SMARTWIZ

GRADE 9 MATHEMATICS EXAM

MARKS: 100

MARKS	

TIME: 2 hours

SCHOOL_____

CLASS (e.g. 4A) _____

SURNAME_____

NAME_____

Instructions for Students:

> Read all instructions carefully before beginning the exam.

> Write your name and student ID clearly on the answer sheet/booklet.

> Answer all questions unless otherwise stated.

> Show all your work/calculations where applicable.

> Write clearly and legibly.

> Use blue or black ink only. * Do not use correction fluid/tape.

> No electronic devices (calculators, phones, etc.) are allowed unless explicitly permitted.

> Raise your hand if you have any questions.

> Do not talk to other students during the exam.

> Any form of cheating will result in disqualification.

This test consists of 8 pages, excluding the cover page.

SECTION A: ALGEBRA AND NUMBER OPERATIONS (30 MARKS)

1. Simplify the following expressions:

a) 3a−2(a+4)+53a - 2(a + 4) + 53a−2(a+4)+5

b) (2x−3)2(2x - 3)^2(2x−3)2

c) 4x2y2xy2\frac{4x^2y}{2xy^2}2xy24x2y

(6)

2. Solve for xxx:

a) 3(x−2)=2x+43(x - 2) = 2x + 43(x−2)=2x+4

b) 2x=45\frac{2}{x} = \frac{4}{5}x2=54

(6)

3. Factorise the following completely:

a) x2+7x+10x^2 + 7x + 10x2+7x+10

b) 2a2−182a^2 - 182a2−18

(4)

4. Expand and simplify:

a) $(x+3)(x-2)(x+3)(x-2)(x+3)(x-2)$

b) $(2x-1)(x+4)(2x-1)(x+4)(2x-1)(x+4)$

(4)

5. Word Problem:
The sum of three consecutive integers is 72. Find the integers.

(4)

6. Write the following in scientific notation:

a) 0.00082

b) 5 300 000

(2)

7. Approximation:

a) Round 876.456 to the nearest hundred:

b) Round 876.456 to one decimal place:

(2)

SECTION B: GEOMETRY AND MEASUREMENT (30 MARKS)

1. Geometry of shapes:

a) Define a quadrilateral:

b) Name two properties of a parallelogram:

(4)

2. Angles: Find xxx.

a) Triangle with angles x∘,2x∘,50∘x^\circ, 2x^\circ, 50^\circx∘,2x∘,50∘:

b) On a straight line: 3x∘3x^\circ3x∘ and (x+20)∘(x+20)^\circ(x+20)∘

(6)

3. Pythagoras Theorem:
Legs are 5 cm and 12 cm. Find the hypotenuse.

(3)

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4. Rectangle: Length = 8 cm, Width = 3 cm.
Find area and perimeter.

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(4)

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5. Cube with side = 6 cm:
Find volume and surface area.

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(5)

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6. Constructions (describe or use drawing):

a) Perpendicular bisector

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b) Angle of 60∘60^\circ60∘

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(4)

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7. Conversions:

a) 1500 m to km:

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b) 3.5 kg to g:

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(2)

SECTION C: DATA HANDLING AND PROBABILITY (20 MARKS)

1. Marks: 12, 16, 14, 18, 20, 14, 16, 10
Find:
a) Mean: _____
b) Median: _____
c) Mode: _____
d) Range: _____
(6)

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2. Probability (spinner with 5 equal sections):
a) Probability of:
i) red _____
ii) not blue _____
(2)

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3. Pie Chart:

- 25% walk, 35% bus, 20% cycle, 20% car
  a) How many cycle if total = 200?

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b) What fraction take a car?

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(4)

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4. Bar graph trends:

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(4)

5. Name two types of graphs for categorical data:
a) _____
b) _____
(2)

SECTION D: GRAPHS AND FUNCTIONS (20 MARKS)

1. Complete the table for y=2x+1y = 2x + 1y=2x+1:

x	**-2**	**-1**	**0**	**1**	**2**
y					

(Use graph paper if required)
(6)

2. Identify from the graph:

a) Y-intercept: _____

b) Gradient: _____
(2)

3. Graph interpretation:
Describe how to find cost of 5 km on a distance-cost graph.

(2)

4. Equation of a line with gradient 3 and y-intercept -2:

(2)

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5. Number pattern: 2, 5, 8, 11,...

a) Common difference: _____

b) Formula for nth term: _____
(4)

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6. Quadratic pattern in table:
Is it linear? Explain.

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(4)

TOTAL :100

SECTION A: ALGEBRA AND NUMBER OPERATIONS (30 MARKS)

1. Simplify (6)
a) 3a−2(a+4)+53a - 2(a + 4) + 53a−2(a+4)+5
= 3a−2a−8+5=a−33a - 2a - 8 + 5 = a - 33a−2a−8+5=a−3 ✓✓

b) (2x−3)2=4x2−12x+9(2x - 3)^2 = 4x^2 - 12x + 9(2x−3)2=4x2−12x+9 ✓✓

c) 4x2y2xy2=4x2y=2x/y\frac{4x^2y}{2xy^2} = \frac{4x}{2y} = 2x/y2xy24x2y=2y4x=2x/y ✓✓

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2. Solve for xxx: (6)
a) 3(x−2)=2x+43(x - 2) = 2x + 43(x−2)=2x+4
3x−6=2x+43x - 6 = 2x + 43x−6=2x+4 ✓
x=10x = 10x=10 ✓

b) 2x=45⇒2·5=4x⇒x=104=52\frac{2}{x} = \frac{4}{5} \Rightarrow 2 \cdot 5 = 4x \Rightarrow x = \frac{10}{4} = \frac{5}{2}x2=54⇒2·5=4x⇒x=410=25 ✓✓

