignore spelling errors.**
- **Accept answers that may be in any official language i.e. if it is a word.**

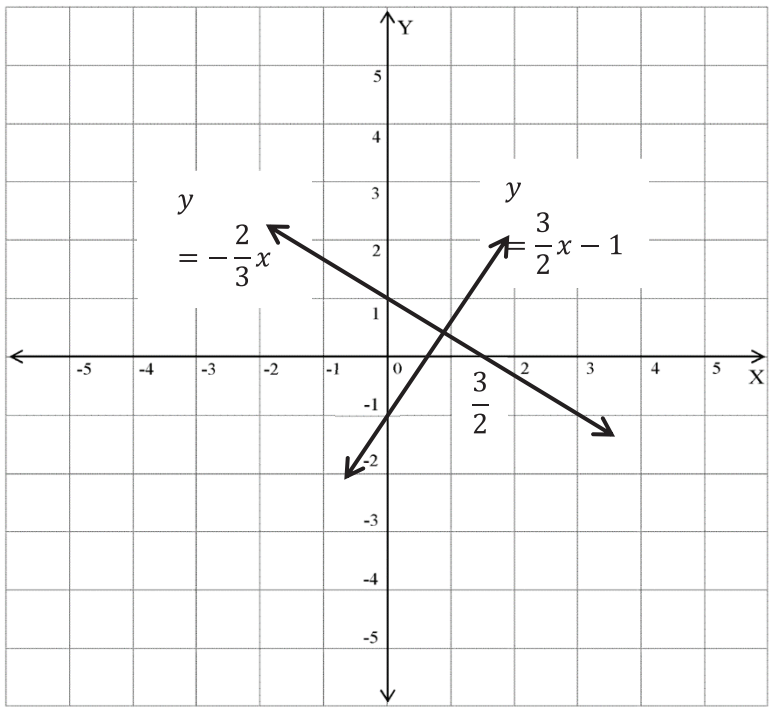
No.	Expected answer	Clarification	Mark	Cognitive level	Level of difficulty	Grade
1.	$4:7$ ✓		1	K	E	7
2.	42 or $2\times3\times7$ ✓		1	R	E	8
3.	$7{,}53\times10^{6}$ ✓		1	K	E	8
4.	$\frac{1}{3}$ ✓	$0{,}1\times10^{2}=1$ and $1\times\frac{1}{3}=\frac{1}{3}$	1	R	E	9
5.	8 ✓	$24=2^{3}\times3$ $32=2^{5}$ HCF $=2^{3}$	1	R	E	9
6.	$5:3:2$ ✓	$250:150:100$ $=5:3:2$	1	R	E	9
7.	400 ✓	$\frac{x}{140}=\frac{100}{35}$ $35x=14000$ $x=400$	1	R	M	10
8.	-1 ✓	$8(\frac{1}{8}-\frac{1}{4})$ = (1-2) = -1	1	C	M	9
9.	$0{,}0067$ ✓		1	R	E	9
10.	$\sqrt{5}$ ✓	$\sqrt{5}$ cannot be written in the form $\frac{integer}{non-zero\ integer}$	1	K	E	9
11.	34 ✓	$p=3\times12-2=36-2$	1	R	M	7
12.	13 ✓	Divided $7x$ and 91 each by 7	1	R	E	7
13.	25 ✓	$13+12$	1	R	E	7
14.	-6 ✓		1	K	E	8
15.	$5x^{2}$ ✓		1	K	E	8
16.	$60x^{2}$ ✓	$49x^{2}+11x^{2}$	1	C	M	8
17.	x^{5} ✓	x^{3+2}	1	K	E	8
18.	4^{2x} ✓	4^{x+x}	1	K	M	9
19.	36 ✓	$6^{2/3\times3}=6^{2}=36$	1	R	M	10
20.	81 ✓	Multiplied by -3	1	R	E	8

No.	Expected answer	Clarification	Mark	Cognitive level	Level of difficulty	Grade
21.	True ✓	Both x and y negative	1	K	E	9
22.	243 ✓	81 x 3	1	R	M	9
23.	$180°$ ✓		1	K	E	7
24.	ΔDEF ✓	s ∠ s	1	K	M	7
25.	$\hat{C}$ ✓		1	K	E	8
26.	$110°$ ✓	$180° - (40° + 30°) = 180° - 70° = 110°$	1	R	E	8
27.	Similar ✓	$\frac{FH}{BD} = \frac{GH}{CD} = 3$	1	R	M	9
28.	$204\ \text{cm}^2$ ✓	$17 \times 12 = 204\ \text{cm}^2$	1	R	E	7
29.	$k = 4$ ✓	New perimeter $= 4(2\ell + 2b)$	1	K	M	10
30.	$P(green) = \frac{5}{12}$ ✓	5 green balls out of 12 balls in total	1	K	E	8

SECTION C

- **This is a marking guideline. In instances where learners have used different but mathematically sound strategies to solve the problems they (learners) should be credited.**
- **Underline errors committed by learners and apply Consistent Accuracy (CA) marking.**
- **Penalise only once if learners e.g. leave out the angle- or the degree notation.**
- **The implementation of this marking guideline (memoranda) seeks to ensure that the marking yields feedback to learners that is accurate, consist, reliable and fair.**

Guide for marking	
Method mark (M)	• Marks are awarded for applying a correct method. • Where there is clear evidence of a misread, a penalty of 1 mark is generally appropriate. This may be achieved by awarding a '**M**' mark but not an '**A**' mark.
Accuracy mark (A)	Accuracy marks may be awarded only for the correct answer.
Consistent Accuracy (CA)	Mark an answer if it is correctly followed through from an incorrect previous answer.

