



**BEATTY SECONDARY SCHOOL
PRELIMINARY EXAMINATION 2024
SECONDARY FOUR NORMAL (ACADEMIC)**

CANDIDATE
NAME

CLASS

REGISTER
NUMBER

MATHEMATICS (SYLLABUS A)

Paper 1

Setter:

4045/01

1 August 2024

2 hours

Candidates answer on the Question Paper

Additional Materials: Nil

READ THESE INSTRUCTIONS FIRST

Write your name, class and register 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.

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 70.

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.

For Examiner's Use

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This document consists of **15** printed pages and **1** blank page.

[Turn over

Mathematical Formulae*Compound Interest*

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

Mensuration

$$\text{Curved surface area of a cone} = \pi rl$$

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

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

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

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

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

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

Trigonometry

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

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

Statistics

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

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

1 $\frac{5\pi}{4}$ 3.9 $0.5^{-\frac{2}{3}}$ $\sqrt{5}$ $\frac{7}{3}$

Write these numbers in order of size, starting with the smallest.

Answer ,,,, [2]
smallest

2 Find the smallest integer satisfying $5 - 3x < 9$.

Answer [2]

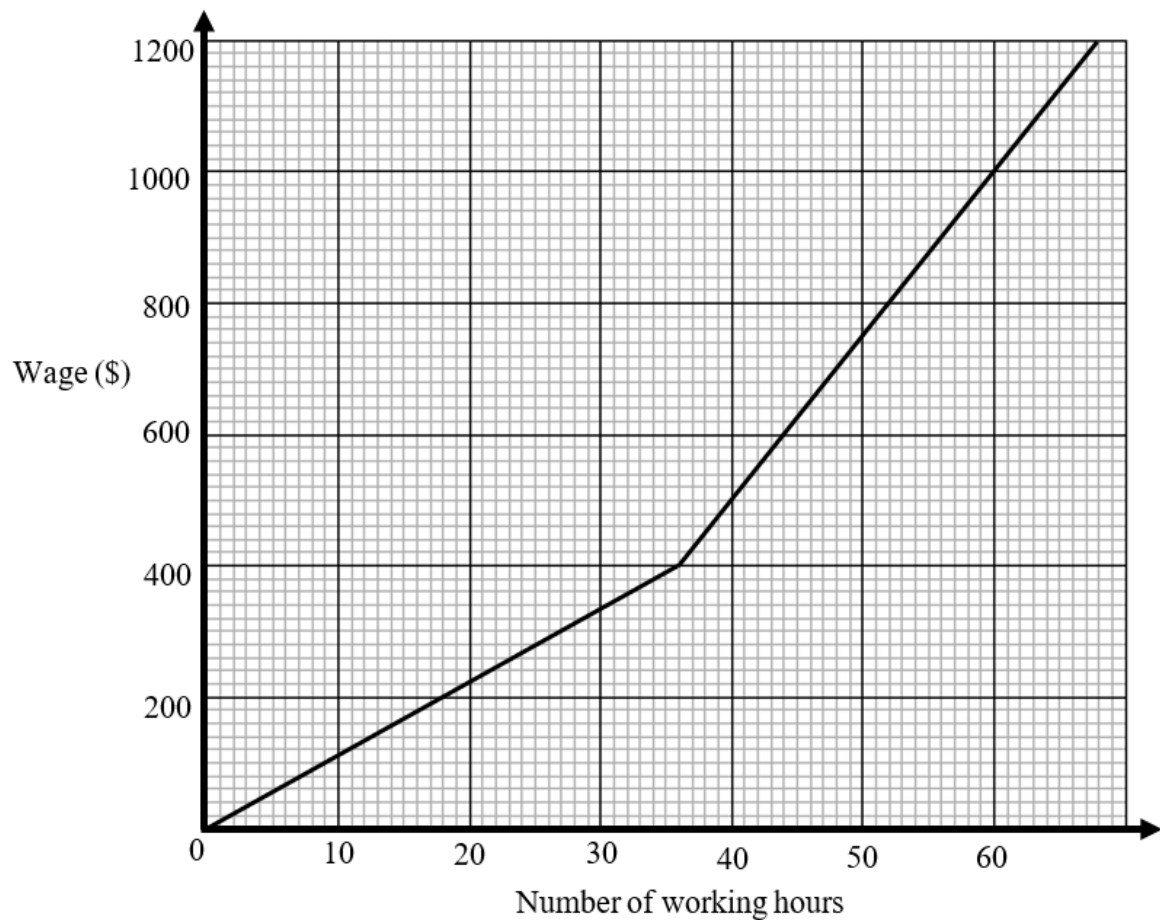
3 (a) Express 1 km : 240 m as a ratio in its simplest form.

