



SENIOR PHASE

GRADE 9

NOVEMBER 2016

MATHEMATICS

MARKS: 100

TIME: 2 hours



This question paper consists of 13 pages including an information sheet.

INSTRUCTIONS AND INFORMATION

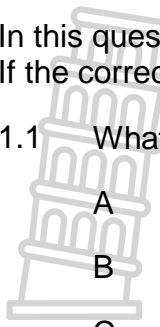
1. Read the following instructions carefully.
2. Answer ALL the questions.
3. Write neatly and legibly.
4. Number your answers exactly as questions are numbered.
5. Give reasons for each statement in QUESTION 5 and QUESTION 6.
6. Show ALL working.
7. You may use an approved scientific calculator (non-programmable and non-graphical).
8. Diagrams are NOT necessarily drawn to scale.
9. Use attached ANNEXTURE A to answer QUESTION 3.3.



QUESTION 1

In this question, write only the correct letter next to the corresponding number, e.g. If the correct answer for question 1.1 is D, write **1.1 D** only.

1.1 What is the correct pair of values of x in $(x - 3)(x + 2) = 0$?



A $x = -3$ and $x = -2$

B $x = 3$ and $x = -2$

C $x = -3$ and $x = 2$

D $x = 3$ and $x = 2$

(1)

1.2 What is the HCF of 210 and 350?

A $2 \times 5 \times 5 \times 7$

B $2 \times 3 \times 5 \times 7$

C $2 \times 5 \times 7$

D 5×7

(1)

1.3 Calculate: $6 + 6 \div 2 - 6 \times (-2)$

A 21

B 18

C 12

D 0

(1)

1.4 Determine the next term in the pattern 2; 5; 9; 14; ...?

A 21

B 20

C 19

D 18

(1)



1.5 Which of the following statements is true about a kite?

A The longer diagonal bisects the shorter diagonal at 90° .

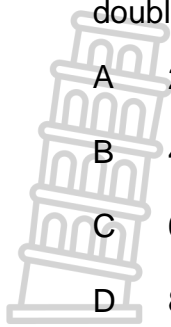
B The shorter diagonal bisects the longer diagonal at 90° .

C Diagonals bisect each other.

D Diagonals are equal.

(1)

1.6 What will be the volume of a rectangular prism if all its dimensions are doubled?



- A $2 \times$ the volume of the original prism.
- B $4 \times$ the volume of the original prism.
- C $6 \times$ the volume of the original prism.
- D $8 \times$ the volume of the original prism.

(1)

1.7 Which of the following statements has the same effect as rotating an object about the line $y = x$?

- A Rotating the object 270° anti-clockwise.
- B Rotating the object 90° anti-clockwise.
- C Rotating the object 180° clockwise.
- D Rotating the object 90° clockwise.

(1)

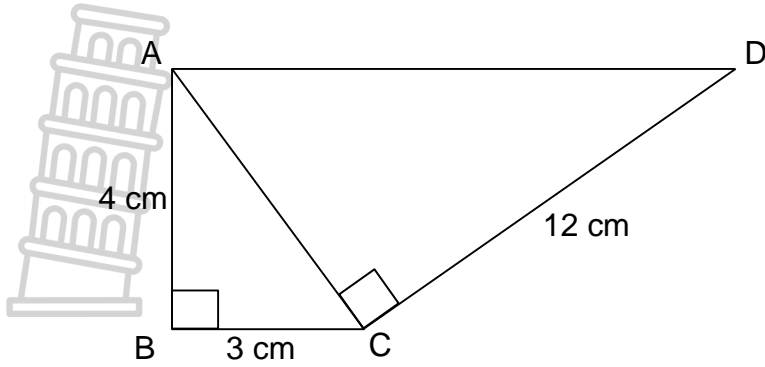
1.8 What will be the total surface area of a cube with a volume of 64 cm^3 ?

- A 96 cm^2
- B 64 cm^2
- C 16 cm^2
- D 4 cm^2

(1)



1.9 What is the length of AD in the figure below?



- A 16 cm
- B 15 cm
- C 13 cm
- D 5 cm

(1)

1.10 What is the mode of the scores presented in the frequency distribution table below?

Score	Frequency
111	2
112,1	7
114,3	6
115	2
211	1

- A 118,5
- B 113,6
- C 112,1
- D 100

(1)
[10]



QUESTION 2

2.1 Write 0,000 000 674 in scientific notation. (1)

2.2 Simplify:



2.1.1 $\sqrt[3]{x^3} + x^0$ (2)

2.1.2 $\sqrt{0,03x^8 + 0,01x^8}$ (2)

2.2.2 $\frac{(2d^2e)^2}{(4d^{-3}e^{-2})^{-1}}$ (3)

2.2.4 $2(x+2)^2 - 2(x+1)(x+2)$ (4)

2.3 Factorise completely:

2.3.1 $x^2 + 5x - 24$ (2)

2.3.2 $2(a-b) - b + a$ (3)

2.4 Solve for x :

2.4.1 $4x - 10 = 6$ (2)

2.4.2 $\frac{3x - 10}{2} = \frac{2x - 5}{3}$ (3)

2.4.3 $x^2 = 4$ (2)

2.4.4 $3x^5 = 96$ (2)

[26]



