



BEATTY SECONDARY SCHOOL
PRELIMINARY EXAMINATION 2023
SECONDARY FOUR NORMAL (ACADEMIC)

CANDIDATE
NAME

CLASS

REGISTER
NUMBER

MATHEMATICS (SYLLABUS A)

Paper 1

Setter: [Click or tap here to enter text.](#)

4045/01
2 August 2023
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 80.

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

This document consists of **19** printed pages and **1** blank pages.

[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

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

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

1

$\frac{\pi}{5}$

$\frac{3}{5}$

$\frac{\sqrt{14}}{6}$

63%

$\frac{17}{25}$

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

Answer,,,, [2]

2 The cost of a laptop bag had decreased from \$250 to \$189.

Calculate the decrease as a percentage of the original cost.

Answer % [2]

3 (a) Express 250 g: 3 kg as a ratio in its simplest form.

Answer : [1]

(b) Owen had a ribbon of length k metres.

He cut it into two parts in the ratio $x : y$, where $y < x$.

Express the length of the longer ribbon, in terms of x , y and k for the length of the longer ribbon.

Answer [1]

4 Find the value of the obtuse angle x , when

(a) $\sin x = 0.813$,

Answer° [1]

(b) $\cos x = -0.57$.

Answer° [1]

5 y is inversely proportional to the square root of x .

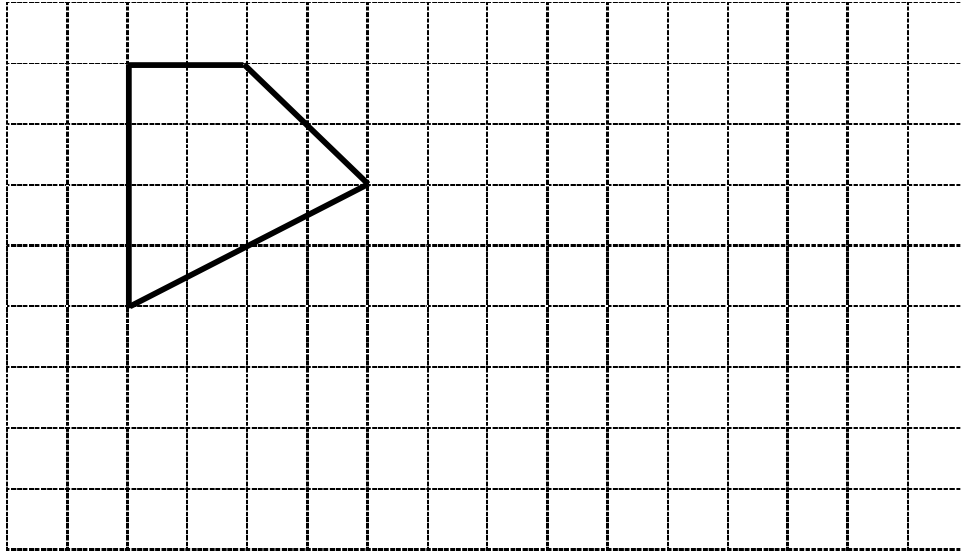
Given that $y = 1.5$ when $x = 16$, find an expression for y in terms of x .

Answer [2]

6 Calculate the length of the line joining the points $(3, -1)$ and $(-2, 5)$.

Answer units [2]

- 7 Draw an enlargement of this given quadrilateral using a scale factor of 1.5.



[2]

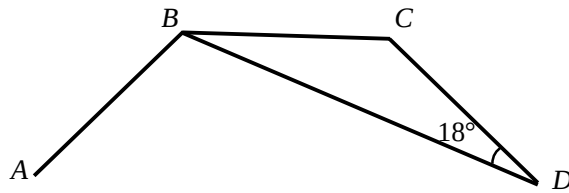
- 8 (a) Find the largest integer satisfying $-6y \geq 15$.

Answer [2]

- (b) Expand and simplify $(3x+5)(7x-2)$.

Answer [2]

- 9 The diagram shows three sides AB , BC and CD of a regular n -sided polygon with $\angle BDC = 18^\circ$.



- (a) Find the interior angle of the polygon.

Answer $^\circ$ [1]

- (b) Calculate the number of sides of the polygon.

Answer [2]

10 (a) $\sqrt{a^{16}} \times a^3 = a^n$

Find the value of n .

