

Credit Mathematics - Reasoning and Enquiry

1. $f(x) = 3x^2 - x - 14$ and $g(x) = 2x - 1$.
Find x given $f(x) = 2g(x)$.

2. $H = \frac{x(x+2)}{5}$. Find x when $H = 3$.

3. P is the point (4,0) and Q is (7,9).

(a) Find the gradient of the line joining P and Q.

(b) If this line is extended it passes through the point (0,-12). Write down the equation of this line.

(c) Does the point (-2,-16) lie on this line?

(d) The point (m,5m) lies on this line. Find m.

4. A delivery company promises next day delivery on all packages. The cost of delivery is £4.20 for packages weighing up to 5kg plus 50p for each extra kilogram above 5kg.

(a) Find the cost of delivery for a package weighing 12kg.

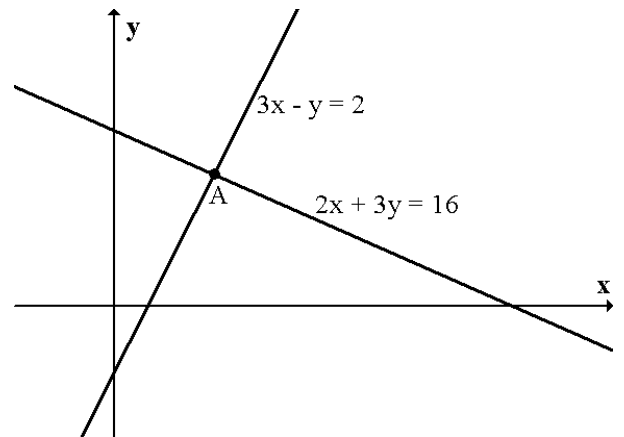
(b) Write down a formula for the cost, £C, of delivering a package weighing P kilograms, where $P > 5$.

5. $f(x) = 3^x$. Given $f(x) = \sqrt{27}$ find x .

6. The diagram opposite shows the lines

$$3x - y = 2 \quad \text{and} \quad 2x + 3y = 16$$

Find the coordinates of A, the point of intersection of these lines.



7. (a) A group of teachers and pupils go to a concert.
There are 20 people in the group altogether.

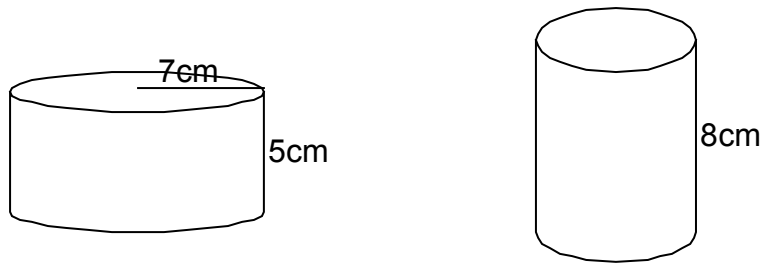
Let x represent the number of teachers in the group and y the number of pupils.
Write down an equation involving x and y .

(b) Tickets for the concert cost £8 for teachers and £3 for pupils. The total cost of the tickets is £80.

Write down another equation in x and y .

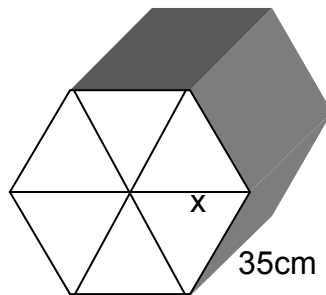
(c) Use your equations to find the number of teachers and the number of pupils in the group.

8. The two cylinders below have the same volume.



Calculate the radius of the second cylinder.

