



basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

ANNUAL NATIONAL ASSESSMENT 2013

GRADE 9

MATHEMATICS

EXEMPLAR QUESTIONS

This booklet consists of 32 pages, excluding the cover page.

GUIDELINES FOR THE USE OF ANA EXEMPLARS

1. How to use the exemplars

While the exemplars for a grade and a subject have been compiled into one comprehensive set, **the learner does not have to respond to the whole set in one sitting. The teacher should select exemplar questions that are relevant to the planned lesson at any given time.** Carefully selected individual exemplar test questions, or a manageable group of questions, can be used at different stages of the teaching and learning process as follows:

- 1.1 At the beginning of a lesson as a diagnostic test to identify learner strengths and weaknesses. The **diagnosis** must lead to prompt **feedback** to learners and the development of **appropriate lessons** that address the identified weaknesses and consolidate the strengths. The diagnostic test could be given as homework to save instructional time in class.
- 1.2 During the lesson as short formative tests to assess whether learners are developing the intended knowledge and skills as the lesson progresses and ensure that no learner is left behind.
- 1.3 At the completion of a lesson or series of lessons as a summative test to assess if the learners have gained adequate understanding and can apply the knowledge and skills acquired in the completed lesson(s). Feedback to learners must be given promptly while the teacher decides on whether there are areas of the lesson(s) that need to be revisited to consolidate particular knowledge and skills.
- 1.4 At all stages to expose learners to different techniques of assessing or questioning, e.g. how to answer multiple-choice (MC) questions, open-ended (OE) or free-response (FR) questions, short-answer questions, etc.

While diagnostic and formative tests may be shorter in terms of the number of questions included, the summative test will include relatively more questions, depending on the work that has been covered at a particular point in time. It is important to ensure that learners eventually get sufficient practice in responding to the exemplar.

2. Memoranda or marking guidelines

A typical example of the expected responses (marking guidelines) has been given for each exemplar test question and for the ANA model test. Teachers must bear in mind that the marking guidelines can in no way be exhaustive. They can only provide broad principles of expected responses and teachers must interrogate and reward acceptable options and variations of the acceptable response(s) given by learners.

3. Curriculum coverage

It is extremely critical that the curriculum must be covered in full in every class. The exemplars for each grade and subject do not represent the entire curriculum. They merely **sample** important knowledge and skills and covers work relating to terms 1, 2 and 3 of the school year.

1. MULTIPLE CHOICE QUESTIONS

Unless otherwise stated, in multiple choice questions you must circle the letter of the correct answer. A practice exercise is provided below.

Practice exercise

Circle the letter of the correct answer.

Which of the numbers below is a mixed number?

0; 0,2; $\frac{1}{8}$; $2\frac{1}{4}$

A 0

☒ B $2\frac{1}{4}$

C 0,2

D $\frac{1}{8}$

You have done it correctly if you circled B.

1.1 Which of the following numbers is a rational number?

- A $\sqrt{3}$
- B $\sqrt{16}$
- C $\sqrt{-9}$
- D $\sqrt{13}$

1.2 The next number in the sequence 3 ; 6 ; 11 ; 18; ... is

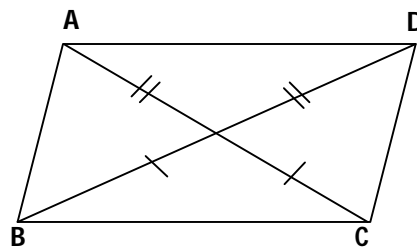
- A 25
- B 24
- C 26
- D 27

1.3 Which of the following trinomial expressions is a polynomial?

- A $\frac{4}{x+1} - \frac{1}{x^2} - 7$
- B $\frac{\sqrt{x+1}}{4} - \frac{1}{x^2} - 7$
- C $\frac{x+1}{4} - x^2 - 7$
- D $\frac{x+1}{4} - \sqrt{x} - 7$

1.4 In the adjacent quadrilateral $AE = ED$ and $BE = EC$, therefore:

- A $\triangle AEB \parallel \triangle DEC$
- B $\triangle AED \parallel \triangle BEC$
- C $\triangle AEB \equiv \triangle DEC$
- D $\triangle AED \equiv \triangle BEC$