No.		Expected answer	Clarification	Mark	Cognitive level	Level of difficulty	Grade
1.		$4^3 \div \sqrt{64} = 64$ ✓ $\div 8$ ✓A $= 8$ ✓CA	64: 1 mark 8: 1 mark Answer: 1 mark	3	C	M	7
2.		$\frac{2\times3^2\times5^4}{5^3\times1}$ ✓M $= 2 \times 9 \times 5$ ✓CA $= 90$ ✓CA	$8^0 = 1$: 1 mark Calculation: 1 mark Answer: 1 mark (Answer only: 1 mark)	3	R	E	9
3.		$3^{\frac{1}{2}+\frac{1}{2}+0} = 3^1$ ✓CA ✓M	$\frac{1}{2}+\frac{1}{2}$: 1 mark Answer: 1 mark	2	R	E	10
4.		$(2x-1)(x^2+2x-3)$ $= 2x^3+4x^2-6x-x^2-2x+3$ ✓✓M $= 2x^3+3x^2-8x+3$ ✓CA	$2x^3+4x^2-6x$: 1 mark $-x^2-2x+3$: 1 mark Answer: 1 mark	3	R	M	10
5.	5.1	$10t^2-5t$ $= 5t(2t-1)$ ✓✓M	$5t$: 1 mark $2t-1$: 1 mark	2	R	E	9
	5.2	$81-100a^2$ $= (9+10a)(9-10a)$ ✓✓M	$9+10a$: 1 mark $9-10a$: 1 mark	2	R	E	9
	5.3	x^2+5x+6 ✓ ✓M $= (x+2)(x+3)$	$x+2$: 1 mark $x+3$: 1 mark	2	R	E	9
6.		$y = -\frac{2}{3}x+1$ On the X-axis: $y=0$ $\frac{2}{3}x = 1$ $2x = 3$ $x = \frac{3}{2}$ ✓M On the Y-axis: $x=0$ $y = 1$ ✓A	$y = \frac{3}{2}x-1$ On the X-axis: $y=0$ $-\frac{3}{2}x = -1$ $-3x = -2$ $x = \frac{2}{3}$ ✓M On the Y-axis: $x=0$ $y = -1$ ✓A	4	R	M	9
							

No.		Expected answer	Clarification	Mark	Cognitive level	Level of difficulty	Grade
			Correct labelling of graphs: 1 mark Correct labelling of X- intercepts: 1 mark Correct labelling of Y- intercepts: 1 mark	3	K	E	9
7.		$\hat{B}_1 + 75° + 55° = 180°$ ✓**M** (suppl. ∠s or ∠s on a straight line) ✓**M** $\hat{B}_1 = 180° - (75° + 55°)$ $= 180° - 130°$ $= 50°$ ✓**CA**	Statement: 1 mark Reason: 1 mark Answer: 1 mark	3	R	E	8
8.	8.1	$\hat{B}_1 = 35°$ ✓**M** (vert. opp. ∠s) ✓**M**	Statement: 1 mark Reason: 1 mark	2	K	E	8
	8.2	$\hat{C} = \hat{B}_1 = 35°$ ✓**CA** (corr. ∠s and $BE \parallel CF$) ✓**M**	Statement: 1 mark Reason: 1 mark	2	K	M	8
9.		$\hat{P}_1 = \hat{P}_2 = 80°$ ✓**M** (vert. opp. ∠s) ✓**M** $\hat{B}_2 = \hat{C}_1$ ✓**M** (∠s opp. equal sides of Δ) ✓**M** $\hat{B}_2 + \hat{B}_2 + 80° = 180°$ (sum ∠s of Δ) ✓**M** $2\hat{B}_2 = 100°$ $\hat{B}_2 = 50°$ ✓**CA** or $D\hat{P}C = 180° - \hat{P}_2$ ✓**M** (suppl. ∠s or ∠s on a straight line) ✓**M** $D\hat{P}C = 100°$ or $A\hat{P}B = 100°$ $\hat{B}_2 = \hat{C}_1$ ✓**M** (∠s opp. equal sides of Δ) ✓**M** $2\hat{B}_2 = D\hat{P}C = 100°$ (ext. ∠ of Δ) $\hat{B}_2 = 50°$ ✓**CA**	Statement: 1 mark Reason: 1 mark Statement: 1 mark Reason: 1 mark Statement and reason: 1 mark Answer: 1 mark or Statement: 1 mark Reason: 1 mark Statement: 1 mark Reason: 1 mark Statement and reason: 1 mark Answer: 1 mark	6	P	D	9
10.		In ΔBCT and ΔAET: $\hat{C}_1 = \hat{E}_1 = 90°$ (given) ✓**A** $\hat{T}_1 = \hat{T}_2$ ✓ (vert. opp. ∠s) ✓**A** $BC = AE$ (given) ✓**A** $\therefore \Delta BCT \equiv \Delta AET$ (∠ ∠ s) ✓**A**	Statement and reason: 1 mark Statement: 1 mark Reason: 1 mark Statement and reason: 1 mark Statement and reason: 1 mark	5	P	M	9
11.		$AC^2 = AB^2 + BC^2$ $= (16 + 9)\ \text{cm}^2$ (Pyth.) ✓**M** $= 25\ \text{cm}^2$ ✓**M** $AC = 5\ \text{cm}$ ✓**CA**	Substitution in correct formula: 1 mark Calculation: 1 mark Answer: 1 mark	3	R	M	8

