basic education
Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

ANNUAL NATIONAL ASSESSMENT 2013
GRADE 9 MATHEMATICS
MEMORANDUM

MARKS: 140

This memorandum consists of 10 pages.

Important Information

- 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.
- Unless otherwise stated, learners who give a correct answer only, should be awarded full marks.
- Underline errors committed by learners and apply Consistent Accuracy (CA) marking.

KEY	
M	Method mark
CA	Consistent Accuracy mark
A	Accuracy mark

QUESTION 1

1.	1.1	**B**	1.2	**A**	1.3	**B**	1.4	**B**	1.5	**C**	Give 1 mark for each correct answer.	**[10]**
	1.6	**C**	1.7	**D**	1.8	**D**	1.9	**A**	1.10	**D**		

QUESTION 2

2.1 $\frac{6x^5}{x^4} - \frac{15x^3}{3x^2} = 6x\checkmark - 5x\checkmark\textbf{M}$
$= x\checkmark\textbf{CA}$

$6x$: 1 mark
$-5x$: 1 mark
Answer: 1 mark

or

$\frac{18x^5-15x^5}{3x^4}$ ✓**M** $= \frac{3x^5}{3x^4}\checkmark\textbf{M}$
$= x\checkmark\textbf{CA}$

$\frac{18x^5-15x^5}{3x^4}$: 1 mark
$\frac{3x^5}{3x^4}$: 1 mark
Answer: 1 mark (3)

2.2 $x(x+2) - (x-1)(x-3)$
$= x^2 + 2x\checkmark - (x^2 - 4x + 3)$ ✓**M**
$= x^2 + 2x - x^2 + 4x - 3\checkmark\textbf{M}$
$= 6x - 3\checkmark\textbf{CA}$

$x^2 + 2x$: 1 mark
$x^2 - 4x + 3$: 1 mark
Simplification: 1 mark
Answer: 1 mark (4)

2.3 $\sqrt{225x^4} - \sqrt[3]{125x^6}$

$= 15x^2$ ✓✓**M** $- 5x^2$ ✓✓**M**

$= 10x^2$ ✓**CA**

15: 1 mark
x^2: 1 mark
-5: 1 mark
x^2: 1 mark
$10x^2$: 1 mark (5)

2.4 $\frac{2x+1}{4} - \frac{x+2}{2} - \frac{1}{4}$

$= \frac{2x+1-2(x+2)-1}{4}$ ✓**M**

$= \frac{2x+1-2x-4-1}{4}$ ✓**M**

$= \frac{-4}{4}$ ✓**M**

$= -1$ ✓**CA**

Same denominator: 1 mark

Note:
If learners treat the expression as an equation 0 out of 4.
If learners leave out denominator the maximum mark is 3 out of 4.

$-2x - 4$: 1 mark

Simplifying numerator: 1 mark (4)

Answer: 1 mark

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QUESTION 3

3.1 $6a^3 - 12a^2 + 18a$

$= 6a$ ✓$(a^2 - 2a + 3)$ ✓ **A**

Common factor $6a$: 1 mark
$a^2 - 2a + 3$:1 mark (2)

3.2 $7x^2 - 28$

$= 7(x^2 - 4)$ ✓**A**

$= 7(x - 2)(x + 2)$ ✓**A**

$7(x^2 - 4)$: 1 mark
$7(x - 2)(x + 2)$: 1 mark (2)

Note: If learners give answer as $(\sqrt{7}x - \sqrt{28})(\sqrt{7}x + \sqrt{28})$, then give 1 mark out of 2.

