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Name	Class				Index Number			
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BROADRICK SECONDARY SCHOOL

SECONDARY 2 G2

END-OF-YEAR EXAMINATION 2023

MATHEMATICS

4045

Section 1

October 2023

Candidates answer on the Question Paper.

2 hours

READ THESE INSTRUCTIONS FIRST

Write your name, class and index number on all the work you hand in.

Write in dark blue or black pen.

You may use an HB pencil for any diagrams or graphs.

Do not use staples, paper clips, glue or correction fluid.

Section 1 & Section 2

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For π , use either your calculator value or 3.142, unless the question requires the answer in terms of π .

At the end of the examination, fasten all your work for each section securely together.

The number of marks is given in brackets [] at the end of each question or part question.

The total number of the marks for this paper is 70.

For Examiner's Use		
Error in	Question Number	Marks Deducted
Rounding-off		
Reasoning		
Presentation		

For Examiner's Use	
Section 1	/ 35
Section 2	/ 35
Total	70

[Turn Over

Answer **all** the questions in this section.

1 Express 185.4962 correct to

(a) 2 decimal places,

Answer [1]

(b) the nearest integer,

Answer [1]

(c) 3 significant figures.

Answer [1]

2 Calculate

(a) $\frac{\sqrt{34}}{2} \times 15^2$, giving your answer to the nearest hundred,

Answer [1]

(b) $\frac{2}{3} \times 4 + 45 \div 3 - 4\frac{3}{5}$, giving your answer to the nearest tenth.

Answer [1]

3

4 1000 29 $\sqrt{1000}$ π

From the above list, write down

(a) one perfect square,

Answer [1]

(b) one irrational number,

Answer [1]

(c) one prime number.

Answer [1]

- 4 (a) Write 150 as a product of its prime factors, leaving your answer in index notation.

Answer [2]

- (b) It is given that $126 = 2 \times 3^2 \times 7$.
Find

- (i) the highest common factor (HCF) of 150 and 126,

Answer [1]

- (ii) the lowest common multiple (LCM) of 150 and 126.

Answer [1]

- (c) Find the smallest integer k such that $126k$ is a perfect square.

Answer $k =$ [1]

-
- 5 Simplify each of the following.

(a) $\frac{3xy^2}{5y} \times \frac{10x}{9x^2y},$

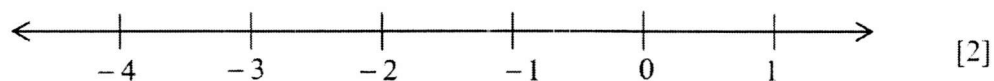
Answer [1]

(b) $\frac{7a^3}{2b^5} \div \frac{14a^3b}{18ab^4}.$

Answer [1]

- 6 (a) Solve the inequality $4x \geq -10$ and represent the solution on the number line.

Answer



- (b) Hence, write down the smallest integer x that satisfies $4x \geq -10$.

Answer smallest $x = \dots\dots\dots$ [1]

- 7 Solve the following equations.

(a) $\frac{2x+5}{3} = \frac{x-1}{2},$

Answer $x = \dots\dots\dots$ [2]

(b) $\frac{2y}{3} + \frac{y+1}{4} = 3.$

Answer $y = \dots\dots\dots$ [3]