1.5 What is the size of each angle in a regular pentagon?

- A 90°
- B 120°
- C 100°
- D 108°

1.6 Complete:

$$\sqrt{17^2 - 15^2} =$$

- A 2
- B 4
- C 8
- D 64

1.7 Complete:

$$2^{-1} + 3^{-1} =$$

- A 5^{-1}
- B 5^{-2}
- C $\frac{1}{6}$
- D $\frac{5}{6}$

1.8 If $\frac{3x}{2} = -6$ then $x =$

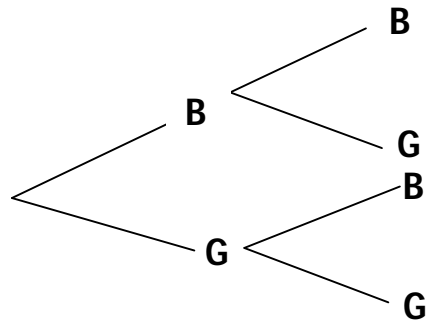
- A 9
- B 4
- C -9
- D -4

1.9 If the length of the side of a square is 0,12 cm then the area =

- A $0,24 \text{ cm}^2$
- B $0,144 \text{ cm}^2$
- C $1,44 \text{ cm}^2$
- D $0,0144 \text{ cm}^2$

1.10 A married couple decided to have two children. The tree diagram below shows all the different combinations of boys and girls that the couple could have.

B represents a boy and G a girl.



What is the probability that both children will be girls?

- A 0,25
- B 0,5
- C 1
- D 0,75

[10]

2. NUMBERS, OPERATIONS AND RELATIONS

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

2.1.2 Write 0, 00000356 *kl* in scientific notation. _____ (1)

2.2 Simplify:

$$7,125 \div \sqrt{25}$$

(2)

2.3 There are 96 boys and 120 girls in Grade 9. Write down the ratio of the number of boys to the number of girls in the class.

(2)

2.4 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*?

(5)

2.5 Calculate the compound interest on an investment of R6 500 at 7,5% per annum invested for 3 years.

(5)

2.6 Nomsí's father wants to buy a new car. He can afford to pay R35 000 as a deposit.

2.6.1 If all the cars are sold at 20% deposit, what is the price of a car he can afford to buy?

(2)

2.6.2 After paying the 20% deposit, calculate the total amount that he must still pay.

(1)

2.6.3 If the interest rate is 10% per annum simple interest, calculate the monthly instalment if he signs a hire-purchase agreement to pay the balance in 48 equal monthly instalments.

(6)

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

(2)

2.8 Six boys each contribute R155,50 towards the purchase of a tent. Calculate how much each would contribute if there were 10 boys in the group.

(3)

2.9 How long will it take for an investment of R3000 at 8% per annum simple interest to earn R960 interest?

(3)

2.10 Calculate what R10 000 will amount to if it is invested at 10 % per annum compound interest for 3 years.

(3)

3. PATTERNS, FUNCTIONS AND ALGEBRA

3.1 Simplify:

3.1.1 $(2x)^2 + 3x^2$

(2)

3.1.2 $2x^{-2} \times \frac{x^3}{2^2}$

(2)

3.1.3 $\frac{4x^{-2}}{(4x)^{-2}}$

(3)

3.2 Multiply and simplify if necessary.

3.2.1 $3a^2bc^2(3a^2 - 4b - c)$

(3)

3.2.2 $(2x - 3)(x + 1)$

(2)

3.2.3 $(a^2 b^3)^2 \cdot ab^2$

(2)

3.3 Factorise fully:

3.3.1 $10t^2 - 5t$

(2)

3.3.2 $81 - 100a^2$

(2)

3.4 Solve for x :

3.4.1 $2x - 5 = 5x + 16$

(3)

3.4.2 $\frac{x-2}{4} + \frac{2x+1}{3} = \frac{5}{3}$

(5)

3.5 Calculate the value of $2x^3 - 3x^2 + 9x + 2$ if $x = -2$.

(4)

3.6 Multiply $5a^2b^2 + 2ab - 3$ by $4ab$

(3)

3.7 Simplify:

3.7.1 $(a^2 b^3)^2 \cdot ab^2$

(2)

3.7.2 $\frac{x-y}{y+x} \times \frac{(x+y)^2}{x-y}$

(2)

3.7.3 $\frac{3a^{-2}b \times 24b^{-1}a^{-1}}{9a^{-4}b^{-3}}$

(3)

3.7.4 $\frac{x-2}{2x} - \frac{x-3}{3x}$

(5)

