



# basic education

Department:  
Basic Education  
REPUBLIC OF SOUTH AFRICA

## ANNUAL NATIONAL ASSESSMENT 2012

### GRADE 9 MATHEMATICS

#### TEST

#### MEMORANDUM

**MARKS: 140**

**This memorandum consists of 9 pages.**

#### Important Information

- This is a marking guideline. In instances where learners have used different but mathematically sound strategies to solve the problems they should be credited.
- Unless stated otherwise, learners who give a correct answer only, should be awarded full marks.
- Apply consistency accuracy and underline errors committed by learners.

KEY	
<b>M</b>	Method mark
<b>CA</b>	Consistent Accuracy mark
<b>A</b>	Accuracy mark

#### QUESTION 1

1.	1.1	<b>C</b>	1.2	<b>B</b>	1.3	<b>C</b>	1.4	<b>C</b>	1.5	<b>B</b>	Give 1 mark for each correct answer.
	1.6	<b>B</b>	1.7	<b>C</b>	1.8	<b>C</b>	1.9	<b>C</b>	1.10	<b>B</b>	

[10]

#### QUESTION 2

2.1  $3,56 \times 10^{-6}$  **A**

Answer: 1 mark (1)

2.2.1  $(3x)^3 + 2x^3$   
 $= 27x^3 + 2x^3$  ✓ **A**  
 $= 29x^3$  ✓ **CA**

$27x^3 + 2x^3$ : 1 mark

Answer =  $29x^3$ : 1 mark (2)

2.2.2  $\frac{a^2b^2}{ac^2} \times \frac{4a^2bc}{20b^3}$   
 $= \frac{4a^4b^3c}{20ab^2c^2}$  ✓ **M**  
 $= \frac{a^3}{5c}$  ✓

Answer: 2 marks  
 $\frac{4a^4b^3c}{20ab^2c^2}$ : 1 mark  
 $\frac{a^3}{5c}$ : 1 mark

(2)



2.3.1	$4ab(5a^2b^2 + 2ab - 3)$ $= 20a^3b^3 \checkmark + 8a^2b^2 \checkmark - 12ab \checkmark$ <b>A</b>	Distributive law: 1 mark each term $20a^3b^3$ : 1 mark $8a^2b^2$ : 1 mark $-12ab$ : 1 mark (3)
2.3.2	$(2x - 1)^2 - (x + 1)(x - 1)$ $= 4x^2 - 4x + 1 \checkmark (-x^2 + 1 \checkmark$ <b>M</b> $= 3x^2 - 4x + 2 \checkmark$ <b>CA</b>	Expanding: 1 mark Simplifying: 1 mark Answer: 1 mark (3)
2.4.1	$8p^3 + 4p^2$ $= 4p^2 \checkmark (2p + 1) \checkmark$ <b>A</b>	Common factor: 1 mark $(2p + 1)$ : 1 mark (2)
2.4.2	$9p^2 - 36q^2$ $= 9(p^2 - 4q^2) \checkmark$ <b>M</b> $= 9(p - 2q)(p + 2q) \checkmark$ <b>A</b> OR $= (3p - 6q)(3p + 6q) \checkmark$ <b>A</b> $= 3(p - 2q)3(p + 2q)$ $= 9(p - 2q)(p + 2q) \checkmark$ <b>A</b>	Common factor: 1 mark Difference of two squares: 1 mark (2)
2.4.3	$tx - ty - 2x + 2y$ $= t(x - y) \checkmark - 2(x - y) \checkmark$ <b>M/A</b> $= (x - y) \checkmark (t - 2) \checkmark$ <b>/M/A</b> OR $= x(t - 2) \checkmark - y(t - 2) \checkmark$ $= (t - 2) \checkmark (x - y) \checkmark$	Common factor t: 1 mark Common factor 2: 1 mark Common factor $(x - y)$ : 2 marks (4)
2.5.1	$3(x + 6) = 12$ $x + 6 = 4 \checkmark$ <b>M</b> $x = -2 \checkmark$ <b>CA</b> OR $3x + 18 = 12$ $3x = -6 \checkmark$ <b>M</b> $x = -2 \checkmark$ <b>CA</b>	Dividing by 3: 1 mark Answer: 1 mark OR $-18$ both sides: 1 mark Answer: 1 mark (2)
2.5.2	$x^2 - 2x = 0$ $x(x - 2) = 0 \checkmark$ <b>M</b> $x = 0 \checkmark$ or $x = 2 \checkmark$ <b>CA</b>	Common factor: 1 mark Answer: 2 marks (1 mark per factor) (3)