QUESTION 3

3.1 Study the geometric pattern below and answer the questions that follow.

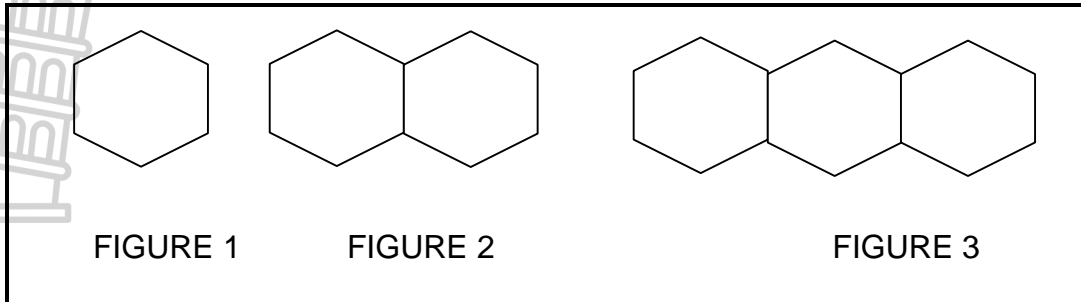
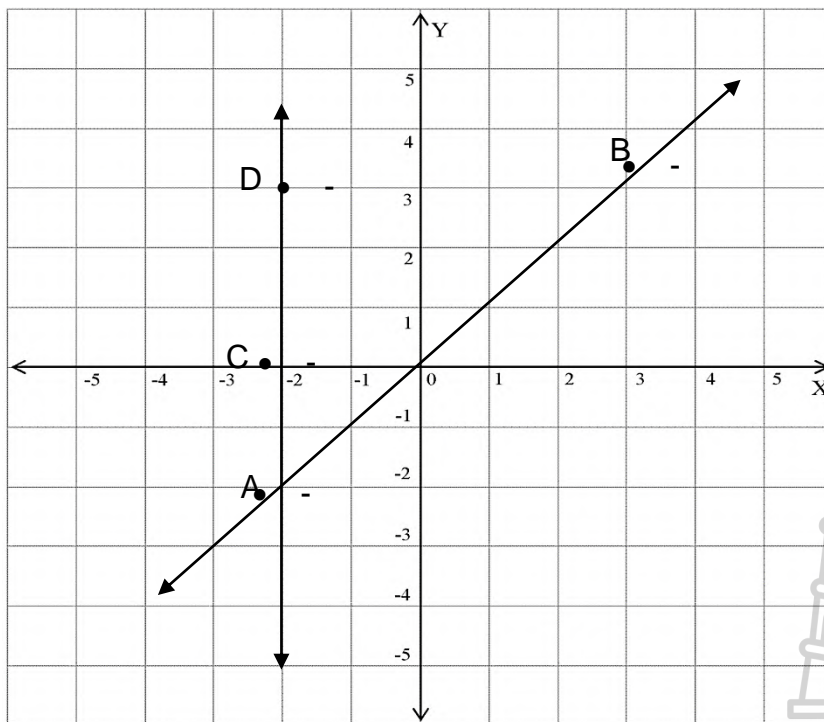


Figure	1	2	3
Number of lines	6	11	

3.1.1 Complete the table. (1)

3.1.2 Write down the general rule for the pattern in the form $T_n =$. (2)

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



3.2.1 Write down the equation of AB. (1)

3.2.2 Write down the equation of AD. (1)

3.3 On the attached grid, draw a graph defined by $y = -2x + 1$. Remove the ANNEXURE and attach it in your ANSWER BOOK. (3)

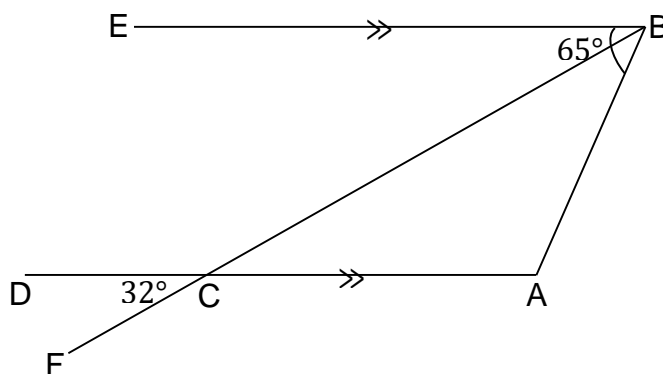
[8]

QUESTION 4

- 4.1 How long will it take an investment of R5 000 at 12% per annum simple interest to earn R1 800 interest? (3)
- 4.2 The sum of two numbers is 143 and their difference is 7, what are the numbers? (3)
- 4.3 There are 10 boxes, five contain pencils, four contain pens and two contain pens and pencils. How many boxes contain no pens and pencils? (2)
- 4.4 A car travelling at an average speed of 100 km/h covers a certain distance in 3 hours. At what average speed must the car travel to cover the same distance in 2 hours? (4)

[12]**QUESTION 5**

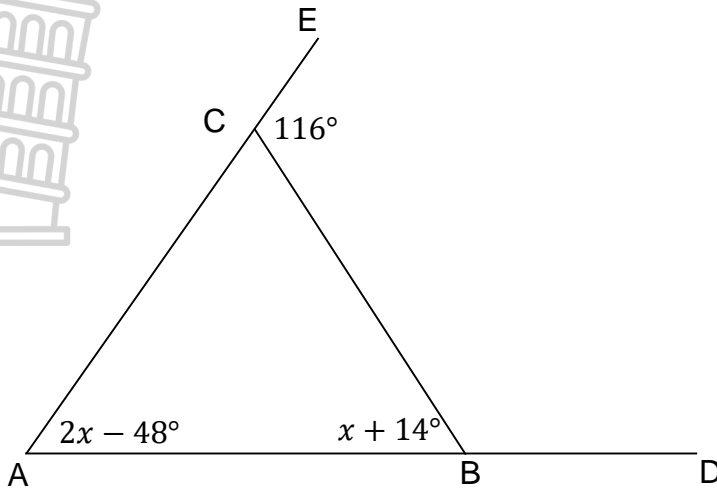
- 5.1 In the diagram below $\widehat{ABE} = 65^\circ$ and $\widehat{DCF} = 32^\circ$.