3.7.5 $\frac{4x^2}{2a^2} \div \frac{4x}{2a^2}$

(2)

3.7.6 $\frac{x^2-1}{3x+3}$

(2)

3.8 Factorise fully:

3.8.1 $3a^3 - 9a^2 - 6a$

(2)

3.8.2 $4(a + b) - x^2(a + b)$

(4)

3.9 Solve for x :

3.9.1 $8x + 3 = 3x - 22$

(2)

3.9.2 $x - \frac{x-1}{2} = 3$

(3)

3.9.3 $3^{x+1} = 81$

(3)

3.10

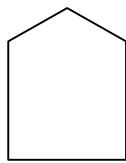


FIGURE 1

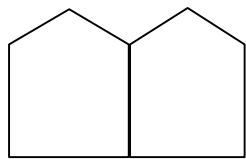


FIGURE 2

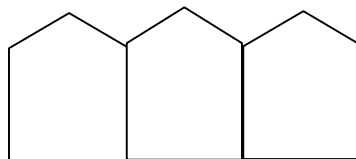


FIGURE 3

3.10.1 Study the above diagram pattern and complete the table.

Figure	1	2	3	4
Number of sides	5	9		

(2)

3.10.2 Describe the pattern in your own words.

(1)

3.10.3 Write down the general term of the pattern in the form, $T_n = \underline{\hspace{2cm}}$

(2)

3.11 Answer the following questions.

Matchsticks are arranged as shown in the following figures.

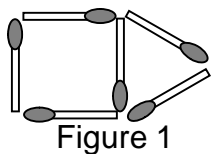


Figure 1

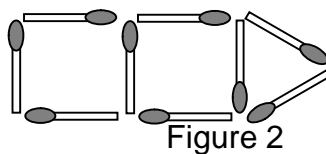


Figure 2

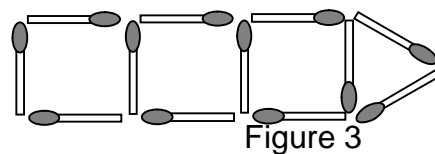


Figure 3

3.11.1 Determine the number of matchsticks in the next figure if the pattern is continued.

(2)

- 3.11.2 Write down the general term of the given sequence of the matchsticks in the form.

$T_n = \underline{\hspace{2cm}}$. (2)

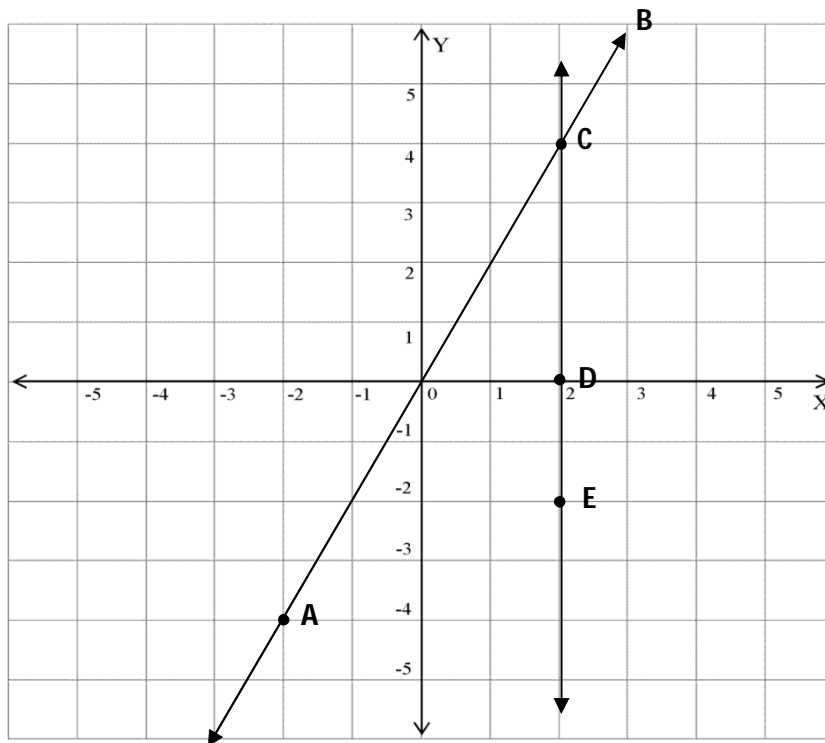
- 3.11.3 Determine the number of matchsticks in the 20th figure.