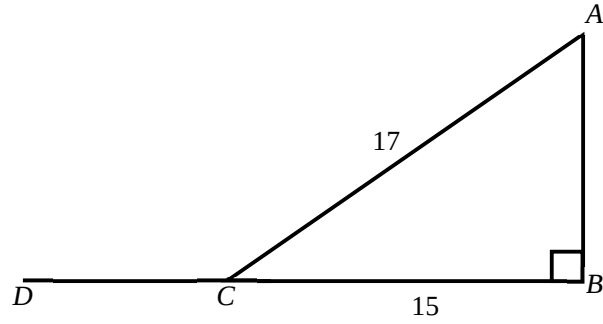
Answer $n =$ [2]

(b) $3^x + 3^x + 3^x = 1$

Find the value of x .

Answer $x =$ [2]

- 11** In triangle ABC , $AC = 17$ cm, $BC = 15$ cm and $\angle ABC = 90^\circ$.



- (a)** Find the length of AB .

Answer cm [2]

- (b)** Find, as a fraction in its simplest form, $\tan \angle CAB$.

Answer [1]

- 12 (a)** Factorise completely $6x^2y - 15xy^2$.

Answer [1]

- (b) Write $\frac{1}{x^2-9} + \frac{4}{x+3}$ as a single fraction in its simplest form.

Answer [2]

13 The first four terms of a sequence are 22, 18, 14 and 10.

- (a) Write down the first negative term of the sequence.

Answer [1]

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

Answer [1]

- (c) The n th term of another sequence is $8n - 2$.
Is 278 a term in this sequence? Explain your answer.

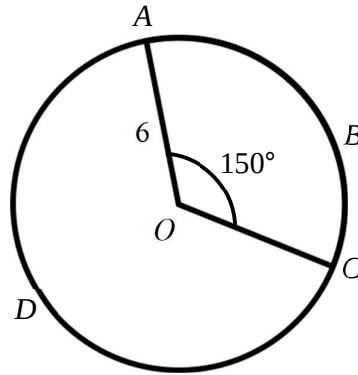
Answer

[2]

.....

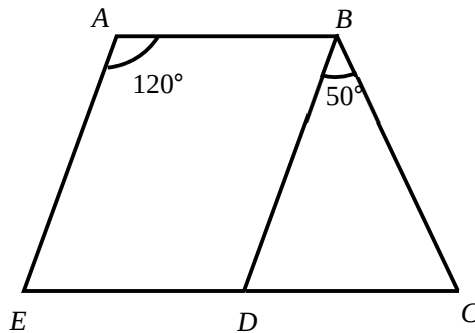
- 14 A circle has centre O and radius 6 cm. The sector $OABC$ has angle $AOC = 150^\circ$.

Find the perimeter of the major sector $OADC$.
Give your answer in the form $p\pi + q$.



Answer cm [3]

- 15 A parallelogram $ABDE$ and a triangle BCD are joined as shown.
 EDC is a straight line.



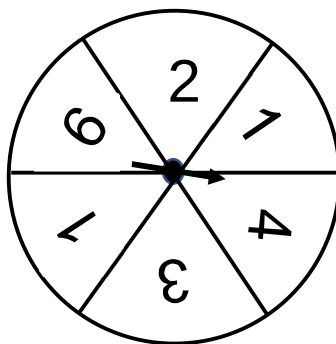
Ryan says that triangle BCD is an isosceles triangle.
Is he correct? Show your workings clearly.

Answer

.....

 [3]

- 16 The diagram shows a spinner with six numbered sectors.



Each time the pointer is spun, it is equally likely to stop on any of the sectors.

The spinner is spun once. Find the probability that it stops on

- (a) an odd number,

Answer [1]

- (b) a prime number,

Answer [1]

- (c) a factor of 6.

Answer [1]

17 (a) $x^2 - 8x + 6 = (x + a)^2 + b$

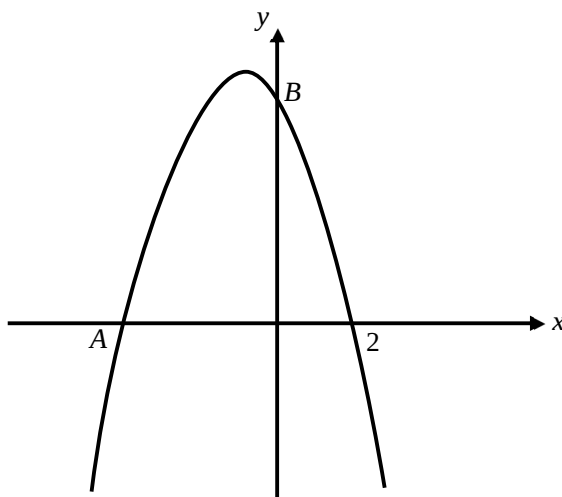
Find a and b .

