BEDOK VIEW SECONDARY SCHOOL
END-OF-YEAR EXAMINATION 2023

CANDIDATE NAME			
REGISTER NUMBER		CLASS	

MATHEMATICS SYLLABUS A
Secondary 2 Normal Academic
Paper 1

4045/01
3 October 2023
1 hour 15 minutes

Candidates answer on the Question Paper.

READ THESE INSTRUCTIONS FIRST

Write your index number and name 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.

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

If working is needed for any question it must be shown with the answer.
Omission of essential working will result in loss of marks.
The total of the marks for this paper is 50.

The use of an approved scientific calculator is expected, where appropriate.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

Total	

Parent's / Guardian's Signature: .....

[Turn over

Answer **all** the questions.

1 Expand and simplify the following.

(a) $3a(9a+1)+2(10-2a^2)$

Answer ..... [2]

(b) $(6c+7)^2$

Answer ..... [2]

---

2 Factorise the following completely.

(a) $3b^2+8b+4$

Answer ..... [2]

[Turn over]

(b) $4-36e^2$

Answer ..... [2]

(c) $16dx^3-8dx^2-12d$

Answer ..... [1]

---

3 Solve the simultaneous equations.

$$8p + q = 32$$
$$5p - 2q = -1$$

Answer p = ...

q = ... [3]

[Turn over]

4 **(a)** A rectangle has a length of x cm and a breadth which is $\frac{1}{3}$ of the length.

Given that the perimeter of the rectangle is 48 cm,

(i) write down an expression, in terms of x, to represent the perimeter of the rectangle,

Answer ..... [1]

(ii) hence, find the length and the breadth of the rectangle.

Length = ...

Breadth = ... [2]

(b) Given that $4x \geq 24$,

(i) solve this inequality, representing your answer on the number line below.

