

- 1 Use your calculator to find $\sqrt{\frac{45 \times 5.75}{3.1 + 1.5}}$.

Answer [2]

- 2 Work out $2(3 \times 10^8 - 4 \times 10^6)$, giving your answer in standard form.

Answer [2]

- 3 Write the following in order of size, **largest** first.

$$\sin 158^\circ \quad \cos 158^\circ \quad \cos 38^\circ \quad \sin 38^\circ$$

Answer > > > [2]

- 4 Write down all the working to show that $\frac{\frac{3}{5} + \frac{2}{3}}{\frac{3}{5} \times \frac{2}{3}} = 3\frac{1}{6}$.

Answer

[3]

5 A circle has a radius of 50 cm.

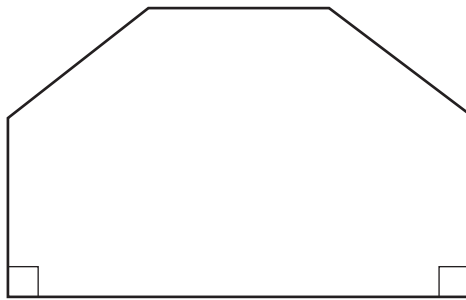
(a) Calculate the area of the circle in cm^2 .

Answer(a) cm^2 [2]

(b) Write your answer to **part (a)** in m^2 .

Answer(b) m^2 [1]

6



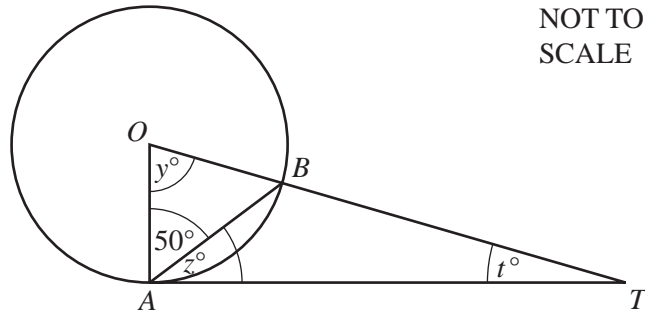
NOT TO
 SCALE

The front of a house is in the shape of a hexagon with two right angles.
 The other four angles are all the same size.

Calculate the size of one of these angles.

Answer [3]

7



TA is a tangent at A to the circle, centre O .
Angle $OAB = 50^\circ$.

Find the value of

(a) y ,

Answer(a) $y = \dots\dots\dots$ [1]

(b) z ,

Answer(b) $z = \dots\dots\dots$ [1]

(c) t .

Answer(c) $t = \dots\dots\dots$ [1]

8 Seismic shock waves travel at speed v through rock of density d .
 v varies **inversely** as the **square root** of d .

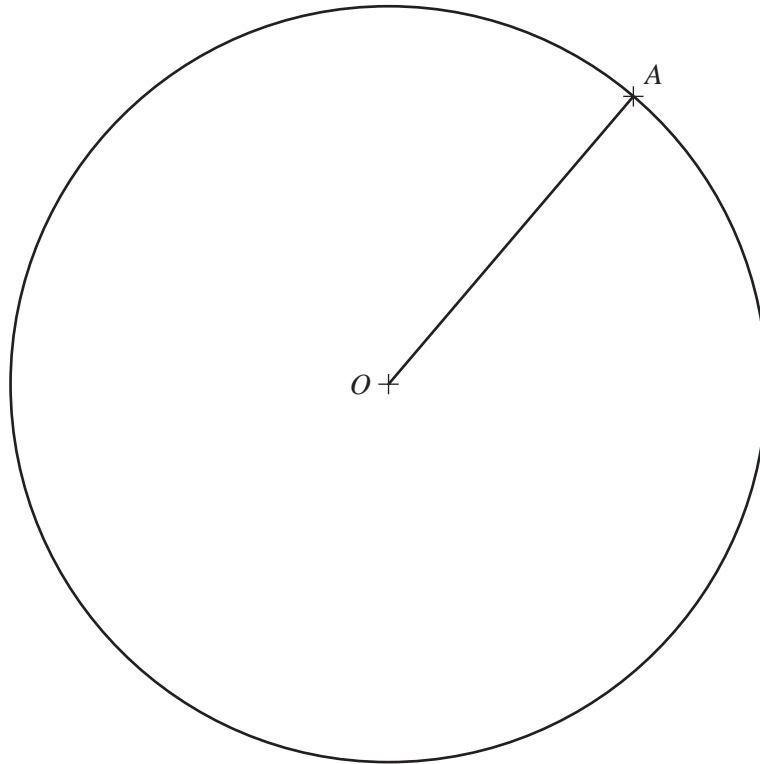
$v = 3$ when $d = 2.25$.