Answer : [1]

(b) A barrister mixes type A tea and type B tea in the ratio of 2 : 5 to get a special blend of tea. How much type B tea are there in 21 kg of the special blend?

Answer kg [1]

- 4 Jamal is paid a fixed rate for the first 36 hours he works in a week. For any extra hours, he is paid an overtime rate. The following graph shows how much he is being paid based on his working hours.



- (a) In a particular week, he worked for 25 hours. How much is he paid?

Answer \$ [1]

- (b) The company that employed Jamal claims that its rate of overtime pay is 2.5 times the normal pay rate.

Is the claim correct? Explain your answer.

Answer

- 5 (a) Express 756 as a product of its prime factors.

Answer [1]

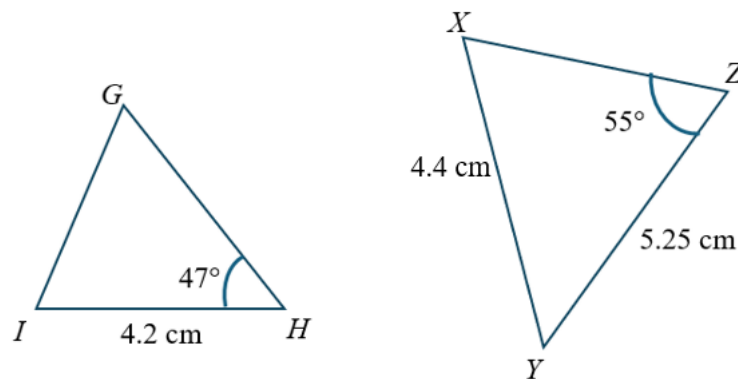
- (b) Find the highest common factor of 756 and $2^3 \times 3^2 \times 5^3$.

Answer [1]

- (c) Write down the smallest positive integer of n , where $756n$ is a perfect square.

Answer [1]

6



It is given that $\triangle GHI$ and $\triangle XYZ$ are similar.
Find

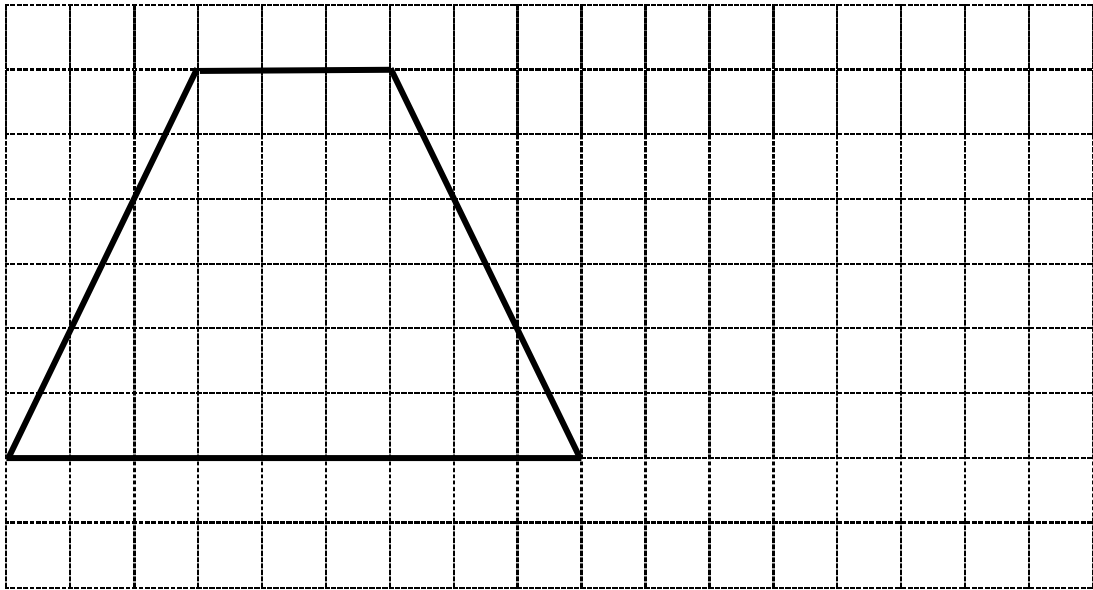
- (a) angle YXZ ,

Answer Angle YXZ = [1]

- (b) the length of GH .

