



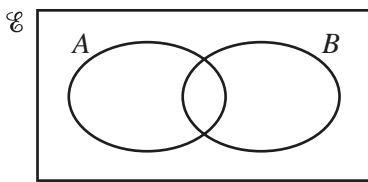
- 1 A concert hall has 1540 seats.

Calculate the number of people in the hall when 55% of the seats are occupied.

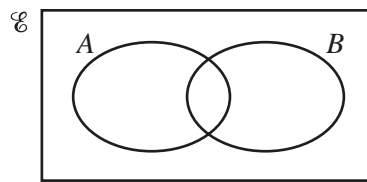
For  
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Answer ..... [1]

- 2 Shade the required region on each Venn diagram.



$A \cup B'$



$(A \cap B)'$

[2]

- 3 Calculate  $81^{0.25} \div 4^{-2}$ .

Answer ..... [2]

- 4 (a) Find  $m$  when  $4^m \times 4^2 = 4^{12}$ .

Answer(a)  $m =$  ..... [1]

- (b) Find  $p$  when  $6^p \div 6^5 = \sqrt{6}$ .

Answer(b)  $p =$  ..... [1]

5 A hummingbird beats its wings 24 times per second.

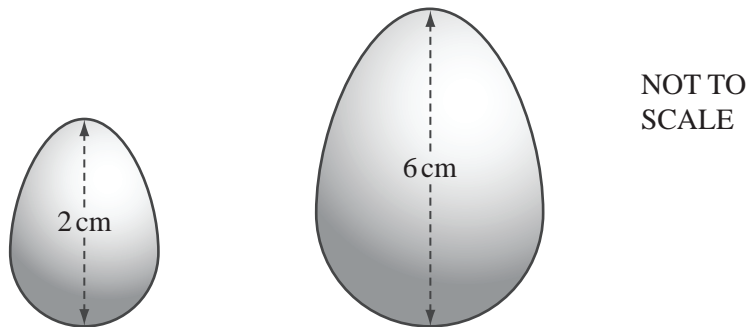
(a) Calculate the number of times the hummingbird beats its wings in one hour.

Answer(a) ..... [1]

(b) Write your answer to **part (a)** in standard form.

Answer(b) ..... [1]

6



A company makes solid chocolate eggs and their shapes are mathematically similar.

The diagram shows eggs of height 2 cm and 6 cm.

The mass of the small egg is 4 g.

Calculate the mass of the large egg.

Answer ..... g [2]

7 Find the length of the straight line from  $Q(-8, 1)$  to  $R(4, 6)$ .

Answer  $QR =$  ..... [3]

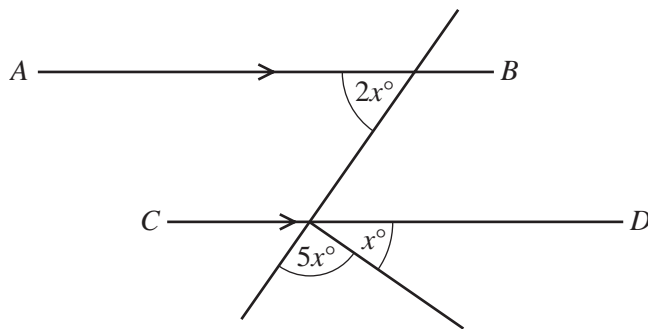
- 8 Calculate the radius of a sphere with volume  $1260 \text{ cm}^3$ .

[The volume,  $V$ , of a sphere with radius  $r$  is  $V = \frac{4}{3}\pi r^3$ .]

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Answer ..... cm [3]

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$AB$  is parallel to  $CD$ .  
Calculate the value of  $x$ .

Answer  $x =$  ..... [3]

- 10 Solve the simultaneous equations.

$$\begin{aligned} 3x + y &= 30 \\ 2x - 3y &= 53 \end{aligned}$$

Answer  $x =$  .....

$y =$  ..... [3]

- 11 A rectangular photograph measures 23.3 cm by 19.7 cm, each correct to 1 decimal place. Calculate the lower bound for

(a) the perimeter,

*Answer(a)* ..... cm [2]

(b) the area.

*Answer(b)* ..... cm<sup>2</sup> [1]

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- 12 A train leaves Barcelona at 21 28 and takes 10 hours and 33 minutes to reach Paris.

(a) Calculate the time the next day when the train arrives in Paris.

*Answer(a)* ..... [1]

(b) The distance from Barcelona to Paris is 827 km.

Calculate the average speed of the train in kilometres per hour.

