

No other items may be taken into the examination room. It is your responsibility to ensure that you do not have any unauthorised notes or other items of a non-personal nature in the examination room. If you have any unauthorised material with you, hand it to the supervisor before reading any further.

Important note to candidates

Special items: drawing instruments, templates, and up to three calculators approved for use in the WACE examinations

Standard items: pens (blue/black preferred), pencils (including coloured), sharpener, correction fluid/cap, eraser, ruler, highlighters

To be provided by the candidate

Materials required/recommended for this section
To be provided by the supervisor
Formula Sheet (referred from Section One)
This Question/Answer Booklet

Time and marks available for this section
Marks available:
Working time for this section: 30 minutes
Reading time before commencing work: 3 minutes

Teacher name _____

Student name _____

ON WHOLE TEST
MATHMATICS METHODS YEAR 11 (NOT INCLUDING Q8(a))
UNIT TEST 2
2018
Christ Church Grammar School

Section Two:
Calculator-assumed
All marks -1 marks for units
rounding on whole test

SOLUTIONS

Instructions to candidates

1. Write your answers in this Question/Answer Booklet.
2. Answer all questions.
3. You must be careful to confine your response to the specific question asked and to follow any instructions that are specific to a particular question.
4. Supplementary pages for the use of planning/continuing your answer to a question have been provided at the end of this Question/Answer booklet. If you use these pages to continue an answer, indicate at the original answer where the answer is continued, i.e. give the page number.
5. **Show all your working clearly.** Your working should be in sufficient detail to allow your answers to be checked readily and for marks to be awarded for reasoning. Incorrect answers given without supporting reasoning cannot be allocated any marks. For any question or part question worth more than two marks, valid working or justification is required to receive full marks. If you repeat an answer to any question, ensure that you cancel the answer you do not wish to have marked.
6. It is recommended that **you do not use pencil**, except in diagrams.

Additional working space

Question number: _____

$$\begin{aligned} m < 1 \rightarrow & (\text{For giving two}) \\ -4m > -4 & \\ \text{so } 4 - 4m > 0 \rightarrow & (\text{For giving initial}) \\ \text{for two solutions, need } \Delta > 0 & \end{aligned}$$

- (b) Hence determine the values of m for which the quadratic equation has two solutions. (2 marks)

$$\begin{aligned} & (\text{for giving the value of } m) \\ = 4 - 4m & \rightarrow \\ = (-2)^2 - 4m & \\ \Delta = b^2 - 4ac & \end{aligned}$$

- (a) Give the value of the discriminant in terms of m . (1 mark)

$$x^2 - 2x + m = 0$$

Consider the quadratic equation:

- Question 5 (3 marks)

Question 6

(2 marks)

If M is the mid-point of XY, find the coordinates of Y when X is (4, -3) and M is (1, -3).

Let Y be (a, b)
 so $\left(\frac{a+4}{2}, \frac{b-3}{2}\right) = (1, -3)$ ✓ (for giving expression
 for x and y coordinates
 of Y)
 $\frac{a+4}{2} = 1 \Rightarrow a = -2$
 $\frac{b-3}{2} = -3$
 $b-3 = -6$ Y is $(-2, -3)$ ✓
 $b = -3$ (for giving final coordinates
 of Y)
 (3 marks)

Question 7

A line has equation:

$$y = 5x - 2$$

Find the distance between the x axis intercept of the line and the y axis intercept of the line.

y intercept is $(0, -2)$ ✓ (for giving y intercept)
 for x intercept: $y = 0 \Rightarrow 0 = 5x - 2$
 $5x = 2$
 $x = 0.4$ $(0.4, 0)$ ✓
 $d = \sqrt{(0.4 - 0)^2 + (0 - 2)^2}$ (for giving x
 intercept)
 $= \sqrt{(0.4)^2 + 2^2}$
 $= 2.04$ ✓ (for giving distance)

See next page

Question 12

(5 marks)

The current A (in amperes) that flows in an electric appliance is inversely proportional to the resistance R (in ohms). The current is 3 amperes when the resistance is 80 ohms.

- (a) Determine the current when the resistance is 100 ohms. (2 marks)

$$A = \frac{k}{R}$$

$$3 = \frac{k}{80}$$

$$k = 240$$

$$A = \frac{240}{100}$$

$$A = \frac{240}{R} \quad \text{when } R = 100$$

$$= 2.4 \text{ amperes} \quad \text{(for calculating current)}$$

$$\text{A in terms of R}$$

- (b) If the current starts at a certain value, determine the percentage increase in the resistance required to reduce the current to 80% of the starting value. (3 marks)

Let starting values be A and R

$$so \quad R = \frac{240}{A}$$

Let new values be A_1 and R_1 ✓ (2 marks for
 clear and
 logical intermediate
 steps and
 working out)

$$so \quad R_1 = \frac{240}{A_1}$$

but $A_1 = 0.8A$

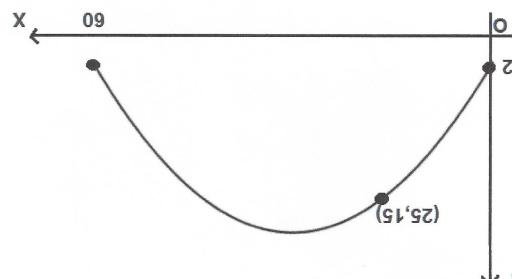
$$so \quad R_1 = \frac{240}{0.8A} = \frac{300}{A} = \frac{300 \times 240}{240A} = 1.25R$$