No.		Expected answer	Clarification	Mark	Cognitive level	Level of difficulty	Grade
12.		Surface area $= 2\pi r^2 + 2\pi rh$ ✓**M** $= 2\left(\frac{22}{7}\right)(7)^2 + 2\left(\frac{22}{7}\right)(7)(16)$ cm² ✓✓ **M** $= (44)(7) + (44)(16)$ cm² $= 1012$ cm² ✓**CA** or Surface area $= 2\pi r^2 + 2\pi rh$ ✓**M** $= 2\pi r(r + h)$ ✓**M** $= 2\left(\frac{22}{7}\right)(7)(23)$ cm² ✓**M** $= 1012$ cm² ✓**CA**	Formula: 1 mark Substitution: 2 marks Answer: 1 mark Formula: 1 mark $2\pi r(r + h)$: 1 mark Substitution: 1 mark Answer: 1 mark	4	R	M	9
13.		Volume $= l \times b \times h$ ✓**M** $7000 = 25 \times 80 \times h$ ✓**M** $h = \frac{7000}{2000}$ $h = 3{,}5$ mm ✓**CA**	Formula: 1 mark Substitution: 1 mark Answer: 1 mark	3	R	M	9
14.	14.1	$300 + 200 = 500$ ✓**A**	Answer: 1 mark	1	K	E	8
	14.2	$500 - 200 = 300$ ✓**A**	Answer: 1 mark	1	K	E	8
	14.3	$500 - 400 = 100$ ✓**A**	Answer: 1 mark	1	K	E	8
15.	15.1	Average age $= \frac{25+28+34+35+35+35+40+40+42+47+49+50+50+50+50+55+55+58}{18}$ $= \frac{778}{18}$ ✓✓**M** $= 43{,}22$ ✓**CA**	Sum of ages: 1 mark Dividing by 18: 1 mark Answer: 1 mark	3	R	E	9
	15.2	Mode $= 50$ ✓**A**	Answer: 1 mark	1	K	E	9
	15.3	Median $= \frac{score\ 9 + score\ 10}{2}$ $= \frac{42+47}{2}$ ✓**M** $= 44{,}5$ ✓**CA**	42 and 47: 1 mark Answer: 1 mark	2	R	M	9

PART FOUR
PHASED BASED DIAGNOSTIC ITEMS

Please note the following keys:

	Content Area	Cognitive levels	Levels of difficulty
NOR	Numbers, Operations and Relationships	**K:** knowledge	**E:** easy
PFA	Patterns, Functions and Algebra	**R:** routine procedure	**M:** moderate
SS	Space and Shape (Geometry)	**C:** complex procedure	**D:** difficult
M	Measurement	**P:** problem solving	
DH	Data Handling		
G (9)	Grade 9		

Please note that the tag above each question, as shown below, provides the following information in this order: content area, topic, grade level of the question, cognitive level and difficulty level e.g.:

Content area	Topic	Grade 7	Cognitive level	Level of difficulty
NOR	Common fractions	G7	R	E

Hereafter it is written in the format: **SS/ Geometry of 2-D shapes /G9/R/E** above each question.

SECTION A

Circle the letter next to the correct answer from Question 1 to Question 25.

NOR/integers/G8/R/M

1. Complete: $\sqrt{\sqrt{16}} = \ldots$

A 8
B 4
C 2
D 64

(1)

NOR/dividing by 0/G9/K/E

2. For which value of x is $\frac{3x}{x-3}$ undefined?

A 0
B 3
C -3
D -1

(1)

NOR/compare fractions/G8/R/M

3. Which of the two given rational numbers lie between $\frac{1}{6}$ and $\frac{1}{3}$?

A $\frac{1}{8}$ and $\frac{3}{8}$
B $\frac{5}{24}$ and $\frac{7}{24}$
C $\frac{5}{12}$ and $\frac{7}{12}$
D $\frac{1}{24}$ and $\frac{1}{2}$

(1)

NOR/LCM of whole numbers/G8/R/M

4. Write the LCM of $2 \times 3 \times 5^3$ and $2 \times 3^2 \times 5^2$.

A $2 \times 3 \times 5$

B $2^2 \times 3^2 \times 5^5$

C $2 \times 3^2 \times 5^3$

D $3^2 \times 5^3$

(1)

NOR/integer number sequence/G8/R/E

5. Write the 5th term in the number sequence -3 ; -6 ; -12 ; …

A -21

B -24

C -36

D -48

(1)

NOR/fraction sequence/G9/R/E

6. Write the next term in the number sequence $\frac{5}{16}$; $\frac{5}{8}$; $\frac{5}{4}$; …

A $\frac{5}{6}$

B $\frac{5}{2}$

C $\frac{1}{2}$

D $\frac{2}{5}$

(1)

PFA/general rule/G9/R/E

7. Determine the relationship between x and y in the table below.

x	3	6	12	24
y	12	24	48	96

A $x = \frac{4}{y}$

B $y = \frac{4}{x}$

C $y = \frac{1}{4}x$

D $y = 4x$

(1)

PFA/indirect proportion/G9/R/M

8. Determine the relationship between x and y in the table below.

x	2	3	4	6
y	24	16	12	8

A $y = 12x$

B $xy = 48$

C $x + y = 26$

D $y - x = 2$

(1)

NOR/rate and whole numbers/G9/R/C

9. If a car travels at a constant speed of 96 km/h, how far will it travel in 20 minutes?

A 4,8 km
B 48 km
C 32 km
D 24 km (1)

NOR/problem solving/G9/P/E

10. The mass of 36 identical books is 7,2 kg. What is the mass of 9 of these books?

A 1,8 kg
B 3,6 kg
C 2,4 kg
D 1,2 kg (1)

NOR/problem solving/G9/P/M

11. 3 workmen can build a wall in 8 days. How many workmen, working at the same pace, will be needed to build the wall in 4 days?