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

(b) Hence, solve $x^2 - 8x + 6 = 0$, giving your answer correct to 2 decimal places.

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

- 18** The diagram shows the sketch of the graph $y = -(x+4)(x-2)$.



Find

- (a)** the coordinates of A,

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

- (b)** the coordinates of B,

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

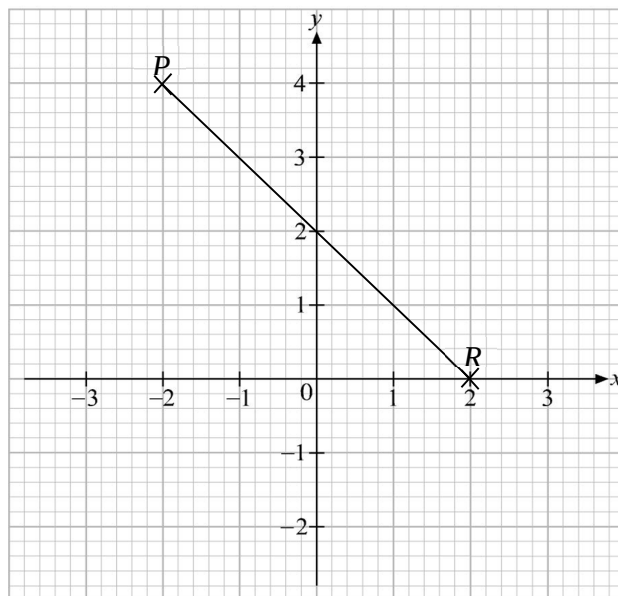
- (c)** the equation of line of symmetry.

Answer [1]

- (d)** the coordinates of the maximum point.

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

19



- (a) Find the equation of the line PR and show that it reduces to $y = -x + 2$.

Answer

[2]

- (b) By drawing another line, find the solutions to the simultaneous equations

$$y = -x + 2$$

$$y = 2x - 1$$

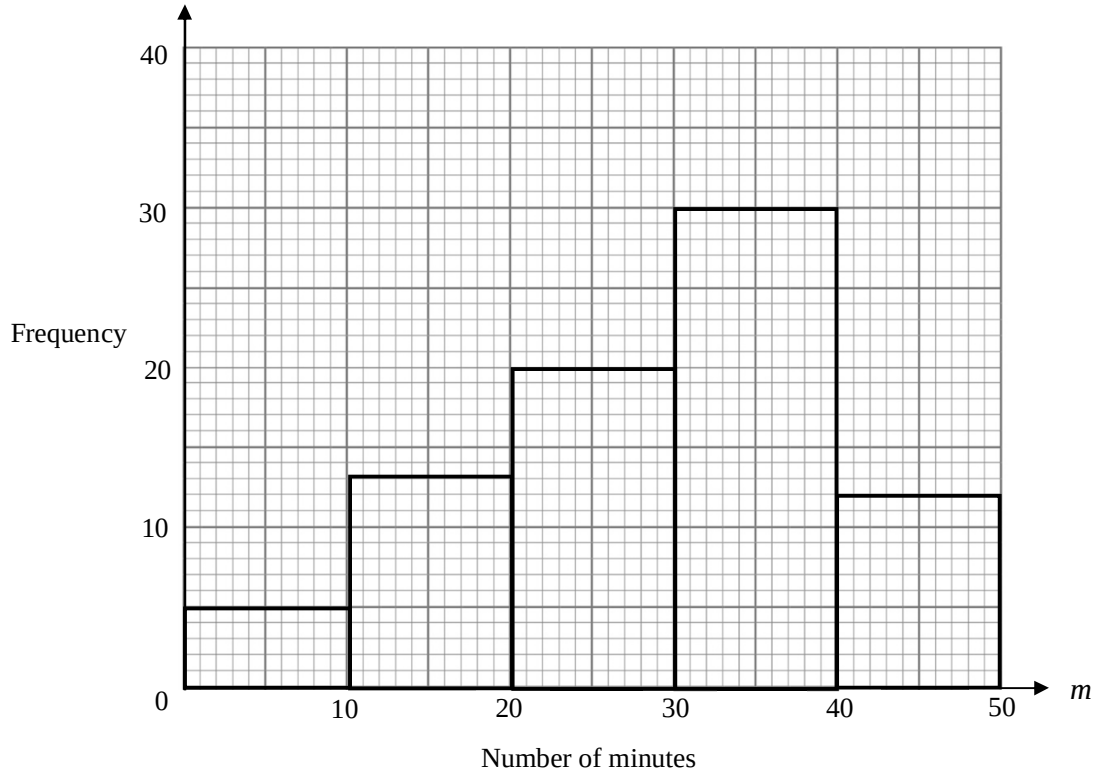
Answer $x = \dots\dots\dots, y = \dots\dots\dots$ [3]

[Turn over

- 20 A survey was carried out to find the number of minutes spent learning a foreign language in a week by a group of students. The information was grouped as follows.