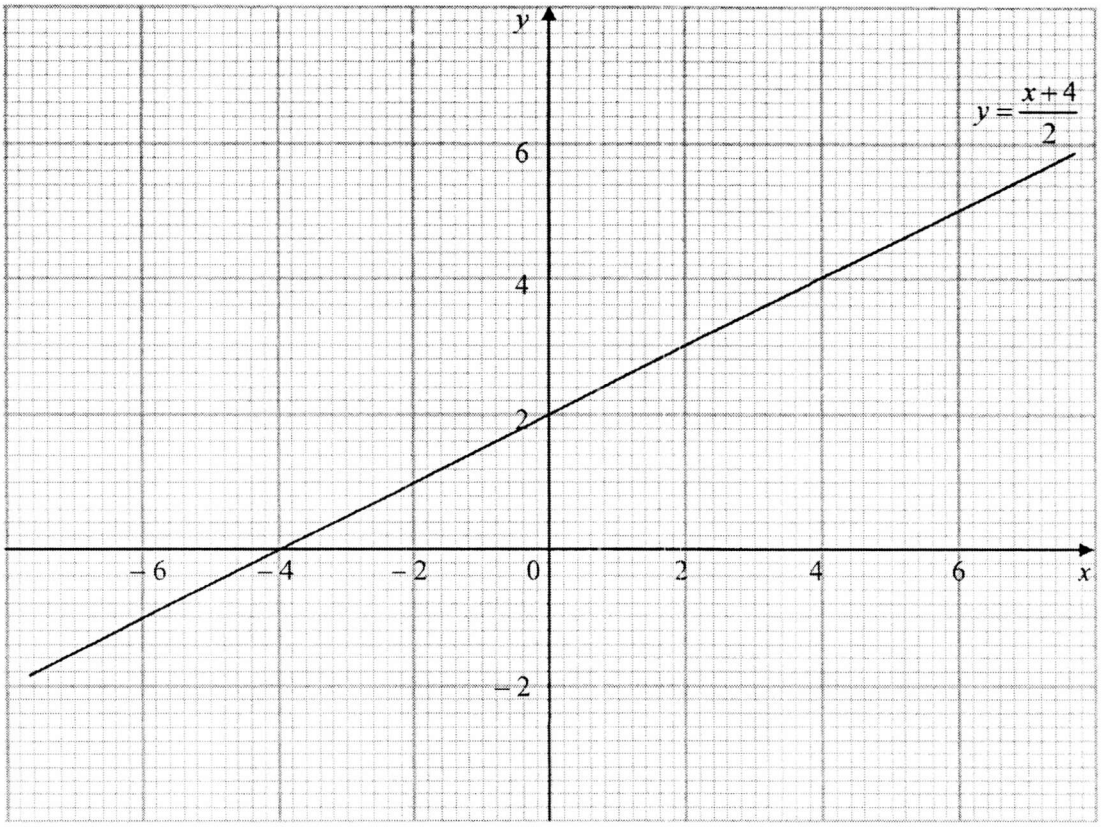
Answer

[2]

(ii) hence, find the smallest perfect cube value of x which satisfies the inequality $4x \geq 24$.

Answer x = ... [1]

5 The diagram shows the graph of $y = \frac{x+4}{2}$.



(a) Write down the gradient of the line $y = \frac{x+4}{2}$.

Answer ..... [1]

(b) Complete the following table for $y = -\frac{3}{2}x + 6$.

x	0	2	4
y	6		

[2]

(c) Using the same axes provided, draw and label the graph of $y = -\frac{3}{2}x + 6$. [1]

(d) Hence solve the equation $\frac{x+4}{2} = -\frac{3}{2}x + 6$.

Answer x = ... [1]

[Turn over]

6 An UNO deck consists of 76 Number cards, 24 Action cards and 8 Wild cards.

(a) What is the total number of cards in the UNO deck?

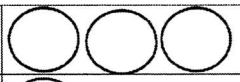
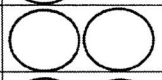
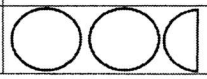
Answer ..... cards [1]

(b) What is the probability of getting an Action or a Wild card?

Answer ..... [1]

---

7 The pictogram below represents the number of students who enjoy playing ball games.

Basketball	
Hockey	
Floorball	
Football	
Netball	
Tchoukball	

Each  represents 2 students.

(a) There are 26 students in total. How many students enjoy playing netball?

Answer ..... students [2]

(b) Complete the pictogram for netball.

Answer In the pictogram above [1]

(c) Find the ratio of students who enjoy hockey to those who enjoy tchoukball.

Answer ..... : ..... [1]

---

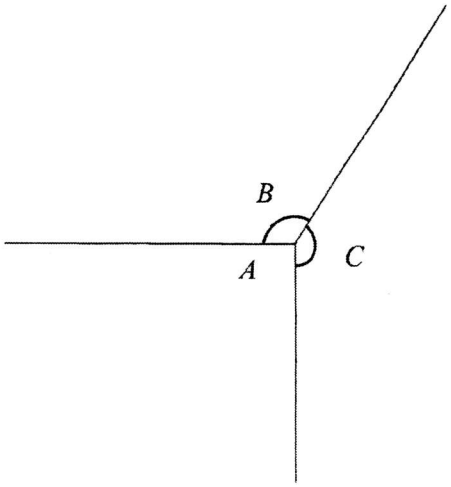
8 In triangle PQR, $PQ = 20$ cm, $QR = 25$ cm and $PR = 32$ cm.
Show that triangle PQR is not a right-angled triangle.

Answer

[4]

[Turn over]

9 In the given figure below, angle A is the interior angle of a rectangle and angle B is the interior angle of a pentagon.



Calculate

(a) angle B,

Answer ..... [2]

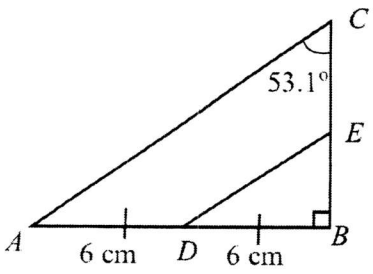
(b) angle C,

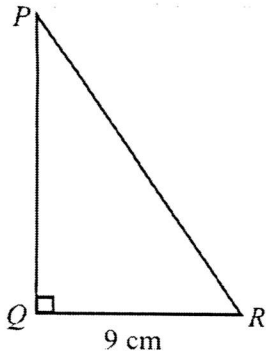
Answer ..... [1]

(c) the value of n if angle C is the interior angle of a regular n-sided polygon.