A 4
B 12
C 9
D 6 (1)

NOR/ratio/G9/R/M

12. Write the ratio $1\frac{1}{2} : 1\frac{1}{3}$ in the simplest form.

A 2:3
B 3:4
C 9:8
D 8:9

(1)

NOR/whole numbers/G9/R/M

13. A dress was sold at a profit of 10 % for R187,00. Calculate the cost price of the dress.

A R18,70
B R17,00
C R205,70
D R170,00

(1)

NOR/exchange rates/G8/R/E

14. How many USA dollars can be exchanged for R1 000,00 if 1 USA dollar can be exchanged for R12,50?

A 40
B 80
C 60
D 125

(1)

NOR/commission/G9/R/M

15. An estate agent received R60 000,00 commission for selling a house for R750 000,00. What percentage commission did he receive?

A 12,5 %
B 7 %
C 8 %
D 9 %

(1)

NOR/interest/G9/K/E

16. Complete: Formula used to calculate simple interest is …

A $SI = P(1 + i)^n - P$
B $SI = P(1 + ni) - P$
C $SI = P(1 - ni) - P$
D $SI = (P + i)^n - P$

(1)

NOR/interest/G9/R/M

17. R2 000,00 is invested at 6 % per annum compound interest. What is the investment worth after 4 years?

A R2 530,64
B R252,50
C R2 524,95
D R2 480,00

(1)

NOR/exponents/G9/K/E

18. Write $2x^{-3}$ with a positive exponent.

A $-2x^3$

B $\frac{1}{2x^3}$

C $\frac{2}{x^3}$

D $\frac{1}{-2x^3}$

(1)

PFA/algebraic equations/G9/R/C

19. For which value of x is $3x^3 = -3$?

A 1

B -3

C -1

D 3

(1)

PFA/algebraic expression/G9/R/M

20. Divide $8x^3 - 2x^2$ by $-2x$.

A $4x^2 - x$

B $-4x^2 + x$

C $-4x + 1$

D $4x - 1$

(1)

PFA/algebraic expressions/G9/R/M

21. Complete: If $x = -3$ the value of $-x^2 = \ldots$

A 6

B 9

C -6

D -9

(1)

PFA/algebraic expressions/G9/R/M

22. Complete: If $x = -1$ the value of $\frac{x+1}{x-1}$ is …

A 0
B -1
C -2
D undefined

(1)

NOR/common fractions/G8/R/E

23. Complete: If $\frac{4}{x} = \frac{2}{5}$ then $x = \ldots$

A 2,5
B 10
C 20
D 18

(1)

PFA/algebraic expressions/G8/R/M

24. Calculate the value of y if $y = 3x^2 - 1$ and $x = 3$.

A 26
B 80
C 17
D 35

(1)

PFA/general rule/G8/R/M

25. Write the nth term, T_n, in the number sequence 3 ; 10 ; 17 ; …

A $7n$
B $7n - 1$
C $7n - 4$
D $4n - 7$

(1)

SECTION B

NOR/exponents/G9/K/M

1. Write 0,000125 in scientific notation. (1)

NOR/whole numbers/G8/R/E

2. For which value of x is $x^5 = 32$? (1)

PFA/algebraic expressions/G8/R/M

3. Write down the product of $2x^2$ and $-3x^3$. (1)

NOR/whole numbers/G8/K/E

4. If $79 \times 63 = 4977$, what will $4977 \div 79$ equal? (1)

NOR/whole numbers/G8/K/E

5. What is the HCF of 19 and 29? (1)

NOR/rate/G9/R/C

6. Which is the slowest? 640 km travelled in 10 hours or 360 km in 6 hours. (1)

NOR/integers/G9/R/M

7. Calculate $8 - 8 \div 4 - 4 \times (-2)$. (1)

PFA/algebraic expressions/G9/R/M

8. Calculate $\sqrt{x^2 - (-3x^2)}$. (1)

NOR/integers/G9/P/M

9. Subtract the sum of -2 and -4 from the product of -2 and -4. (1)

NOR/ratio/G9/R/M

10. $\frac{8}{9}$ of a mass $= 160$ kg. Calculate $\frac{2}{9}$ of the same mass. (1)

SECTION C

Show all the calculation steps.

NOR/exponents/G8/R/E

1. Express 2744 as a product of its prime factors. Hence determine the value of $\sqrt[3]{2744}$. (3)

NOR/rational numbers/G9/K/E

2. Identify and write down the rational numbers in the following list of numbers.
$-8\ ,\sqrt{8}\ ,\sqrt[3]{9}\ ,\sqrt[3]{-1}\ ,\sqrt{100-64}\ ,\sqrt{6{,}25}\ ,1\frac{3}{4}\ ,0,\dot{6}$ (3)

NOR/fractions/G8/R/M

3. Calculate $\frac{4}{5}$ of $6\frac{1}{4}-\frac{1}{4}$. (2)

NOR/ratio/G9/R/M

4. R880,00 is shared among A, B and C in the ratio 2 : 4 : 5.
Calculate B's share. (2)

NOR/decimal fractions/G8/R/E

5. Convert Sibu's test mark of 105 out of 150 to a percentage. (2)

NOR/loss/G9/R/M

6. A book was sold for R45,00 at a loss of 40 %. Calculate the cost price of the book. (3)

NOR/cost/G9/R/M

7. 8 boys each pay R92,50 to attend a holiday camp. How much will each have to pay if 10 boys go to the camp? (2)