$\underline{\hspace{10cm}}$ (2)

- 3.12 If $x = -1$, calculate the value of y if $y = 2x^2 - 3x + 5$.

$\underline{\hspace{10cm}}$ (2)

- 3.13 Study the straight line graphs below and answer the questions that follow.



Complete:

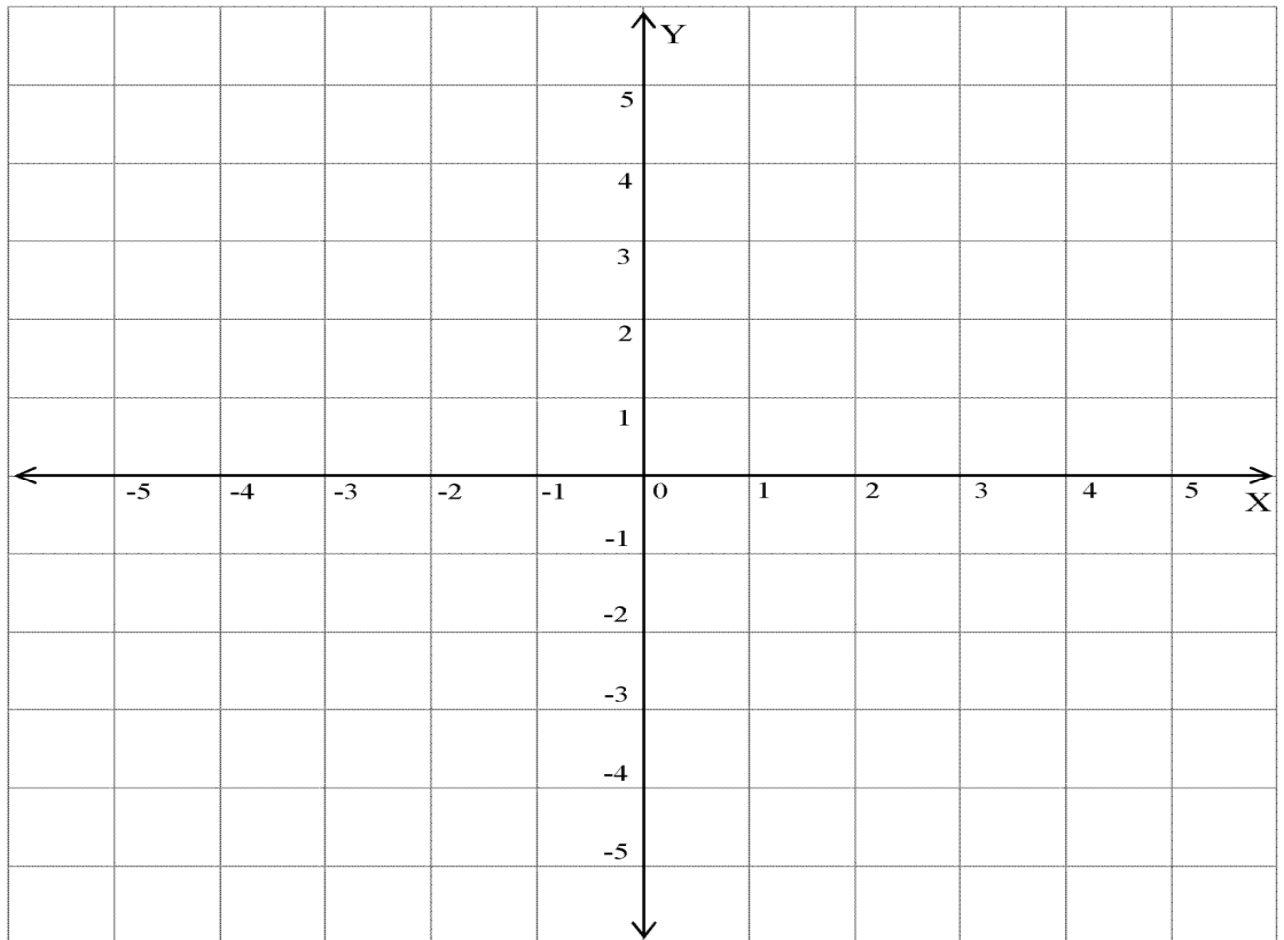
- 3.13.1 The equation of the line CD is $\underline{\hspace{2cm}}$ (1)

- 3.13.2 The equation of the line AB is $\underline{\hspace{2cm}}$ (2)

- 3.13.3 If $DE = 2$, the co-ordinates of E are $\underline{\hspace{2cm}}$ (2)

- 3.14.1 On the given grid draw the graphs defined by $y = 3x - 2$ and $y = 3x + 1$ on the same set of axes.