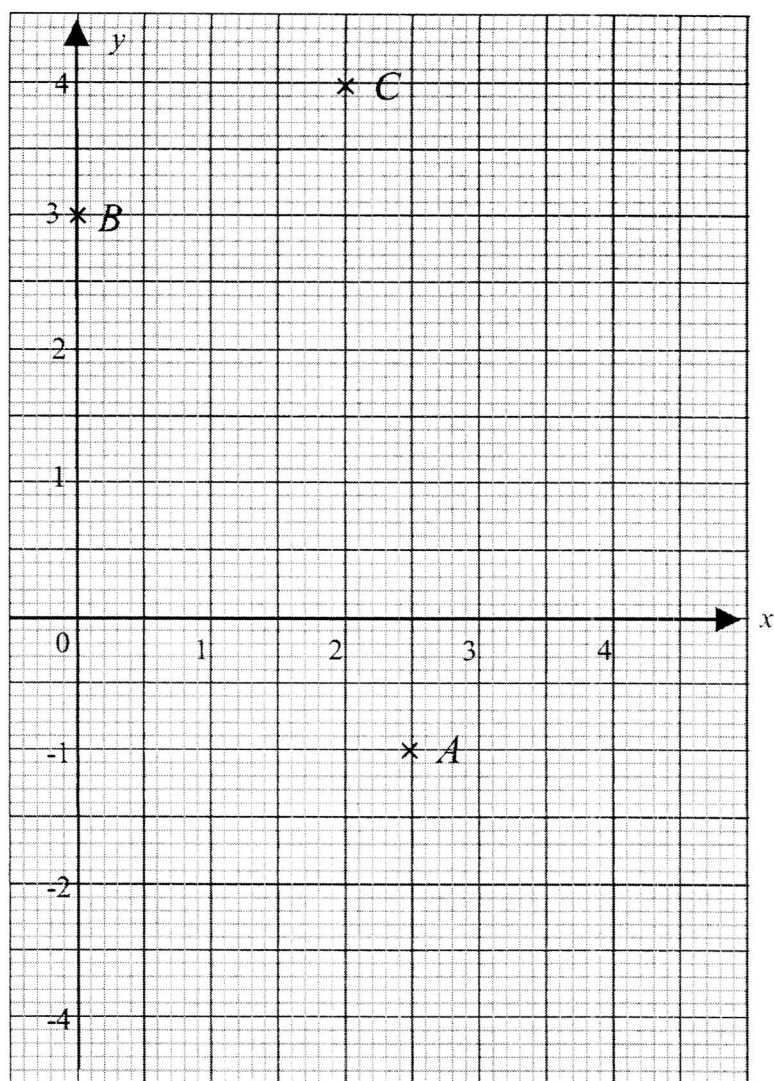
- 8 A map has a scale of 1: 25000.
(a) Find the actual distance represented by 6 cm on the map in metres.

Answer m [2]

- (b) The length and width of a park is 7 km and 6 km respectively.
Find the area of the park on the map, giving your answer in cm^2 .

Answer cm^2 [2]

- 9 The grid shows the points A , B and C .



- (a) State the coordinates of point C .

Answer (.....,) [1]

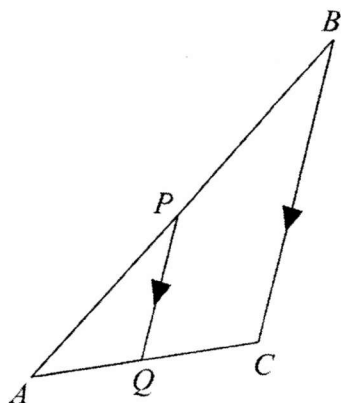
- (b) Find the gradient of the line AB .

Answer [2]

- (c) Write down the coordinates of point D such that $ABCD$ forms a parallelogram.

Answer (.....,) [1]

- 10 In the diagram below the points P and Q lie on AB and AC respectively. PQ is parallel to BC .



- (a) Explain why triangle ABC is similar to triangle APQ .

Answer

.....

.....

..... [2]

(b) Given that $BC = 10$ cm, $PQ = 4$ cm and $QC = 3$ cm, find the length of AC .

Answer cm [2]

End of Section 1

Name

Class			
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Index Number		
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BROADRICK SECONDARY SCHOOL

SECONDARY 2 G2

END-OF-YEAR EXAMINATION 2023

MATHEMATICS

4045

Section 2

October 2023

Candidates answer on the Question Paper.

2 hours

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Section 2

Answer **all** the questions.

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Omission of essential working will result in loss of marks.

The total of the marks for Section 2 is 35.

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For π , use either your calculator value or 3.142.

You are to hand in Section 1 and Section 2 separately.

For Examiner's Use (To combine with Section 1)		
Error in	Question Number	Marks Deducted
Rounding-off		
Reasoning		
Presentation		

For Examiner's Use
35

Answer **all** the questions in this section.

- 1 (a) Factorise $3x^2 + 5x - 2$.

Answer [1]

- (b) Hence, simplify $\frac{3x^2 + 5x - 2}{x^2 - 4}$.