NOR/interest/G9/R/C

8. Calculate the compound interest on R6500,00 invested at 8 % per annum for 3 years. (4)

PFA/geometric sequence/G9/R/M

9. Examine the growing triangle pattern.

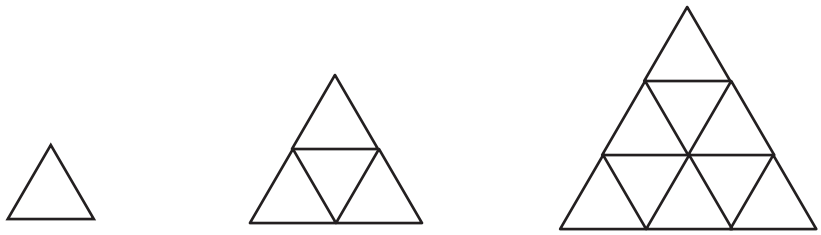


Figure 1 Figure 2 Figure 3

9.1 How many triangles will there be in the 6th figure? (1)

9.2 How many triangles will there be in the nth figure? (1)

PFA/algebraic expressions/G9/K/E

10. Study the given algebraic expression and answer the questions that follow.

$13 + 5y^4 - 6y + 16y^2 + (2y - y^3)$

10.1 How many terms are there in the expression? (1)

10.2 Write down the coefficient of y^4. (1)

10.3 What is the degree of the expression? (1)

PFA/exponents/G9/C/M

11. Simplify $\frac{2^{n+1}.3^{n-1}}{2^n.3^n}$. (Give your answer with a positive exponent.) (3)

PFA/algebraic expressions/G9/R/M

12. Simplify: $(x + 1)(x - 3) - (x - 2)^2$ (4)

PFA/algebraic equations/G9/C/M

13. Calculate the value of f in the formula $\frac{1}{f} = \frac{1}{a} + \frac{1}{b}$, if $a = 3$ and $b = 4$. (3)

PFA/algebraic equations/G9/R/M

14. Solve for x:

14.1 $2^x . 2^4 = 2^7$ (2)

14.2 $2(x - 1) - 3(x + 1) = -4$ (3)

14.3 $\frac{x-2}{3} - \frac{x+1}{2} = -1$ (4)

14.4 $(x - 1)(2x + 1) = 2(x + 3)(x - 3)$ (4)

PFA/problem solving/G9/P/M

15. Mr C's salary of Rx per annum is increased by 10 %. Because of an administration error the new salary is decreased by 10 %. Show that his salary will now be R0,99x. (2)

basic education
Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

DIAGNOSTIC TEST ITEMS: MARKING GUIDELINE
MATHEMATICS TERM 1: ENGLISH
GRADE 9

This marking guideline consists 9 pages.

Sections	Cognitive levels	Levels of difficulty
A: multiple-choice questions	**K:** knowledge	**E:** easy
B: short answer questions	**R:** routine procedure	**M:** moderate
C: multiple step questions	**C:** complex procedure	**D:** difficult
	P: problem solving	

Levels of understanding
1: There are unrelated strategies or excessive dependence on the information that is provided in the question and is incorrectly used/is duplicated.
2: There is some computational ability that **may** not relate to the question/topic.
3: There is some conceptual knowledge and ability to analyse but is inconsistent in computational and/reasoning skills.
4: Correct response. The learner is able to consistently apply/demonstrate correct computational and reasoning skills required in the question.

SECTION A

One mark per answer.

No.		Expected answer	Level of understanding or error analysis		Cognitive level	Level of difficulty	Grade
1.	A	8	1	Lack of knowledge	R	M	8
	B	4	2	Dividing the 16 by 2 twice.			
	C	2 ✓	4	Correct response. $\sqrt{\sqrt{16}} = \sqrt{4}$			
	D	64	1	Lack of knowledge			
2.	A	0	1	$\frac{0}{0-3} = 0$	K	E	9
	B	3 ✓	4	Correct response. Division by 0 is undefined.			
	C	-3	1	$\frac{-3}{-3-3} = \frac{-3}{0}$			
	D	-1	1	Lack of knowledge			
3.	A	$\frac{1}{8}$ and $\frac{3}{8}$	2	$\frac{1}{8} = \frac{3}{24}$ and $\frac{3}{8} = \frac{9}{24}$. Neither between $\frac{1}{6}$ and $\frac{1}{3}$.	R	M	8

No.		Expected answer	Level of understanding or error analysis		Cognitive level	Level of difficulty	Grade
	B	$\frac{5}{24}$ and $\frac{7}{24}$ ✓	4	Correct response. $\frac{1}{6}=\frac{4}{24}$ and $\frac{1}{3}=\frac{8}{24}$			
	C	$\frac{5}{12}$ and $\frac{7}{12}$	1	$\frac{5}{12}=\frac{10}{24}$ and $\frac{7}{12}=\frac{14}{24}$. Both more than $\frac{1}{6}$ and $\frac{1}{3}$.			
	D	$\frac{1}{24}$ and $\frac{1}{2}$	2	$\frac{1}{24}$ and $\frac{1}{2}=\frac{12}{24}$. Neither between $\frac{1}{6}$ and $\frac{1}{3}$.			
4.	A	$2\times3\times5$	1	Just identified the common prime factors	R	M	8
	B	$2^2\times3^2\times5^5$	1	Lack of knowledge			
	C	$2\times3^2\times5^3$ ✓	4	Correct response			
	D	$3^2\times5^3$	1	Lack of knowledge			
5.	A	-21	2	Incorrectly added -3, then -6 and then -9	R	E	8
	B	-24	1	Incorrectly selected the 4th term			
	C	-36	1	Incorrectly added the 3rd and 4th terms, $-12+(-24)=-36$.			
	D	-48 ✓	4	Correct response. Multiplied by 2. $(-3\,;\,-6\,;\,-12\,;\,-24\,;\,-48)$			
6.	A	$\frac{5}{6}$	1	Lack of knowledge	R	E	9
	B	$\frac{5}{2}$ ✓	4	Correct response			
	C	$\frac{1}{2}$	2	Incorrectly selected the ratio			
	D	$\frac{2}{5}$	2	Incorrectly selected the reciprocal of the fraction			
7.	A	$x=\frac{4}{y}$	1	Lack of knowledge	R	E	9
	B	$y=\frac{4}{x}$					
	C	$y=\frac{1}{4}x$	1	Incorrectly stated y is 4 times smaller than x.			
	D	$y=4x$ ✓	4	Correct response. Every value of x multiplied by 4 gives the value of y			
8.	A	$y=12x$	1	Incorrectly applied the rule only for the first term.	R	M	9
	B	$xy=48$ ✓	4	Correct response. The product of x and y is always 48.			
	C	$x+y=26$	1	Incorrectly added the first value of x and y.			
	D	$y-x=2$	1	Incorrectly subtracted the last value of x and y.			