Label each graph and clearly mark the points where the graphs cut the axes.



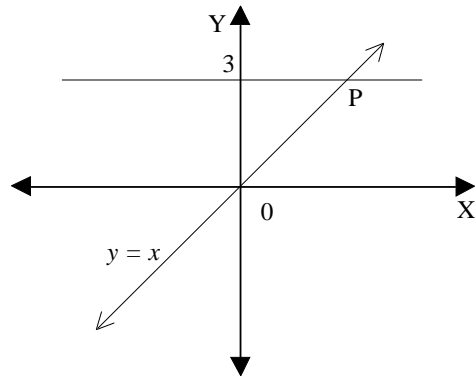
(6)

- 3.14.2 What is the relationship between the lines that you have drawn?

(1)

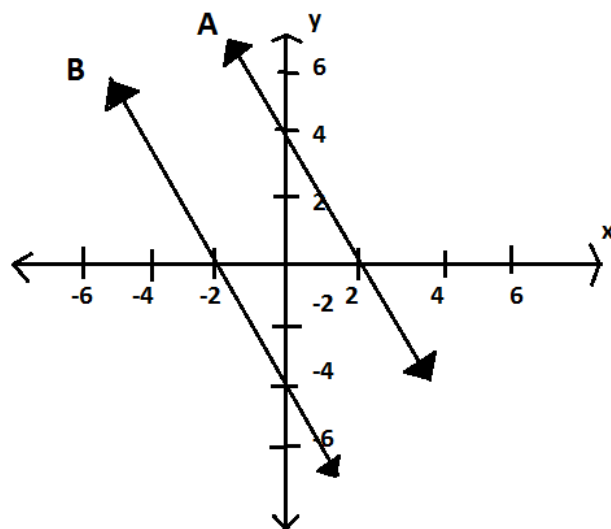
3.15

Determine the co-ordinates of P in the graph below.



(1)

3.16.1 Write down the defining equation of each of the following straight line graphs.



(4)

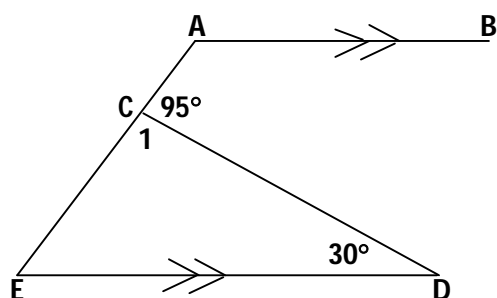
3.16.2 What can you deduce about lines AD and BC?

Give a reason for your answer.

(2)

4. SPACE AND SHAPE

4.1

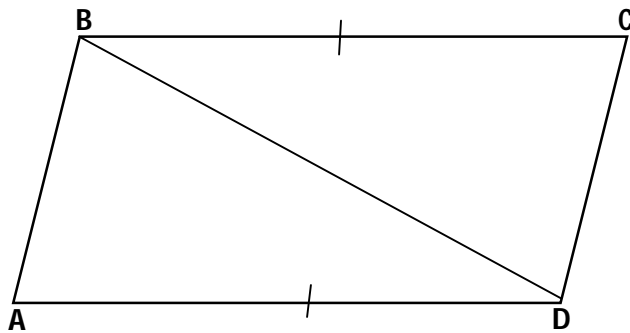


In the above figure $AB \parallel ED$, $\angle ACD = 95^\circ$ and $\angle D = 30^\circ$.

Determine the sizes of $\angle E$ and $\angle A$.

(4)

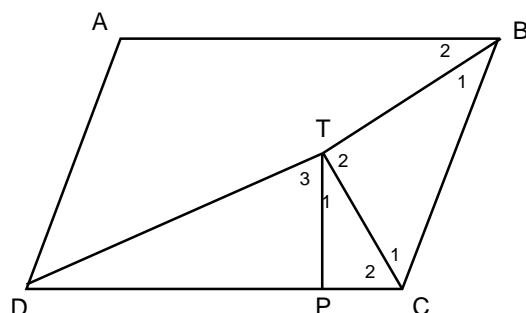
- 4.2 In the figure below $\widehat{ABD} = \widehat{CDB} = 90^\circ$ and $AD = BC$.