Answer cm [2]

- 7 Draw a reduction of the given trapezium using a scale factor of $\frac{2}{3}$.



[2]

- 8 One of the angles of a triangle measures x° .
Given that $\sin x^\circ = \frac{4}{7}$, find the two possible values of x .

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

- 9 The first four terms of a sequence are 11, 8, 5 and 2.

(a) Write down the next two terms in the sequence.

Answer $\dots\dots\dots, \dots\dots\dots$ [1]

(b) Find an expression for the n th term in the sequence.

Answer $\dots\dots\dots$ [1]

(c) Is -45 a term of this sequence? Explain your answer.

Answer

[2]

- 10 The following stem-and-leaf diagram shows the weight distribution of 18 students in kg.

Stem	Leaf
4	5 7 9
5	1 5 7 7 7 8
6	0 1 4 5 8
7	1 1 3 6

Key: 4 | 5 means 45 kg

- (a) State the modal weight.

Answer kg [1]

- (b) Find the median of the distribution.

Answer kg [1]

- (c) Find the interquartile range of the distribution.

Answer kg [2]

- 11 (a) Convert 50 m/s to km/h.

Answer km/h [1]

- (b) A lorry travels at x km/h and completes its journey in 1 hour 15 minutes.
Find the speed of the lorry, in terms of x , if it is required to complete the same journey in 45 minutes.

Answer km/h [2]

12 It is given that $p = \frac{m^2 - n^2}{3q}$.

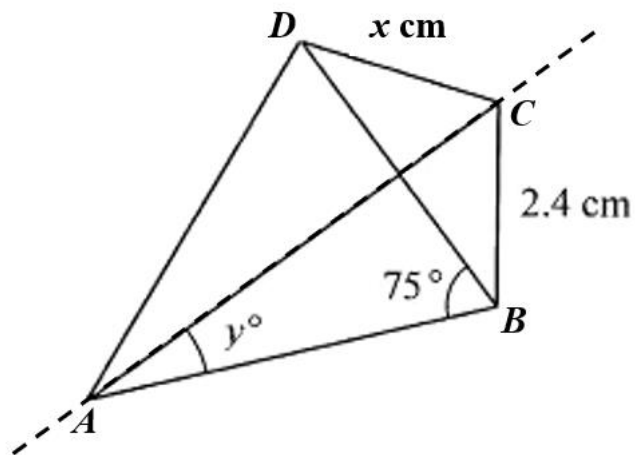
(a) Find p when $m = -2$, $n = -3$ and $q = 5$.

Answer [1]

(b) Rearrange the formula to make n the subject.

Answer $n =$ [2]

13



The quadrilateral has one line of symmetry, marked as a dotted line in the diagram.

(a) Write down the value of x .

Answer $x =$ [1]

(b) Calculate y .

Answer $y =$ [2]

- 14 May invested \$4800 in a company, which pays a simple interest of 5% per annum. Find the number of years it will take for her to receive an interest of \$2280 on her investment.

Answer years [2]