Answer [2]

-
- 2 It is given that C is directly proportional to the square of m .

When $C = 855$, $m = 10$.

Find

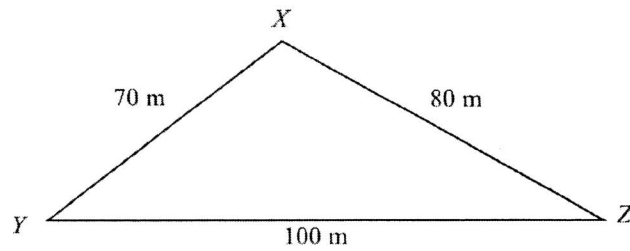
- (a) an equation connecting C and m ,

Answer [2]

- (b) the value of C when $m = 28$.

Answer $C =$ [1]

- 3 The diagram shows a sketch of a triangular field XYZ .



Construct an accurate scale drawing of the triangular field in the space provided below.

Use a scale of 1 cm to represent 10 m .

Answer

[2]

- 4 (a) Three sides of a triangle are $(4x - 3)$ cm, $(2x - 2)$ cm and $(2x + 5)$ cm.
The perimeter of the triangle is 40 cm.
Find the value of x .

Answer $x = \dots\dots\dots$ [2]

- (b) Hence, show that the triangle is a right-angled triangle.

Answer

[3]

5 A bookshop sells pens at \$ x each and notebooks at \$ y for a pack of 6.

(a) Ali bought 9 pens and 3 packs of notebooks.

He paid \$36.

Show that $3x + y = 12$

Answer

[1]

(b) Sarah bought 16 pens and 8 packs of notebooks.

She paid \$76.

Show that $4x + 2y = 19$

Answer

[1]

(c) Solve these simultaneous equations.

$$3x + y = 12$$

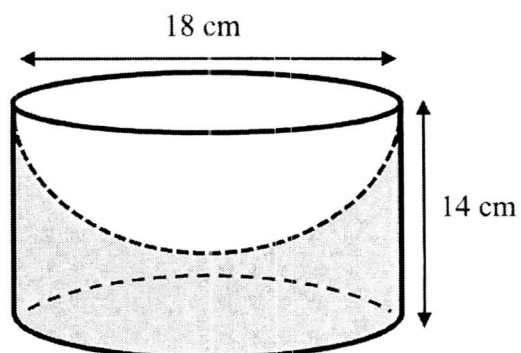
$$4x + 2y = 19$$

Answer $x = \dots\dots\dots, y = \dots\dots\dots$ [2]

(d) Find the cost of a notebook.

Answer \$..... [1]

- 6 A solid container is made by removing a hemisphere from the top of a solid cylinder with base diameter 18 cm and vertical height 14 cm.



- (a) Find the surface area of the hemisphere.

Answercm² [2]

- (b) Calculate the volume of the container.

Answercm³ [2]

- 7 The stem-and-leaf diagram shows the weight, in kilograms, of the students in a class.

4	1	2	5	7	9	9		
5	0	1	1	4	5	5	9	9
6	1	3	6	7	8			
7	0	2	2					

Key: 4 | 1 means 41

Find

- (a) the number of students in the class,

Answerstudents [1]

- (b) the number of students with weight more than 55kg,

Answerstudents [1]

- (c) the median weight.

Answerkg [1]

- 8 (a) A regular polygon has 12 sides.
Find the size of each interior angle.

Answer° [2]

- (b) Is it possible for a regular polygon to have an exterior angle of 40° ?
Give a reason for your answer.

Answer

[2]

- 9 (a) John drives 14 km at an average speed of 50 km/h from Dakota to Sentosa.
He then drives 15 minutes from Sentosa to Changi Airport at an average
speed of 62 km/h.

- (i) Find the time taken for John to travel from Dakota to Sentosa.

Answerhr [1]

- (ii) Find the distance between Sentosa and Changi Airport.

Answerkm [1]

- (b) John compares prices of petrol between different kiosks.
The table shows the prices of the petrol at two different petrol kiosks and the discounts offered.