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QUESTION 4

4.1 $3x - 1 = 5$

$3x = 6$ ✓**M**

$x = 2$ ✓**CA**

Add 1 on both sides: 1 mark
Answer: 1 mark (2)

4.2 $2(x-2)^2 = (2x-1)(x-3)$

$2(x^2-4x+4)$✓ $= 2x^2-7x+3$✓**M**

$2x^2-8x+8 = 2x^2-7x+3$✓**M**

$x = 5$ ✓***CA***

Squaring a binomial: 1 mark
Product of 2 binomials: 1 mark
$2x^2-8x+8$: 1 mark
Answer: 1 mark (4)

4.3 $\frac{2x-3}{2}+\frac{x+1}{3}=\frac{3x-1}{2}$

$\times 6$

$3(2x-3)+2(x+1)=3(3x-1)$ ✓**M**

Multiply LHS and RHS by 6: 1 mark

$6x-9+2x+2=9x-3$✓**M**

Multiplying out: 1 mark

$8x-7=9x-3$✓**M**

Simplification: 1 mark

$x=-4$ ✓**CA**

Answer: 1 mark (4)

4.4 $x^3=64$ or $x^3=64$

$x^3=4^3$✓**M** $x=\sqrt[3]{64}$ ✓**M**

$x=4$ ✓**A** $x=4$ ✓**A**

Calculation: 1 mark
Answer: 1 mark (2)

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QUESTION 5

5.1 19 ✓and 23 ✓**A**

19: 1 mark
23: 1 mark (2)

5.2 $T_n=4n+3$✓ ✓**A**
or
$T_n=7+4(n-1)$✓ ✓**A**

$4n$: 1 mark
$+3$: 1 mark
or
7: 1 mark
$4(n-1)$: 1 mark (2)

5.3 $T_n=4(50)+3$✓**M**
$=203$✓**CA**

Substituting 50 for n: 1 mark
Answer: 1 mark (2)

Note: Give full marks if learner has correctly substituted in his/her "incorrect" general term from 5.2.

[6]

QUESTION 6

6.1 Time$= \frac{432}{96}\ h$ ✓**M**

$= \frac{36}{8}\ h$

$= 4\frac{1}{2}h$ or $4\ h\ 30\ min$ ✓**CA**

Formula/ Substitution: 1 mark

Answer: 1 mark (2)

or

Speed x time = distance

96 *km/h* x time = 432 *km* ✓**M**

Time = $\frac{432\ km}{96\ km/h} = 4{,}5\ h$ ✓**A**

6.2 $A = P(1 + ni)$ ✓**M**

$A = R3\ 500(1 + 3(0{,}06))$ ✓**M**

$= R3\ 500(1{,}18)$

$= R4\ 130{,}00$ ✓**CA**

$S.I = R4\ 130 - R3\ 500$ ✓**M**

$= R630$ ✓**CA**

or

$S.I = \frac{P.n.r}{100}$ ✓**M**

$S.I = \frac{R3\ 500(3)(6)}{100}$ ✓✓✓**M**

$= R630$ ✓**CA**

Formula: 1 mark

Substitution: 1 mark

Calculation: 1 mark

Subtraction: 1 mark

S.I answer: 1 mark

or

Formula: 1 mark

Substitution (P, n, r): 3 marks

Answer: 1 mark (5)

6.3 $A = P(1 + i)^n$ ✓**M**

$= R7\ 500(1 + 0{,}13)^3$ ✓✓**M**

$= R7\ 500(1{,}13)^3$

$= R10\ 821{,}73$ ✓**CA**

or

Year 1: $R7\ 500 \times 13\% = R975{,}00$

Year 2: $R8\ 475{,}00 \times 13\% = R1\ 101{,}75$

Year 3: $R9\ 576{,}75 \times 13\% = R1\ 244{,}98$

The amount will be $R10\ 821{,}73$ ✓**CA**

✓✓✓**M**

Formula: 1 mark

Substitution $i = 0{,}13$: 1 mark

Substitution P & n: 1 mark

Answer: 1 mark (4)