Find v when $d = 2.56$.

Answer $v = \dots\dots\dots$ [3]

5

9



The point A lies on the circle centre O , radius 5 cm.

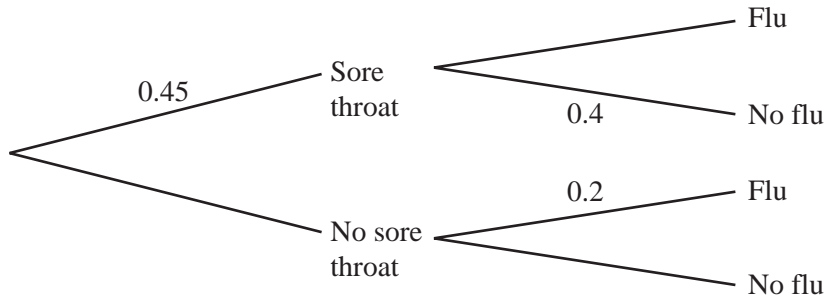
(a) **Using a straight edge and compasses only**, construct the perpendicular bisector of the line OA . [2]

(b) The perpendicular bisector meets the circle at the points C and D .

Measure and write down the size of the angle AOD .

Answer(b) Angle AOD = [1]

- 10 In a flu epidemic 45% of people have a sore throat.
If a person has a sore throat the probability of **not** having flu is 0.4.
If a person does not have a sore throat the probability of having flu is 0.2.



Calculate the probability that a person chosen at random has flu.

Answer [4]

- 11 Work out.