- 5.1.1 Calculate the size of \widehat{EBC} . Give reasons for your answer. (2)
- 5.1.2 Calculate the size of \widehat{AB} . Give reasons for your answer. (3)



5.2 In the diagram below, $\widehat{CAB} = 2x - 48^\circ$, $\widehat{ABC} = x + 14^\circ$ and $\widehat{BCE} = 116^\circ$.

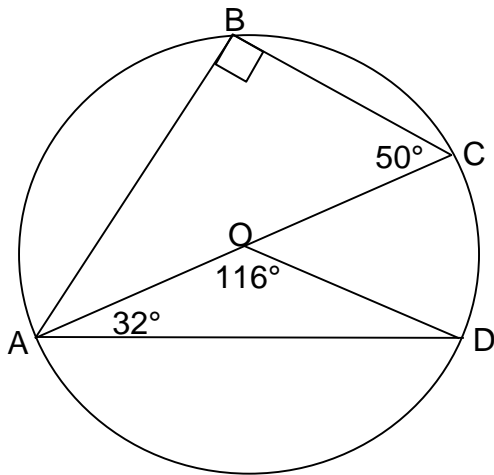


5.2.1 Calculate the value of x . Give reasons for your answer. (3)

5.2.2 Calculate the actual size of \widehat{CAB} . (2)

5.2.3 What type of Δ is ΔABC ? Give reasons for your answer. (2)

5.3 In the figure below, O is the centre of the circle.



5.3.1 Calculate the size of \widehat{CAB} . Give a reason for your answer. (2)

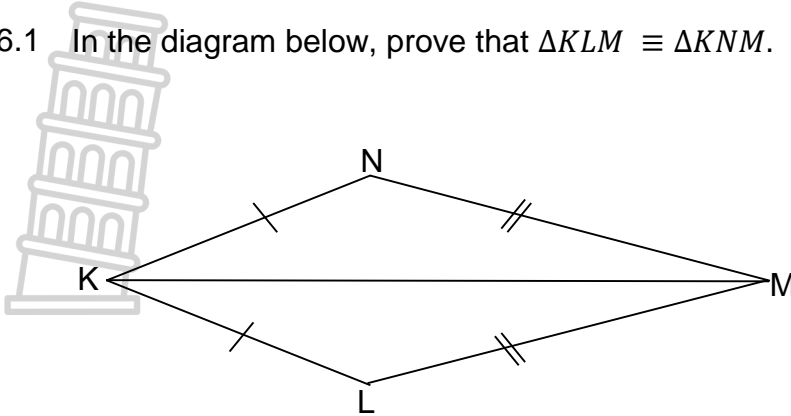
5.3.2 Calculate the size of \widehat{ADO} . Give a reason for your answer. (2)

[16]

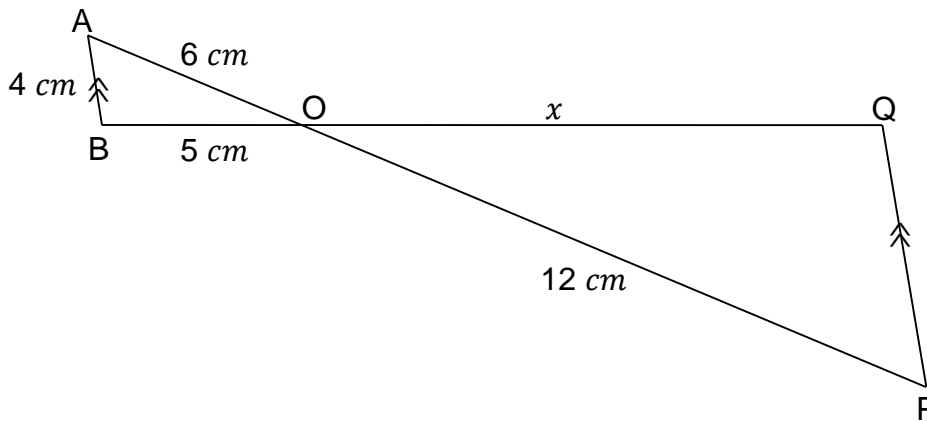


QUESTION 6

6.1 In the diagram below, prove that $\Delta KLM \equiv \Delta KNM$. (4)



6.2 In the diagram below, $AB \parallel PQ$.



6.2.1 Prove that $\Delta ABO \parallel \Delta PQO$. (4)

6.2.2 Calculate the value of x . (3)

[11]

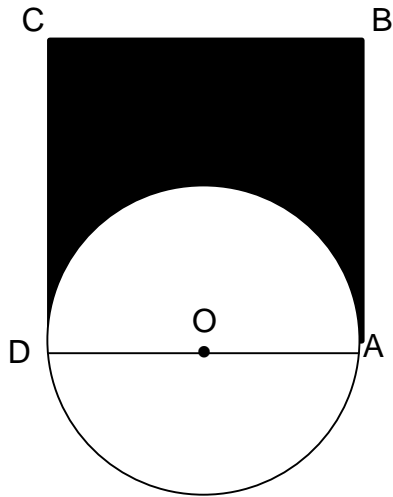
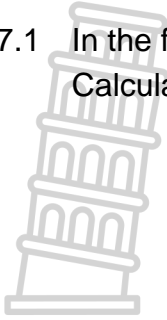


QUESTION 7

7.1 In the figure below ABCD is a square and AOD is the diameter of the circle.

Calculate the area of the shaded part if $r = 7\text{ cm}$. N.B $\pi = \frac{22}{7}$

(4)



7.2 A rectangular carpet has a perimeter of 16 m and an area of 15 m^2 . What are the dimensions of the sides of the carpet?

