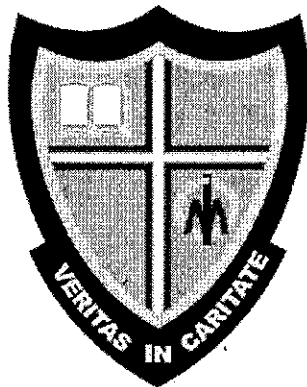




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SUBJECT	Mathematics	PAPER	Algebra Part A
GRADE	12	DATE	4 February 2022
EXAMINER	Miss A. Balzer	MARKS	41
NAME	Memo	MODERATOR	Gr 12 Teachers
TEACHER	Final	DURATION	45min

QUESTION NO	DESCRIPTION	MAXIMUM MARK	ACTUAL MARK
1	Quadratic Equations and Inequalities	12	
2	Exponents	13	
3	Nature of Roots	7	
4	Surds	6	
5	Problem Solving	3	
TOTAL		41	

1. This paper consists of 5 questions and 8 pages.
2. Read the questions carefully.
3. Answer all questions in the spaces provided
4. You may use an approved non-programmable and non-graphical calculator, unless otherwise stated.
5. Round off your answers to **one decimal digit** where necessary.
6. All necessary working details must be shown. Answers only, without the relevant calculations will not be given marks. Equations may not be solved solely with a calculator.
7. It is in your interest to write legibly and present your work neatly.

USEFUL FORMULA:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

QUESTION 1

12 MARKS

Solve for x in each of the following:

a) $2x^2 - 6x = 7$

(3)

$$2x^2 - 6x - 7 = 0$$

$$x = \frac{-(-6) \pm \sqrt{(-6)^2 - 4(2)(-7)}}{2(2)}$$

$$x = 3,9$$

or $x = -0,9$

b) $\sqrt{4x-3} = x-2$

(5)

$$4x-3 = (x-2)^2$$

$$4x-3 = x^2 - 4x + 4$$

$$0 = x^2 - 8x + 7$$

$$0 = (x-7)(x-1)$$

$$x = 7 \quad \text{or} \quad x = 1$$

$$\checkmark$$

$$\checkmark$$

c) $x(5x-7) \geq 6$

(4)

$$5x^2 - 7x - 6 \geq 0$$

$$(5x+3)(x-2) \geq 0$$

CVs: $-3/5$; 2



$$x \leq -3/5 \quad \text{or} \quad x \geq 2$$

$$\checkmark$$

$$\checkmark$$

QUESTION 2

13 MARKS

a) Simplify the following:

$$1) \frac{8^{2n+1} \cdot 16^{1-n}}{4^{n+1}} \quad (4)$$

$$= \frac{(2^3)^{2n+1} \cdot (2^4)^{1-n}}{(2^2)^{n+1}} \quad \checkmark \begin{matrix} m \\ \text{bases} \end{matrix}$$

$$= \frac{2^{6n+3} \cdot 2^{4-4n}}{2^{2n+2}} \quad \checkmark a$$

$$= 2^{6n+3+4-4n-2n-2} \quad \checkmark m$$

$$= 2^5 \quad \checkmark a$$

$$= 32$$

$$2) \frac{2^{2x} - 3 \cdot 2^{2x-2}}{3 \cdot 2^{2x-2}} \quad (4)$$

$$= \frac{\cancel{2^{2x}} \cdot (1 - 3 \cdot 2^{-2})}{3 \cdot \cancel{2^{2x}} \cdot 2^{-2}} \quad \checkmark \begin{matrix} m \\ a \end{matrix}$$

$$= \frac{1 - \frac{3}{4}}{\frac{3}{4}} \quad \checkmark a$$

$$= \frac{1}{3} \quad \checkmark ca$$

b) Solve for x in the following equation: $2^{2x} + 7 \cdot 2^x = 8$

(5)

$$2^{2x} + 7 \cdot 2^x - 8 = 0$$

$$\text{Let } 2^x = k$$

$$k^2 + 7k - 8 = 0$$

$$(k+8)(k-1) = 0$$

$$k = -8$$

or

$$k = 1$$

$$2^x = -8$$

N/A

$$2^x = 1$$

$$x = 0$$

QUESTION 3

7 MARKS

a) Given $M = \frac{1}{\sqrt{2x-1}}$, determine the value(s) of x for which M is real.

(2)

$$2x - 1 > 0$$

$$2x > 1$$

$$x > \frac{1}{2}$$

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b) Given the equation $2x^2 + 8x + p = 0$.

- 1) Solve for x in terms of p , leaving answers in simplest surd form. (3)

$$x = \frac{-8 \pm \sqrt{64 - 8p}}{4}$$
$$= \frac{-4 \pm \sqrt{16 - 2p}}{2}$$

Handwritten red marks: ✓ m, ✓ a, ✓ a

- 2) For which value(s) of p will the equation have equal roots? (2)

$$\Delta = 0$$
$$16 - 2p = 0$$
$$-2p = -16$$
$$p = 8$$

Handwritten red marks: ✓ m, ✓ a, ✓ a

QUESTION 4

6 MARKS

- a) Simplify the following expression, without the use of a calculator:

$$2\sqrt{8} - 4\sqrt{32} + 3\sqrt{50}$$

(2)

$$= 4\sqrt{2} - 16\sqrt{2} + 15\sqrt{2}$$
$$= 3\sqrt{2}$$

Handwritten red marks: ✓ m, ✓ a

QUESTION 5

3 MARKS

Suppose that you are given the following:

$$4^a = 5$$

$$5^b = 6$$

$$6^c = 7$$

$$7^d = 8$$

Find the value of $abcd$.

$$4^a = 5$$

$$4^{ab} = 5^b = 6 \checkmark^a$$

$$4^{abc} = 5^{bc} = 6^c = 7$$

$$4^{abcd} = 5^{bcd} = 6^{cd} = 7^d = 8$$

$$\therefore 4^{abcd} = 8 \checkmark^a$$

$$2^{2abcd} = 2^3$$

$$2abcd = 3$$

$$abcd = \frac{3}{2} \checkmark^a$$

b) Without the use of a calculator, show that:

$$\frac{2}{1+\sqrt{2}} - \frac{8}{\sqrt{8}} = -2$$

(4)

$$\begin{aligned} & \frac{2}{1+\sqrt{2}} - \frac{8}{\sqrt{8}} \\ &= \frac{2}{1+\sqrt{2}} - \frac{8}{2\sqrt{2}} \\ &= \frac{4\sqrt{2} - 8(1+\sqrt{2})}{2\sqrt{2}(1+\sqrt{2})} \quad \checkmark^m \\ &= \frac{4\sqrt{2} - 8 - 8\sqrt{2}}{2\sqrt{2}(1+\sqrt{2})} \\ &= \frac{-8 - 4\sqrt{2}}{2\sqrt{2}(1+\sqrt{2})} \\ &= \frac{-4(2 + \sqrt{2})}{2\sqrt{2}(1+\sqrt{2})} \quad \checkmark^a \\ &= \frac{-2(2 + \sqrt{2})}{\sqrt{2} + 2} \quad \checkmark^a \\ &= -2 \quad \checkmark^a \end{aligned}$$