*Answer(b)* ..... km/h [3]

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13 The scale on a map is 1: 20 000.

- (a) Calculate the actual distance between two points which are 2.7 cm apart on the map.  
Give your answer in kilometres.

Answer(a) ..... km [2]

- (b) A field has an area of  $64\,400\text{ m}^2$ .  
Calculate the area of the field on the map in  $\text{cm}^2$ .

Answer(b) .....  $\text{cm}^2$  [2]

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- 14 Solve the equation  $2x^2 + 3x - 6 = 0$ .  
Show all your working and give your answers correct to 2 decimal places.

Answer  $x =$  ..... or  $x =$  ..... [4]

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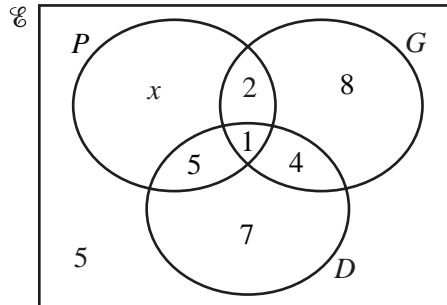
- 15 A teacher asks 36 students which musical instruments they play.

$$P = \{\text{students who play the piano}\}$$

$$G = \{\text{students who play the guitar}\}$$

$$D = \{\text{students who play the drums}\}$$

The Venn diagram shows the results.



- (a) Find the value of  $x$ .

Answer(a)  $x =$  ..... [1]

- (b) A student is chosen at random.

Find the probability that this student

- (i) plays the drums but **not** the guitar,

Answer(b)(i) ..... [1]

- (ii) plays only 2 different instruments.

Answer(b)(ii) ..... [1]

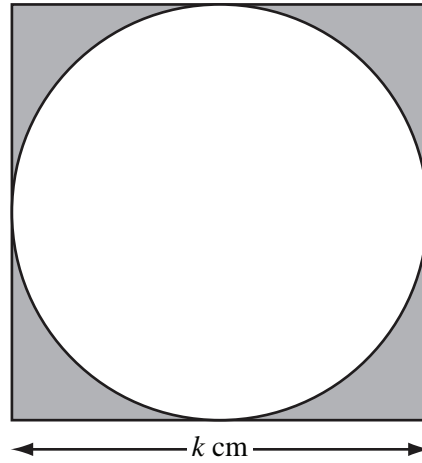
- (c) A student is chosen at random from those who play the guitar.

Find the probability that this student plays no other instrument.

Answer(c) ..... [1]

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The diagram shows a square of side  $k$  cm.

The circle inside the square touches all four sides of the square.

(a) The shaded area is  $A$  cm<sup>2</sup>.

Show that  $4A = 4k^2 - \pi k^2$ .

*Answer (a)*

[2]

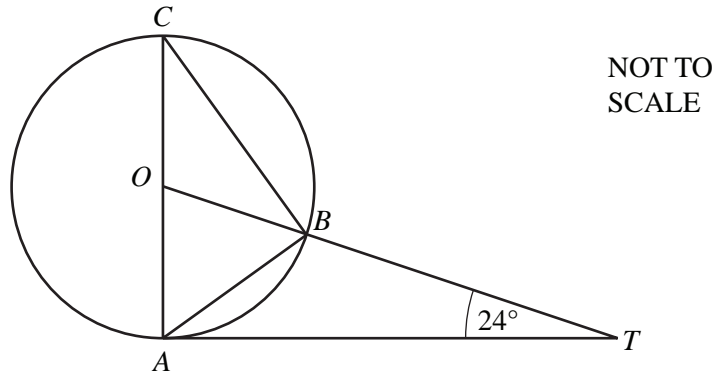
(b) Make  $k$  the subject of the formula  $4A = 4k^2 - \pi k^2$ .

*Answer(b)*  $k =$  ..... [3]

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$A$ ,  $B$  and  $C$  are points on a circle, centre  $O$ .  
 $TA$  is a tangent to the circle at  $A$  and  $OBT$  is a straight line.  
 $AC$  is a diameter and angle  $OTA = 24^\circ$ .