(4)
[8]



QUESTION 8

8.1 A spinner with 5 colours, red, yellow, green, black and white is spun and a coin is tossed, at the same time.

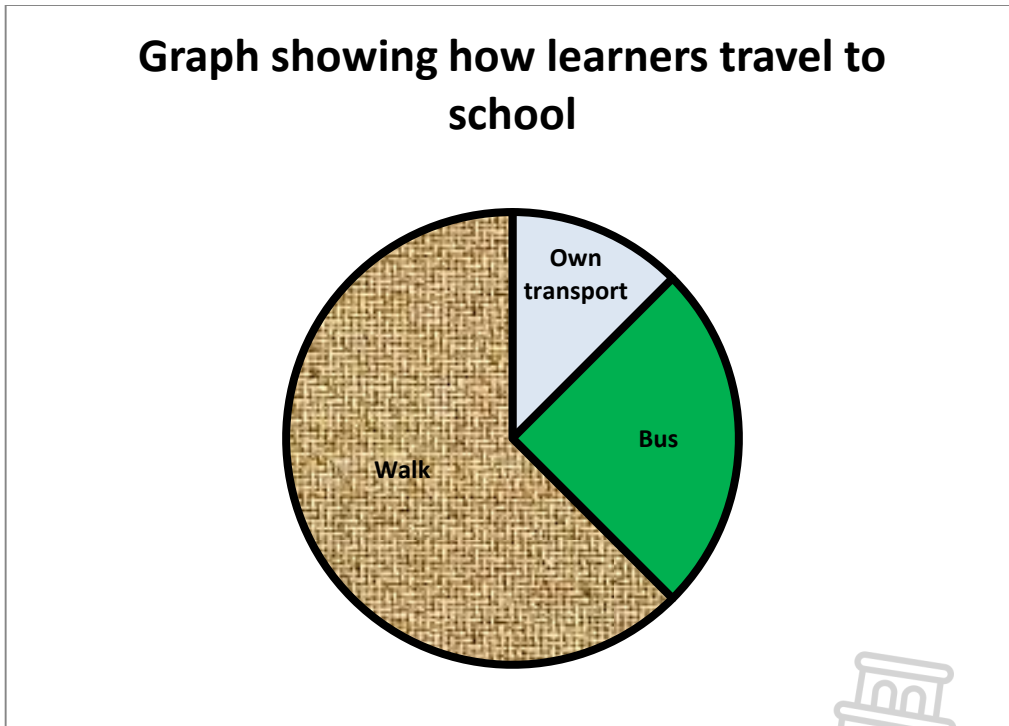


8.1.1 Draw a tree diagram to illustrate the number of possible outcomes for the experiment. (2)

8.1.2 What is the probability of spinning any colour and tossing a head? (1)

8.1.3 What is the probability of spinning a red colour? (1)

8.2 The pie chart below shows different modes of transport used by learners of Boiteko Junior Secondary School when travelling to school. The total number of learners in the school is 600. Study the graph and answer the questions that follow.