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3. Factorise (4)
a) x2+7x+10=(x+5)(x+2)x^2 + 7x + 10 = (x + 5)(x + 2)x2+7x+10=(x+5)(x+2) ✓✓

b) 2a2−18=2(a2−9)=2(a−3)(a+3)2a^2 - 18 = 2(a^2 - 9) = 2(a - 3)(a + 3)2a2−18=2(a2−9)=2(a−3)(a+3) ✓✓

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4. Expand (4)
a) (x+3)(x−2)=x2−2x+3x−6=x2+x−6(x + 3)(x - 2) = x^2 - 2x + 3x - 6 = x^2 + x - 6(x+3)(x−2)=x2−2x+3x−6=x2+x−6 ✓✓

b) (2x−1)(x+4)=2x2+8x−x−4=2x2+7x−4(2x - 1)(x + 4) = 2x^2 + 8x - x - 4 = 2x^2 + 7x - 4(2x−1)(x+4)=2x2+8x−x−4=2x2+7x−4 ✓✓

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5. Word Problem (4)
Let numbers be x,x+1,x+2x, x+1, x+2x,x+1,x+2
x+x+1+x+2=72⇒3x+3=72⇒x=23x + x + 1 + x + 2 = 72 \Rightarrow 3x + 3 = 72 \Rightarrow x = 23x+x+1+x+2=72⇒3x+3=72⇒x=23 ✓
Numbers: 23, 24, 25 ✓✓

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6. Scientific notation (2)
a) 8.2×10−48.2 \times 10^{-4}8.2×10−4 ✓
b) 5.3×1065.3 \times 10^65.3×106 ✓

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7. Approximation (2)
a) 900 ✓
b) 876.5 ✓

SECTION B: GEOMETRY AND MEASUREMENT (30 MARKS)

1. Geometry (4)
a) 4-sided polygon ✓
b) Opposite sides equal, opposite angles equal ✓✓

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2. Angles (6)
a) x+2x+50=180⇒3x=130⇒x=43.3∘x + 2x + 50 = 180 \Rightarrow 3x = 130 \Rightarrow x = 43.3^\circx+2x+50=180⇒3x=130⇒x=43.3∘ ✓✓

b) 3x+x+20=180⇒4x=160⇒x=40∘3x + x + 20 = 180 \Rightarrow 4x = 160 \Rightarrow x = 40^\circ3x+x+20=180⇒4x=160⇒x=40∘ ✓✓

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3. Pythagoras (3)
c=52+122=25+144=169=13 cmc = \sqrt{5^2 + 12^2} = \sqrt{25 + 144} = \sqrt{169} = 13 \text{ cm}c=52+122=25+144=169=13 cm ✓✓✓

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4. Rectangle (4)
Area = 8×3=24 cm28 \times 3 = 24 \, \text{cm}^28×3=24cm2 ✓
Perimeter = 2(8+3)=22 cm2(8 + 3) = 22 \, \text{cm}2(8+3)=22cm ✓

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5. Cube (5)
Volume = 63=216 cm36^3 = 216 \, \text{cm}^363=216cm3 ✓
Surface Area = 6×62=216 cm26 \times 6^2 = 216 \, \text{cm}^26×62=216cm2 ✓✓

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6. Constructions (4)
a) Correct bisector steps described ✓✓
b) 60° using equilateral triangle or compass steps ✓✓

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7. Conversions (2)
a) 1500 m=1.5 km1500 \, \text{m} = 1.5 \, \text{km}1500m=1.5km ✓
b) 3.5 kg=3500 g3.5 \, \text{kg} = 3500 \, \text{g}3.5kg=3500g ✓

SECTION C: DATA HANDLING & PROBABILITY (20 MARKS)

1. Data (6)
Mean = 1208=15\frac{120}{8} = 158120=15 ✓
Median = (14+16)/2=15(14 + 16)/2 = 15(14+16)/2=15 ✓
Mode = 14 & 16 ✓
Range = 20−10=1020 - 10 = 1020−10=10 ✓

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2. Probability (2)
a.i) 15\frac{1}{5}51 ✓
a.ii) 45\frac{4}{5}54 ✓

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3. Pie Chart (4)
a) 20% of 200 = 40 ✓
b) 20100=15\frac{20}{100} = \frac{1}{5}10020=51 ✓

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4. Bar Graph (4)
✓ Clear increasing/decreasing trend ✓
✓ Comparisons of monthly performance ✓

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5. Graph Types (2)
Bar graph ✓
Pie chart ✓

SECTION D: GRAPHS AND FUNCTIONS (20 MARKS)

1. Table (y = 2x + 1) (6)

x	**-2**	**-1**	**0**	**1**	**2**
y	-3	-1	1	3	5

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2. Graph properties (2)
a) Y-intercept = 1 ✓
b) Gradient = 2 ✓

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3. Graph interpretation (2)
✓ Read 5 km value on x-axis and find corresponding y ✓✓

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4. Equation of a line (2)
y=3x−2y = 3x - 2y=3x−2 ✓✓

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5. Pattern (4)
a) +3 ✓
b) Tn=3n−1T_n = 3n - 1Tn=3n−1 ✓✓

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6. Quadratic pattern (4)
✓ Differences not constant
✓ Second differences constant = quadratic ✓✓✓✓

TOTAL : 100