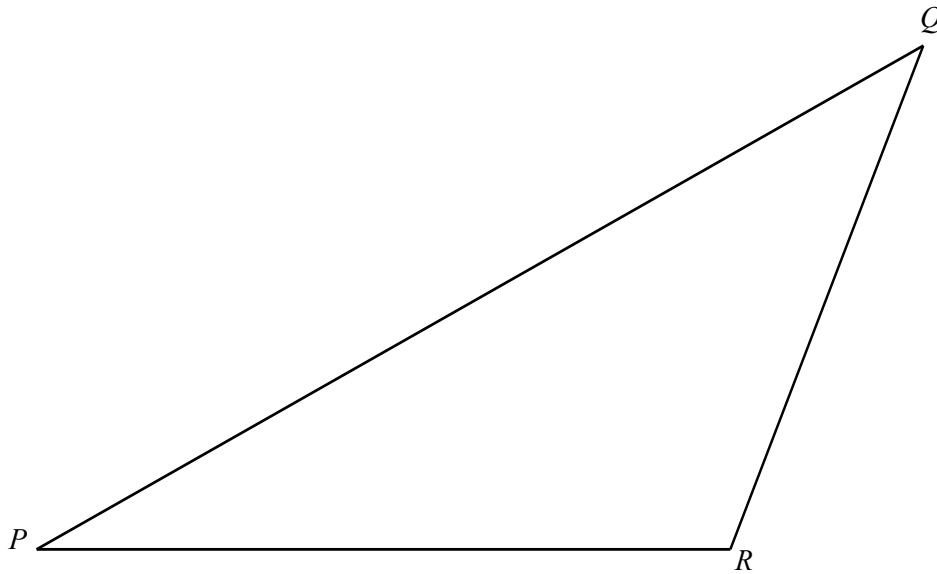
15 $\frac{a}{x-2} + \frac{b}{x^2-5x+6} = \frac{4x-10}{x^2-5x+6}$

Find a and b .

Answer $a =$

$b =$ [3]

16



X is the intersection of the angle bisector of angle QRP and the perpendicular bisector of QR .

- (a) By using construction, find and label X . [3]
- (b) Measure the longest possible distance of X from a vertex of the triangle PQR .

Answer cm [1]

- 17 (a) June exchanges 500 Singapore dollars (S\$) for 555 Australian dollars (AUD).
Complete the exchange rate.

Answer S\$1 = AUD [1]

- (b) \$1 = ¥119.09
₩1022.96 = \$1

A particular brand of cosmetic product cost ¥19610 in Japan.
The same product is also available in South Korea for ₩178,099.

June is travelling to Japan and South Korea for holiday. She says that it is cheaper to buy the product in Japan.

Do you agree? Explain your answer

Answer

18 (a) Solve $\frac{2x-1}{3} = 1-x$.

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

(b) $x^2 - 10x - 5 = (x+a)^2 + b$

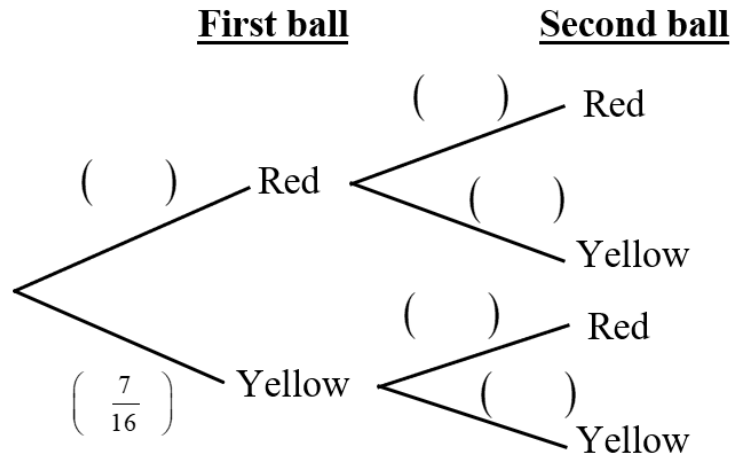
(i) Find a and b .

Answer $a = \dots\dots\dots b = \dots\dots\dots$ [2]

(ii) Hence solve $x^2 - 10x - 5 = 0$, giving your answers correct to 2 decimal places.

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

- 19 A bag contains 9 red balls and 7 yellow balls. Two balls are taken from the bag at random, one after the other without replacement. The diagram shows part of the probability tree.



- (a) Complete the probability tree. [2]

- (b) Find the probability that

- (i) the second ball is yellow,

Answer [1]

- (ii) at least one ball is red.

Answer [1]

- (c) A third ball is now taken out at random.
Calculate the probability that he does not have 3 balls of the same colour.