8.2.1 What fraction of learners walk to school? Give your answer as a fraction. (1)

8.2.2 Express the number of learners who travel by bus as a percentage. (2)

8.2.3 What is the ratio of learners who walk to school to those who use their own transport? (2)

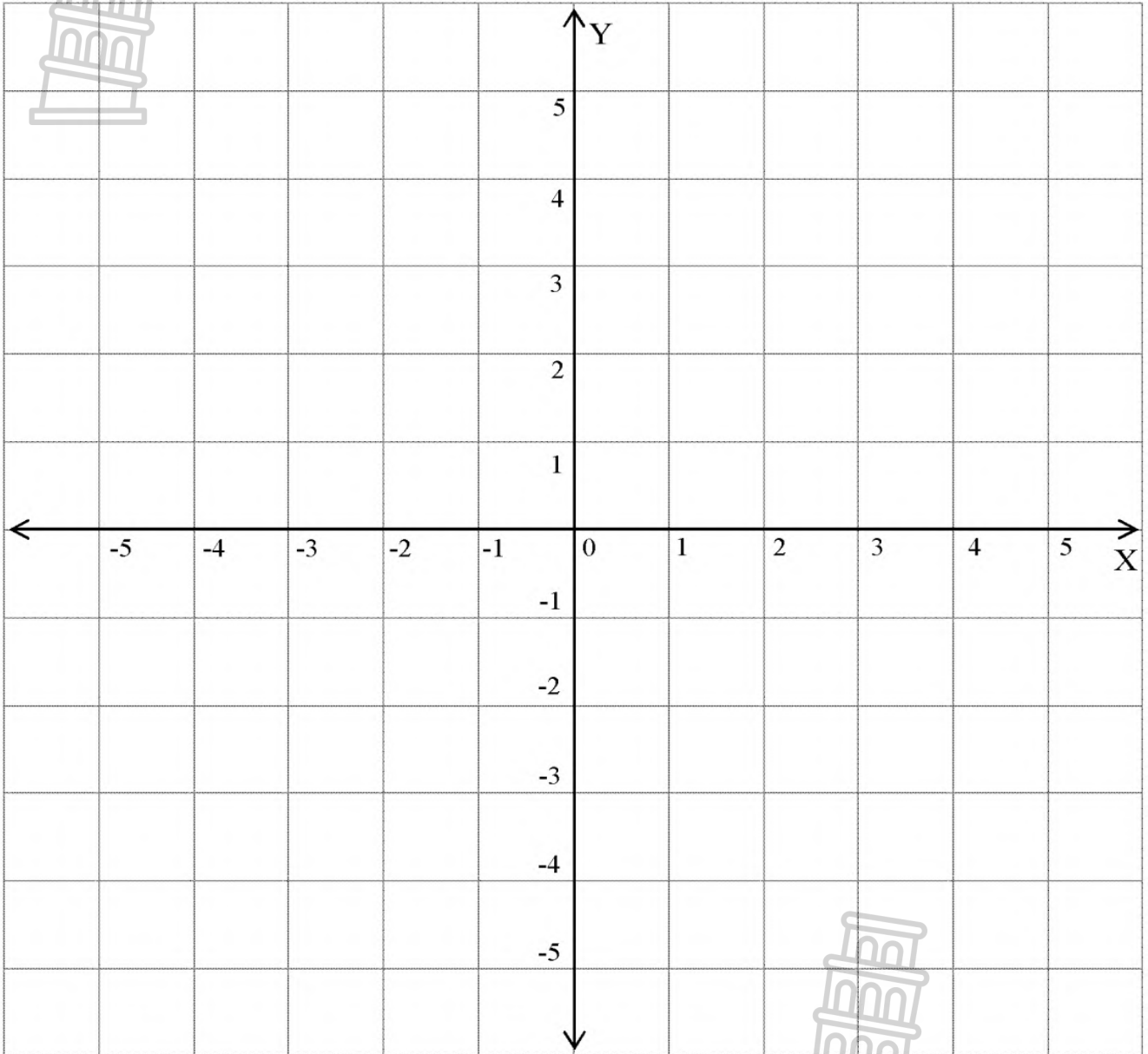
[9]

TOTAL: 100

ANNEXURE A

NAME:

SURNAME:





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**TO: THE HEADS OF EXAMINATIONS: DISTRICTS
 PRINCIPALS OF GET SCHOOLS/INSTITUTIONS**

**FROM: CES: INSTRUMENT DEVELOPMENT AND MODERATION SECTION
 MS N. MBELEKI**

SUBJECT: ERRATA – MATHEMATICS GRADE 9 NOVEMBER 2016

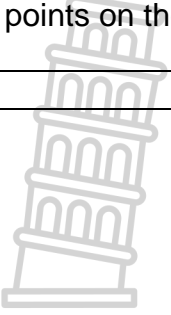
DATE: 21 NOVEMBER 2016

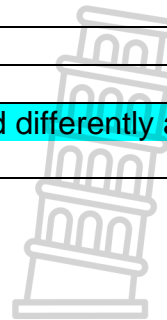
Although great care is taken with the setting and quality assurance of question paper, unfortunately due to various factors, errors do creep in. In order to ensure that learners are not disadvantaged in any way, it is requested that the following must be brought to the attention of learners before they start to write.

ERRATA FOR GRADE 9 MATHS PAPER BEFORE WRITING COMMENCES

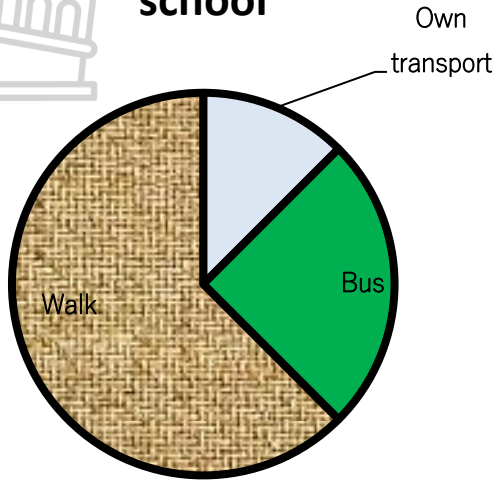
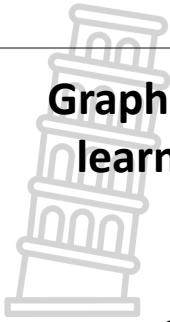
QUESTION PAPER

ITEM NO.	INCORRECT STATEMENT	CORRECT STATEMENT/ SUGGESTIONS
1.7	Which of the following statements has the same effect as rotating an object about the line $y = x$?	Which of the following statements has the same effect as rotating an object 270° clockwise about the origin?
2.2	Numbering is incorrect.	The correct numbering is:
	2.1.1	2.2.1
	2.1.2	2.2.2
	2.2.2	2.2.3

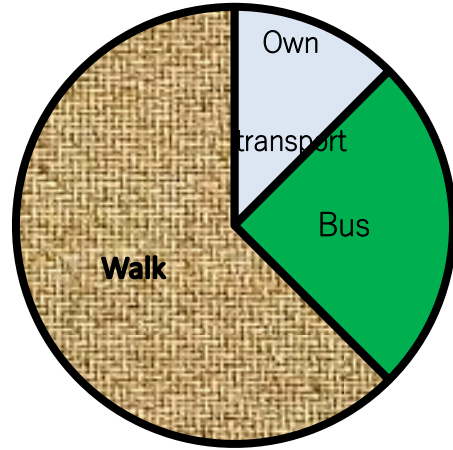
3.2	The points on the graph have shifted.	The correct graph with correct points is drawn below.
		
