## **SMARTWIZ**

#### **GRADE 9 MATHEMATICS EXAM**

MARKS: 100	MARKS	
TIME: 2 hours		
SCHOOL		_
CLASS (e.g. 4A)		
SURNAME		
NAME		_
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#### 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: NUMBER PATTERNS & SEQUENCES (20 MARKS)

1. Complete the sequence and describe the pattern: a) 2, 5, 10, 17,,
Pattern:
(4)
2. General term:
Given: 3, 6, 9, 12,
a) Write the formula for the nth term (Tn):
b) Find T15:
3. Quadratic pattern:
<b>3. Quadratic pattern:</b> Given: 1, 4, 9, 16, 25
a) Determine the first and second differences.
b) What type of sequence is this?
(4)
4. Geometric sequence:
a) Given: 81, 27, 9,
Common ratio (r): b) What is the 5th term?
(4)
<b>5. Fibonacci-type pattern:</b> Given: 1, 1, 2, 3, 5,,
Next two terms:
(4)

## **SECTION B: GEOMETRY & ANGLES (25 MARKS)**

1. Parallel lines and angles:
Given a transversal cutting two parallel lines:
a) Alternate angles are:
b) Corresponding angles are:
(4)
2. Triangle rules:
a) Sum of interior angles of a triangle:
b) Triangle with angles 40° and 65°, find the third angle.
(3)
3. Classify triangles by: a) Sides: triangle with all sides equal →
b) Angles: triangle with one angle $> 90^{\circ} \rightarrow$
(2)
4. Construct with a compass and ruler:
a) Construct a perpendicular bisector (describe steps).
(4)
5 Enterior and male
<b>5. Exterior angle rule:</b> a) If one exterior angle is 130°, what is the interior opposite angle?
a) If one exterior angle is 130, what is the interior opposite angle:
b) Interior and exterior of same vertex must add to:
(4)

6. Angle properties in quadrilaterals:  a) Sum of angles in any quadrilateral =  b) One angle in a parallelogram is 70°, find the opposite angle.		
(4)		
7. Drawing: Sketch and label a kite.  (4)  SECTION C: ALGEBRAIC EXPRESSIONS & EQUATIONS  (30 MARKS)		
a) Simplify: 3x2+2x-x2+5x3x^2 + 2x - x^2 + 5x3x2+2x-x2+5x		
(3)		
2. Factorising: a) x2+5x+6=x^2 + 5x + 6 = x2+5x+6= b) 2x2-8=2x^2 - 8 = 2x2-8=  (4)		
3. Algebraic fractions: Simplify: a) 2x4x=\frac{2x}{4x} = 4x2x= b) 3a2b6ab2=\frac{3a^2b}{6ab^2} = 6ab23a2b=  (4)		

4	Solving	equations:
4.	SOLVILLE	eduadons.

a) 
$$2(x-3)=4x-102(x-3)=4x-10$$

b) 
$$2x+13=5$$
\frac{2x + 1}{3} = 532x+1=5

(6)

#### 5. Word problem (equation):

The perimeter of a rectangle is 36 cm. The length is twice the width. Find the dimensions.

(5)

#### 6. Algebraic substitution:

If a=2a = 2a=2, b=-3b = -3b=-3, evaluate:

a) 
$$ab+a2ab + a^2ab+a2$$

b) 
$$b2-aa+b\frac\{b^2 - a\}\{a + b\}a+bb2-a$$

(4)

#### 7. Expand and simplify:

a) 
$$(x+1)2=(x+1)^2=(x+1)2=$$

a) 
$$(x+1)2=(x+1)^2=(x+1)2=$$
  
b)  $(2x-3)(x+4)=(2x-3)(x+4)=(2x-3)(x+4)=$ 

(4)



## 🚺 SECTION D: GRAPHS & COORDINATES (25 MARKS)

#### 1. Coordinate points:

Plot and label: A(2, 3), B(-1, 2), C(0, -2)

[Leave space for graph]

(3)

2.	Gradient	•
4.	Graultin	

- a) Gradient between A(1, 2) and B(3, 6):
- b) Is it positive, negative, or zero?