Calculate

(a) angle  $AOT$ ,

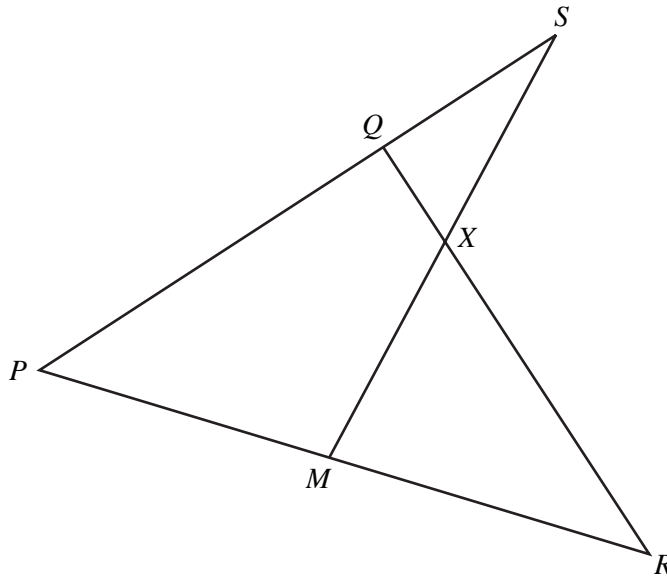
Answer(a) Angle  $AOT = \dots\dots\dots$  [2]

(b) angle  $ACB$ ,

Answer(b) Angle  $ACB = \dots\dots\dots$  [1]

(c) angle  $ABT$ .

Answer(c) Angle  $ABT = \dots\dots\dots$  [2]



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In the diagram,  $PQS$ ,  $PMR$ ,  $MXS$  and  $QXR$  are straight lines.

$PQ = 2 QS$ .

$M$  is the midpoint of  $PR$ .

$QX : XR = 1 : 3$ .

$\vec{PQ} = \mathbf{q}$  and  $\vec{PR} = \mathbf{r}$ .

(a) Find, in terms of  $\mathbf{q}$  and  $\mathbf{r}$ ,

(i)  $\vec{RQ}$ ,

Answer(a)(i)  $\vec{RQ} = \dots\dots\dots$  [1]

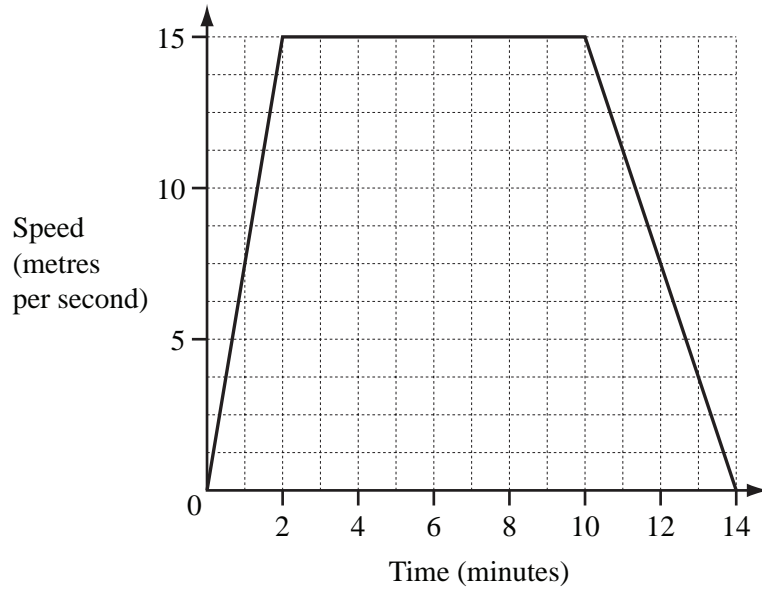
(ii)  $\vec{MS}$ .

Answer(a)(ii)  $\vec{MS} = \dots\dots\dots$  [1]

(b) By finding  $\vec{MX}$ , show that  $X$  is the midpoint of  $MS$ .

Answer (b)

[3]



The diagram shows the speed-time graph of a train journey between two stations. The train accelerates for two minutes, travels at a constant maximum speed, then slows to a stop.

(a) Write down the number of **seconds** that the train travels at its constant maximum speed.

Answer(a) ..... s [1]

(b) Calculate the distance between the two stations **in metres**.

Answer(b) ..... m [3]

(c) Find the acceleration of the train in the **first two minutes**.  
Give your answer in **m/s<sup>2</sup>**.

Answer(c) ..... m/s<sup>2</sup> [2]

Question 20 is printed on the next page.

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$f(x) = x^3$

$g(x) = 2x - 3$

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(a) Find

(i)  $g(6)$ ,*Answer(a)(i)* ..... [1](ii)  $f(2x)$ .*Answer(a)(ii)* ..... [1](b) Solve  $fg(x) = 125$ .*Answer(b)*  $x =$  ..... [3](c) Find the inverse function  $g^{-1}(x)$ .*Answer(c)*  $g^{-1}(x) =$  ..... [2]

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