$$2.5.3 \quad \frac{x+1}{3} - \frac{x-1}{6} = 1$$

$$\begin{aligned} 2(x+1) - (x-1) &= 6 \checkmark \text{ M} \\ 2x + 2 - x + 1 &= 6 \checkmark \text{ CA} \\ x &= 3 \checkmark \text{ CA} \end{aligned}$$

Multiplying by 6: 1 mark  
Expanding: 1 mark  
Answer: 1 mark

(3)

$$2.5.4 \quad 2^{x+1} = 32$$

$$2^{x+1} = 2^5 \checkmark \text{ M}$$

$$x + 1 = 5 \checkmark \text{ M/CA}$$

$$x = 4 \checkmark \text{ CA}$$

$2^5$ : 1 mark  
Applying exponential law: 1 mark  
Answer: 1 mark

(3)

[30]

### QUESTION 3

$$3.1 \quad \text{Number of boys} = \frac{3}{4} \checkmark \times 240 = 180 \checkmark \text{ M/CA}$$

$\frac{3}{4}$ : 1 mark  
Answer: 1 mark

(2)

$$\begin{aligned} 3.2 \quad \text{Speed} &= \frac{\text{distance}}{\text{time}} \checkmark \text{ M/ A} \\ 40 \text{ km/h} &= \frac{9 \text{ km}}{\text{time}} \\ \text{time} &= \frac{9}{40} \times 60 \text{ minutes} \checkmark \text{ M} \\ &\text{OR } 0,225 \times 60 \text{ minutes} \\ &= 13,5 \text{ minutes} \checkmark \text{ CA} \end{aligned}$$

Formula / Substitution: 1 mark

$\frac{9}{40}$  or 0,225: 1 mark  
Answer: 1 mark

(3)

$$\begin{aligned} 3.3 \quad A &= P(1+i)^n \checkmark \text{ M/ A} \\ &= R12\,000(1+0,065)^5 \checkmark \text{ M} \\ &= R16\,441,04 \checkmark \text{ CA} \end{aligned}$$

OR

Year 1: 12 000 x 6,5% = 780  
Year 2: 12 780 x 6,5% = 830,70  
Year 3: 13 610,7 x 6,5% = 884,70  
Year 4: 14 495,4 x 6,5% = 942,20  
Year 5: 15 437,6 x 6,5% = 1 003,44  
There will be R16 441,04 in his account

Formula: 1 mark  
Substitution: 1 mark  
Answer: 1 mark

(3)

OR

$$\begin{aligned} A &= P \left( 1 + \frac{r}{100} \right)^n \checkmark \\ &= R12\,000 \left( 1 + \frac{6,5}{100} \right)^5 \checkmark \\ &= R16\,441,04 \checkmark \end{aligned}$$

$$\begin{aligned} 3.4.1 \quad 15\% \text{ cash} &= \frac{15}{100} \times R15\,000 \\ &= R2\,250 \checkmark \text{ A} \end{aligned}$$

Answer: 1 mark

(1)

$$\begin{aligned} 3.4.2 \quad A &= P(1+ni) \checkmark \quad \text{CA from 3.4.1} \\ &= R12\,750 \checkmark [1 + 2(0,1)] \checkmark \\ &= R15\,300 \checkmark \end{aligned}$$

OR

$$\begin{aligned} SI &= \frac{Pnr}{100} \checkmark \\ &= \frac{R12\,750 \checkmark (2) (10)}{100} \checkmark \end{aligned}$$

Formula: 1 mark  
Substitution: 2 marks  
Answer: 1 mark

OR

Formula: 1 mark  
Substitution: 1 mark  
Answer: 1 mark

Answer: 1 mark

(4)

$$= R2\,250$$

$$\text{Total amount} = R12\,750 + R2\,250$$

3.4.3 Monthly payments =  $R15\,300 \div 24$  ✓ **CA from 3.4.2**  
 $= R637,50$  ✓  
 $= R15\,300$  ✓

$R15\,300 \div 24$ : 1 mark

Answer: 1 mark (2)