Answer n = ... [2]

10 Triangles ABC and PQR are congruent.





(a) Write down the length of BC.

Answer BC = ... cm [1]

(b) Find the length of AC.

Answer AC = ... cm [2]

(c) Find angle QPR.

Answer Angle QPR = ...° [2]

(d) Triangles ABC and DBE are similar.
Find the length of BE.

Answer BE = ... cm [2]

[Turn over]

11 It is given that y is inversely proportional to the square of x and when $x = 10, y = 30$.

(a) Find an equation connecting x and y.

Answer ..... [2]

(b) Find the value of y when $x = 20$.

Answer ..... [1]

(c) Find the positive value of x when $y = \frac{5}{6}$.

Answer ..... [2]

END OF PAPER

BEDOK VIEW SECONDARY SCHOOL
END-OF-YEAR EXAMINATION 2023

CANDIDATE NAME			
REGISTER NUMBER		CLASS	

MATHEMATICS SYLLABUS A
Secondary 2 Normal Academic
Paper 2

4045/02
5 October 2023
1 hour 30 minutes

Candidates answer on the Question Paper.

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For π, use either your calculator value or 3.142.

Total	

Parent's / Guardian's Signature: .....

[Turn over

Answer **all** the questions.

1 **(a)** Arrange the following numbers in descending order.

$$60\%,\ -0.26,\ \frac{13}{20},\ 0.\dot{5},\ 0.63$$

Answer ....., ..., ..., ..., ... [2]

(b) The number of tickets sold for the Taylor Swift concert was 55 000 when rounded off to 3 significant figures. What is the largest possible number of tickets sold?

Answer ..... [1]

---

2 **(a)** Express 1500 g as a percentage of 130 kg.

Answer .....% [2]

(b) 20% of a number is 800. Find the number.

Answer ..... [1]

[Turn over

3 Lionel Messi takes 10 seconds on average to cover 12 m during a football match.

(a) Express the speed of Messi in km/min.

Answer ..... km/min [2]

(b) Calculate the maximum distance that Messi would run during a full soccer match of 90 minutes. Give your answer in kilometres.

Answer ..... km [2]

---

4 Given that $(a+b)^2 = 64$ and $ab = 15$, find the value of $a^2 + b^2$.

Answer ..... [2]

---

5 A map is drawn to a scale of 1 cm to 250 m.

(a) Given that an expressway measures 20 cm on the map, find its actual length in kilometres.

Answer ..... km [2]

(b) The actual width of a building is 150 m. Find the width of the building on the map.

Answer ..... cm [2]

(c) The area of a field on the map is 8 cm^2. Find the actual area of the field in km^2.

Answer ..... km^2 [2]

[Turn over

6 Solve the following equation.

$$\frac{3}{5}x + 5 = 20$$

Answer ..... [2]

---

7 Simplify the following.

(a) $\dfrac{3xz + 3yz}{x^2 + xy}$

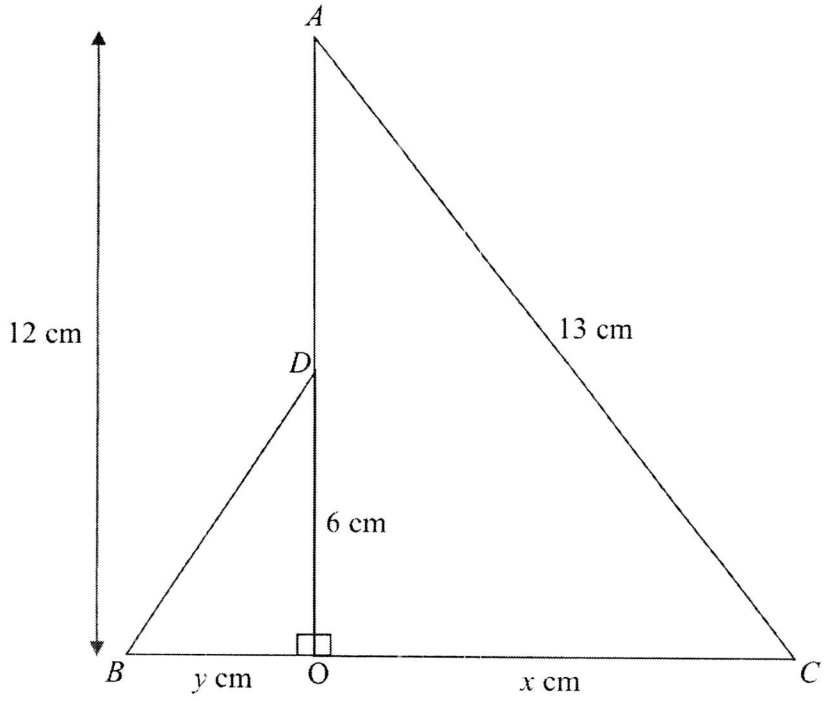
Answer ..... [2]