(4)

#### 3. Linear graphs:

Given: y=3x-1y = 3x - 1y=3x-1

a) Complete the table:

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b) What is the y-intercept?

(5)

#### 4. Function values:

Given:  $f(x)=x^2-2xf(x) = x^2 - 2xf(x)=x^2-2x$ 

- a) Find f(3)f(3)f(3) =\_\_\_\_\_ b) Find f(-2)f(-2)f(-2) =\_\_\_\_\_

(4)

#### 5. Pattern table (non-linear):

x: 1, 2, 3, 4

y: 1, 4, 9, 16

- a) What is the pattern?
- b) Equation: y=y =y= \_\_\_\_\_
- (3)

#### 6. Cartesian quadrant identification:

a) In which quadrant is point (-3, 4)?

b) In which quadrant is point (2, -5)?

(2)

**TOTAL** ; 100



#### **MEMO**

#### **SECTION A: NUMBER PATTERNS & SEQUENCES (20 MARKS)**

**1. Pattern:** (4)

2, 5, 10, 17, **26**, **37 ✓**✓

Pattern: Add consecutive odd numbers: +3, +5, +7, etc.  $\checkmark\checkmark$ 

#### 2. General term: (4)

- a)  $Tn=3nT_n = 3nTn=3n$
- b) T15= $3\times15=45T_{15} = 3 \times 15 = 45T15=3\times15=45 \checkmark$

#### 3. Quadratic sequence: (4)

a) 1, 4, 9, 16, 25

1st diff: 3, 5, 7, 9 **\** 

2nd diff: 2 ✓

b) Quadratic sequence ✓

#### 4. Geometric sequence: (4)

- a) Common ratio  $r=2781=13r = \frac{27}{81} = \frac{1}{3}r=8127=31$
- b) 81, 27, 9, 3,  $1 \rightarrow 5$ th term =  $1 \checkmark$

#### **5. Fibonacci-type:** (4)

5, **8**, **13 √√** 

#### SECTION B: GEOMETRY & ANGLES (25 MARKS)

- **1. Parallel lines:** (4)
- a) Equal but opposite sides of transversal ✓
- b) Equal angles on same side of transversal 🗸

#### 2. Triangle angles: (3)

- a) 180° **✓**
- b)  $40^{\circ} + 65^{\circ} = 105^{\circ}$ , third =  $75^{\circ}$   $\checkmark$

#### **3. Classification:** (2)

- a) Equilateral 🗸
- b) Obtuse ✓

#### **4. Perpendicular bisector steps:** (4)

- ✓ Mark segment ends
- ✓ Compass from each end with equal radius
- ✓ Draw arcs above/below
- **✓** Connect intersections

#### **5. Exterior angle rule:** (4)

- a)  $180^{\circ} 130^{\circ} = 50^{\circ} \checkmark$
- b) 180° **√**

#### **6. Quadrilateral angles:** (4)

- a) 360° **√**
- b) Opposite angle =  $70^{\circ}$

#### **7. Kite sketch:** (4)

- ✓ Correct shape with two adjacent equal sides
- ✓ Diagonals intersect at 90°
- ✓ One pair opposite angles equal
- ✓ Neat and labelled



#### SECTION C: ALGEBRAIC EXPRESSIONS & EQUATIONS (30 MARKS)

#### **1. Like terms: (3)**

 $3x2-x2+2x+5x=2x2+7x3x^2-x^2+2x+5x=2x^2+7x3x2-x2+2x+5x=2x2+7x$ 

#### 2. Factorising: (4)

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

#### **3. Algebraic fractions:** (4)

- a) 12\frac{1}{2}21 ✓
- b) a2b\frac{a}{2b}2ba ✓✓

#### **4. Solve equations:** (6)

- $22x-6=4x-10\Rightarrow -6+10=2x\Rightarrow x=2$
- b)  $2x+13=5 \Rightarrow 2x+1=15 \Rightarrow x=7 \frac{2x+1}{3} = 5 \frac{2x+1}{1} = 15 \frac{$
- $=5 \Rightarrow 2x+1=15 \Rightarrow x=7 \checkmark \checkmark \checkmark$

