

1 (a) Expand and simplify $(a-b+2c)^2$. [2]

(b) Simplify $\frac{7+x}{x^2+14x+49} \times \frac{x^2-49}{7-x}$. [3]

(c) Solve $\frac{4}{r+2} + \frac{3}{r-3} = 5$. Give your solutions correct to 3 decimal places. [4]

2 Make T the subject of the equation $\frac{1}{R} = \sqrt[3]{\frac{k}{(T-r)^2}}$. [4]

3 (i) Express $3x^2 - 12x - 11$ in the form $a(x-h)^2 + k$, where a , h and k are integers. [2]

(ii) Hence solve $3x^2 - 12x - 11 = 0$. [3]

4 Factorise $9(x+2)^2 + (14xy+28y) - 8y^2$ completely. [3]

5 Shops A and B both sell chocolates, donuts and sweets at a price of \$2.50, \$1.75 and \$0.85 each respectively. The quantities of each item sold for a particular week in both shops are shown in the table below.

Shop Quantity	Chocolate	Donut	Sweet
Shop A	240	720	$2x$
Shop B	385	x	505

(a) Write a 2×3 matrix P to represent the number of items sold in both shops. [1]

(b) Given that $Q = \begin{pmatrix} 2.5 \\ 1.75 \\ 0.85 \end{pmatrix}$, calculate PQ in terms of x , and explain what the elements of this matrix represent. [2]

(c) If Shop A has a higher sales of \$354 than that of Shop B , find the value of x . [2]

(d) Write a matrix R such that the matrix RPQ shows the average daily sales for each shop. [1]

[Turn Over]

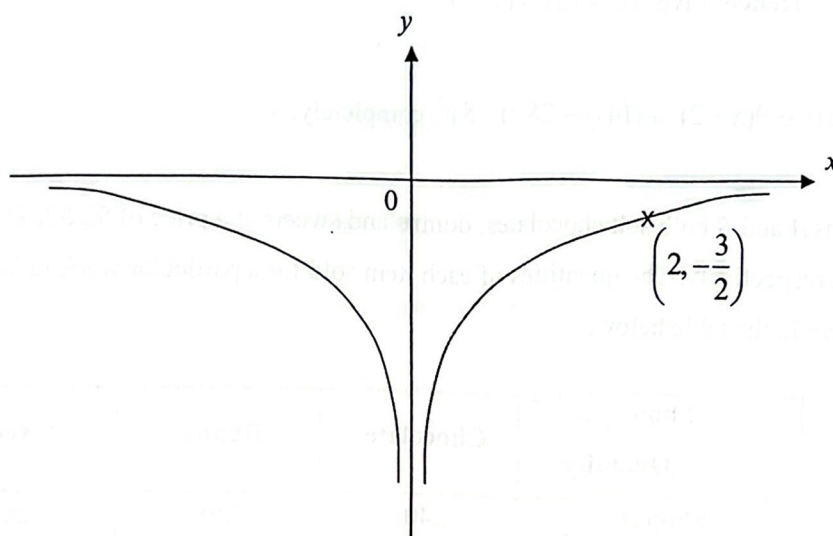
- 6 A quadratic curve is given by $y = a(x-h)^2 + k$, where a , h and k are constants.

One of the x -intercepts of the curve is four times the other.

The maximum point of the curve is $(5, 27)$.

- (a) State the equation of the line of symmetry of the curve. [1]
- (b) Show that the smaller x -intercept p is 2 and hence find the other x -intercept. [2]
- (c) Find the equation of the curve. [3]
- (d) Sketch the curve, labelling clearly the maximum point, intercepts and the axes. [3]

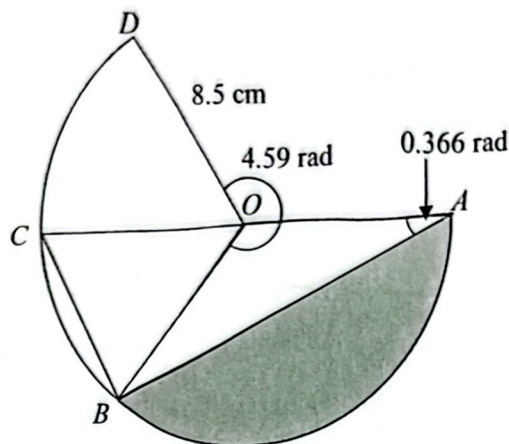
- 7 (a) The diagram shows the sketch of the curve $y = ax^k$, where k is an integer and $-3 < k < 0$.