(b) $\dfrac{5x - 15y}{6x - 8y} \div \dfrac{4x - 12y}{9x - 12y}$

Answer ..... [3]

---

8 In the diagram below, $\angle AOC = 90°$, $AC = 13$ cm, $OA = 12$ cm, $OB = y$ cm $OC = x$ cm and $OD = 6$ cm. ΔBOD is similar to ΔCOA.



Find,

(a) the value of x,

Answer..... [2]

(b) the value of y.

Answer ..... [2]

[Turn over

9 A store has a total of 120 size 6 and size 7 basketballs. A basketball is chosen at random by a student and the probability of choosing a size 7 ball is $\frac{3}{5}$.

(a) Find the number of size 6 basketballs in the store.

Answer ..... basketballs [2]

(b) After losing x number of size 7 basketballs, the probability of choosing a size 6 ball is now $\frac{1}{2}$. Find the value of x.

Answer $x =$ ..... [3]

---

10 Given that it took 5 days for 15 workers to paint 5 houses, find the number of workers needed to paint 10 such houses in 3 days.

Answer .....workers [2]

---

11 The stem-and-leaf diagram below shows the number of hours a group of teenagers spend on gaming in a week.

Time spent on gaming in hours	
0	3 5
1	2 4 5 8
2	0 0 0 2 4 4 5 6 7 7
3	1 5 9
4	5

Key: 1 | 2 means 12 hours

(a) State the modal time spent gaming.

Answer ..... hrs [1]

(b) Calculate the mean time spent gaming.

Answer ..... hrs [2]

(c) Find the median time spent gaming.

Answer ..... hrs [2]

(d) A teenager is randomly selected from the group. What is the probability of the teenager spending less than 20 hours on gaming?

Answer ..... [2]

[Turn over

12 Construct a quadrilateral $ABCD$ such that $AB = 6.5$ cm, $BC = 8$ cm, $CD = 10$ cm, $\angle ABC = 110°$, $\angle BCD = 45°$. [3]

Using the figure you have drawn,

(a) measure the length of line AD,

Answer ..... cm [1]

(b) measure $\angle BAD$,

Answer ..... ° [1]

(c) measure the length of diagonal BD,

Answer ..... cm [1]

(d) mark the point M in the quadrilateral where M is the intersection point between the 2 diagonals in the quadrilateral. [1]

END OF PAPER

Bedok View Secondary School

Mathematics Department Marking Scheme

Year	2023	Level & Stream	2NA
Type of Exam	EYE	Subject	Mathematics P1

No.	Working	Remarks
1 (a)	$3a(9a+1)+2(10-2a^2)$	
	$=27a^2+3a+20-4a^2$ **[M1 (expansion)]**	
	$=23a^2+3a+20$ **[A1 (simplification)]**	
(b)	$(6c+7)^2$	
	$=(6c)^2+2(6c)(7)+7^2$ **[M1 (using special algebraic identity)]**	
	$=36c^2+84c+49$ **[A1]**	
	Alternative working (not using identity): $(6c+7)^2$	
	$=(6c+7)(6c+7)$	
	$=36c^2+42c+42c+49$ **[M1 expansion via 'rainbows']**	
	$=36c^2+84c+49$ **[A1]**	

[Total: 4m]

