Full Name	Class Index No	Class

Anglo-Chinese School (Barker Road)

END-OF-YEAR EXAMINATION 2024
SECONDARY THREE EXPRESS

MATHEMATICS
4052
PAPER 1

1 HOUR 45 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.

Answer **all** 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

Mathematical Formulae

Compound interest

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

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

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

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

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

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1 **(a)** $\sin x° = 0.5321$
Find the values of x in the range $0 \leq x \leq 180$.

Answer $x =$ _____ or _____ [2]

(b) Convert 150° to radians, giving your answer in terms of π.

Answer _____ [1]

2 **(a)** Simplify $\left(\frac{4p^4}{q^2}\right)^3 \div \frac{p^2}{8q^4}$.

Answer _____ [3]

(b) It is given that $\left(x^2+2\right)^{3a-b} = 1$. Use the law of indices to find a in terms of b.
Show your working.

Answer $a =$ _____ [2]

3 Tom, Peter and Raul share $480.
The ratio of the amount that Tom receives to the total amount that Peter and Raul receives is 3 : 2.
Peter receives $24 more than Raul.
Calculate how much they each receive.

Answer : Tom $ _____

Peter $ _____

Raul $ _____ [4]

4 The highest air temperature recorded is 58.8°C.
The lowest air temperature recorded is −89.2°C.
(a) Find the difference between these two temperatures

Answer _____ °C [1]

(b) The lowest air temperature recorded in Britain is 62°C higher than −89.2°C.
Find the lowest air temperature recorded in Britain.

Answer _____ °C [1]

5 A map is drawn to a scale of 1 : 400 000.

(a) Find the actual distance, in kilometres, represented by 7 centimetres on the map.

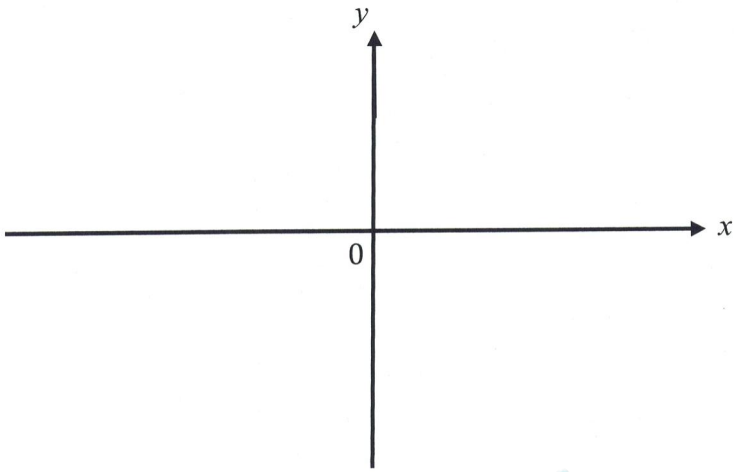
Answer _____km [2]

(b) A city covers an area of 800 square kilometres.
Find, in square centimetres, the area representing the city on the map.

Answer _____cm^2 [2]

6 **(a)** Sketch the graph of $y=(x-1)(x+4)$ on the axes below.
Indicate clearly the coordinates of the points where the graph crosses the axes. [2]

Answer



(b) Write down the equation of the line of symmetry of $y=(x-1)(x+4)$.

Answer _____ [1]

7 One of the solutions of the equation $2x^2 + kx - 10 = 0$ is $x = -2$.

(a) Find the value of k.

Answer $k =$ _____ [2]

(b) Using the value of k found in part **(a)**, factorise $2x^2 + kx - 10$.

Answer _____ [1]

8 **(a)** Factorise completely

(i) $x^4y^2 - x^2y^4$,

Answer _____ [2]

(ii) $15cd - 10ce + 12d^2 - 8de$.

Answer _____ [2]

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

Answer _____ [2]

9 **(a)** Solve the inequalities $\frac{x-11}{2} < \frac{x+4}{5} \leq 2x-1$.

Answer _____ [3]

(b) Represent the solution in part **(a)** on the number line below.

Answer

[1]

10 The value of fuels and lubricants exported from Singapore in 2017 was \$90 182 billion.
Write 90 182 billion in standard form correct to 3 significant figures.

