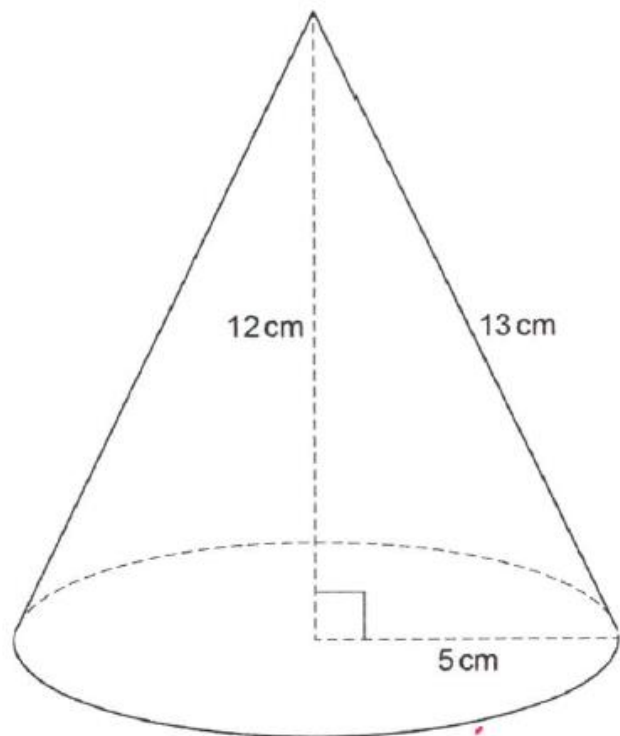


Mensuration and calculations – GCSE Mathematics

1. No.7

Here is a cone.



(a)

Curved surface area of a cone = $\pi r l$
 where r is the radius and l is the slant height

Beth tries to work out the curved surface area in terms of π

$$\begin{aligned}\text{Curved surface area of the cone} &= \pi \times 5 \times 12 \\ &= 60\pi \text{ cm}^2\end{aligned}$$

What mistake has she made?

$$\begin{aligned}\text{Curved} &= \pi r l \\ &= \pi \times 5 \times 13 \\ &= 65\pi \text{ cm}^2\end{aligned}$$

[1 mark]

She used the height instead of the slant height for the curved surface area.

- (b) Adam uses $\pi = 3$ to estimate the area of the **base** of the cone.

Work out his estimate.

[2 marks]

$$\begin{aligned}\text{Area of base} &= \pi r^2 \\ &= 3 \times 5^2 \\ &= 3 \times 5 \times 5 \\ &= \underline{75} \text{ cm}^2\end{aligned}$$

Answer 75 cm²

- (c) Beth uses $\pi = 3.14$ to estimate the area of the **base** of the cone.

Is Beth's estimate more than or less than Adam's estimate?

Tick a box.

More than



Less than



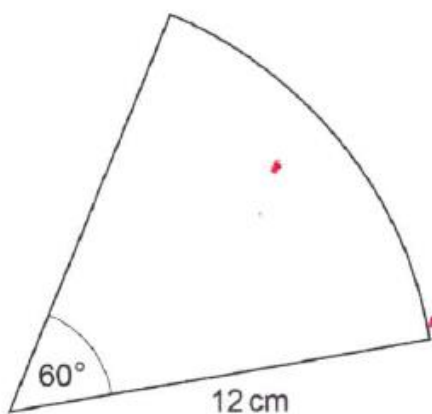
Give a reason for your answer.

[1 mark]

Since 3.14 is greater than 3; Means
 3.14×5^2 is $>$ than 3×5^2 , thus a
 greater area.

2. No.12

A sector has radius 12 cm and angle 60°



Not drawn
accurately

Work out the length of the arc.

Give your answer in terms of π

[3 marks]