No.	Working	Remarks
2 (a)	**[M1 (show factorisation)]** $3b \times +2 \mid +2b$ $b \times +2 \mid +6b$ $3b^2 \quad +4 \mid +8b$ OR X | $3b$ | $+2$ b | $3b^2$ | $+2b$ $+2$ | $+6b$ | $+4$ $3b^2+8b+4$ $=(3b+2)(b+2)$ **[A1]**	
(b)	***Method 1 (take out common factor 4 as the first step)*** $4-36e^2$ $=4(1-9e^2)$ **[M1]** $=4[1^2-(3e)^2]$ $=4(1+3e)(1-3e)$ **[A1 (using special algebraic identity)]** ***Method 2 (take out common factor 4 as the last step)*** $4-36e^2$ $=2^2-(6e)^2$ $=(2+6e)(2-6e)$ **[M1 (using special algebraic identity)** $=2(1+3e)\times 2(1-3e)$ $=4(1+3e)(1-3e)$ **[A1]**	

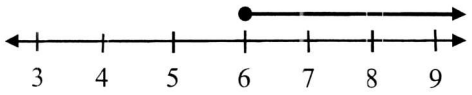
No.	Working	Remarks
	Method 3 (not using identity): **[M1 (show factorisation)]** $2 \times +6e \mid +12e$ $2 \times -6e \mid -12e$ $4 \quad -36e^2 \mid +0e$ OR X | 2 | $-6e$ 2 | 4 | $-12e$ $+6e$ | $+12e$ | $-36e^2$ OR $1 \times +3e \mid +3e$ $1 \times -3e \mid -3e$ $1 \quad -9e^2 \mid +0e$ OR X | 1 | $-3e$ 1 | 1 | $-3e$ $+3e$ | $+3e$ | $-9e^2$ $4-36e^2$ $=4(1+3e)(1-3e)$ **[A1]**	
(c)	$16dx^3-8dx^2-12d$ $=4d(4x^3-2x^2-3)$ **[B1]**	

[Total: 5m]

No.	Working	Remarks
3	***Method 1: Elimination of q*** $8p+q=32$ -- (1) $5p-2q=-1$ -- (2) (1) × 2: $16p+2q=64$ -- (3) (2) + (3): $21p=63$ **[M1]** $p=3$ **[A1]** Sub $p=3$ into (1): $8(3)+q=32$ $24+q=32$ $q=8$ **[A1]** ***Method 2: Elimination of p*** $8p+q=32$ -- (1) $5p-2q=-1$ -- (2) (1) × 5: $40p+5q=160$ -- (3) (2) × 8: $40p-16q=-8$ -- (4) (3) – (4): $21q=168$ **[M1]** $q=8$ **[A1]** Sub $q=8$ into (2): $5p-2(8)=-1$ $5p-16=-1$ $5p=15$ $p=3$ **[A1]** ***Method 3: Substitution of q*** $8p+q=32$ -- (1) $5p-2q=-1$ -- (2) From (1): $q=32-8p$ -- (3) Sub (3) into (1): $5p-2(32-8p)=-1$ **[M1]** $5p-64+16p=-1$ $21p=63$ $p=3$ **[A1]** Sub $p=3$ into (3): $q=32-8(3)$ $q=8$ **[A1]**	

No.	Working	Remarks
	Method 4: Substitution of p $8p+q=32$ -- (1) $5p-2q=-1$ -- (2) From (2): $5p-2q=-1$ $p=\frac{2q-1}{5}$ -- (3) Sub (3) into (1): $8\left(\frac{2q-1}{5}\right)+q=32$ **[M1]** $8(2q-1)+5q=160$ $16q-8+5q=160$ $21q=168$ $q=8$ **[A1]** Sub $q=8$ into (3): $p=\frac{2(8)-1}{5}$ $p=3$ **[A1]**	

[Total: 3m]