Answer _____ [2]

11 A jar contains 10 green marbles, 8 yellow marbles and 5 purple marbles.
An additional m yellow marbles are added to the jar.

The probability of picking a yellow marble is now $\frac{4}{9}$.

Find the value of m.

Answer $m =$ _____ [2]

12 Written as the product of its prime factors, $360 = 2^3 \times 3^2 \times 5$.

(a) Write 108 as the product of its prime factors.

Answer _____ [1]

(b) Find the lowest common multiple (LCM) of 108 and 360.
Give your answer as the product of its prime factors.

Answer _____ [1]

(c) The number $360k$ is a perfect cube.
Find the smallest positive integer value of k.

Answer $k =$ _____ [1]

13 **(a)** The nth term of a sequence is given by $T_n = n^2 + pn + q$, where p and q are constants.
It is known that $T_1 = 5$ and $T_2 = 6$.

(i) When $n = 1$, $p+q = 4$.
Show that $2p + q = 2$. [1]

(ii) Solve $p + q = 4$
$2p + q = 2$.

Answer $p =$_____, $q =$_____ [3]

(b) The sum of the first n terms of a different sequence is given by $n^2 + 3n + 4$.
Find the 4th term of this sequence.

Answer _____ [2]

14 Explain why $(5n+4)^2 - 1$ is a multiple of 5 for all integer values of n.

Answer _____

_____

_____ [2]

15 m is directly proportional to $\sqrt{q}$.
It is known that $m = 7$ for a particular value of q.
Find the value of m when q is doubled.

Answer _____ [2]

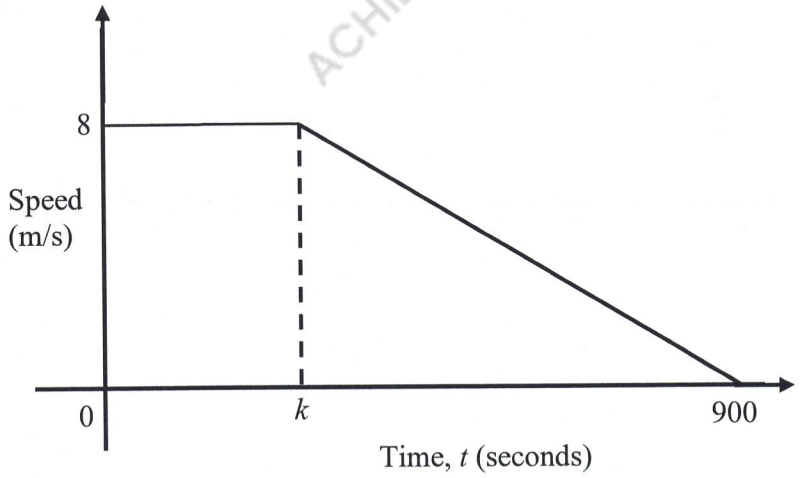
16 **(a)** John opened a bank account.
He deposited $800 in his account.
This account pays simple interest at the rate of 5% per year.
Calculate the total amount in his account after 3 years.

Answer $_____ [2]

(b) Leslie borrowed a sum of money at 10% per year compound interest.
After 3 years he owed a total of $532.40.
Calculate how much he borrowed.

Answer $_____ [2]

17 **(a)** The diagram shows the speed-time graph of a jogger.



Find an expression, in terms of k, the distance covered by the jogger,

(i) between $t = 0$ and $t = k$,

Answer _____ m [1]

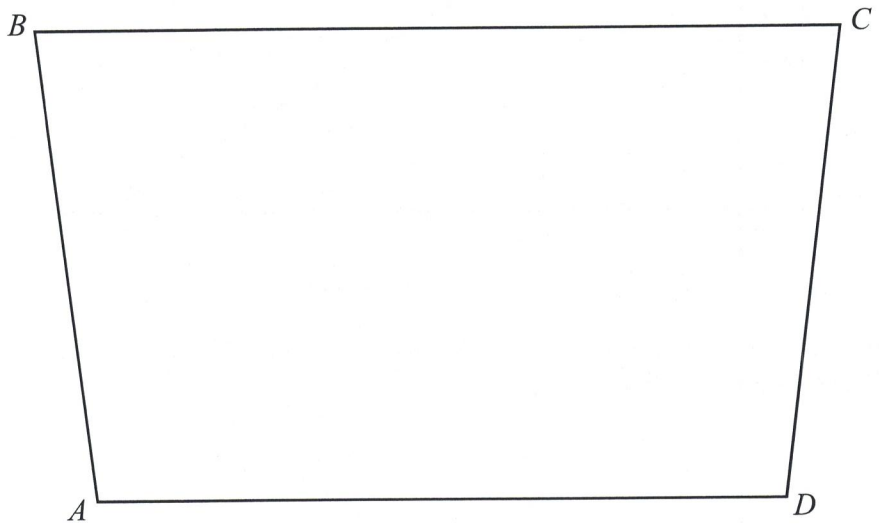
(ii) between $t = k$ and $t = 900$.