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QUESTION 7

7.1.1

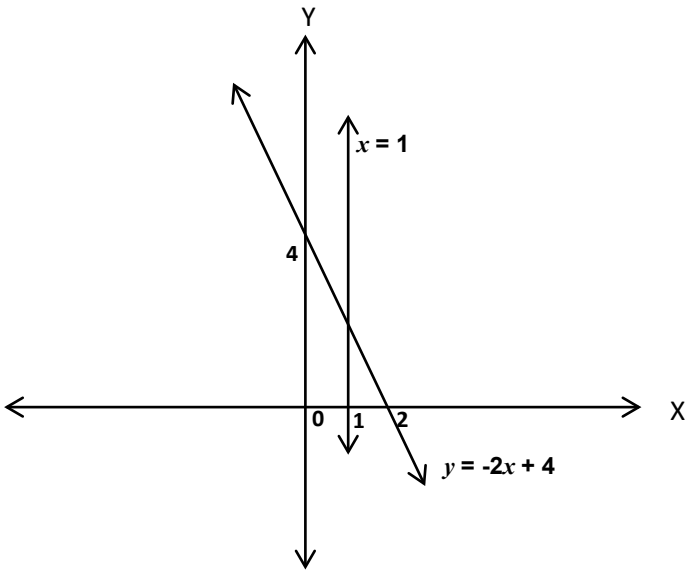
	A	B	C
x co-ordinate	0	2	4
y co-ordinate	-2	0	2
	✓	✓	✓

1 mark per pair of coordinates of each point (3)

7.1.2 $y = x - 2$ ✓✓**A**

x: 1 mark
-2: 1 mark (2)

7.2.1



$y-$ intercept: 1 mark ✓
$x-$ intercept: 1 mark per graph ✓ + ✓
Labelling graph: 1 mark per graph ✓ + ✓ (5)

7.2.2 $(1; 2)$ ✓✓**CA**

Note: Give full marks if learner has correctly identified the point of intersection of his/her graphs.

1 mark for x-value
1 mark for y-value (2)

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QUESTION 8

Note: Penalty for leaving out reasons: only deduct 1 mark for this entire question.

8.1.1 $\widehat{T_1} = \widehat{P_1} = 25°$ ($\angle s$ opp. equal sides of Δ)✓**A**

Correct statement with reason: 1 mark (1)

8.1.2 $\widehat{M_2} = 50°$ (ext ∠ of ΔMPT) ✓**A or** (suppl. $\angle s$ on a str line) ✓**A**

Correct statement with reason: 1 mark (1)

8.1.3 $\hat{R} + \widehat{T_2} = 130°$ (sum of $\angle s$ of Δ$= 180°$✓**A**
But $\hat{R} = \widehat{T_2}$ ($\angle s$ opp. equal sides of Δ)✓**A**
$= 65°$✓**A**

Correct statement with reason: 1 mark
Correct statement with reason: 1 mark
Answer: 1 mark
(3)

8.2.1 $BD + DE = CE + DE$ ✓**A**

Answer: 1 mark (1)

8.2.2 $\Delta ACD \equiv \Delta ABE$ $(s\angle s)$ ✓**A**

Correct statement and reason: 1 mark
NOTE: Order of the vertices should be correct (1)

8.3 In ΔKNQ and ΔMPQ
$\hat{Q} = \hat{Q}$ (common) ✓**A**
$NQ = PQ$ (given) ✓**A**
$KQ = MQ$ (given)✓**A**
$\therefore \Delta KNQ \equiv \Delta MPQ$ $(s\angle s)$ ✓**A**

Correct statement with reason: 1 mark
Correct statement with reason: 1 mark
Correct statement with reason: 1 mark
Correct deduction with reason: 1 mark
(4)

8.4.1 In ΔQPN and ΔLMN
$\widehat{N} = \widehat{N}$ (common angle) ✓**A**
$\widehat{P_1} = \widehat{M}$ (corr$\angle s$, QP || LM) ✓**A**
$\hat{Q}_1 = \hat{L}$ (corr$\angle s$, QP || LM) ✓**A**
$\therefore \Delta QPN \,|||\, \Delta LMN$ $(\angle\angle\angle)$ ✓**A**