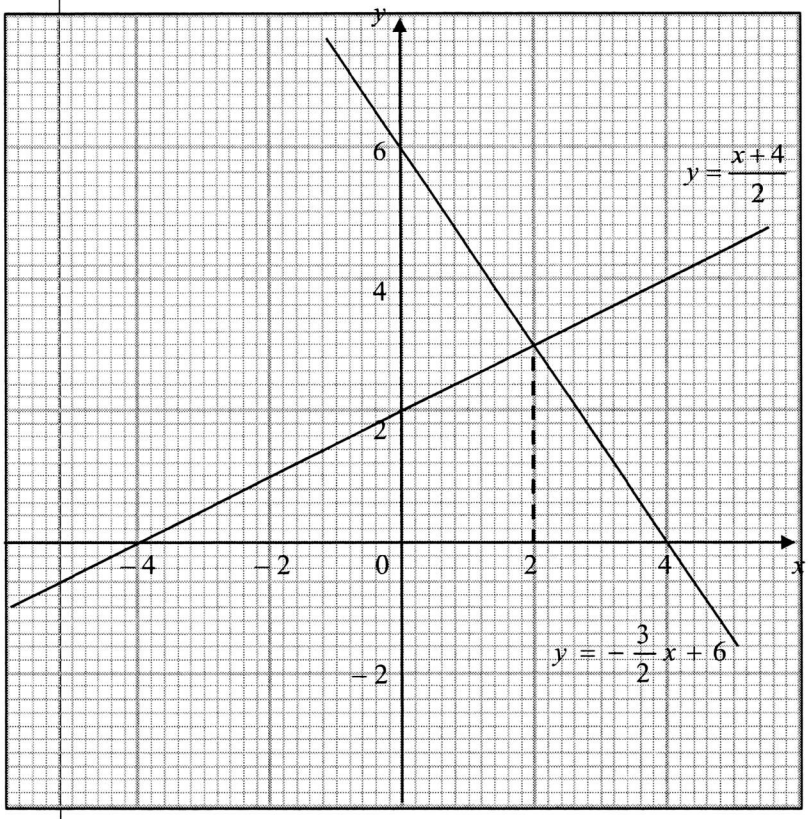
No.		Working	Remarks
4 (a)	(i)	Perimeter of rectangle $= x + x + \frac{x}{3} + \frac{x}{3}$ $= \frac{3x}{3} + \frac{3x}{3} + \frac{x}{3} + \frac{x}{3}$ $= \frac{8x}{3}$ **[B1]**	
	(ii)	$\frac{8x}{3} = 48$ **[M1√ - follow through mark for (i)]** $8x = 144$ $x = \frac{144}{8}$ $x = 18$ Length $= x$ $= 18$ cm Breadth $= \frac{x}{3}$ $= 6$ cm **[A1 for both length and breadth]**	0 marks for whole of (ii) if this first step is missing (hence).
(b)	(i)	$4x \geq 24$ $x \geq 6$ **[B1 – for inequality]** $x \geq 6$  **[B1 – for number line]**	
	(ii)	If x is a perfect cube, smallest possible value of $x = 8$ **[B1]**	

[Total: 6m]

No.	Working	Remarks
5 (a)	Gradient $= \frac{1}{2}$ **[B1]**	**Award B1 if student gave the gradient as 0.5.**
(b)		**B1, B1**

x	0	2	4
y	6	**3**	**0**

(c)



B1 for both line and labelling. P error if line is not labelled.

(d) From the graph, the intersection point is at (2, 3).
Therefore, $x = 2$. **[B1]**

0 mark if student worked out the fractional equation to solve for x.

[Total: 6m]

No.	Working	Remarks
6 (a)	Total number of cards in the UNO deck = 76 +24 + 8 = 108 **[B1]**	
(b)	P (Action or Wild card) $= \frac{24+8}{108}$ $= \frac{32}{108}$ $= \frac{8}{27}$ **[B1]**	Follow through error-mark from (a)

[Total: 2m]

No.	Working	Remarks
7 (a)	Number of students who enjoy playing netball $= 26 - 3(2) - 1(2) - 2(2) - 2(2) - 2.5(2)$ **[M1]** $= 26 - 6 - 2 - 4 - 4 - 5$ $= 5$ **[A1]**	
(b)	 **[B1]**	
(c)	Ratio of students who enjoy hockey to those who enjoy tchoukball $= \mathbf{2 : 5}$ **[B1]**	