	BILMO	TEXCAR
Price of petrol (per litre)	\$3.37	\$3.44
Credit card discount	7%	10%
Additional rebate	\$2 instant rebate with minimum spend of \$60	-

John usually pays for his petrol using credit card.
Given that 1 litre of petrol can cover 12km, which petrol kiosk would be cheaper for John to pump at if he needs to cover 300km?
Show your workings.

Answer

John should pump at because he can save \$..... [4]

End of Section 2 & End of Paper

Name	Class				Index Number			
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SECONDARY 2 G2

END-OF-YEAR EXAMINATION 2023

MATHEMATICS

4045

Section 1

October 2023

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2 hours

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Section 1 & Section 2

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For π , use either your calculator value or 3.142, unless the question requires the answer in terms of π .

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Error in	Question Number	Marks Deducted
Rounding-off		
Reasoning		
Presentation		

For Examiner's Use	
Section 1	/ 35
Section 2	/ 35
Total	70

This document consists of 8 printed pages.

Setter: Mr See Woon Loon

[Turn Over

Mathematical Formulae*Compound interest*

$$\text{Total amount} = P \left(1 + \frac{r}{100} \right)^n$$

Mensuration

$$\text{Curved Surface area of a cone} = \pi r l$$

$$\text{Surface area of a sphere} = 4\pi r^2$$

$$\text{Volume of a cone} = \frac{1}{3} \pi r^2 h$$

$$\text{Volume of a sphere} = \frac{4}{3} \pi r^3$$

$$\text{Area of triangle } ABC = \frac{1}{2} ab \sin C$$

$$\text{Arc length} = r\theta, \text{ where } \theta \text{ is in radians}$$

$$\text{Sector area} = \frac{1}{2} r^2 \theta, \text{ where } \theta \text{ is in radians}$$

Trigonometry

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$a^2 = b^2 + c^2 - 2bc \cos A$$

Statistics

$$\text{Mean} = \frac{\sum fx}{\sum f}$$

$$\text{Standard deviation} = \sqrt{\frac{\sum fx^2}{\sum f} - \left(\frac{\sum fx}{\sum f} \right)^2}$$

Answer **all** the questions in this section.

1 Express 185.4962 correct to

(a) 2 decimal places,

Answer 185.50 AI [1]

(b) the nearest integer,

Answer 185 AI [1]

(c) 3 significant figures.

Answer 185 AI [1]

2 Calculate

(a) $\frac{\sqrt{34}}{2} \times 15^2$, giving your answer to the nearest hundred,

Answer 700 AI [1]

(b) $\frac{2}{3} \times 4 + 45 \div 3 - 4\frac{3}{5}$, giving your answer to the nearest tenth.

Answer 13.1 AI [1]

3

4

1000

29

$\sqrt{100}$

π

From the above list, write down

(a) one perfect square,

Answer 4 AI [1]

(b) one irrational number,

Answer π AI [1]

(c) one prime number.

Answer 29 AI [1]

- 4 (a) Write 150 as a product of its prime factors, leaving your answer in index notation.

$$\begin{array}{r} 2 \overline{)150} \\ 3 \overline{)75} \\ 5 \overline{)25} \\ 5 \overline{)5} \\ 1 \end{array}$$

MI

Answer $2 \times 3 \times 5^2$ AI [2]

- (b) It is given that $126 = 2 \times 3^2 \times 7$.
Find

- (i) the highest common factor (HCF) of 150 and 126,

$$\begin{aligned} \text{HCF} &= 2 \times 3 \\ &= 6 \end{aligned}$$

Answer 6 AI [1]

- (ii) the lowest common multiple (LCM) of 150 and 126.

$$\begin{aligned} \text{LCM} &= 2 \times 3^2 \times 5^2 \times 7 \\ &= 3150 \end{aligned}$$

Answer 3150 AI [1]

- (c) Find the smallest integer k such that $126k$ is a perfect square.

$$\begin{aligned} k &= 2 \times 7 \\ &= 14 \end{aligned}$$

Answer $k = 14$ AI [1]

- 5 Simplify each of the following.