Prove that $\triangle ABD \equiv \triangle CDB$.

(4)

4.3



The bisectors of \hat{B} and \hat{C} of parallelogram $ABCD$ intersect at T . Points B , T and D do not lie on a straight line. P is a point on DC such that $TP \perp DC$.

4.3.1 Prove that $\hat{T}_2 = 90^\circ$.

(5)

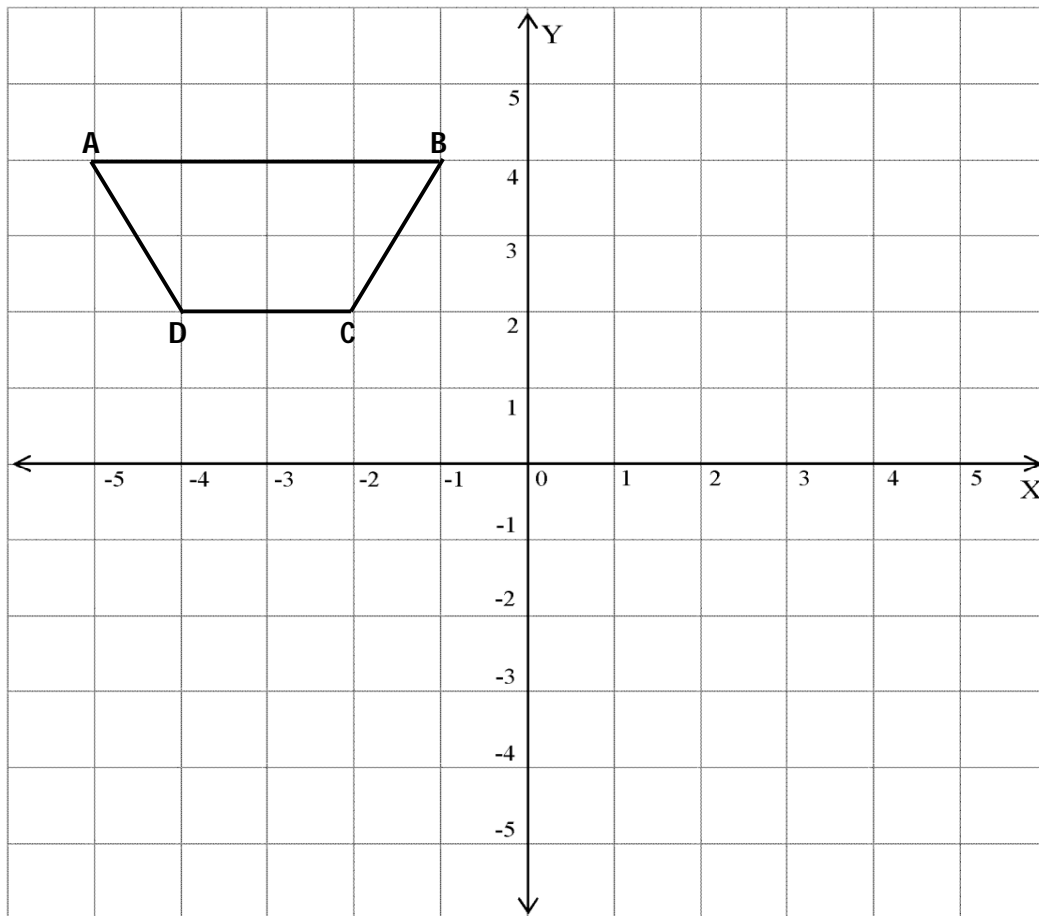
4.3.2 Which triangle is similar to $\triangle BCT$?

(2)

4.3.3 If $BC = 2TC$ and $TP = 4 \text{ cm}$, calculate the length of BT .

(3)

4.4 Study the diagram of trapezium $ABCD$ and answer the questions that follow.



4.4.1 Write down the co-ordinates of A and D .

(2)

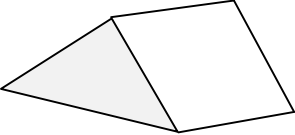
4.4.2 On the above grid draw trapezium $A'B'C'D'$, the image of $ABCD$, after reflecting $ABCD$ about the Y -axis.