Answer _____ m [1]

(b) The distance covered between $t = 0$ and $t = k$ is equal to that between $t = k$ and $t = 900$. Find the value of k.

Answer $k =$ _____ [2]

18 The diagram shows a quadrilateral $ABCD$.

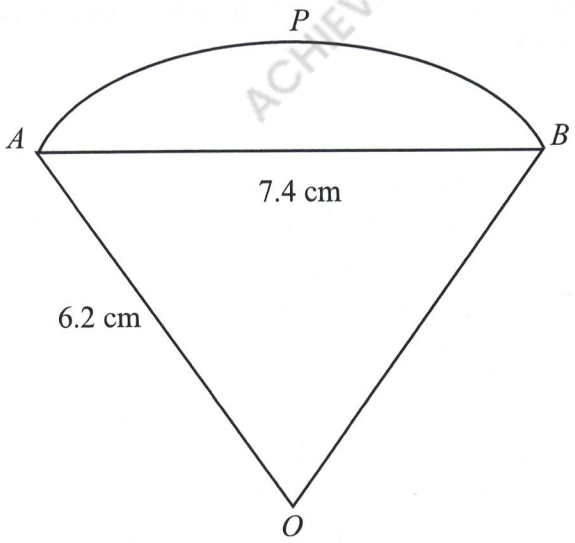


(a) Construct the bisector of angle ABC. [1]

(b) Construct the perpendicular bisector of AD. [1]

(c) Mark a point P in the region inside $ABCD$ that is closer to BA than BC and closer to D than A. [1]

19



In the diagram, $OAPB$ is a sector of a circle with centre O, radius 6.2 cm and $AB = 7.4$ cm. Find

(a) angle AOB,

Answer _____ ° [2]

(b) the perimeter of the sector $OAPB$.

Answer _____ cm [3]

20 The following stem-and-leaf diagrams represent the test scores of students in Class ***A*** and class ***B***, in a recent mathematics examination.

Class ***A*:**

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

Class ***B*:**

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

Key: 5 | 2 represent 52 marks

(a) State the median score of Class ***A*** and Class ***B***

Answer Median score of Class ***A*** = _____

Median score of Class ***B*** = _____

[2]

(b) Make a comment comparing the marks of students in Class ***A*** and in Class ***B***.

Answer _____

_____

_____

_____ [1]

Full Name	Class Index No	Class

Anglo-Chinese School (Barker Road)

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MATHEMATICS 4052
PAPER 2

1 HOUR 45 MINUTES

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1 The normal price of a roll of film for 36 photographs is $8.99.
The normal price of printing 36 photographs is $17.65 for each roll of film.

(a) Find the cost of each photograph in cents.

Answer _____cents [2]

(b) Shop A offered '4 rolls of film for the price of 3'.
The price of printing 36 photographs remained at $17.65 for each roll of film.
Kim bought 4 rolls of film at Shop A and had the photographs printed there.
Calculate how much each photograph cost her, correct to the nearest cent.

Answer _____cents [3]

(c) Shop B kept the price of each roll of film at $8.99. It offered a 20% reduction off the normal price for printing the photographs.
Sue bought one roll of film at Shop B and had the photographs printed there.
Calculate how much each photograph cost her, correct to the nearest cent.

Answer _____cents [3]

2 The points A, B and C are $(9, 8)$, $(12, 4)$ and $(4, -2)$ respectively.

(a) Find

(i) the gradient of the line through A and B,

Answer _____ [1]

(ii) the equation of the line through C which has the same gradient as AB.