Find the value of a and of k . [3]

- (b) (i) Expand and simplify $(x+1)^3$. [1]
- (ii) Describe a two-step transformation which transforms the curve $y = x^3$ to $y = x^3 + 3x^2 + 3x - 1$. [2]

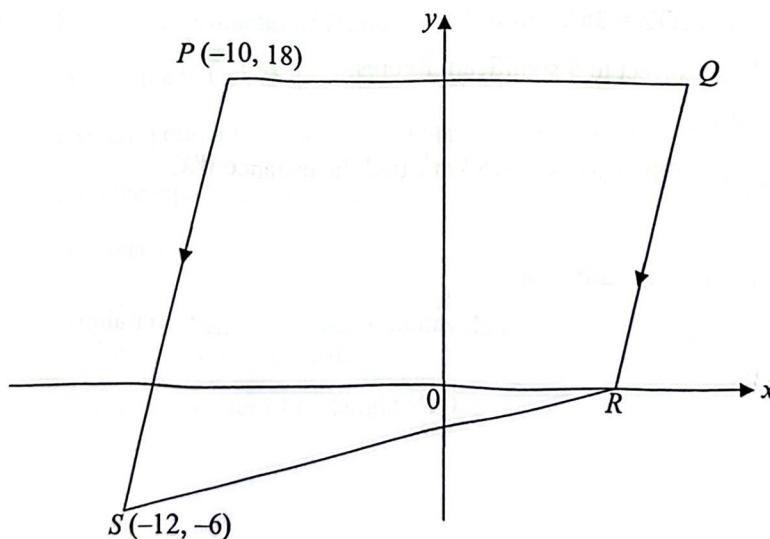
- 8 The diagram shows a sector $OABCD$ with centre O and radius 8.5 cm. In addition, reflex angle $DOB = 4.59$ radians and angle $BAC = 0.366$ radians.



Find

- the perimeter of the sector $OBCD$, [2]
- the area of sector AOB , [2]
- the percentage of the area in sector $OABCD$ that is shaded. [4]

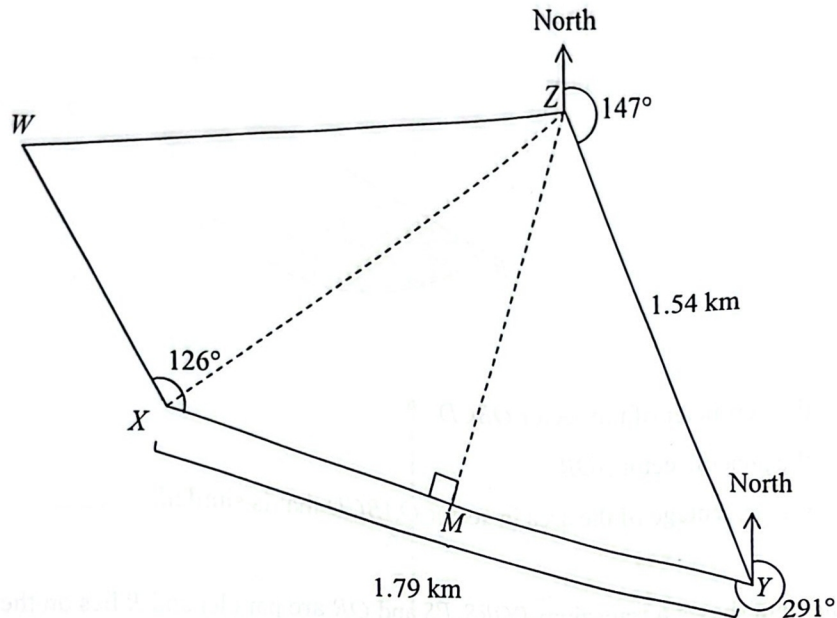
- 9 The diagram shows a trapezium $PQRS$. PS and QR are parallel and R lies on the x -axis. PQ is a horizontal line which is 18 units long.