$$\text{Arc length} = \frac{\theta}{360} \times 2\pi r$$

$$= \frac{60}{360} \times 2 \times \pi \times 12$$

$$= \frac{6}{36} \times 24\pi = \frac{24\pi}{6}$$

$$= \underline{\underline{4\pi}}$$

Answer 4π cm

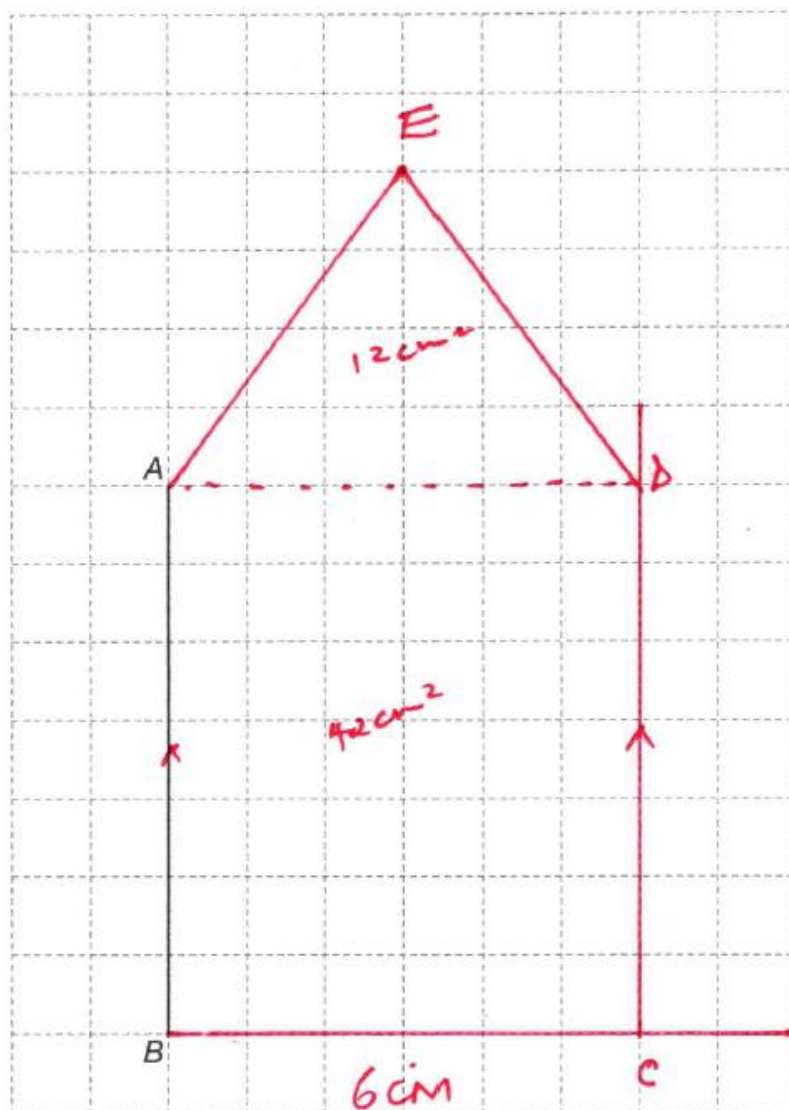
3. No.13

$ABCDE$ is a pentagon with $AB = 7$ cm

- $BC = 6$ cm
- AB and BC are perpendicular.
- AB and DC are equal and parallel.
- Area of the pentagon = 54 cm^2
- The pentagon has exactly **one** line of symmetry.

Complete a **labelled** drawing of the pentagon.

[4 marks]



$$\frac{1}{2} \times 6 \times 4 = 12$$

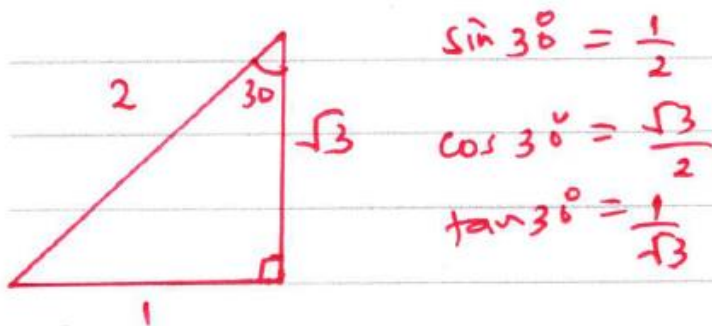
$$\begin{aligned} \text{Area of rectangle} &= 7 \times 6 \\ &= 42 \text{ cm}^2 \\ \text{Area remaining} &= 54 - 42 \\ &= 12 \text{ cm}^2 \end{aligned}$$

$$\begin{aligned} \text{Area of triangle} \\ A &= \frac{1}{2} \times b \times h \end{aligned}$$

4. No.25

Show that the value of $6 \sin 30^\circ + 2 \cos 30^\circ \times 4 \tan 30^\circ$ is an integer.

[4 marks]



$$\text{Now, } 6 \times \frac{1}{2} + 2 \times \frac{\sqrt{3}}{2} \times 4 \times \frac{1}{\sqrt{3}}$$

$$= 3 + \cancel{\sqrt{3}} \times \frac{4\cancel{\sqrt{3}}}{\cancel{\sqrt{3}}}$$

$$= 3 + 4 = \underline{\underline{7}}$$

$$= \underline{\underline{7}}$$

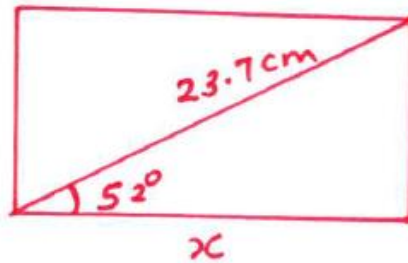
5. No.18

A diagonal of a rectangle is 23.7 cm long.

The diagonal makes an angle of 52° with a side of length x cm

Work out the value of x .