∴ 25% increase
 in resistance
 ✓ (for giving final
 percentage
 increase)

End of questions

(5 marks)

Question 8

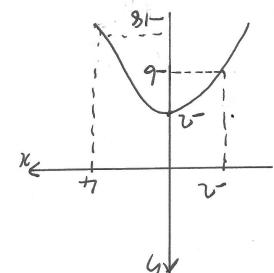


- A cricket ball is thrown by a fielder. It leaves his hand at a height of 2 metres above the ground and the wicketkeeper takes the ball 60 metres away, again at a height of 2 metres. It is known that after the ball has gone 25 metres, it is 15 metres above the ground. The path of the cricket ball follows a quadratic equation of the form: $y = ax^2 + bx + c$
- (a) Calculate the values of a , b and c . You must give your answers correct to 5 decimal places where appropriate. (3 marks)
- (b) Evaluate the maximum height that the ball reaches above the ground. (2 marks)
- (c) Calculate the values of a , b and c . You must give your answers correct to 5 decimal places where appropriate. (3 marks)

See next page

- Question 11
- (4 marks)
- (a) Give the domain and range of the following function:
- $$f(x) = 2\sqrt{x} - 5$$
- (b) Consider the following function:
- $$f(x) = -x^2 - 2$$
- with the domain $\{x \in \mathbb{R} : -2 \leq x \leq 4\}$.

- Give the range for this function for the given domain.
- (2 marks)
- range is $y \geq -2$ (for giving range)
- min y value in domain is -16 (for giving min value)
- max y value in domain is -2 (for giving max value)
- range is $-18 \leq y \leq 2$ (for giving range)
- $f(x) = -x^2 + 2$
- Graph of $f(x) = -x^2 + 2$ is shown below.



- domain = $\{x \in \mathbb{R} : x \geq 5\}$ (for giving domain)
- range = $\{y \in \mathbb{R} : y \geq 0\}$ (for giving range)

$$(2 \text{ marks})$$

- (a) Give the domain and range of the following function:

$$f(x) = 2\sqrt{x} - 5$$

- (b) Consider the following function:
- $$f(x) = -x^2 - 2$$
- with the domain $\{x \in \mathbb{R} : -2 \leq x \leq 4\}$.

Question 9

(4 marks)

A shopkeeper buys a first crate of eggs at \$1.50 per dozen. He buys another crate, containing three dozen more eggs than the first crate, at \$2.00 per dozen. He sells them all for \$2.50 a dozen and makes \$15 profit. How many dozens were there in the first crate of eggs? Note: there are 12 items in a dozen.

Let 1st crate have x dozens
so 2nd crate has $x+3$ dozens

$$\text{Profit} = 15$$

$$\begin{aligned} \text{So Revenue} &= 2.5x(x+3) \\ 15 &= \overbrace{2.5x(x+3)}^{\text{Revenue}} - \overbrace{(1.5x + 2x(x+3))}^{\text{Costs}} \\ 15 &= 2.5(2x+3) - 1.5x - 2(x+3) \quad \text{profit expression} \end{aligned}$$

$$15 = 1.5x + 1.5$$

$$1.5(x+1) = 15$$

$$x+1 = \frac{15}{1.5} = 10$$

$$x = 9$$

so 9 dozens in first crate

Marking key:

- ✓ revenue determined in terms of ' x '
- ✓ cost determined in terms of ' x '
- ✓ expression for profit is correct
- ✓ correct number of dozens calculated

See next page

Question 10

(4 marks)

A line with equation $3x - 2y = 12$ intersects a second line at the point where $x = 2$. The second line is perpendicular to the first line. Determine the equation of the second line.

$$3x - 2y = 12$$

$$-2y = 12 - 3x$$

$$\frac{-2y}{-2} = \frac{12 - 3x}{-2}$$

$$y = \frac{3}{2}x - 6$$

$$\text{so gradient} = \frac{3}{2}$$

(for determining gradient of first line)

\therefore gradient of perpendicular line is $-\frac{2}{3}$

(for calculating gradient of second line)

$$\therefore y = -\frac{2}{3}x + C$$

$$\text{when } x = 2 \quad 3x - 2y = 12$$

$$-2y = 6$$

$$y = -3$$

point is $(2, -3)$

(for calculating the intersection point)

$$\text{use } (2, -3) \quad -3 = -\frac{2}{3} \times 2 + C$$

$$C = -3 + \frac{4}{3} = -\frac{9}{3} + \frac{4}{3} = -\frac{5}{3}$$

$$\therefore \text{line is } y = -\frac{2}{3}x - \frac{5}{3}$$

(for giving equation of second line)

See next page