(a) $\frac{3xy^2}{5y} \times \frac{10x}{9x^2y}$,

Answer $\frac{2}{3}$ AI [1]

(b) $\frac{7a^3}{2b^5} \div \frac{14a^3b}{18ab^4}$.

Answer $\frac{9a}{2b^2}$ AI [1]

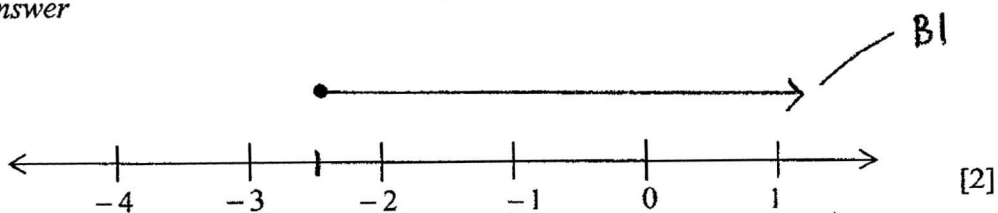
- 6 (a) Solve the inequality $4x \geq -10$ and represent the solution on the number line.

$$4x \geq -10$$

$$x \geq -2.5$$

B1

Answer



- (b) Hence, write down the smallest integer x that satisfies $4x \geq -10$.

Answer smallest $x = -2$ [1]

- 7 Solve the following equations.

(a) $\frac{2x+5}{3} = \frac{x-1}{2}$

$$\frac{2x+5}{3} = \frac{x-1}{2}$$

$$4x+10 = 3x-3$$

$$x = -13$$

M1

Answer $x = -13$ [2]

(b) $\frac{2y}{3} + \frac{y+1}{4} = 3$

$$\frac{2y}{3} + \frac{y+1}{4} = 3$$

$$\frac{8y+3y+3}{12} = 3$$

$$11y+3 = 36$$

$$11y = 33$$

$$y = 3$$

Answer $y = 3$ [3]

8 A map has a scale of 1: 25000.

(a) Find the actual distance represented by 6 cm on the map in metres.

$$\begin{array}{ccc}
 \text{Map} & : & \text{Actual} \\
 & & \\
 \times 6 \quad \left(\begin{array}{ccc} 1 & : & 25000 \\ 6 & : & 150000 \end{array} \right. & & \left. \times 6 \right) \quad \text{M1} \\
 & & \\
 150000 \text{ cm} & = & 1500 \text{ m}
 \end{array}$$

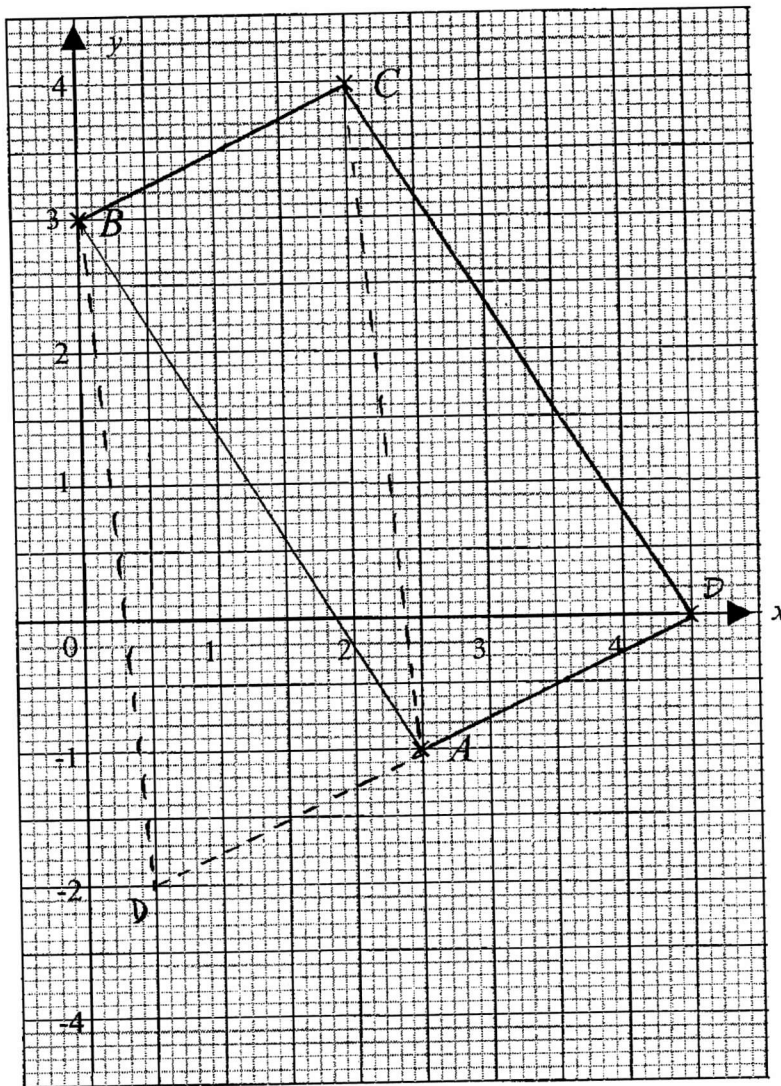
Answer 1500 m [2]