4.3	There are 10 boxes, five contain pencils, four contain pens and two contain pens and pencils. How many boxes contain no pens and pencils ?	There are 10 boxes, five contain pencils, four contain pens and two contain pens and pencils. How many boxes contain neither pens nor pencils (i.e. no pens and no pencils)?
6.2	In the diagram below, $AB \parallel PQ$.	In the diagram below, $AB \parallel PQ$, $OB = 5\text{ cm}$ and $QO = x$.
8.2	The sectors are all labelled as CATEGORY NAME	Sectors are labelled differently as Own transport, Bus and Walk



Graph showing how learners travel to school



Graph showing how learners travel to school



We want to apologise for any inconvenience caused and please note that the errata was issued to ensure that learners are assessed in the most accurate and fair manner.

Yours in education.

MS N. MBELEKI
CES: INSTRUMENT DEVELOPMENT SECTION

21 November 2016

DATE



THIS MUST BE ISSUED ONLY TO MARKERS OF THE PAPER AFTER THE PAPER HAS BEEN WRITTEN.

MEMORANDUM

ITEM NO.	INCORRECT ANSWER	CORRECT ANSWER
1.7	C	B
2.3.2	$2(a - b) - b + a$ $2(a - b) - 1(b - a) \quad \checkmark \text{ M}$ $2(a - b) + 1(a - b) \quad \checkmark \text{ M}$ $3(a - b) \quad \checkmark \text{ A}$	$2(a - b) - b + a$ $2(a - b) + 1(a - b) \quad \checkmark \text{ M}$ $(2 + 1)(a - b) \quad \checkmark \text{ M}$ $3(a - b) \quad \checkmark \text{ A}$
2.4.3		Alternative response $x^2 = (\pm 2)^2 \quad \checkmark \text{ M}$ $x = -2 \text{ or } x = 2 \quad \checkmark \text{ A}$

We want to apologise for any inconvenience caused and please note that the errata was issued to ensure that learners are assessed in the most accurate and fair manner.

Yours in education.



MS N. MBELEKI
CES: INSTRUMENT DEVELOPMENT SECTION

21 November 2016

DATE





Province of the
EASTERN CAPE
EDUCATION

SENIOR PHASE

GRADE 9

NOVEMBER 2016

**MATHEMATICS
MEMORANDUM**

MARKS: 100



This memorandum consists of 9 pages.

NOTE:

- This is marking guideline. In instances where learners have used different mathematically sound strategies to solve the problems, they should be credited.
- Underline errors committed by learners and apply Consistent Accuracy (CA) marking.

KEY	
M	Method mark
CA	Consistent Accuracy mark
A	Accuracy mark
S	Statement
R	Reason
S/R	Statement and Reason

QUESTION 1 [10 marks]				
Ques.			Mark Allocation	Total
1.1	B	✓	1 mark for each correct answer	(1)
1.2	C	✓		(1)
1.3	A	✓		(1)
1.4	B	✓		(1)
1.5	A	✓		(1)
1.6	D	✓		(1)
1.7	C	✓		(1)
1.8	A	✓		(1)
1.9	C	✓		(1)
1.10	C	✓		(1)
				[10]

QUESTION 2 [26 marks]			
Ques.	Solution	Mark Allocation	Total
2.1	$6,74 \times 10^{-7}$ ✓ A	Answer: 1 mark	(1)
2.2.1	$\sqrt[3]{x^3} + x^0$ ✓ A ✓ A $x + 1$	x : 1 mark +1: 1 mark	(2)
2.2.2	$\sqrt{0,03x^8 + 0,01x^8}$ ✓ A $\sqrt{0,04x^8}$ $0,2x^4$ ✓ A	$\sqrt{0,04x^8}$: 1 mark Answer: 1 mark	(2)
2.2.3	$\frac{(2d^2e)^2}{(4d^{-3}e^{-2})^{-1}}$ ✓ M ✓ M $2^2d^4e^2 \times 2^2d^{-3}e^{-2}$ $16d$ ✓ A	$2^2d^4e^2$: 1 mark $2^2d^{-3}e^{-2}$: 1 mark Answer: 1 mark	(3)
2.2.4	$2(x+2)^2 - 2(x+1)(x+2)$ ✓ M ✓ M $2(x^2 + 4x + 4) - 2(x^2 + 3x + 2)$ $2x^2 + 8x + 8 - 2x^2 - 6x - 4$ ✓ A $2x + 4$ ✓ CA	$x^2 + 4x + 4$: 1 mark $x^2 + 3x + 2$: 1 mark $2x^2 + 8x + 8 - 2x^2 - 6x - 4$: 1 mark Answer: 1 mark	(4)
2.3.1	$x^2 + 5x - 24$ ✓ A ✓ A $(x+8)(x-3)$	$x+8$: 1 mark $x-3$: 1 mark	(2)
2.3.2	$2(a-b) - b + a$ $2(a-b) + 1(a-b)$ ✓ M $(2+1)(a-b)$ ✓ M $3(a-b)$ ✓ A	+1(a-b): 1 mark (2+1)(a-b): 1 mark Answer: 1 mark	(3)
2.4.1	$4x - 10 = 6$ $4x = 16$ ✓ M $x = 4$ ✓ A	$4x = 16$: 1 mark Answer: 1 mark	(2)
2.4.2	$\frac{3x-10}{2} = \frac{2x-5}{3}$ $6 \times \left(\frac{3x-10}{2}\right) = 6 \times \left(\frac{2x-5}{3}\right)$ ✓ M $9x - 30 = 4x - 10$ ✓ A $5x = 20$ $x = 4$ ✓ CA	\times LCD: 6: 1 mark $9x - 30 = 4x - 10$: 1 mark Answer: 1 mark	(3)

