



Maths & Science
I N F I N I T Y

MATHEMATICS

MATERIAL FOR GRADE 12

ALGEBRA

QUESTIONS

QUESTION 1

1.1 Solve for x :

1.1.1 $(x^2 - 4)(x - 2) = 0$ (3)

1.1.2 $1 - x - x^2 = 0$ (3)

1.1.3 $2^{x+2} + 2^{x-2} + 2^x = 42$ (4)

1.2 Solve for x in the following:

1.2.1 $\sqrt{4x - 11} = -1$ (1)

1.2.2 $\sqrt{4x - 11} = 2 - x$ (4)

1.3 $-x^2 + 5x \leq 4$ (5)

1.4 Determine an ordered pair $(x; y)$ which satisfies the equation.

$(2q + x)^2 = 4q^2 + 12q + y$ (5)

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QUESTION 2

2.1 Solve for x in the following:

2.1.1 $4x^2 = 25$ (2)

2.1.2 (a) $x^2 - 5x = 2$ (4)

(b) Hence, or otherwise, solve $(x - 2)^2 - 5x + 8 = 0$. (3)

2.1.3 $(2 - x)(x + 4) \geq 0$ (3)

2.1.4 $3^{x+1} - 4 + \frac{1}{3^x} = 0$ (5)

2.2 Solve for x and y simultaneously:

$$2x - y + 1 = 0$$

$$x^2 - 3x - 4 - y = y^2$$
 (6)

2.3 Given: $x = \frac{\pm\sqrt{b^2-9}}{-2}$

Determine the value(s) of b for which x is a real number. (3)

QUESTION 3

Solve for x :

3.1.1 $(x - 1)(x + 8) = 10$ (4)

3.1.2 $4x + \frac{4}{x} + 11 = 0; x \neq 0$
(Leave your answer correct to TWO decimal places.) (4)

3.2 $6x < 3x^2$ (5)

Solve for x and y simultaneously:

3.2.1 $3 + x = 2y$ and $x^2 + 4y^2 = 2xy + 7$ (7)

3.2.2 For which values of m will $x + y$ be a factor of $x^m + y^m$? (2)

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QUESTION 4

4.1 Given $x^2 + 2x = 0$

4.1.1 Solve for x (2)

4.1.2 Hence, determine the positive values of x for which
 $x^2 \geq -2x$ (3)

4.2 Solve for x :
 $2x^2 - 3x - 7 = 0$ (correct to TWO decimal places) (4)

4.3 Given: $k + 5 = \frac{14}{k}$
4.3.1 Solve for k . (3)

4.3.2 Hence, or otherwise, solve for x if $\sqrt{x+5} + 5 = \frac{14}{\sqrt{x+5}}$. (3)

4.4 Solve for x and y simultaneously if:

$$\frac{1}{x} + \frac{1}{y} = 3 \quad \text{and}$$

$$x - y = \frac{1}{2} \quad (7)$$

4.5 The roots of a quadratic equation is given by $x = \frac{-2 \pm \sqrt{4-20k}}{2}$. Determine the value(s) of k for which the equation will have real roots. (2)

[24]

QUESTION 5

5.1 Solve for x :

5.1.1 $x^2 + x = 0$ (3)

5.1.2 $\sqrt{x+2} = x$ (4)

5.1.3 $x^2 + 3x - 10 < 0$ (3)

5.1.4 $x^{-1} - x^{\frac{1}{2}} = 20$ (4)

5.2 Solve for x and y if $y = x + 2$ and $x^2 + y^2 = 20$. (6)

5.3 Solve for $\frac{x}{y}$ if $2x^2 - 7xy + 4y^2 = 0$. (Give your answer correct to 2 decimal places). (4)

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QUESTION 6

6.1 Solve for x in each of the following:

6.1.1 $2x(3x - 5) = 0$ (2)

6.1.2 $x^2 - 3x = 7$ (Give answer correct to TWO decimal places) (4)

6.1.3 $2x - 5\sqrt{x} = 3$ (6)

6.1.4 $2^x(3x + 1) < 0$ (3)

6.2 Calculate, **without using a calculator** $2^{100} - 2^{99}$ (3)

6.3 Solve for x and y simultaneously:

$$2x - y = 3 \quad \text{and}$$

$$x^2 + 5xy + y^2 = 15$$

(6)

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QUESTION 7

7.1 Solve for x :

7.1.1 $x(x - 1) + 2(x - 1) = 0$ (2)

7.1.2 $1 + 3x^2 - 5x = 0$ (3)

7.1.3 $\sqrt{2x - 1} = 2x - 3$ (4)

7.1.4 $(2x)^{\frac{2}{3}} = 64$ (3)

7.1.5 $(2 - x)(1 - x)^2 \leq 0$ (4)

7.2 Solve for x and y simultaneously.

$$y + 3 = 2x \quad \text{and} \quad x^2 - xy + 2y^2 = 4 \quad (5)$$

7.3 Given that $f(x) = bx^2 + 3x + 4$ and $g(x) = -x - 1$, calculate the value(s)

of b for which the graph of g will intersect the graph of f . (4)

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QUESTION 8

Solve for x :

$$8.1.1 \quad 7x(2x - 1) = 0 \quad (2)$$

$$8.1.2 \quad 2x^2 + x = 4 \quad (\text{Leave your answer correct to TWO decimal places.}) \quad (4)$$

$$8.1.3 \quad (x - 4)(x + 5) \geq 0 \quad (3)$$

$$8.1.4 \quad 3x^{\frac{2}{5}} - 5x^{\frac{1}{5}} - 2 = 0 \quad (4)$$

Solve for x and y simultaneously:

$$\frac{2x}{1+y} = 1; y \neq -1 \quad \text{and} \quad (3x - y)(x + y) = 0 \quad (6)$$

Given: $f(x) = \frac{3}{x-2}$ and $g(x) = 3^{x-2}$. Explain why

$f(x) = g(x)$ will have only ONE root. Motivate your answer. (3)

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QUESTION 9

9.1 Solve for x .

9.1.1 $x(5x + 2) = 0$ (2)

9.1.2 $x(2x - 3) = 4$ (correct to TWO decimal places) (4)

9.1.3 $x^2 - x - 6 \geq 6$ (4)

9.2 Solve for x and y simultaneously if:

$$x - y = 3 \quad \text{and} \quad x^2 + xy - 2y^2 = 0 \quad (5)$$

9.3 The solution of a quadratic equation is given by:

$$x = \frac{-2 \pm \sqrt{13 - 2k}}{3}$$

Determine the largest integral value of k for which these x -values will be rational. (3)

9.4 Determine the value(s) of a for which the graphs of $f(x) = x^2 - 2x - 3$ and $g(x) = 2x + a$ will not intersect each other. (5)

[23]