(b) A rectangular park has a length of 7 km and a width of 6 km.
Find the area of the park on the map, giving your answer in cm^2 .

$$\begin{array}{ccc}
 \text{Map} & : & \text{Actual} \\
 & & \\
 & & 1 \text{ cm} : 0.25 \text{ km} \\
 & & \\
 \times \frac{42}{0.0625} \quad \left(\begin{array}{ccc} 1 \text{ cm}^2 & : & 0.0625 \text{ km}^2 \\ 672 \text{ cm}^2 & : & 7 \times 6 = 42 \text{ km}^2 \end{array} \right. & & \left. \times \frac{42}{0.0625} \right) \quad \text{M1}
 \end{array}$$

Answer 672 cm^2 [2]

- 9 The grid shows the points A , B and C .



- (a) State the coordinates of point C .

Answer (.....2.....,4.....) [1] A1

- (b) Find the gradient of the line AB .

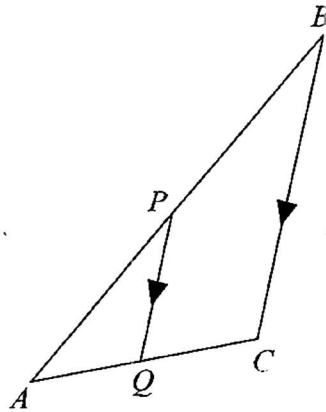
$$\text{gradient} = \frac{3 - (-1)}{0 - 2.5} = -1.6$$

Answer-1.6..... [2] A1

- (c) Write down the coordinates of point D such that $ABCD$ forms a parallelogram.

Answer (.....4.5.....,0.....) [1] A1
or 0.5 -2

- 10 In the diagram below the points P and Q lie on AB and AC respectively. PQ is parallel to BC .



- (a) Explain why triangle ABC is similar to triangle APQ .

Answer ... $\triangle ABC$ is similar to $\triangle APQ$ because they have the same shape and all their corresponding angles are the same.

M1

M1

[2]

- (b) Given that $BC = 10$ cm, $PQ = 4$ cm and $QC = 3$ cm, find the length of AC .

$\triangle ABC$ is similar to $\triangle APQ$,

$$\frac{BC}{PQ} = \frac{AC}{AQ} \quad \text{M1}$$

$$\frac{10}{4} = \frac{AC}{AC-3}$$

$$\frac{5}{2} = \frac{AC}{AC-3}$$

$$5AC - 15 = 2AC$$

$$3AC = 15$$

$$AC = 5$$

Answer $AC = 5$ cm [2]

A1

End of Section 1

Name Answers

Class			
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Index Number		
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BROADRICK SECONDARY SCHOOL
SECONDARY 2 G2
END-OF-YEAR EXAMINATION 2023

MATHEMATICS

4045

Section 2

October 2023

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2 hours

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Section 2

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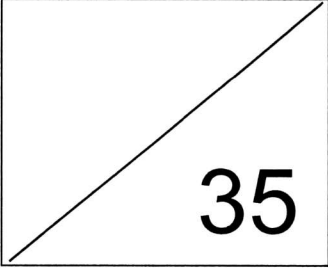
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For Examiner's Use (To combine with Section 1)		
Error in	Question Number	Marks Deducted
Rounding-off		
Reasoning		
Presentation		

For Examiner's Use
 35

Setter: Ms Hafizah

Answer **all** the questions in this section.