- Show that the coordinates of R are $\left(\frac{13}{2}, 0\right)$. [4]
- Find the area of $PQRS$. [2]

[Turn Over

- 10 The diagram shows a park in the shape of $WXYZ$.
 Point M is the foot of perpendicular from Z to XY .
 $YZ = 1.54$ km, $XY = 1.79$ km and angle $WXY = 126^\circ$.
 The bearing of Y from Z is 147° and the bearing of X from Y is 291° .



- Show that angle $XYZ = 36^\circ$. [2]
- Hence find XZ , correct to 5 significant figures. [2]
- Find angle WXZ . [3]
- If the total area of the park is 1.415 km^2 , find the distance WX . [3]

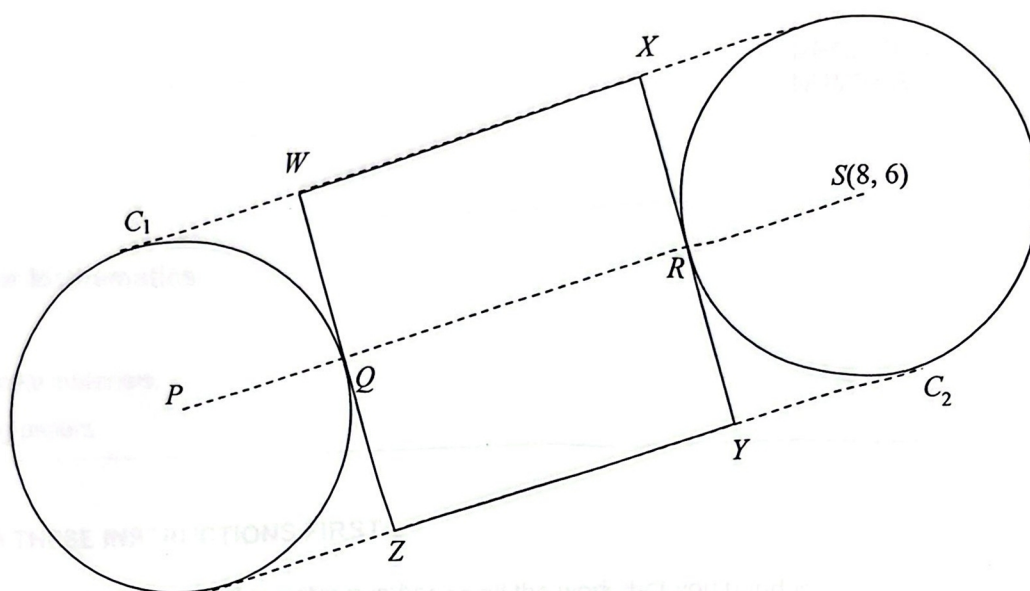
A 250 m tall tower is built on Z .

- Find the largest possible angle of elevation to the top of the tower along the path XY . [3]

- 11 The diagram shows a rectangle $WXYZ$ placed in between two identical circles C_1 and C_2 with centres P and S respectively. $PQRS$ is a straight line.

WZ and XY are tangents to the circles C_1 and C_2 at Q and R respectively. Lines WX and YZ are tangents to both circles.

The equation of C_1 is $(x+4)^2 + (y-2)^2 = 9$ and the coordinates of point S are $(8, 6)$.



- (a) State the coordinates of P and the radius of C_1 . [2]
- (b) Determine if $(-3, 5)$ lies inside circle C_1 .
Explain your answer and show your working clearly. [1]
- (c) Find the equation of C_2 in the form $x^2 + y^2 + fx + gy + c = 0$, where f , g and c are constants. [2]
- (d) C_2 can be obtained from C_1 by a reflection about a straight line l .
Find the equation of the line l . [4]
- (e) Find the perimeter of rectangle $WXYZ$. [2]

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