[15]

#### QUESTION 4

4.1  $18$  ✓ and  $23$  ✓ **A**

Answer: 2 marks

1 mark per term (2)

4.2 Add 5 to the last term to get the next. ✓ **A**

Correct answer: 1 mark

(1)

4.3  $T_n = 5n - 2$  ✓ **A**

Answer: 2 marks

(2)

4.4  $T_n = 5n - 2$  **CA from 4.3**  
 $38 = 5n - 2$  ✓ **CA**  
 $40 = 5n$  ✓ **M**  
 $\therefore 8 = n$  ✓ **A**

Substitution into the formula: 1 mark

Solving equation: 1 mark

Answer: 1 mark

(3)

[8]

## QUESTION 5

5.1.1 Parallel ✓ **A**

Answer: 1 mark (1)

5.1.2  $y = -2$  ✓ **A**

Answer: 1 mark (1)

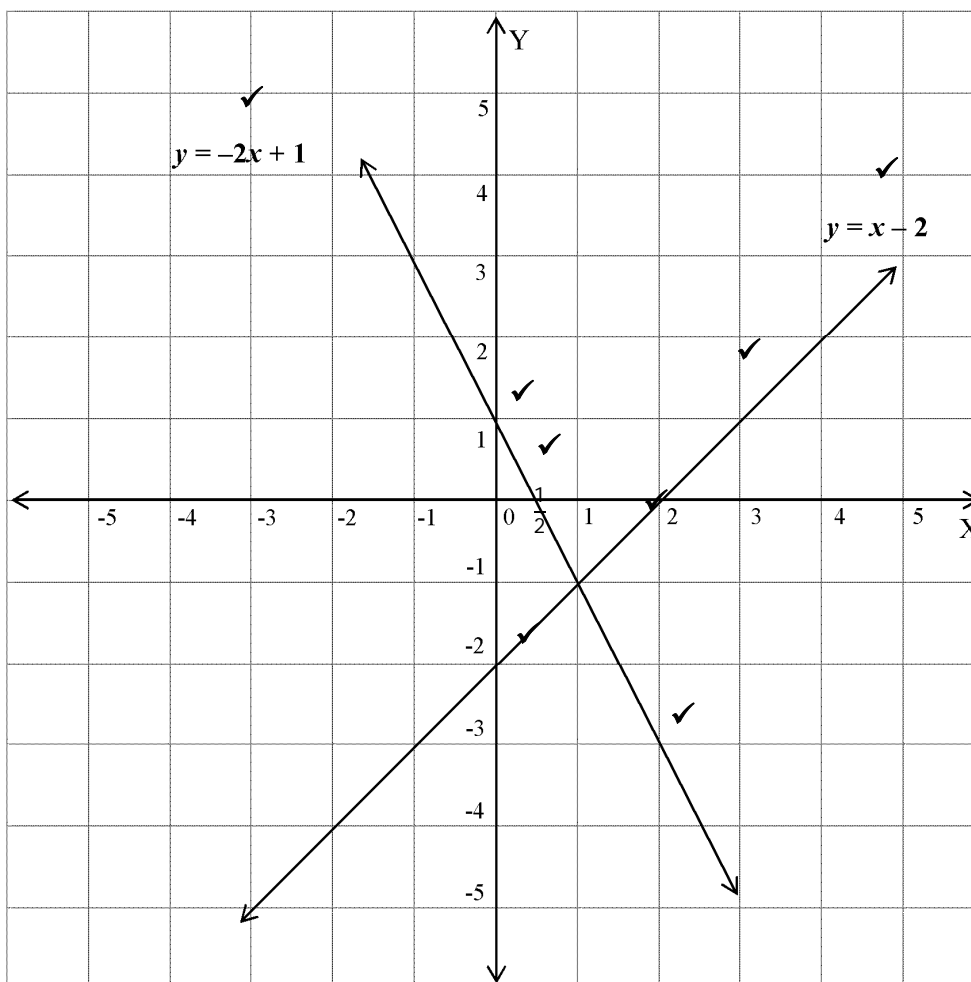
5.1.3 4 ✓ **A**

Answer: 1 mark (1)