- 1 (a) Factorise $3x^2 + 5x - 2$.

$$(3x-1)(x+2) \text{ --B1}$$

Answer [1]

- (b) Hence, simplify $\frac{3x^2 + 5x - 2}{x^2 - 4}$.

$$\frac{(3x-1)(x+2)}{(x+2)(x-2)} = \frac{(3x-1)}{(x-2)} \text{ ---B1}$$

Answer [1]

- 2 It is given that C is directly proportional to the square of m .

When $C = 855$, $m = 10$.

Find

- (a) an equation connecting C and m ,

$$K = \frac{C}{m^2}$$

$$= \frac{855}{10^2} = 8.55 \text{ ----M1}$$

$$C = 8.55m \text{ ----A1}$$

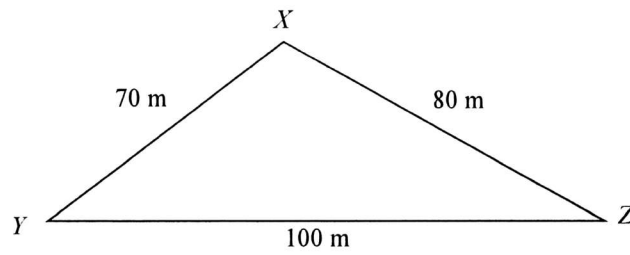
Answer ... $C = 8.55m^2$ [2]

- (b) the value of C when $m = 28.5$.

$$C = 8.55(28.5)^2 = 6944.7375 \text{ ----B1}$$

Answer $C =$ [1]

- 3 The diagram shows a sketch of a triangular field XYZ .



Construct an accurate scale drawing of the triangular field in the space provided [2]
below.

Use a scale of 1 cm to represent 10 m.

Answer

- 4 Three sides of a triangle are $(4x - 3)$ cm, $(2x - 2)$ cm and $(2x + 5)$ cm.
The perimeter of the triangle is 40 cm.
Find the value of x .

$$(4x - 3) + (2x - 2) + (2x + 5) = 40 \text{-----M1}$$

$$x = 5 \text{----A1}$$

Answer $x = \dots\dots\dots$ [2]

- (b) Show that the triangle is a right-angled triangle.

Answer

$$(4x - 3) = 17$$

$$(2x - 2) = 8$$

$$(2x + 5) = 15$$

$$a^2 + b^2 = 8^2 + 15^2 = 289$$

$$c^2 = 17^2 = 289$$

$$\text{Since } a^2 + b^2 = c^2$$

By the converse of Pythagoras theorem, hence the triangle is a right angled triangle

Answer $\dots\dots\dots$ [2]

- 5 A bookshop sells pens at \$ x each and notebooks at \$ y for a pack of 6.
 Ali bought 9 pens and 3 packs of notebooks.
 He paid \$36.
 Sarah bought 16 pens and 8 packs of notebooks.
 She paid \$76.

(a) *Answer*

$$\text{Ali: } 9x + y = 36$$

$$3x + y = 12 \text{ ----- B1 (shown)}$$

$$\text{Sarah: } 16x + 8y = 76$$

$$4x + 2y = 19 \text{ ----- B1 (Shown)}$$

shown

(b) Solve these simultaneous equations.

$$3x + y = 12$$

$$4x + 2y = 19$$

$$3x + y = 12 \text{ --(1)}$$

$$4x + 2y = 19 \text{ --(2)}$$

$$6x + 2y = 24 \text{ --(3)}$$

$$(3) - (2)$$

$$2x = 5$$

$$x = 2.5 \text{ ----- A1}$$

$$y = 12 - 3(2.5)$$

$$= 4.5 \text{ ----- A1}$$

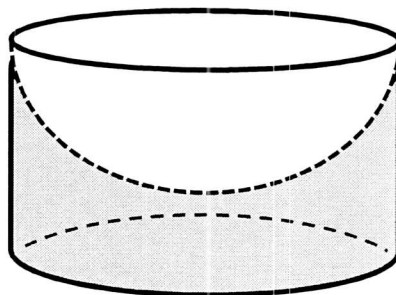
Answer $x = \dots\dots\dots, y = \dots\dots\dots$ [2]

(d) What is the cost of a notebook?

$$4.5 \div 6 = 0.75 \text{ ----- B1}$$

Answer \$..... [1]

- 6 A solid container is made by removing a hemisphere from the top of a solid cylinder with base diameter 18 cm and vertical height 14 cm.