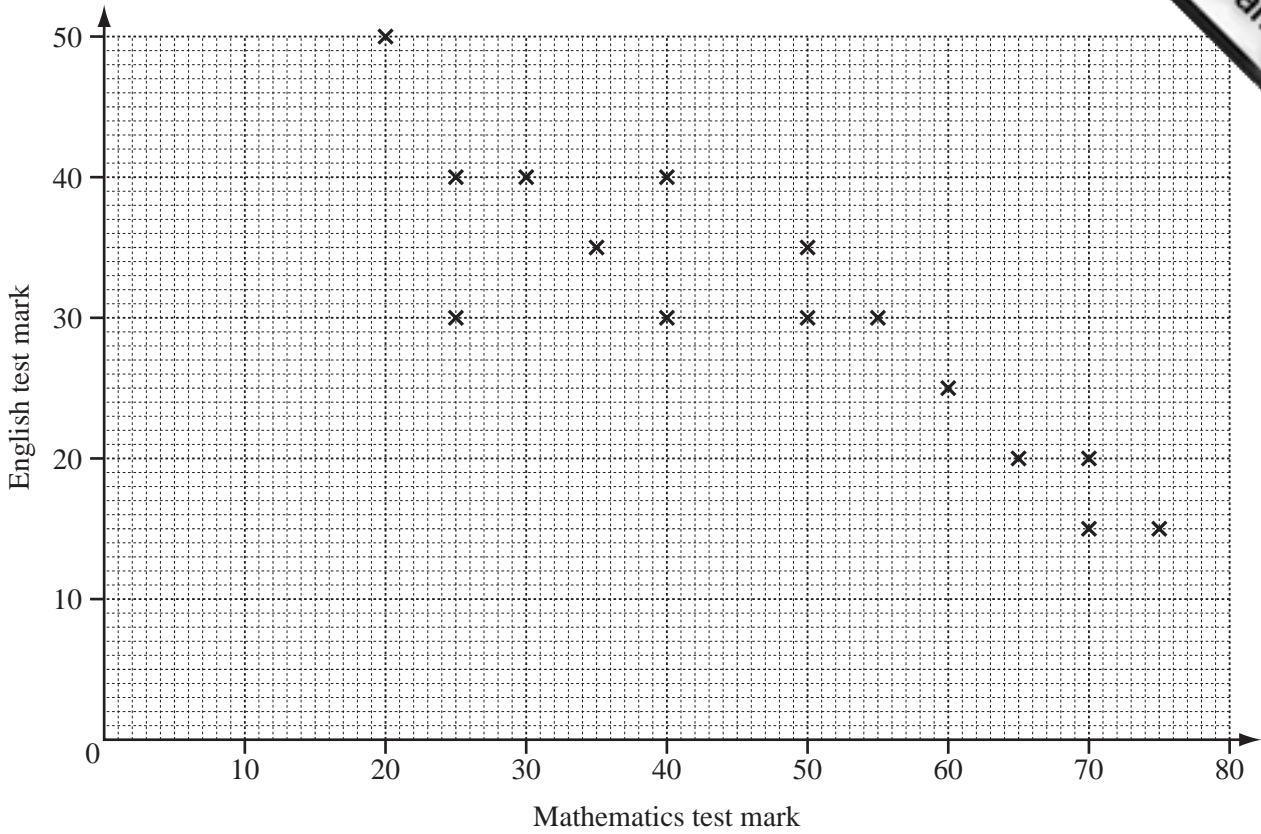
(a) $\begin{pmatrix} 2 & 1 \\ 4 & 3 \end{pmatrix}^2$

Answer(a) $\begin{pmatrix} & \\ & \end{pmatrix}$ [2]

(b) $\begin{pmatrix} 2 & 1 \\ 4 & 3 \end{pmatrix}^{-1}$

Answer(b) $\begin{pmatrix} & \\ & \end{pmatrix}$ [2]

12



The scatter diagram shows the marks obtained in a Mathematics test and the marks obtained in an English test by 15 students.

(a) Describe the correlation.

Answer(a) [1]

(b) The mean for the Mathematics test is 47.3 .
The mean for the English test is 30.3 .

Plot the mean point (47.3, 30.3) on the scatter diagram above. [1]

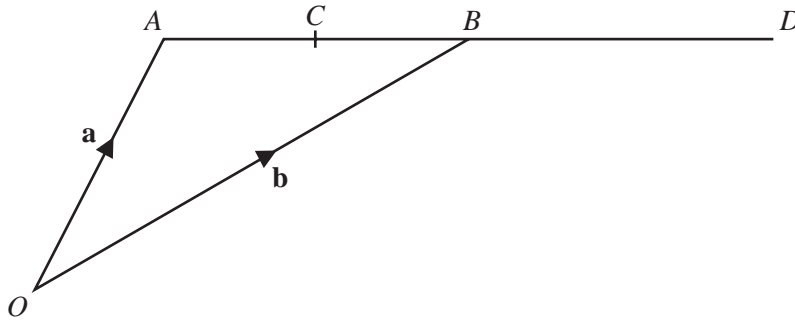
(c) (i) Draw the line of best fit on the diagram above. [1]

(ii) One student missed the English test.
She received 45 marks in the Mathematics test.

Use your line to estimate the mark she might have gained in the English test.

Answer(c)(ii) [1]

13



A and B have position vectors \mathbf{a} and \mathbf{b} relative to the origin O .
 C is the midpoint of AB and B is the midpoint of AD .

Find, in terms of \mathbf{a} and \mathbf{b} , in their simplest form

(a) the position vector of C ,

Answer(a) [2]

(b) the vector \vec{CD} .