(2)

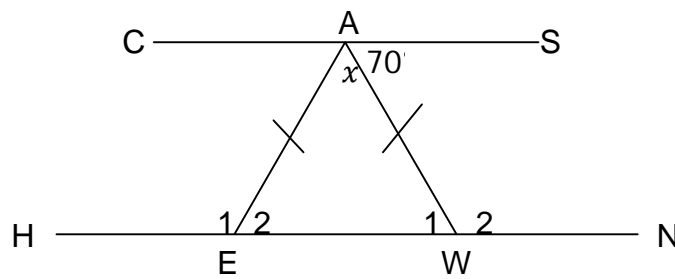
4.4.3 Write down the co-ordinates of A' and D' .

(2)

4.5 Complete the table below.

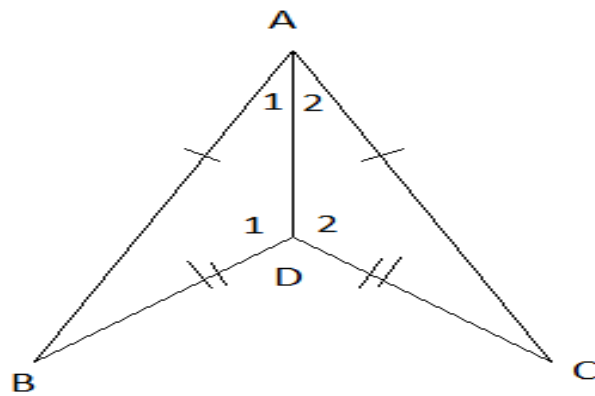
3-D object	Number of faces	Number of vertices	Number of edges
			

(3)



4.6 In the above figure, $CS \parallel HN$, $\angle EAW = 70^\circ$, $AE = AW$ and $\angle CAE = x$. Determine the value of x .

(3)



4.7 In the above figure, $AB = AC$ and $BD = CD$.

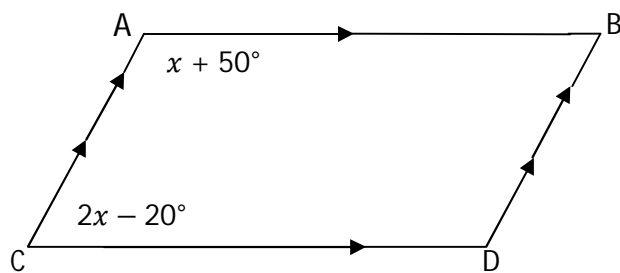
4.7.1 Prove that $\triangle ABD \cong \triangle ADC$

(4)

4.7.2 Prove that DA bisects $\angle BAC$.

(2)

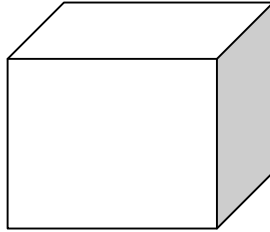
4.8 ABCD is a parallelogram .Calculate the size of \hat{B} .



(4)

5. MEASUREMENT

- 5.1 The side length of the cube below is 6 cm . Calculate the total surface area of the cube.



(2)

- 5.2 A solid gold object which is cylindrical in shape has a diameter of 18 cm and its height is 100 cm . The gold object must be re-cast into rectangular prisms with dimensions $30\text{ cm} \times 14\text{ cm} \times 8\text{ cm}$.

- 5.2.1 Calculate the volume of the cylinder.

(3)

- 5.2.2 Calculate the volume of the rectangular prism.

(3)

- 5.2.3 How many rectangular prisms can be made from the gold cylinder?

(3)

- 5.3 A ladder is standing against the wall. If the ladder reaches a height of $12m$ up the wall and has its foot $5m$ away from it, calculate the length of the ladder.

(3)

- 5.4 What is the height, correct to the nearest cm , of a 5 litre cylindrical oil container with a radius of $20cm$? ($1\text{ litre} \approx 1000\text{ cm}^3$)

(3)