Number of minutes (m)	$0 \leq m < 10$	$10 \leq m < 20$	$20 \leq m < 30$	$30 \leq m < 40$	$40 \leq m < 50$
Frequency	5	13	20	30	12

The histogram below represents the result of the survey.



- (a) Which interval contains the median minutes?

Answer [1]

- (b) Calculate an **estimate** of the mean number of minutes spent learning a foreign language in one week.

Answer minutes [2]

- (c) Calculate the percentage of number of students who spent at least 30 minutes learning a foreign language.

Answer% [2]

- (d) Anya says that a pie chart is a better representation of this set of data. Do you agree? Give a reason for your answer. [1]

Answer

.....

.....

.....

- 21** A piece of wire of length 117 cm is cut into two pieces. One piece, $4x$ cm long, is bent to form a square and the other piece is bent to form an equilateral triangle. The numerical value of the area of the square is equal to the numerical value of the perimeter of the triangle.

(a) Show that $x^2 + 4x - 117 = 0$.

Answer

[2]

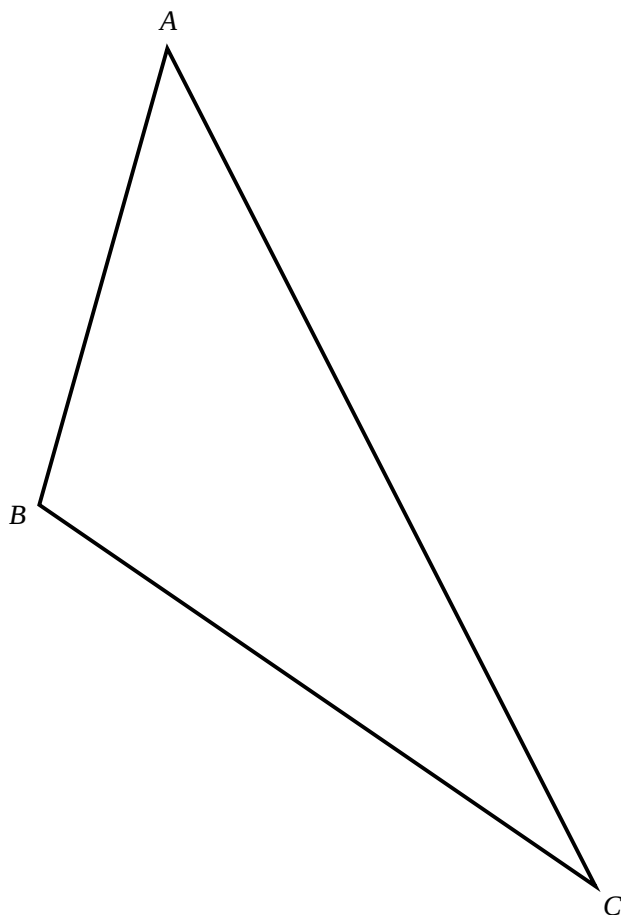
(b) Using factorisation, solve the equation $x^2 + 4x - 117 = 0$.

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

(c) Hence, find the length of one side of the equilateral triangle.

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

22 The triangle ABC is drawn below.



(a) Measure $\angle ABC$.

Answer $^{\circ}$ [1]

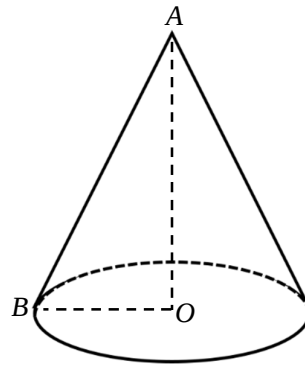
(b) P is the point of intersection of the bisector of the angle ABC and perpendicular bisector of BC . By constructing the necessary lines, determine if P lies inside or outside triangle ABC .

Answer P lies triangle ABC . [3]

(c) Measure PA .

Answer cm [1]

23



A solid cone has a perpendicular height of 12 cm.

- (a) Given that the cone has a volume of $100\pi \text{ cm}^3$, calculate OB .

Answer cm [3]

- (b) (i) Calculate the slant height AB .

Answer cm [2]

- (ii) Calculate the **total** surface area of the cone.

Answer cm² [2]