No.		Expected answer	Level of understanding or error analysis		Cognitive level	Level of difficulty	Grade
9.	A	4,8 km	1	$\frac{96}{20} = 4{,}8$ km	R	C	9
	B	48 km	1	$\frac{96}{2} = 48$ km			
	C	32 km ✓	4	Correct response. Distance $= \frac{20}{60} \times 96$ km			
	D	24 km	1	$\frac{96}{20} \times 5 = 24$ km			
10.	A	1,8 kg ✓	4	Correct response. Mass $= \frac{7{,}2}{36} \times 9$ kg or $\frac{1}{4}$ of 7,2 kg $= 1{,}8$ kg	P	E	9
	B	3,6 kg	1	Incorrectly divided the mass by 2			
	C	2,4 kg	1	Incorrectly calculated a third of the mass			
	D	1,2 kg	1	Incorrectly calculated a sixth of the mass			
11.	A	4	1	Incorrectly selected the last number given	P	M	9
	B	12	1	Incorrectly multiplied 3 and 4			
	C	9	1	No. of workmen $= 8 + 4 - 3$			
	D	6 ✓	4	Correct response. Indirect proportion $4x = 8 \times 3$			
12.	A	2:3	1	Incorrectly selected the numerators	R	M	9
	B	3:4	1	$\frac{3}{2} : \frac{4}{3}$. Selected the denominators.			
	C	9:8 ✓	4	Correct response. $\frac{3}{2} : \frac{4}{3} = \frac{9}{6} : \frac{8}{6}$			
	D	8:9	1	Incorrectly changed the ratio			
13.	A	R18,70	1	Incorrectly calculated 10 % of R187	R	M	9
	B	R17,00	1	Incorrectly calculated 10 % of R170			
	C	R205,70	1	Cost price $= 187 \times \frac{110}{100}$			
	D	R170,00 ✓	4	Correct response. Cost price $= 187 \times \frac{100}{110}$			
14.	A	40	1	No. of USA dollars $= \frac{1000}{12{,}50} \div 2$	R	E	8
	B	80 ✓	4	Correct response. No. of USA dollars $= \frac{1000}{12{,}50} = \frac{10000}{125}$			
	C	60	1	Lack of knowledge			
	D	125	1	Incorrectly multiplied R12,50 by 10			

No.		Expected answer	Level of understanding or error analysis		Cognitive level	Level of difficulty	Grade
15.	A	12,5 %	1	Incorrectly calculated $\frac{750000}{60000}$	R	M	9
	B	7 %	1	Incorrectly calculated $\frac{60000}{750000+60000} \times 100$			
	C	8 % ✓	4	Correct response. % commission $= \frac{60000}{750000} \times 100$			
	D	9 %	1	Incorrectly calculated $\frac{60000}{750000-60000} \times 100$			
16.	A	$SI = P(1+i)^n - P$	1	Compound interest formula	K	E	9
	B	$SI = P(1+ni) - P$ ✓	4	Correct response			
	C	$SI = P(1-ni) - P$	1	Depreciation formula			
	D	$SI = (P+i)^n - P$	1	Lack of knowledge			
17.	A	R2 530,64	1	Incorrectly calculated $2000(1+0{,}04)^6$	R	M	9
	B	R252,50	2	Used R200 instead of R2000			
	C	R2 524,95 ✓	4	Correct response. Amount $= 2000(1+0{,}06)^4$			
	D	R2 480,00	1	Incorrectly calculated amount $= 2000(1+0{,}06 \times 4)$			
18.	A	$-2x^3$	1	Lack of knowledge	K	E	9
	B	$\frac{1}{2x^3}$	2	Incorrectly handled the coefficient the same as the power with negative exponent			
	C	$\frac{2}{x^3}$ ✓	4	Correct response			
	D	$\frac{1}{-2x^3}$	1	Incorrectly changed the sign of the coefficient instead of the exponent (2^{-1})			
19.	A	1	3	$x^3 = 1$ and then $x = \sqrt[3]{1}$	R	C	9
	B	-3	1	Lack of knowledge			
	C	-1 ✓	4	Correct response. $x^3 = -1$ and then $x = \sqrt[3]{-1}$			
	D	3	1	Lack of knowledge			
20.	A	$4x^2 - x$	2	Incorrectly calculated $\frac{8x^3}{2x} - \frac{2x^2}{2x}$	R	M	9
	B	$-4x^2 + x$ ✓	4	Correct response. $\frac{8x^3}{-2x} - \frac{2x^2}{-2x}$			
	C	$-4x + 1$	1	Divided by $-2x^2$			