Correct statement with reason: 1 mark
Correct statement with reason: 1 mark
Correct statement with reason: 1 mark
Correct deduction and reason: 1 mark

Note: Do not penalize learners if they leave out the third condition ($\widehat{N} = \widehat{N}$). (4)

8.4.2 $\frac{QP}{LM} = \frac{PN}{MN} = \frac{QN}{LN}$ (prop sides of similar Δs)✓**A**

$\frac{3}{8} = \frac{PN}{16}$ ✓**A**

$PN = 6\ cm$ ✓**A**

Correct statement with reason:1 mark

Substitution: 1 mark

Answer: 1 mark
Note: Answer only give 3 marks (3)

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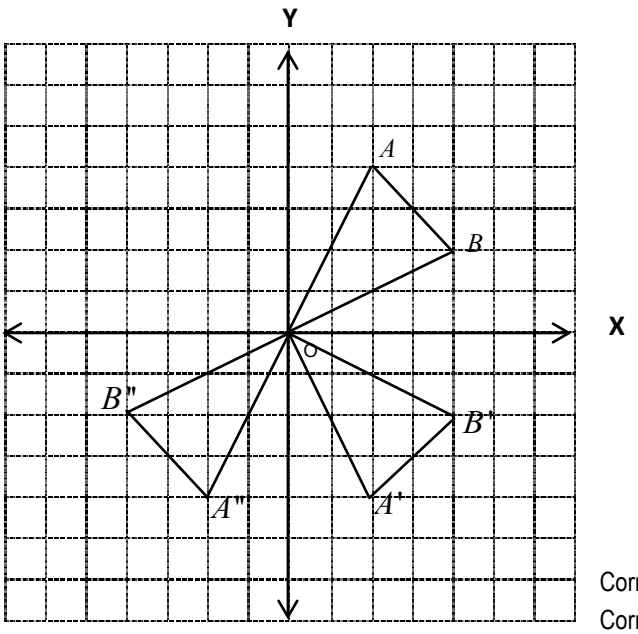
QUESTION 9

9.1 and 9.3



Correct drawing of $\Delta A'OB'$: 2 marks ✓✓**A**
Correct drawing of $\Delta A''OB''$: 2 marks✓✓**A** (4)

9.2 $B'(4;-2)$ ✓**CA**

NOTE: Give full marks if learner has written the coordinates of B' from his/her triangle. Answer: 1 mark (1)

9.4 $A'A'' = 4$ units✓**CA**

NOTE: Give full marks if learner has given the correct length of his/her A'A" . Answer: 1 mark (1)

[6]

QUESTION 10

10.1.1 Area of ring $= \pi R^2 - \pi r^2$ ✓✓**M/A**
$= \pi(R^2 - r^2)$
Formula: 1 mark
Subtraction: 1 mark (2)

10.1.2 Area of ring
$= \pi(14^2) - \pi(8^2)\ cm^2$✓**M**
$= 132\pi\ cm^2$✓**CA**
or $\pi(14+8)(14-8)\ cm^2$✓**M**
$= \pi(22)(6)\ cm^2$
$= 132\pi\ cm^2$ ✓**CA**
Substitution: 1 mark
Answer: 1 mark (2)

10.2.1 $QT = TR = 24\ cm$ ✓ $(\Delta PQT \equiv \Delta PRT)$ ✓**A**
Correct statement with reason: 2 marks (2)

10.2.2 In ΔPQT:
$PT^2 = (25^2 - 24^2)\ cm^2$ (Pythagoras) ✓✓**M**
$= (625 - 576)\ cm^2$ ✓**M or** (25+24)(25-24) cm^2 ✓**M**
$= 49\ cm^2$
$PT = 7\ cm$✓**M**
Correct statement with reason: 2 marks
Calculations: 1 mark
Answer: 1 mark (4)