5.1.4 Non-linear ✓ **A**

Answer: 1 mark (1)

5.2.1



X-intercept and Y-intercept: 2 marks per graph ✓✓ + ✓✓

Gradient: 1 mark per graph ✓ + ✓

Correct labelling of graph: 1 mark per graph ✓ + ✓

(8)

5.2.2 At point of intersection:  $-2x + 1 = x - 2$  ✓

$$-3x = -3$$

$$x = 1$$

$$\text{and } y = (1) - 2 = -1 \text{ ✓}$$

Equating: 1 mark  
Substitution: 1 mark

(2)

OR

$$y = -2x + 1 \quad \text{If } x = 1; y = (-2(1) + 1) = -1$$

$$y = x - 2 \quad \text{If } x = 1; y = 1 - 2 = -1$$

Therefore, this point lies on both graphs and it must be the point of intersection

[14]

### QUESTION 6

6.1      6.1.1       $2x + 3x + 4x = 180^\circ$  ✓ (TQS is a straight angle) ✓ M/A  
 $9x = 180^\circ$   
 $x = 20^\circ$  ✓ A

Statement: 1 mark  
Reason: 1 mark  
Answer: 1 mark

(3)

6.1.2       $y = 3x$  ✓ (alternate  $\angle$ s ; PQ || RS) ✓ M  
 $y = 60^\circ$  ✓ CA for 6.1.1

Statement: 1 mark  
Reason: 1 mark  
Answer: 1 mark

(3)

6.1.3       $\hat{S} = \hat{Q}_1$  ✓ (corresponding  $\angle$ s ; PQ || RS) ✓ M  
 $z = 2x^\circ$   
 $z = 40^\circ$  ✓ A

OR

$$\hat{Q} + \hat{R} + \hat{S} = 180^\circ \quad \checkmark \text{ (sum of } \angle \text{ s of } \Delta = 180^\circ) \checkmark \text{ M}$$

$$4x + y + z = 180^\circ$$

$$80^\circ + 60^\circ + z = 180^\circ$$

$$z = 180^\circ - 140$$

$$z = 40^\circ \checkmark \text{ A}$$

OR

$$\hat{Q}_1 + \hat{Q}_2 = \hat{R} + \hat{S} \quad \checkmark \text{ (ext } \angle \text{ of } \Delta = \text{sum of int opp } \angle \text{ s)} \checkmark \text{ M}$$

$$2x + 3x = y + z$$

$$5x = 60^\circ + z$$

$$100^\circ = 60^\circ + z$$

$$z = 40^\circ \checkmark \text{ A}$$

Statement: 1 mark  
Reason: 1 mark  
Answer: 1 mark

(3)

6.2       $\Delta STV \equiv \Delta ABC$  ✓      (S,  $\angle$ , S) ✓ A

Statement with vertices in the correct order: 1 mark  
Reason : 1 mark

(2)

6.3.1      In  $\Delta ABD$  and  $\Delta ACD$   
 $AB = AC$  (given) ✓ A  
 $BD = CD$  (given) ✓ A  
 $AD = AD$  (common side) ✓ A  
 $\therefore \Delta ABD \equiv \Delta ACD$  (s, s, s) ✓ 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

(4)

OR

In  $\Delta ABD$  and  $\Delta ACD$   
 $\angle ABD = \angle ACD$  (opposite angles of a kite)  
 $AB = AC$  (given) ✓  
 $BD = CD$  (given) ✓  
 $\therefore \Delta ABD \equiv \Delta ACD$  (s,  $\angle$ , s) ✓



6.3.2 In  $\triangle ABE$  and  $\triangle ACE$

$AB = AC$  (given) ✓ **A**

$AE = AE$  (common side) ✓ **A**

$\hat{A}_1 = \hat{A}_2$  (corr.  $\angle$  s of congr.  $\Delta$ s/ bisecting diagonals) ✓ **A**