#### **5. Rectangle word problem:** (5)

Let width = x, length = 2x

Perimeter =  $2(x+2x)=6x=36 \Rightarrow x=62(x+2x)=6x=36 \Rightarrow x=62(x+2x)=6x=36(x+2x)=6x=36(x+2x)=6x=36(x+2x)=6x=36(x+2x)=6x=36(x+2x)=6x=36(x+2x)=6x=36(x+2x)=6x$ 

Dimensions: Width = 6 cm, Length = 12 cm  $\checkmark$ 

#### 6. Substitution: (4)

- a)  $ab+a2=(2)(-3)+4=-6+4=-2ab+a^2=(2)(-3)+4=-6+4=-2ab+a^2=(2)(-3)+4=-6+4=-2$
- b)  $9-2-1=7-1=-7 \text{ frac } \{9-2\} \{-1\} = \text{ frac } \{7\} \{-1\} = -7-19-2=-17=-7 \text{ } \checkmark \text{ }$

#### 7. Expand & simplify: (4)

- a)  $(x+1)2=x^2+2x+1(x+1)^2=x^2+2x+1(x+1)2=x^2+2x+1$
- b)  $(2x-3)(x+4)=2x^2+8x-3x-12=2x^2+5x-12(2x-3)(x+4)=2x^2+8x-3x-12=2x^2+5x-12(2x-3)(x+4)=2x^2+8x-3x-12=2x^2+5x-12(2x-3)(x+4)=2x^2+8x-3x-12=2x^2+5x-12(2x-3)(x+4)=2x^2+8x-3x-12=2x^2+5x-12(2x-3)(x+4)=2x^2+8x-3x-12=2x^2+5x-12(2x-3)(x+4)=2x^2+8x-3x-12=2x^2+5x-12(2x-3)(x+4)=2x^2+8x-3x-12=2x^2+5x-12(2x-3)(x+4)=2x^2+8x-3x-12=2x^2+5x-12(2x-3)(x+4)=2x^2+8x-3x-12=2x^2+5x-12(2x-3)(x+4)=2x^2+8x-3x-12=2x^2+5x-12(2x-3)(x+4)=2x^2+6x-12(x+4)=2x^2+6x-12(x+4)=2$
- 12(2x-3)(x+4)=2x2+8x-3x-12=2x2+5x-12

### **SECTION D: GRAPHS & COORDINATES (25 MARKS)**

#### 1. Plotting points: (3)

- $\checkmark$  A(2, 3) in quadrant I
- $\checkmark$  B(-1, 2) in quadrant II
- $\checkmark$  C(0, -2) on y-axis

**2. Gradient:** (4)

a) 
$$m=6-23-1=42=2m = \frac{6-2}{3-1} = \frac{4}{2} = 2m=3-16-2=24=2 \checkmark$$

b) Positive **✓** 

#### 3. Linear graph table: (5)

a)

X	-1	0	1	2
У	-4	-1	2	5

b) Y-intercept = -1 ✓

#### **4. Function values:** (4)

a) 
$$f(3)=32-6=9-6=3f(3)=3^2-6=9-6=3$$

b) 
$$f(-2)=4+4=8f(-2)=4+4=8f(-2)=4+4=8$$

#### **5. Pattern table:** (3)

- a) Perfect squares 🗸
- b)  $y=x^2y = x^2y=x^2$

#### **6. Quadrants:** (2)

- a) Quadrant II 🗸
- b) Quadrant IV 🗸

**TOTAL: 100**