10.2.3 Area $\Delta PQR = \frac{base \times height}{2}$ ✓**M** **or** $= \frac{1}{2}(base \times height)$
$= \frac{(48)(7)}{2}\ cm^2$✓**M**
$= (24)(7)\ cm^2$
$= 168\ cm^2$✓**CA**
Formula: 1 mark
Substitution: 1 mark
Answer: 1 mark (3)

10.2.4 Volume = Area of base × height✓**M**
$= 168\ cm^2 \times 80\ cm$
$= 13\ 440\ cm^3$✓**CA**
Formula/substitution: 1 mark
Answer: 1 mark (2)

10.2.5 Surface area $= 2(Area\ \Delta PQR) + 2(Area\ PRSW) + Area\ QRSU$✓**M**
$= 2(168)\ cm^2 + 2(80 \times 25)\ cm^2 + 80(48)\ cm^2$✓✓✓**M**
$= 336\ cm^2 + 4\ 000\ cm^2 + 3\ 840\ cm^2$
$= 8\ 176\ cm^2$✓**CA**
Formula: 1 mark
Substitution: 3 marks
Answer: 1 mark (5)

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QUESTION 11

11.1

Mark x	f	$f.x$	
1	2	2	
2	3	6	✓
3	4	12	
4	6	24	✓
5	7	35	
6	9	54	✓
7	4	28	
8	3	24	✓
9	2	18	

$f.x$ values: 4 marks (4)

11.2 Number of learners $= \Sigma f = 40$ ✓**A** Answer: 1 mark (1)

11.3 The mean mark $= \frac{\Sigma fx}{\Sigma f}$ ✓**M** Formula: 1 mark

$= \frac{203}{40}$ ✓**M** Substitution: 1 mark

$= 5{,}075$ ✓**CA** Answer: 1 mark

Note: If answer is given as 5 then give full marks. (3)

11.4 % of learners $= \frac{9}{40} \times 100$ ✓**M** Correct fraction: 1 mark

$= 22{,}5$ ✓**CA** Answer: 1 mark (2)

NOTE: If answer is given as $22{,}5$ then give full marks.

[10]

QUESTION 12

12.1

Stem	Leaves	
13	7	✓
14	5 6 7 9	✓
15	0 3 3 3 6 6 7 8 8	✓
16	3 5 5	✓
17	0 3 7	✓

Ordered table: 5 marks (5)

12.2.1 Range $= (177 - 137)\ cm = 40\ cm$ ✓**A** Answer: 1 mark (1)

12.2.2 Mode $= 153\ cm$ ✓**A** Answer: 1 mark (1)

12.2.3 Median $= 156\ cm$ ✓**A** Answer: 1 mark (1)

12.2.4 14 ✓**A** Answer: 1 mark (1)

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QUESTION 13

13.1 $P(G) = \frac{5}{12}$ ✓**A** Answer: 1 mark (1)

13.2 $P(W) = \frac{4}{12} = \frac{1}{3}$ ✓**A** Answer: 1 mark (1)

13.3 $P(W) = \frac{3}{11}$ ✓**A** Answer: 1 mark (1)

[3]

QUESTION 14

Let x boys play soccer and hockey

$150 + (130 - x) = 200$ ✓**M**
$280 - x = 200$ ✓**M**
$x = 80$ ✓**A**

or $130 + (150 - x) = 200$ ✓**M**
$280 - x = 200$ ✓**M**
$x = 80$ ✓**A**

Correct statement: 1 mark
Calculation: 1 mark
Answer: 1 mark

or

Total number of boys who play hockey and soccer
$= 150 + 130 = 280$ ✓**M**
But this is 80 more than the number of boys in grade 9 which means 80 boys must play both soccer and hockey ✓✓**M**

Correct statement: 1 mark
Calculation: 1 mark
Answer: 1 mark (3)

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TOTAL: 140