$\therefore \triangle ABE \equiv \triangle ACE$  (s,  $\angle$ , s) ✓ **A**

OR

In  $\triangle ABE$  and  $\triangle ACE$

$AB = AC$  (given) ✓

$\hat{B}_1 = \hat{C}_1$  (Ls opp = sides of  $\triangle$ ) ✓

$\hat{A}_1 = \hat{A}_2$  (corr.  $\angle$  s of congr.  $\Delta$ s) or  $BE = EC$  (AD bisects BC) ✓

$ABE \equiv \triangle ACE$  ( $\angle$ ,  $\angle$ , s) ✓

Correct statement with reason: 1 mark

Correct statement with reason: 1 mark

Correct statement with reason: 1 mark

Correct deduction and reason: 1 mark (4)

6.3.3  $\hat{E}_1 + \hat{E}_2 = 180^\circ$  ( $B\hat{E}C$  is str L) ✓ **A**

But  $\hat{E}_1 = \hat{E}_2$  (corr.  $\angle$  of congr.  $\Delta$ s) ✓ **A**

$\therefore \hat{E}_1 = \hat{E}_2 = 90^\circ$  ✓ **A**

Correct statement with reason: 1 mark

Correct statement with reason: 1 mark

Conclusion: 1 mark (3)

OR

$BC \perp AD$  ✓✓ (diagonals of a kite) ✓

Correct statement: 2 marks

Reason: 1 mark

6.3.4  $AE$  is perpendicular to  $BC$  ✓ **A**

Answer: 1 mark (1)

6.4  $\frac{AB}{ED} = \frac{BC}{DF}$  ✓ (proportional sides of similar  $\Delta$ s) ✓ **A**

$$\frac{AB}{6cm} = \frac{15cm}{10cm} \quad \checkmark \quad \mathbf{A}$$

$$AB = \frac{(15)(6)}{10} cm$$

$$AB = 9 cm \quad \checkmark \quad \mathbf{A}$$

Proportional sides and reason: 2 marks

substitution: 1 mark

Answer: 1 mark

(4)

[27]

## QUESTION 7

7.1  $D'(-1; 1)$  ✓  $E'(1; 1)$  ✓ **A**

Answer: 2 marks

1 mark per pair of co-ordinates (2)

7.2  $A'(1; 7)$  ✓  $B'(1; 1)$  ✓ **A**

Answer: 2 marks

1 mark per pair of co-ordinates (2)

7.3 The perimeter =  $(3 + 1,5 + 1 + 1 + 2 + 0,5) \text{ units} = 9 \text{ units}$  ✓✓ **M/A**

Length of reduced sides: 1 mark

Answer: 1 mark (2)

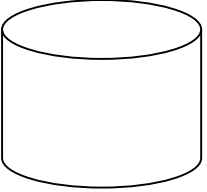
OR

- 7.4  $(6+3+2+2+4+1) \div 2 = 9$  units  
 Area of fig. P: Area of reduced fig = 4: 1 ✓✓ **M/ A**  
 OR  
 Area of fig P to Area of reduced Fig = 1:0,25 or  $1:\frac{1}{4}$   
 OR  
 Area of fig P to Area of reduced Fig = 10:2,5

Answer: 2 marks  
 (Dimensions halved: Area  $\frac{1}{4}$  of original) (2)

[8]

### QUESTION 8

8.1	3-D figure	Name of figure	No. of faces	No. of vertices	No. of edges	1 mark for each answer
		Cylinder ✓	3 faces ✓	No vertices ✓	2 edges ✓	
	Shape of the faces: Circles ✓ and a rectangle ✓					(6)

- 8.2 The surface area of a rectangular prism is:  
 $= 2(l \times b) + 2(l \times h) + 2(b \times h)$   
 $= 2(7,2 \times 5) \checkmark + 2(7,2 \times 3,32) \checkmark + 2(5 \times 3,32) m^2 \checkmark$  **M/ A**  
 $= (72 + 47,808 + 33,2) m^2 \checkmark$  **CA**  
 $= 153,01 m^2 \checkmark$  **CA**

Formula/substitution into the correct formula: 3 marks  
 Calculation: 1 mark  
 Answer: 1 mark  
 Wrong formula: 0 marks

(5)