Answer _____ [2]

(b) Calculate the length of the line segment

(i) AB,

Answer _____ [1]

(ii) BC.

Answer _____ [1]

(c) Hence, show that AB is perpendicular to BC.

Answer

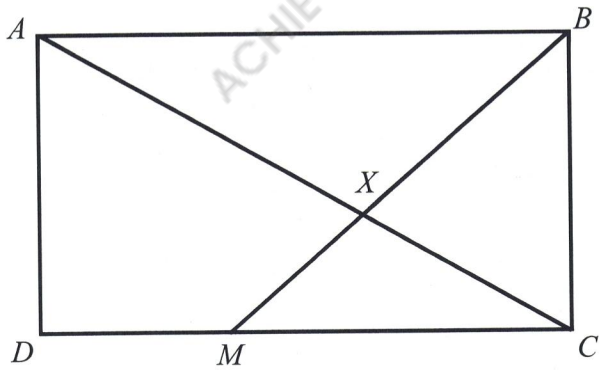
_____

_____ [3]

(d) Calculate the area of triangle ABC.

Answer _____ [1]

3



$ABCD$ is a rectangle and M is a point on CD.
AC and BM meet at X.

(a) Prove that triangles CXM and AXB are similar.
Give a reason for each of the statement you make.

_____

_____

_____ [2]

(b) It is given that $CM = 3MD$.
Find the ratio

(i) area of triangle CXM : area of triangle AXB,

Answer _____:_____ [1]

(ii) area of triangle BXC : area of rectangle $ABCD$.

Answer _____:_____ [2]

4 A road tanker holds 24 tonnes of oil.

(a) In cold weather it can pump out x tonnes of oil per minute.
Write down an expression, in terms of x, for the number of minutes it takes to empty the tanker in cold weather.

Answer _____ minutes [1]

(b) In hot weather it can pump out $(x + 0.5)$ tonnes of oil per minute.
Write down an expression, in terms of x, for the number of minutes it takes to empty the tanker in hot weather.

Answer _____ minutes [1]

(c) It takes 2 minutes longer to empty the tanker in cold weather than in hot weather.
Write down an equation in x, and show that it simplifies to

$$2x^2 + x - 12 = 0.$$

Answer

[3]

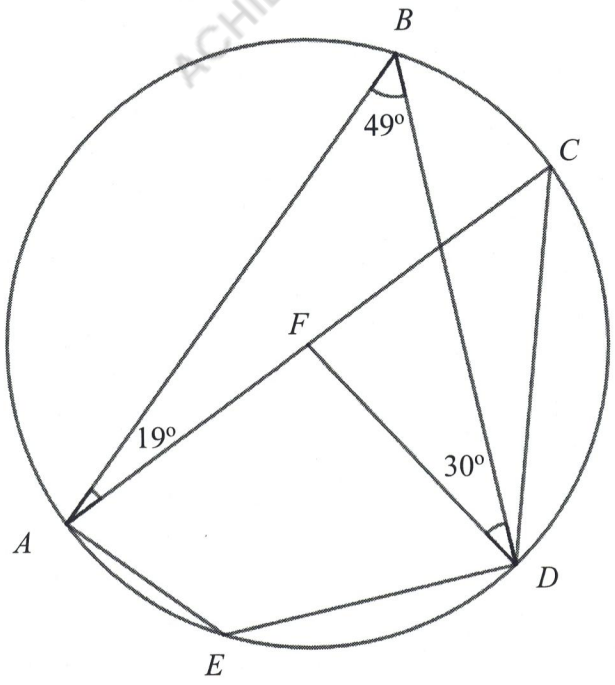
(d) Solve the equation $2x^2 + x - 12 = 0$, giving the solutions correct to 3 decimal places.

Answer $x =$ _____ or $x =$ _____ [3]

(e) Find the time taken, in minutes and seconds, correct to the nearest second, to empty the tanker in cold weather.

Answer _____minutes_____seconds [2]

5 **(a)**



AFC is a straight line.
Angle $ABD = 49°$, angle $BAC = 19°$ and $FDB = 30°$.

(i) Angle ACD = _____ ° because _____

_____ [2]

(ii) Angle AED = _____ ° because _____

_____ [2]

(b) Show that F is the centre of the circle.