2.4.3	$x^2 = 4$ $(x + 2)(x - 2) = 0$ ✓ M $x = -2$ or $x = 2$ ✓ A	$(x + 2)(x - 2) = 0$: 1 mark Answer: 1 mark	(2)
2.4.4	$3x^5 = 96$ $x^5 = 32$ $x^5 = 2^5$ ✓ M $x = 2$ ✓ A	2^5 : 1 mark Answer: 1 mark	(2)
			[26]

QUESTION 3 [8 marks]

Ques.	Solution	Mark Allocation	Total
3.1.1	16 ✓ A	Answer: 1 mark	(1)
3.1.2	✓ A ✓ A $5n + 1$	$5n$: 1 mark +1: 1 mark	(2)
3.2.1	$y = x$ ✓ A	Answer: 1 mark	(1)
3.2.2	$x = -2$ ✓ A	Answer: 1 mark	(1)

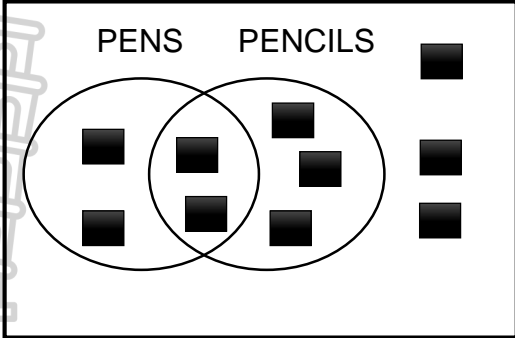
$y = -2x + 1$

y intercept : $y = +1$ ✓ A
 x intercept : $x = \frac{1}{2}$ ✓ A
 label ✓ A

(3)

[8]

Question 4 [12 marks]			
Ques.	Solution	Mark Allocation	Total
4.1	$p.n.i = SI \quad \checkmark M$ $5\,000 \times n \times 0,12 = 1\,800 \quad \checkmark M$ $n = 3 \quad \checkmark A$ OR $A = P(1 + ni) \quad \checkmark M$ $6\,800 = 5\,000(1 + 0,12n) \quad \checkmark M$ $1.36 = 1 + 0,12n$ $0,36 = 0,12n$ $n = 3 \quad \checkmark A$	Formula: 1 mark Substitution: 1 mark Answer: 1 mark	(3)
4.2	Let the numbers be a and $b \quad \checkmark M$ $a + b = 143$ $a - b = 7$ $a = b + 7$ $b + 7 + b = 143$ $2b = 136$ $b = 68$ $a = 68 + 7$ $a = 75 \quad \checkmark A \quad \checkmark A$ The numbers are 75 and 68 OR $a + b = 143$ $a - b = 7$ $\therefore 2a = 150$ (adding the 2 equations) $a = 75$ $75 + b = 143$ $b = 68$	Any method: 1 mark 75: 1 mark 68: 1 mark	(3)

<p>4.3</p> 	<p style="text-align: right;">S = 10</p>	<p>Answer: 2 marks</p>							
<p>4.4</p>	<p> $10 - 7 = 3$ boxes ✓✓A $d = s \times t$ ✓M $d = 100 \text{ km/h} \times 3\text{h}$ ✓A $d = 300 \text{ km}$ $S = \frac{d}{t}$ Av. Speed = $\frac{300\text{km}}{2\text{hrs}}$ ✓M $= 150 \text{ km/h}$ ✓CA OR <table border="1" data-bbox="309 954 865 1048"> <tr> <td>Speed</td> <td>100 km</td> <td>x km</td> </tr> <tr> <td>Time</td> <td>3 hrs</td> <td>2 hrs</td> </tr> </table> $2x = 300$ $x = 150 \text{ km/h}$ </p>	Speed	100 km	x km	Time	3 hrs	2 hrs	<p>Formula/method: 1 mark</p> <p>300 km: 1 mark $\frac{300 \text{ km}}{2 \text{ hrs}}$: 1 mark Answer: 1 mark</p>	<p>(2)</p> <p>(4)</p>
Speed	100 km	x km							
Time	3 hrs	2 hrs							
			<p>[12]</p>						