OR

$$\begin{aligned}
 &2lb + 2(l + b)h \checkmark \\
 &= 2(7,2 \times 5) + 2(7,2 + 5)3,32 \checkmark \checkmark \\
 &= 72m^2 + 81,01 m^2 \checkmark \\
 &= 153,01 m^2 \checkmark
 \end{aligned}$$

- 8.3 Volume of a cylinder =  $1\,000\,cm^3$   
 $\pi r^2 h = 1\,000\,cm^3 \checkmark \checkmark$  **M**  
 $\pi (2,82)^2 h = 1\,000\,cm^3 \checkmark$  **M**  
 $h = 40,0268\,cm \approx 40\,cm \checkmark$  **CA**

Formula: 1 marks  
 Substitution: 1 mark  
 Calculation: 1 mark  
 Answer: 1 mark

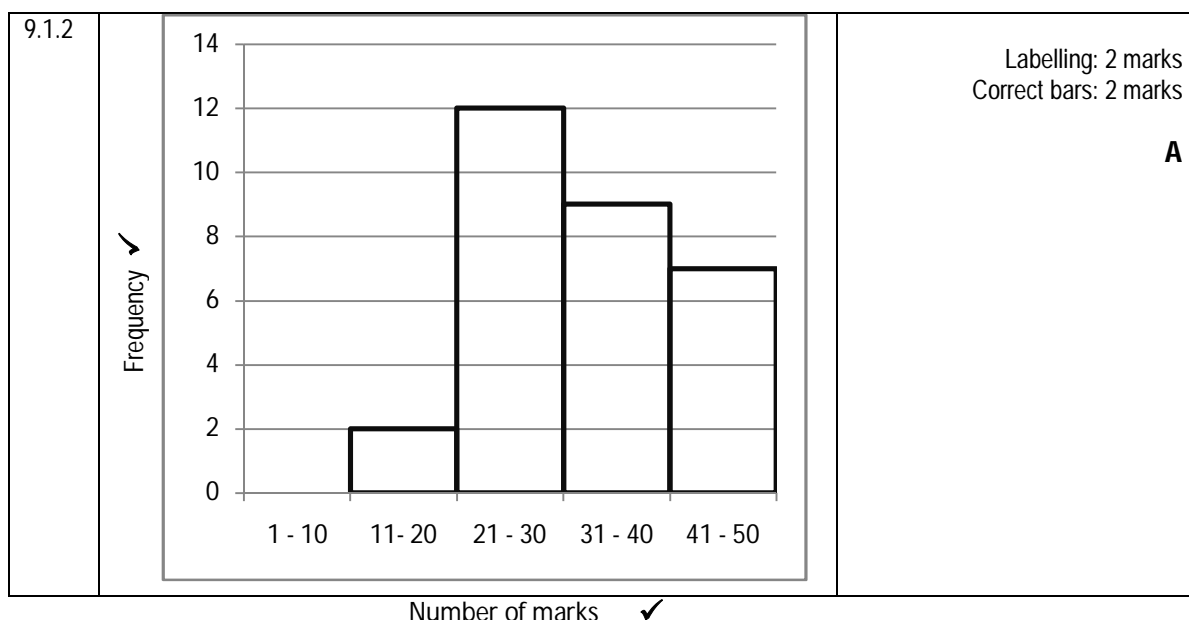
(4)

[15]

### QUESTION 9

9.1.1	Class Interval	Tally marks	Frequency	1 mark per correct interval
	1 – 10	—	0	
	11 – 20	II	2	✓
	21 – 30		12	✓
	31 – 40		9	✓
	41 – 50	II	7	✓
				<b>A</b>

(4)



(4)

9.2.1 Range =  $10 - 5 = 5$  ✓ **A**

Range: 1 mark

Median: 1 mark

(2)

5 5 6 7 8 8 9 9 9 10

Median = 8 ✓ **A**

9.2.2 Mode = 5 ✓

Answer: 1 mark

(1)

9.2.3 Mean =  $\frac{5+7+7+5+5+7+5+5+8+6}{10}$  ✓ **M**

Formula: 1 mark

Answer: 1 mark

(2)

= 6 ✓ **A**

[13]

**TOTAL: 140**