Answer(b) [2]

14

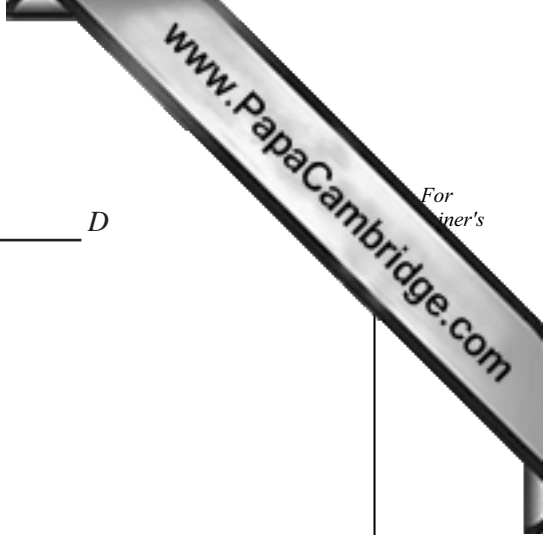
$$T = 2\pi \sqrt{\frac{\ell}{g}}$$

(a) Find T when $g = 9.8$ and $\ell = 2$.

Answer(a) $T =$ [2]

(b) Make g the subject of the formula.

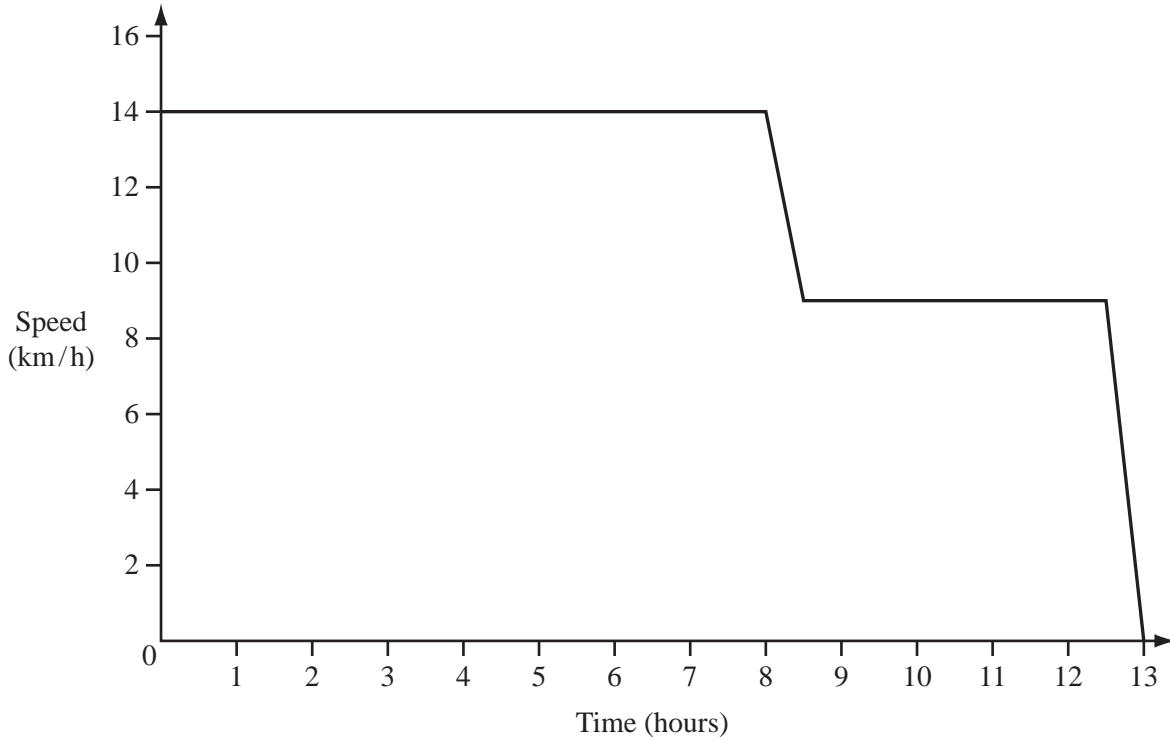
Answer(b) $g =$ [3]



15 A container ship travelled at 14 km/h for 8 hours and then slowed down to 9 km/h over a period of 30 minutes.

It travelled at this speed for another 4 hours and then slowed to a stop over 30 minutes.