QUESTION 5 [16 marks]			
Ques.	Solution	Mark Allocation	Total
5.1.1	$\angle ACB = \angle DCF = 32^\circ$ (Vert. opp. \angle 's) $\angle EBC = \angle ACB = 32^\circ$ (Alt. \angle 's, $EB \parallel DA$)	Statement and reason: 1 mark each	(2)
5.1.2	$\angle CAB + \angle ABE = 180^\circ$ (Co int. \angle 's : $EB \parallel DA$) ✓S/R $\angle CAB = 180^\circ - 65^\circ$ ✓M $\angle CAB = 115^\circ$ ✓A OR $\angle CAB + \angle ACB + \angle ABC = 180^\circ$ (\angle 's of a Δ) ✓S/R $\angle CAB = 180^\circ - (32^\circ + 33^\circ)$ [$\angle ABC = 65^\circ - 32^\circ$] ✓M $\angle CAB = 180^\circ - 65^\circ$ $\angle CAB = 115^\circ$ ✓A	Statement and reason: 1 mark Substitution: 1 mark Answer: 1 mark	(3)
5.2.1	$\angle A + \angle ABC = \angle BCE$ (Ext \angle of a Δ) ✓S/R $(2x - 48^\circ) + (x + 14^\circ) = 116^\circ$ ✓M $3x - 34^\circ = 116^\circ$ $3x = 150^\circ$ ✓A $x = 50^\circ$ OR ✓S/R $\angle A + \angle ABC + \angle ACB = 180^\circ$ (\angle 's of a Δ) $(2x - 48^\circ) + (x + 14^\circ) + 64^\circ = 180^\circ$ ✓M $3x + 30^\circ = 180^\circ$ $3x = 150^\circ$ $x = 50^\circ$ ✓A	Statement and reason: 1 mark Substitution: 1 mark Answer: 1 mark	(3)
5.2.2	$\angle A = 2x - 48^\circ$ $= 2(50^\circ) - 48^\circ$ ✓M $= 100^\circ - 48^\circ$ $= 52^\circ$ ✓A	Substitution: 1 mark Answer: 1 mark	(2)
5.2.3	$\angle ABC = 50^\circ + 14^\circ = 64^\circ$ $\angle ACB = 180^\circ - 116^\circ = 64^\circ$ ✓S ✓R ΔABC is an isosceles triangle ($\angle ABC = \angle ACB$)	Correct statement: 1 mark Correct Reason: 1 mark	(2)
5.3.1	✓S ✓R $\angle ABC = 40^\circ$ (Complementary \angle 's)	Correct statement: 1 mark Correct Reason: 1 mark	(2)
5.3.2	✓S ✓R $\angle ADO = 32^\circ$ (AO = OD / radii)	Correct statement: 1 mark Correct Reason: 1 mark	(2)
			[16]

QUESTION 6 [11 marks]			
Ques.	Solution	Mark Allocation	Total
6.1	STATEMENT	REASON	Correct statement with reason: 1 mark each (4)
	$KL = KN$	Given ✓A	
	$LM = NM$	Given ✓A	
	$KM = KM$ $\therefore \Delta KLM \equiv \Delta KNM.$	Common ✓A SSS ✓A	
6.2.1	STATEMENT	REASON	Correct statement with reason: 1 mark each (4)
	$\hat{A} = \hat{P}$	Alt \angle 's, $AB \parallel PQ$ ✓A	
	$\hat{B} = \hat{Q}$	Alt \angle 's, $AB \parallel PQ$ ✓A	
	$A\hat{O}B = P\hat{O}Q$ $\therefore \Delta ABO \equiv \Delta PQO.$	Vert. opp. \angle 's ✓A AAA ✓A	
6.2.2	$\frac{OQ}{OB} = \frac{OP}{AO}$ (Corr. sides are proportional) ✓S/R $\frac{x}{5 \text{ cm}} = \frac{12 \text{ cm}}{6 \text{ cm}}$ ✓A $x = OQ = 10 \text{ cm}$ ✓CA	Statement and reason: 1 mark $\frac{x}{5 \text{ cm}} = \frac{12 \text{ cm}}{6 \text{ cm}}$: 1 mark Answer: 1 mark	(3)
			[11]
QUESTION 7 [8 marks]			
Ques.	Solution	Mark Allocation	Total
7.1	$d = 7 \times 2 = 14 \text{ cm}$ ✓M Area of the shaded part = $s^2 - \frac{\pi r^2}{2}$ ✓M $= 14 \times 14 - \frac{\frac{22}{7} \times 49}{2}$ $= 196 \text{ cm}^2 - 77 \text{ cm}^2$ ✓A $= 119 \text{ cm}^2$ ✓CA	14 cm : 1 mark $s^2 - \frac{\pi r^2}{2}$: 1 mark $196 \text{ cm}^2 - 77 \text{ cm}^2$: 1 mark Answer: 1 mark	(4)
7.2	$2l + 2b = 16$ ✓M $l + b = 8$ $b = 8 - l$ $l \times b = 15$ ✓M $l(8 - l) = 15$ $8l - l^2 = 15$ $l^2 - 8l - 15 = 0$ $(l - 5)(l - 3) = 0$ $l = 5$ or $l = 3$ ✓A $b = 3$ or $b = 5$ ✓A	$2l + 2b = 16$: 1 mark $l \times b = 15$: 1 mark 5 : 1 mark 3 : 1 mark	(4)
			[8]

Question 8 [9 marks]			
Ques.	Solution	Mark Allocation	Total
8.1.1			(2)
	<p>Key: G – Green, R – Red, Y – Yellow, B – Black, W – White, H – head, T – tail</p> <p>2 marks for correct tree diagram.</p>		
8.1.2	$\frac{5}{10} = \frac{1}{2}$ ✓A	Answer: 1 mark	(1)
8.1.3	$\frac{2}{10} = \frac{1}{5}$ ✓A	Answer: 1 mark	(1)
8.2.1	$\frac{5}{8}$ ✓A	Answer: 1 mark	(1)
8.2.2	✓A ✓A $\frac{1}{4} = 25\%$	$\frac{1}{4}$: 1 mark 25%: 1 mark	(2)
8.2.3	✓A ✓A 5:1	5: 1 mark 1: 1 mark	(2)
			[9]
		TOTAL:	100