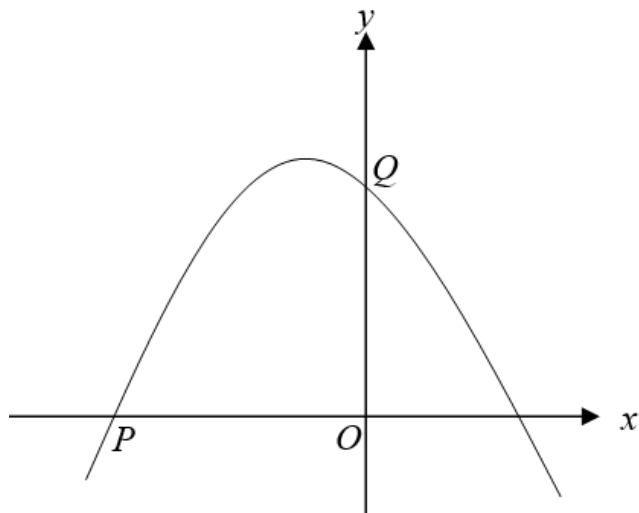
Answer [2]

- 20 (a)** The coordinates of points A , B and C are $(4, 3)$, $(1, -3)$ and $(-2, -10)$ respectively. Do points A , B and C lie on the same straight line? Explain your answer.

Answer

[2]

- (b)** The sketch shows a quadratic curve of $y = (x + 5)(3 - x)$.
 P is the point on the x -axis and Q is the point on the y -axis.



- (i)** Write down the coordinates of P and of Q .

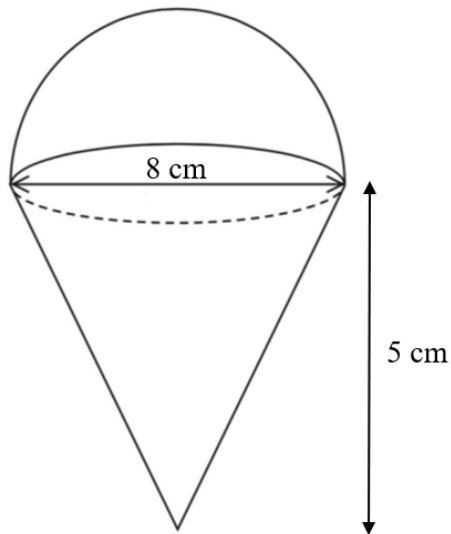
Answer $P = (\dots\dots\dots, \dots\dots\dots)$

$Q = (\dots\dots\dots, \dots\dots\dots)$ [2]

- (ii)** State the equation of the line of symmetry of the graph.

Answer [1]

- 21** The following diagram shows a solid toy with a hemispherical top of diameter 8 cm and a inverted conical bottom of vertical height 5 cm.



- (a)** Find the slant height of the cone.

Answer cm [1]

- (b)** Find the total surface area of the toy.

Answer cm² [3]

Answers

1	$0.5^{-\frac{2}{3}}, \sqrt{5}, \frac{7}{3}, 3.9, \frac{5\pi}{4}$
2	-1
3(a)	25:6
3(b)	15 kg
4(a)	\$280
4(b)	His claim is NOT correct.
5(a)	$2^2 \times 3^3 \times 7$
5(b)	36 or $2^2 \times 3^2$
5(c)	21
6(a)	78
6(b)	3.52 or $\frac{88}{25}$
8	34.8 or 145.2
9(a)	-1, -4
9(b)	$-3n + 14$
9(c)	Since n is not a whole number/positive integer , -45 is not a term of this sequence.
10(a)	57 kg
10(b)	59 kg
10(c)	13 kg
11(a)	180
11(b)	$\frac{5}{3}x$
12(a)	$-\frac{1}{3}$
12(b)	$\pm\sqrt{m^2 - 3pq}$
13(a)	2.4
13(b)	15
14	9.5%
15	$a = 4, b = 2$
16(a)	
16(b)	6.6 ± 0.1

17(a)	1.11
17(b)	Cheaper to buy the product in Japan
18(a)	$\frac{4}{5}$
18(b)(i)	$a = -5, b = -30$
18(b)(ii)	$x = 10.48$ or $x = -0.48$
19(a)	<u>First ball</u> <u>Second ball</u> <pre> graph LR F1["(9/16) Red"] --> S1["(8/15) Red"] F1 --> S2["(7/15) Yellow"] F2["(7/16) Yellow"] --> S3["(9/15) Red"] F2 --> S4["(6/15) Yellow"] </pre>
19(b)(i)	$\frac{7}{16}$
19(b)(ii)	$\frac{33}{40}$
19(c)	$\frac{63}{80}$
20(a)	A, B and C DO NOT lie on the same straight line.
20(b)(i)	$(-5, 0)$
20(b)(ii)	$x = -1$
21(a)	6.40 cm
21(b)	181 cm ²