The speed-time graph shows this voyage.



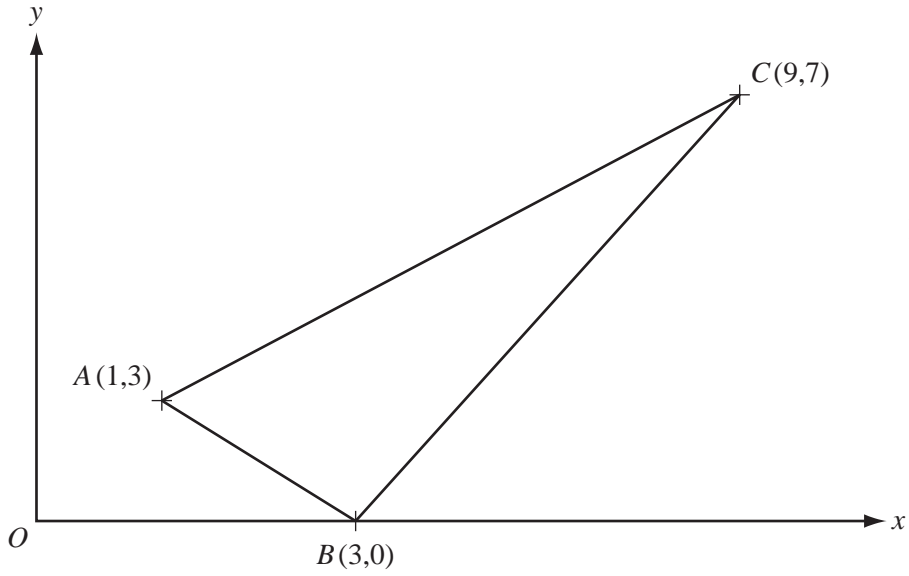
(a) Calculate the total distance travelled by the ship.

Answer(a) km [4]

(b) Calculate the average speed of the ship for the whole voyage.

Answer(b) km/h [1]

16



The co-ordinates of A , B and C are shown on the diagram, which is not to scale.

(a) Find the length of the line AB .

Answer(a) $AB =$ [3]

(b) Find the equation of the line AC .

Answer(b) [3]

17

$$f(x) = \frac{1}{x+4} \quad (x \neq -4)$$

$$g(x) = x^2 - 3x$$

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

(a) Work out $fg(1)$.

Answer(a) [2]

(b) Find $h^{-1}(x)$.

Answer(b) $h^{-1}(x) =$ [2]

(c) Solve the equation $g(x) = -2$.

Answer(c) $x =$ or $x =$ [3]

Question 18 is printed on the next page.

18 The first four terms of a sequence are

$$T_1 = 1^2 \quad T_2 = 1^2 + 2^2 \quad T_3 = 1^2 + 2^2 + 3^2 \quad T_4 = 1^2 + 2^2 + 3^2 + 4^2.$$

(a) The n th term is given by $T_n = \frac{1}{6} n(n+1)(2n+1)$.

Work out the value of T_{23} .

Answer(a) $T_{23} =$ [2]

(b) A new sequence is formed as follows.

$$U_1 = T_2 - T_1 \quad U_2 = T_3 - T_2 \quad U_3 = T_4 - T_3 \quad \dots$$

(i) Find the values of U_1 and U_2 .

Answer(b)(i) $U_1 =$ and $U_2 =$ [2]

(ii) Write down a formula for the n th term, U_n .

Answer(b)(ii) $U_n =$ [1]

(c) The first four terms of another sequence are

$$V_1 = 2^2 \quad V_2 = 2^2 + 4^2 \quad V_3 = 2^2 + 4^2 + 6^2 \quad V_4 = 2^2 + 4^2 + 6^2 + 8^2.$$

By comparing this sequence with the one in **part (a)**, find a formula for the n th term, V_n .

Answer(c) $V_n =$ [2]