No.		Expected answer	Level of understanding or error analysis		Cognitive level	Level of difficulty	Grade
	D	$4x - 1$	1	Divided by $2x^2$			
21.	A	6	1	$-(-3)^2 = 3^2 = 3 \times 2$	R	M	9
	B	9	2	$-(-3)^2 = 3^2 = 3 \times 3$			
	C	-6	1	$-(-3)^2 = -(-3) \times (-2) = 3 \times -2$			
	D	-9 ✓	4	Correct response. $-x^2 = -(-3)^2 = -(-3) \times (-3)$			
22.	A	0 ✓	4	Correct response. $\frac{-1+1}{-1-1} = \frac{0}{-2}$	R	M	9
	B	-1	1	Incorrectly divided $\frac{x+1}{x-1} = \frac{1}{-1} = -1$			
	C	-2	1	Incorrectly divided $\frac{-1+1}{-1-1} = \frac{0}{-2} = -2$			
	D	undefined	1	Incorrectly substituted $\frac{1+1}{1-1} = \frac{2}{0}$			
23.	A	2,5	1	Incorrectly multiplied $x = 5 \times 2 \div 4 = 10 \div 4$	R	E	8
	B	10 ✓	4	Correct response. $\frac{4}{10} = \frac{2}{5}$ or $2x = 20$			
	C	20	1	Incorrectly stated $x = 4 \times 5$			
	D	18	1	Calculated $x = 4 \times 5 - 2$			
24.	A	26 ✓	4	Correct response. $y = 3 \times 3^2 - 1 = 3 \times 9 - 1$ $= 27 - 1$	R	M	8
	B	80	1	$y = 3 \times 3^2 - 1 = 9^2 - 1$ $= 81 - 1$			
	C	17	1	$y = 3 \times 3^2 - 1 = 3 \times 6 - 1$ $= 18 - 1$			
	D	35	1	$y = (3 + 3)^2 - 1 = 6 \times 6 - 1$			
25.	A	$7n$	1	Incorrectly only used the constant difference.	R	M	8
	B	$7n - 1$	1	Lack of knowledge			
	C	$7n - 4$ ✓	4	Correct response. The constant difference is 7 and to find the first term subtract 4 ($7 \times 1 + c = 3$ and $c = 3 - 7$)			
	D	$4n - 7$	1	Incorrectly swopped the two correct values			

SECTION B

One mark per answer.

- **Ignore spelling errors.**
- **Accept answers that may be in any official language i.e. if it is a word.**

No.	Expected answer	Clarification	Mark	Cognitive level	Level of difficulty	Grade
1.	$1{,}25 \times 10^{-4}$ ✓	$1{,}25 \div 10\,000 = 1{,}25 \div 10^4 = 1{,}25 \times 10^{-4}$	1	K	M	9
2.	$x = 2$ ✓	$2^5 = 32$	1	R	E	8
3.	$-6x^5$ ✓	$2x^2 \times -3x^3 = 2 \times -3x^{2+3}$	1	R	M	8
4.	63 ✓	$79 \times 63 = 4977$ $\therefore 4977 \div 79 = 63$	1	K	E	8
5.	HCF $= 1$ ✓	19 and 29 are prime numbers $19 = 19 \times 1$ and $29 = 29 \times 1$	1	K	E	8
6.	360 km in 6 hours ✓	Speed $= \frac{640}{10} = 64$ km/h Speed $= \frac{360}{6} = 60$ km/h	1	R	C	9
7.	14 ✓	$8 - 8 \div 4 - 4 \times (-2)$ $= 8 - 2 + 8$ $= 6 + 8$	1	R	M	9
8.	$2x$ ✓	$\sqrt{x^2 - (-3x^2)} = \sqrt{x^2 + 3x^2}$ $= \sqrt{4x^2}$	1	R	M	9
9.	14 ✓	$-2 \times -4 - (-2 + (-4))$ $= 8 - (-6) = 8 + 6$	1	P	M	9
10.	40 kg ✓	$\frac{2}{9}$ of a mass $= \frac{160}{8} \times 2$ kg $= 20 \times 2$ kg or $\frac{2}{9}$ of a mass $= \frac{160}{4}$ kg	1	R	M	9

SECTION C

- **This is a marking guideline. In instances where learners have used different but mathematically sound strategies to solve the problems they (learners) should be credited.**
- **Underline errors committed by learners and apply Consistent Accuracy (CA) marking.**
- **Penalise only once if learners e.g. leave out the angle- or the degree notation.**
- **The implementation of this marking guideline (memoranda) seeks to ensure that the marking yields feedback to learners that is accurate, consistent, reliable and fair.**
-

Levels of understanding (number and explanation)
1. There are unrelated strategies or excessive dependence on the given information in the question which is incorrectly used or is duplicated.
2. There are some computational ability that mat not relate to the question/topic.
3. There are some conceptual knowledge and ability to analyse but it is inconsistent in computational and/reasoning skills.
4. Correct response. The learner is able to apply/demonstrate correct computational and reasoning skills required in the question.

No.		**Expected answer**	**Clarification**	**Mark**	**Cognitive level**	**Level of difficulty**	**Grade**
1.		$2744 = 2^3 \times 7^3$ ✓**A** $\sqrt[3]{2744} = 2 \times 7$ ✓**CA** $= 14$ ✓**CA**	Prime factors: 1 mark 2×7: 1 mark Answer: 1 mark	3	R	M	8
2.		$-8, \sqrt[3]{-1}, \sqrt{100-64}, \sqrt{6{,}25}, 1\frac{3}{4}, 0, \dot{6}$ ✓✓✓A	Two correct options: 1 mark each	3	K	E	9
3.		$\frac{4}{5} \times 6\frac{1}{4} - \frac{1}{4}$ $= \frac{4}{5} \times \frac{25}{4} - \frac{1}{4}$ $= 5 - \frac{1}{4}$ ✓**M** $= 4\frac{3}{4}$ or $4{,}75$ ✓**CA**	5: 1 mark Answer: 1 mark	2	R	E	9
4.		B's share in rand $= \frac{4}{11} \times 880{,}00$ ✓**M** $= 320$ ✓**CA** or One share in rand $= \frac{1}{11} \times 880{,}00$ $= 80$ ✓**M** B's share in rand $= 4 \times 80$ $= 320$ ✓**CA**	Fraction $\frac{4}{11}$: 1 mark Answer: 1 mark	2	R	E	9
5.		Sibu's test mark $= \frac{105}{150} \times 100\ \%$ ✓**M** $= 70\ \%$ ✓**CA**	Test as a fraction: 1 mark Answer: 1 mark	2	R	E	8