Answer

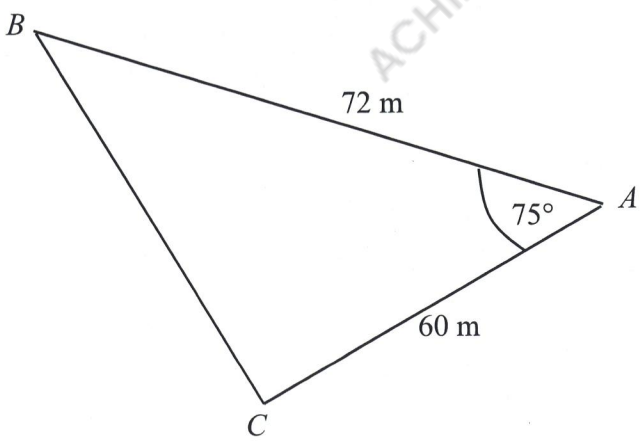
_____

_____

_____ [3]

[Question 6 is printed on the next page]

6



Three points, A,B and C, lie on a horizontal field.
Angle BAC =75° and the bearing of C from A is 217°.
AB = 72 m and AC = 60 m.

(a) Calculate

(i) the bearing of B from A,

Answer _____ ° [1]

(ii) BC,

Answer _____ m [3]

(iii) angle ABC.

Answer _____ ° [2]

(b) A girl standing at B is flying a kite.
The kite, K, is vertically above A.
The string, BK, attached to the kite is at $24°$ to the horizontal.
Calculate the angle of elevation of the kite when viewed from C.

Answer _____ ° [3]

7 The variables x and y are connected by the equation

$$y = \frac{x^2}{5} + \frac{5}{x}.$$

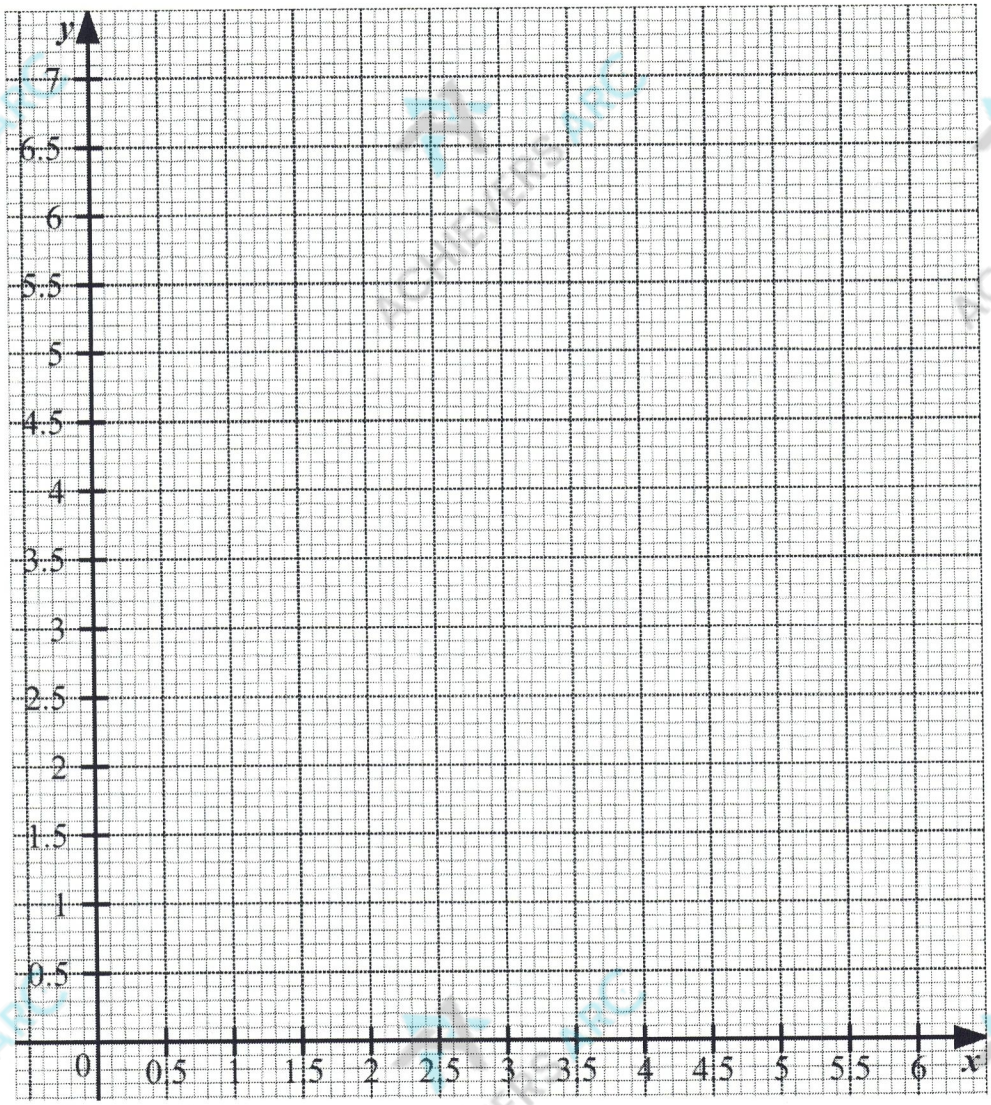
Some corresponding values of x and y are given in the table below.