6. DATA HANDLING

6.1 The data below shows the ages of passengers in a bus travelling from Durban to Johannesburg.

3	2	15	27	35	4	5	14
45	30	2	37	42	53	33	50
70	15	34	31	2	1	32	59

6.1.1 How many passengers were in the bus?

_____ (1)

6.1.2 Determine the range of the ages.

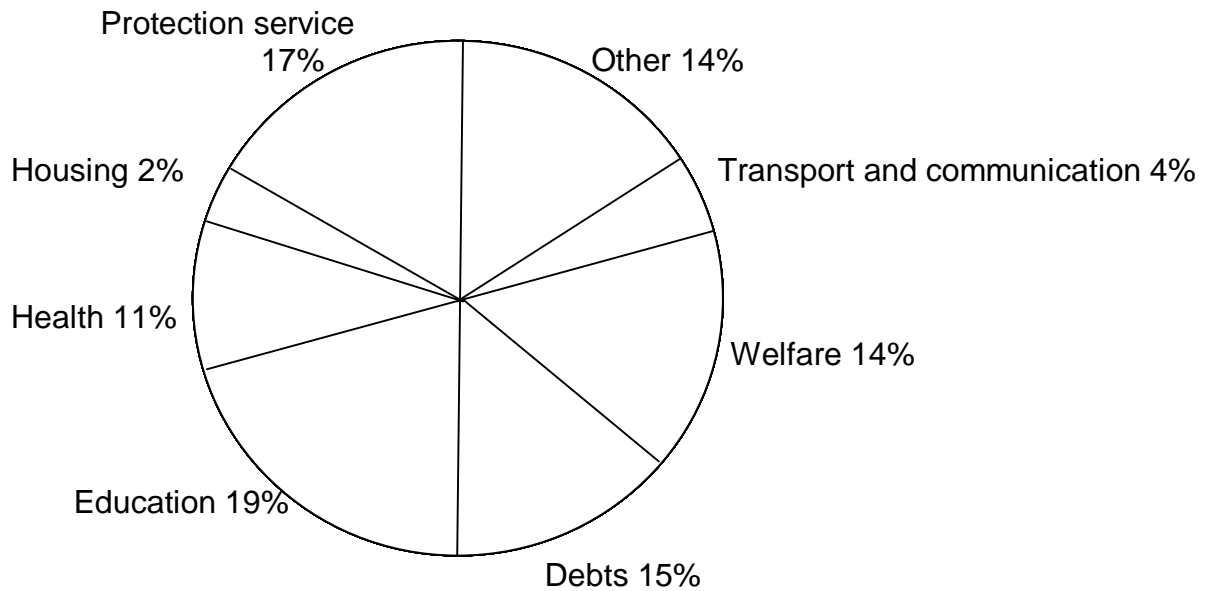
_____ (1)

6.1.3 Calculate the mean age of the passengers on the bus to the nearest whole number.

_____ (3)

6.2

Government expenditure in 2003



The above pie chart shows how the R105 billion budget was shared amongst the various services in 2003.

6.2.1 How much money was budgeted for education?

(2)

6.2.2 What percentage was budgeted for protection services and welfare combined?

(1)

6.2.3 What amount was allocated for education and health combined?

(2)
[5]

6.3 The marks obtained by the grade 9 learners for a Maths test out of 30 were listed as follows:

3	5	6	7	9
11	10	13	11	14
11	21	15	17	23
22	13	20	23	26

6.3.1 Complete the stem - and - leaf display in ascending order.

Stem	Leaves
0	
1	
2	

(3)

6.3.2 What was the range of the marks?

_____ (1)

6.3.3 What was the median mark?

_____ (1)

6.3.4 What was the modal mark?

_____ (1)

6.4 The three possible outcomes of a soccer game are **win, draw** or **lose**.

Bafana-Bafana played two games at Soccer City.

6.4.1 Complete a two-way table to list all the possible outcomes:

	Win (W)	Draw (D)	Lose (L)
Win (W)			
Draw (D)			
Lose (L)			

(3)

6.4.2 What is the probability of

6.4.2.1 winning both games?

_____ (1)

6.4.2.2 winning 1 game and losing 1 game ?

_____ (1)

6.4.2.3 winning at least 1 game ?

_____ (1)

6.5 The data set contains the heights of a class of grade 9 learners.

140	149	152	159	153	143	161	152	145	162
153	158	154	160	164	165	165	155	167	153
148	166	144	160	150	155	141	162	161	151
159	163	170	153	172	158	174	166	164	163

6.5.1 Complete the table.

Class-interval	Tally marks	Frequency
140---144		
145---149		
150---154		
155---159		
160---164		
165---169		
170---174		

(14)

6.5.2 What is the range of the heights?

(2)

6.5.3 What is the modal class-interval?

(2)

6.5.4 In which class-interval lies the median?

(2)

7. PROBLEM SOLVING

Share R48 amongst A, B and C so that for every R4 given to A, B receives R3 and for every R4 given to B, C receives R3.

(3)

END