- (a) Find the surface area of the hemisphere.

$$SA = 2(\pi)(9^2) \text{-----} M1$$

$$= 162\pi = 509cm^2 (3sf) \text{-----} A1$$

Answer [2]

- (b) Calculate the volume of the container.

$$vol = \pi(9^2)(14) - \frac{2}{3}(\pi)(9^3) \text{-----} M1$$

$$= 1134\pi - 486\pi$$

$$= 648\pi = 2040cm^3 (3sf) \text{-----} A1$$

Answer [2]

- 7 The stem-and-leaf diagram shows the weight, in kilogram, of the students in a class.

4	1	2	5	7	9	9		
5	0	1	1	4	5	5	9	9
6	1	3	6	7	8			
7	0	2	2					

Key: 4 | 1 means 41

Find

- (a) the number of students in the class,

22-----B1

Answer[1].....

- (b) the number of students with weight more than 55,

10-----B1

Answerstudents [1]

- (b) the median weight.

55kg---B1

Answerkg [1]

- 8 (a) A regular polygon has 12 sides.
Find the size of each interior angle.

$$\frac{(12-2) \times 180}{12} \text{ --- } M1$$

$$= 150 \text{ --- } A1$$

Answer [2]

- (b) Is it possible for a regular polygon to have an exterior angle of 40° ?
Give a reason for your answer.

Answer

$$\frac{360}{40} \text{ --- } M1$$

$$= 9$$

Yes the regular polygon will have 9 sides. --- A1

[2]

- 9 (a) John drives 14 km at an average speed of 50 km/h from Dakota to Sentosa. He then drives 15 minutes from Sentosa to Changi Airport at an average speed of 62 km/h.

- (i) Find the time taken for John to travel from Dakota to Sentosa.

$$\begin{aligned} \text{Time} &= \frac{14}{50} \\ &= 0.28 \text{ hour} \text{ ---- } B1 \end{aligned}$$

Answerhr [1]

- (ii) Find the distance between Sentosa and Changi Airport

$$\begin{aligned} \text{Time} &= \frac{15}{60} \times 62 \\ &= 15.5 \text{ km} \text{ ---- } B1 \end{aligned}$$

Answerkm [1]

- (iii) His travel companion, Muthu, says that his average speed for the whole journey is 56 km/h. Do you agree with Muthu? Show your workings.

$$\text{TotalTime} = 0.28 + 0.25 = 0.53 \text{ hr}$$

$$\text{Totaldist} = 14 + 15.5 = 29.5 \text{ km}$$

$$\text{Averagespeed} = \frac{29.5}{0.53} = 55.7 \text{ km / h (3sf)}$$

No I do not agree with Muthu as the average speed is 55.7km/h

Answer

.....

..... [3]

- (b) The next day, John wants to refuel his car with 25 litres of petrol for the week.
He compares prices of petrol between different kiosks.
The table shows the prices of the petrol at two different petrol kiosks and the discounts offered.

	BILMO	TEXCAR
Price of petrol (per litre)	\$3.37	\$3.44
Credit card discount	7%	10%
Additional rebate	\$2 instant rebate with minimum spend of \$60	-

John usually pays for his petrol using credit card.
Which petrol kiosk should he pump petrol at?
Show your workings.

Answer

BILMO: $(25 \times \$3.37 \times 0.93) - 2 = \$76.3525 \text{ --- } M1$

TEXCAR: $(25 \times \$3.44 \times 0.9) = \$77.40 \text{ --- } M1$

John should pump at BILMO because he can save \$1.05.-----A1

John should pump at because he can save \$. [3]

End of Section 2 & End of Paper