x	1	1.5	2	3	4	5
y	5.2	3.8	3.3	3.5	4.5	p

(a) Calculate the value of p.

Answer $p =$ _____ [1]

(b) On the grid, draw the graph of $y = \frac{x^2}{5} + \frac{5}{x}$ for $0 \le x \le 5$. [2]



(c) **By drawing a tangent,** find the gradient of the curve at the point $(4, 4.5)$.

Answer _____ [2]

(d) **(i)** On the same axes, draw the graph of $y = \frac{1}{2}x + 3$. [1]

(ii) Write down the x-coordinates of the points at which the two graphs intersect.

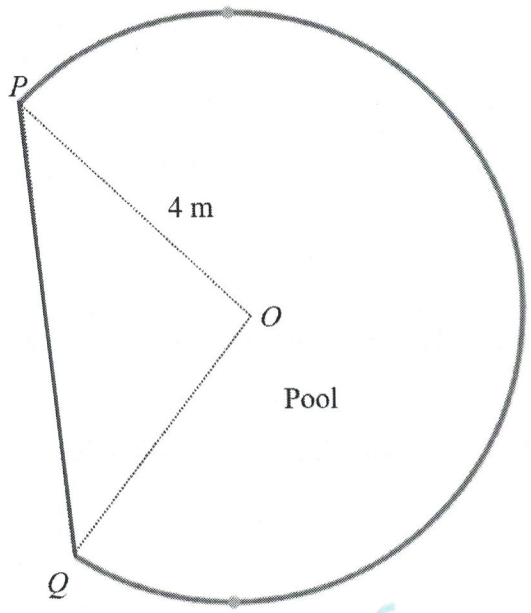
Answer $x =$ _____ and $x =$ _____ [2]

(iii) Find the equation, in the form $2x^3 + ax^2 + bx + c = 0$, which is satisfied by the values of x found in part **(d)(ii).**

Answer _____ [2]

8

Top view



The diagram shows a kids' pool in a refurbished hotel.
The cross-section of the pool is a major segment of a circle, centre O and radius 4 m.
The depth of the pool is 0.5 m.

(a) The area of the major sector OPQ is 39.065 m^2.

(i) Show that angle $POQ = 1.40$ radians.

Answer

[2]

(ii) Show that the capacity of the pool is 23.47 m^3, correct to 2 decimal places.

Answer

[3]

(b) For safety reasons, a flight of stairs made from 1.05 m^3 cement was placed along *PQ* inside the pool.
Mr Tan, the manager, needs to fill the pool with water, up to 95% capacity.
Company GRC provides water-filling service for swimming pools.

Water pump	8 gallons per minute
Cost of water pump	\$17 per 100 gallons of water
Labour cost	\$30 per hour

1 gallon = 3.785 litres
1 litre = 0.001 m^3

Mr Tan thinks that the pool can be filled in 10 hours and within a budget of \$1200.
Is Mr Tan correct?
Justify your answer.

Answer

[continue your working on the next page]

_____

_____

_____ [7]