9. The diagram below shows a prism whose cross-section is a regular hexagon.



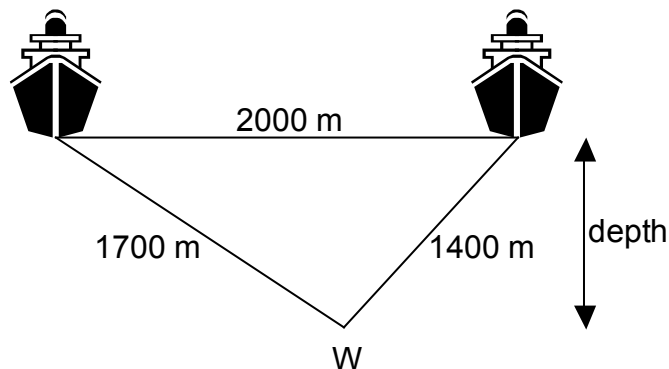
The volume of this prism is $20\,500\text{cm}^3$ and its depth is 35 cm.
Calculate the length x .

10. The height of a fairground ride, in metres, is given by the formula

$$H = 8.2 + 4.1\sin(30t)^\circ$$

where t is the time in seconds after the ride starts.

- (a) What is the maximum height of the ride?
(b) What is the height of the ride before it starts?
(c) Find the height of the ride after 20 seconds.
(d) After how many seconds does the ride first reach a height of 6.15 metres?
11. Two ships are positioned 2000 metres apart. Each ship detects a wreck, W , on the sea bed, as shown below.



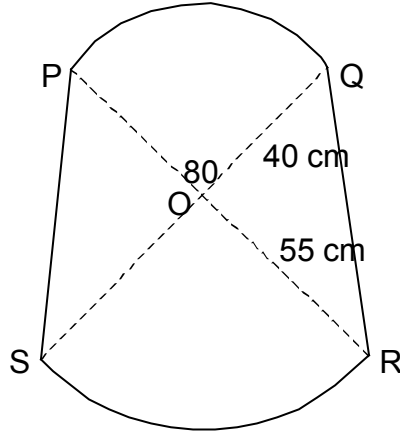
Calculate the depth of the wreck, W , below the surface.

12. A triangle PQR has area 150 cm^2 . $PQ = 35 \text{ cm}$ and $QR = 20 \text{ cm}$.
Find the size of angle PQR given it is an obtuse angle.

13. The value of a boat decreased from £35 000 to £32 200 in one year.

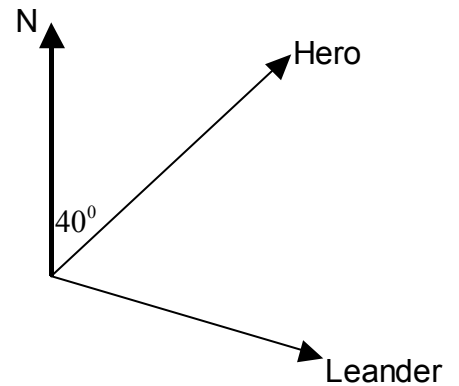
- (a) What was the percentage decrease?
(b) If the value of the boat continues to fall at this rate, what would its value be after a further 3 years?

14. In the diagram PQ and RS are arcs of circles with centre O. The radius, $OQ = 40 \text{ cm}$ and the radius OR is 55 cm long. Angle $POQ = 80^\circ$
Calculate the perimeter of the shape.



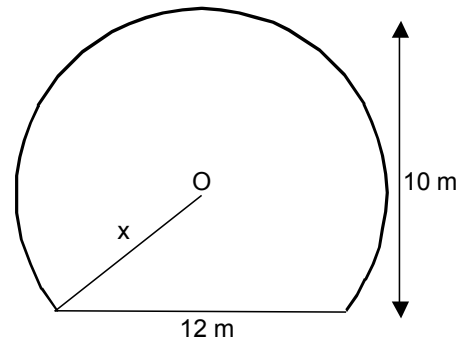
15. Two ships, Hero and Leander, leave port at the same time.
Hero sails on a bearing of 040° at a speed of 20 kmph .
Leander sails on a bearing of 110° at a speed of 16 kmph .

How far apart are the ships after $1\frac{1}{2}$ hours?



16. The diagram opposite shows a tunnel in the shape of part of a circle with radius OB .
The height of the tunnel is 10 metres .

Calculate x .



17. The cost of a season ticket for Hillside Town is £273 for a child. If this represents 65% of the cost of an adult ticket, find the cost of an adult season ticket.