No.		Expected answer	Clarification	Mark	Cognitive level	Level of difficulty	Grade
6.		Cost price in rand $= 45 \times \frac{100}{60}$ ✓**M** $= 75$ ✓**CA**	$\times \frac{100}{60}$: 1 mark Answer: 1 mark	2	R	M	9
7.		Cost per boy in rand $= \frac{8}{10} \times 92{,}50$ ✓**M** $= \frac{740}{10}$ $= 74$ ✓**CA**	Fraction $\frac{8}{10}$: 1 mark Answer: 1 mark	2	R	E	8
8.		$A = P(1+i)^n$ ✓**A** $= \text{R}6500(1+0{,}08)^3$ ✓**M** $= \text{R}8188{,}128$ ✓**CA** Interest $= \text{R}8188{,}128 - \text{R}6500{,}00$ $= \text{R}1688{,}13$ ✓**CA**	Formula: 1 mark Substitution: 1 mark Value of A: 1 mark Answer: 1 mark	4	R	M	9
9.	9.1	Number of triangles $= 6^2 = 36$ ✓**A**	Answer: 1 mark	1	K	E	8
	9.2	$T_n = n^2$ ✓**A** or $n \times n$	Answer: 1 mark	1	K	M	8
10.	10.1	5 terms ✓**A**	Answer: 1 mark	1	K	E	8
	10.2	5 ✓**A**	Answer: 1 mark	1	K	E	8
	10.3	4th degree ✓**A**	Answer: 1 mark	1	K	E	9
11.		$\frac{2^{n+1}.3^{n-1}}{2^n \times 3^n}$ $= 2^1.3^{-1}$ ✓✓**M** $= \frac{2}{3}$ ✓**CA**	Division rule: 1 mark each base Answer: 1 mark	3	C	D	9
12.		$(x+1)(x-3) - (x-2)^2$ $= x^2 - 2x - 3 - (x^2 - 4x + 4)$ ✓✓**M** $= x^2 - 2x - 3 - x^2 + 4x - 4$ ✓**CA** $= 2x - 7$ ✓**CA**	Product of binomial: 1 mark each Multiplication by -1: 1 mark Answer: 1 mark	4	R	M	9
13.		$\frac{1}{f} = \frac{1}{a} + \frac{1}{b}$ $\frac{1}{f} = \frac{1}{3} + \frac{1}{4}$ ✓**M** $\frac{1}{f} = \frac{4}{12} + \frac{3}{12}$ $\frac{1}{f} = \frac{7}{12}$ ✓**CA** $f = \frac{12}{7}$ or $1\frac{5}{7}$ ✓**CA**	Substitution: 1 mark Fraction $\frac{7}{12}$: 1 mark Answer: 1 mark	3	C	D	9
14.	14.1	$2^x.2^4 = 2^7$ $2^{x+4} = 2^7$ ✓**M** $x + 4 = 7$ $x = 3$ ✓**CA**	Multiplication rule: 1 mark Answer: 1 mark	2	R	M	8
	14.2	$2(x-1) - 3(x+1) = -4$ $2x - 2 - 3x - 3 = -4$ ✓✓**M** $-x = 1$ $x = -1$ ✓**CA**	Remove brackets: 1 mark each Answer: 1 mark	3	R	E	8

No.		Expected answer	Clarification	Mark	Cognitive level	Level of difficulty	Grade
	14.3	$\frac{x-2}{3}-\frac{x+1}{2}=-1$ $\times 6$: $\frac{2(x-2)}{6}-\frac{3(x+1)}{6}=-\frac{6}{6}$ ✓✓**M** $2x-4-3x-3=-6$ ✓**CA** $-x=1$ $x=-1$ ✓**CA**	Numerators the same: 1 mark Denominators: 1 mark Multiplication: 1 mark Answer: 1 mark	4	R	M	9
	14.4	$(x-1)(2x+1)=2(x+3)(x-3)$ $2x^2-x-1=2(x^2-9)$ ✓**M** $2x^2-x-1=2x^2-18$ ✓**M** $-x=-17$ $x=17$ ✓**CA**	Multiplication LHS: 1 mark Multiplication RHS: 1 mark Answer: 1 mark	3	R	M	9
15.		Increased salary in rand $=\frac{110}{100}\times x$ ✓**M** $=1{,}10x$ ✓**CA** Decreased salary in rand $=\frac{90}{100}\times 1{,}10x$ ✓**M** $=0{,}99x$	Fraction $\frac{110}{100}$: 1 mark Answer: 1 mark Fraction $\frac{90}{100}$: 1 mark	3	P	D	9

DIAGNOSTIC ASSESMENT TOOL GRADE 9 PHASE BASED AND TERM ONE ASSESSMENTS

MATHEMATICS

DEPARTMENT OF BASIC EDUCATION
222 STruben Street, Pretoria, 0001
Private Bag X895, Pretoria, 0001, South Africa
Tel: (012) 357 3000 **Fax:** (012) 323 0601
HOTLINE: 0800 202 933

Website
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