[Total: 4m]

No.	Working	Remarks
8	PQ^2 $= 20^2$ $= 400$ QR^2 $= 25^2$ $= 625$ **[B1]** PR^2 $= 32^2$ $= 1024$ **[B1]** Sum of squares of shorter two sides $= PQ^2 + QR^2$ $= 400 + 625$ $= 1025$ But square of the third side $PR^2 = 1024$, not 1025. **[B1]** Therefore, $PQ^2 + QR^2 \neq PR^2$, so Pythagoras' Theorem is not satisfied. By the converse of Pythagoras' Theorem, triangle PQR is not a right-angled triangle. **[A1]**	

[Total: 4m]

No.	Working	Remarks
9 (a)	Angle $A = 90°$ (interior angle of rectangle)	P error if wrong or missing reason
	Angle B $= \frac{(5-2)\times 180°}{5}$ **[M1 (int angle formula)]** $= \frac{3\times 180°}{5}$ $= 108°$ **[A1]**	
(b)	Angle C $= 360° - 90° - 108°$ (angles at a point) $= 162°$ **[B1]**	P error if wrong or missing reason
(c)	***Method 1: Interior angle formula (for regular polygon)*** $\frac{(n-2)\times 180°}{n} = 162°$ **[M1]** $180°n - 360° = 162°n$ $180°n - 162°n = 360°$ $18°n = 360°$ $n = 20$ **[A1]**	
	Method 2: Exterior angle formula (for regular polygon) $\frac{360°}{n} = 180° - 162°$ **[M1 (ext angle formula)]** $360 = 18n$ $18n = 360$ $n = 20$ **[A1]**	

[Total: 5m]

No.	Working	Remarks
10 (a)	BC $= QR$ $= 9$ cm **[B1]**	
(b)	By Pythagoras' Theorem, $AC^2 = AB^2 + BC^2$ $AC^2 = 12^2 + 9^2$ $AC^2 = 144 + 81$ $AC^2 = 225$ $AC = 15$ **[A1]**	
(c)	Angle QPR = Angle BAC = $180^\circ - 90^\circ - 53.1^\circ$ (angle sum of triangle) **[M1** = 36.9° **[A1]**	
(d)	Triangles ABC and DBE are similar. $\frac{BE}{BC} = \frac{DB}{AB}$ $\frac{BE}{9} = \frac{6}{6+6}$ **[M1√]** $\frac{BE}{9} = \frac{6}{12}$ $BE = 4.5cm$ **[A1]**	Follow through from **(a)**

[Total: 7m]

No.	Working	Remarks
11 (a)	$y = \frac{k}{x^2}$ When $x = 10$ and $y = 30$, $30 = \frac{k}{10^2}$ **[M1]** $k = 10^2 \times 30$ $k = 3000$ $y = \frac{3000}{x^2}$ **[A1]**	
(b)	When $x = 20$, $y = \frac{3000}{20^2}$ $y = \frac{3000}{400}$ $y = 7.5$ **[B1]**	
(c)	When $y = \frac{5}{6}$, $\frac{5}{6} = \frac{3000}{x^2}$ $5x^2 = 18000$ **[M1]** $x^2 = 3600$ $x = 60$ **[A1]**	0 mark if student's final answer included the negative value of x.

[Total: 5m]

Bedok View Secondary School
Mathematics Department

Marking Scheme

Year	2023	Level & Stream	2N
Type of Exam	EYE PAPER 2	Subject	E Maths

No.		Working	Remarks
1	(a)	$\frac{13}{20}$, 0.63, 60%, $0.\dot{5}$, -0.26 **[B2]**	Deduct 1 mark for 1 mistake
	(b)	55049 **[B1]**	

[Total: 3m]

2	(a)	$\frac{1500}{130\times1000}\times100$ **[M1]** $=1.15\%$ **[A1]**	
	(b)	$\frac{800}{20}\times100$ $=4000$ **[B1]**	

[Total: 3m]

3	(a)	Speed$=\frac{12}{1000}\times6$ **[M1]** $=0.072$km/min **[A1]**	
	(b)	Max distance $=0.072\times90$ **[M1]** $=6.48$ km **[A1]**	

