

PROVINCIAL EXAMINATION

JUNE 2022

GRADE 11

MATHEMATICS

PAPER 1

TIME: 2 hours

MARKS: 100

7 pages

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INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

- 1. Answer ALL the questions.
- 2. This question paper consists of 7 questions.
- 3. Present your answers according to the instructions of each question.
- 4. Clearly show ALL calculations, diagrams, graphs et cetera which were used in determining the answers.
- 5. Answers only will NOT necessarily be awarded full marks.
- 6. Use an approved scientific calculator (non-programmable and non-graphical), unless stated otherwise.
- 7. If necessary, answers should be rounded-off to TWO decimal places, unless stated otherwise.
- 8. Diagrams are NOT necessarily drawn to scale.
- 9. Number the questions correctly according to the numbering system used in the question paper.
- 10. Write neatly and legibly.

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QUESTION 1

1.1 For which values of x is $\sqrt{\frac{x+3}{(x+1)^2}}$ real? (2)

1.2 Solve for x:

1.3

1.2.1 (x+4)(x-1) = 0	(1)
1.2.2 $3x^2 - 2x = 14$ (correct to TWO decimal places)	(4)
$1.2.3 x^2 - 2x = 18 - \frac{45}{x^2 - 2x}$	(4)
1.2.4 $\sqrt{5-x} + 1 = -x$	(5)
$1.2.5 3^{2x+1} - 4.3^x = -1$	(4)
1.2.6 (a) $x^2 - 3x \le 0$	(2)
(b) If $f(x) = x^2 - 3x$, write down the values of x for which $f(x-3) \le 0$.	(2)
The sum of TWO numbers is -10 and the product of the same numbers is -600. Determine the value of the two numbers.	(5)

[29]

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QUESTION 2

2.2

- 2.1 Simplify completely WITHOUT the use of a calculator.
 - 2.1.1 $2\sqrt{8} 4\sqrt{32} + 3\sqrt{50}$ (3) 2.1.2 $3^{-\frac{1}{2}} [\sqrt{12} + \sqrt[3]{(3\sqrt{3})}]$ (4) 2.1.3 $\frac{5^{2006} - 5^{2004} + 24}{5^{2004} + 1}$ (4) Given: $x = \sqrt{6 + \sqrt{6 + \sqrt{6 + \sqrt{6 + \dots}}}}$ 2.2.1 Write x^2 in terms of x. (2) 2.2.2 Hence determine the value of x. (4)

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(Paper 1)

2.3 Given rectangle PQRS with:

• $QR = \sqrt{8} - 1$

•
$$RS = \sqrt{8} + 1$$

Determine the length of ANY diagonal of rectangle PQRS. (Leave the answer in the simplest surd form.)

 $P \qquad Q \qquad \sqrt{8} - 1 \qquad (3)$ $S \qquad \sqrt{8} + 1 \qquad R$

[20]

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QUESTION 3

3.1	The fin	rst four terms of a quadratic number pattern are -7; 0; 9; 20.	
	3.1.1	Determine a formula to represent the general term of the pattern.	(4)
	3.1.2	Which term of the pattern has a value of 128?	(3)
	3.1.3	Determine between which successive terms in the quadratic number pattern will the FIRST difference be 599.	(3)
3.2	Given	the quadratic pattern:	
	5; 12;	29; 56;	
	3.2.1	Write down the next term of the pattern.	(1)
	3.2.2	Show that the first differences of this pattern will always be odd values.	(4) [15]
QUES	STION	4	
Given	the line	ear pattern: $1 - p; 2p - 3; p + 5;$	
4.1	Calcul	ate the value of <i>p</i> .	(3)
4.2	Write	down the value of:	
	4.2.1	The first term of the pattern.	(1)
	4.2.2	The common difference.	(1)
4.3	Explai	n why none of the numbers in this linear pattern are perfect squares.	(2) [7]

QUESTION 5

The graphs of $f(x) = ax^2 + bx + c$; $a \neq 0$ and g(x) = 6x + k are drawn below.

- Point D(1; -8) is a common point on f and g.
- f intersects the x-axis at (-3; 0) and (2; 0).
- g intercepts the graph of f at point D only.



5.5	Determine the equation of a line q which is perpendicular to g passing through the point (-3; 0) in the form $y = mx + c$.	(3) [12]
5.4	Write down the equation of the axis of symmetry of <i>h</i> if $h(x) = f(x-7) + 2$.	(1)
5.3	Determine the coordinates of the turning point of f .	(3)
5.2	Determine the values of a , b , and c .	(4)
5.1	For which value(s) of x is $f(x) \le 0$?	(1)

QUESTION 6

Given: $p(x) = 4^x$ and $h(x) = 2(x-1)^2 - 8$.

- 6.1 Sketch the graphs of p and h on the same set of axes in your ANSWER BOOK.Indicate ALL intercepts with the axes and any turning points. (4)
- 6.2 Sketch the graph of f(x) if f(x) = p(-x) using the same axes as in QUESTION 6.1. (1)
- 6.3 The graph of h is shifted 2 units to the LEFT. Write down the equation of the new graph.

6.4 Show, algebraically, that
$$p(x+\frac{1}{2}) = 2p(x)$$

QUESTION 7

The sketch below represents the graph of $f(x) = \frac{a}{x-p} + q$. T (5; 3) is a point on f.



7.1	Determine the values of a , p , and q .	(4)
7.2	Write down an equation for $h(x)$ if h is the graph of f where $a < 0$.	(1)
7.3	Write down the range of f .	(1)

7.4 If the graph of f is reflected in the line y = -x + c, the new graph coincides with the graph of y = f(x). Determine the value of c. (2) [8]

TOTAL: 100

(1)

(3)

[9]