[Total: 4m]

4	$(a+b)^2=64$ $a^2+b^2+2ab=64$ $a^2+b^2=64-2(15)$ **[M1]** $a^2+b^2=34$ **[A1]**	

[Total: 2m]

5	(a)	1 cm : 250 m Actual length $= 20 \times 250$ **[M1]** $= 5000$ m $= 5$ km **[A1]**	
	(b)	Width on the map $= \frac{1}{250} \times 150$ **[M1]** $= 0.6$cm **[A1]**	
	(c)	Area Scale : 1 cm^2 : $(250 \times 250) m^2$ 8 cm^2 : $(250 \times 250 \times 8) m^2$ **[M1-**change to area scale**]** $= 500000 m^2$ $= 0.5$ km^2 **[A1]**	

[Total: 6m]

6	$\frac{3}{5}x + 5 = 20$ $\frac{3}{5}x = 15$ $3x = 75$ **[M1]** $x = 25$ **[A1]**	

[Total: 2m]

[M1 – for using pythagoras' theorem**]**

7	**(a)**	$\frac{3xz+3yz}{x^2+xy}$ $=\frac{3z(x+y)}{x(x+y)}$ **[M1 –** for factorising numerator and denominator**]** $=\frac{3z}{x}$ **[A1]**	
	(b)	$\frac{5x-15y}{6x-8y} \div \frac{4x-12y}{9x-12y}$ $=\frac{5(x-3y)}{2(3x-4y)} \div \frac{4(x-3y)}{3(3x-4y)}$ **[M1 –** for factorising all terms**]** $=\frac{5(x-3y)}{2(3x-4y)} \times \frac{3(3x-4y)}{4(x-3y)}$ **[M1 –** for flipping fraction **]** $=1\frac{7}{8}$ **[A1]**	***P*** if answer is in improper fraction

[Total: 5m]

8(a)	$x^2+12^2=13^2$ $x=\sqrt{13^3-12^2}$ $x=\sqrt{25}$ $x=5$ **[A1]**	
8(b)	$\frac{12}{6}=\frac{5}{y}$ **[M1]** $y=2.5$ **[A1]**	

[Total:4m]

9	**(a)**	Number of Size 6 basketballs $=\frac{2}{5}\times 120$ **[M1]** $=48$ **[A1]**	
	(b)	$\frac{48}{120-x}=\frac{1}{2}$ **[M1- For forming the algebraic equation]** $120-x=96$ $x=120-96$ **[M1]** $x=24$ **[A1]**	

[Total: 5m]

10	No of Workers | No of Days | No of Figures 15 | 5 | 5 15 | 10 | 10 150 | 1 | 10 50 | 3 | 10 **[M1]** Number of workers needed = 50 **[A1]**	

[Total: 2m]

11 (a) Mode = 20 hours **[B1]**

(b)

Time spent on gaming in hours		Total hours
0	3 5	8
1	2 4 5 8	59
2	0 0 0 2 4 4 5 6 7 7	235
3	1 5 9	105
4	5	45
		Total: 452

$$\text{Mean} = \frac{452}{20} \quad \textbf{[M1]}$$

$$= 22.6 \text{ hrs} \quad \textbf{[A1]}$$

(c)

$$\text{Median} = \frac{22+24}{2}$$

$$= 23 \text{ hrs} \quad \textbf{[B2]}$$

(d)

$$\text{Probability} = \frac{6}{20} \quad \textbf{[M1]}$$

$$= \frac{3}{10} \quad \textbf{[A1]}$$

Accept 0.3

[Total: 7m]

12	[**B1** – for drawing lines AB, BC and CD] [**B1** – for drawing] $\angle ABC$] [**B1** – for drawing $\angle BCD$]	
(a)	3.3 cm $\pm$ 0.1 cm **[B1]**	**FT** if answer is accurate from the diagram drawn
(b)	87° $\pm$ 1° **[B1]**	
(c)	7 cm **[B1]**	
(d)	Mark point M correctly **[B1]**	**FT** if point M is marked accurately using the diagram drawn.

[Total:7m]