[3 marks]



Using trigonometric ratios SOH CAH TOA

$$\cos 52^\circ = \frac{x}{23.7 \text{ cm}}$$

$$x = 23.7 \cos 52^\circ$$

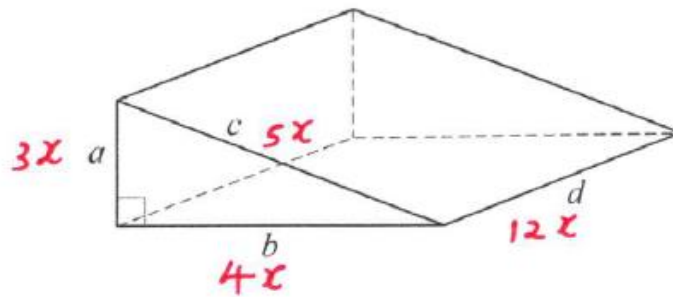
$$x = 14.59117$$

$$x = \underline{\underline{14.6 \text{ cm}}}$$

$$x = 14.6 \text{ cm}$$

6. No.25

Here is a right-angled triangular prism.

The ratio of the edges is $a : b : c : d = 3 : 4 : 5 : 12$ The **volume** of the prism is 1125 cm^3 Work out the total length of **all** of the edges of the prism.

[5 marks]

Let a be $3x$, $b = 4x$, $c = 5x$ and $d = 12x$.

Volume = Area of cross-section $\times$ length.

$$1125 = \left(\frac{1}{2} \times 4x \times 3x \right) \times 12x$$

$$\frac{1125}{72} = \frac{72x^3}{72}$$

$$3\sqrt{15.625} = x^3$$

$$\underline{\underline{2.5}} = x$$

$$a = 3 \times 2.5 = 7.5$$

$$b = 4 \times 2.5 = \underline{\underline{10}}$$

$$c = 5 \times 2.5 = \underline{\underline{12.5}}$$

$$d = 12 \times 2.5 = \underline{\underline{30}}$$

$$\begin{aligned} \text{Total length} &= (7.5 \times 2) + \\ &+ (3 \times 30) + (2 \times 12.5) + \\ &+ (10 \times 2) = \end{aligned}$$

$$15 + 90 + 25 + 20$$

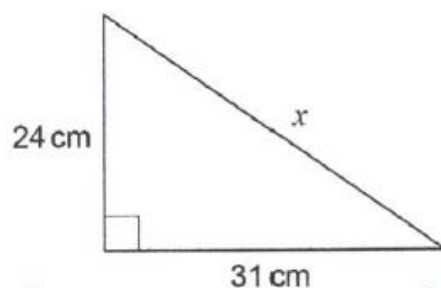
$$= \underline{\underline{150}} \text{ cm}$$

Answer

150

cm

7. No.2

Not drawn
accuratelyUse Pythagoras' theorem to work out the value of x .

Give your answer as a decimal.

[3 marks]

$$x^2 = 24^2 + 31^2$$

$$x^2 = 576 + 961$$

$$x^2 = 1537$$

$$x = \sqrt{1537}$$

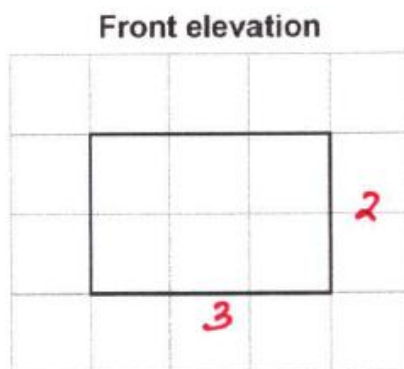
$$x = 39.20459157$$

$$x = 39.2 \text{ cm}$$

Answer 39.2 cm

8. No.5

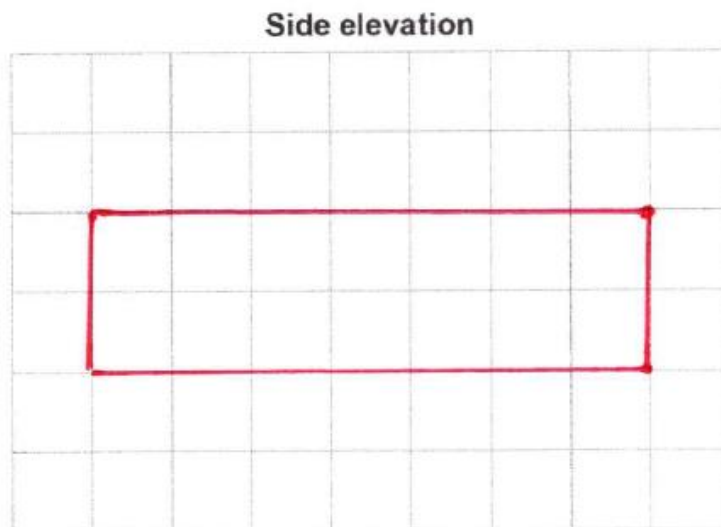
The front elevation of a cuboid is shown on this centimetre grid.



The volume of the cuboid is 42 cm^3

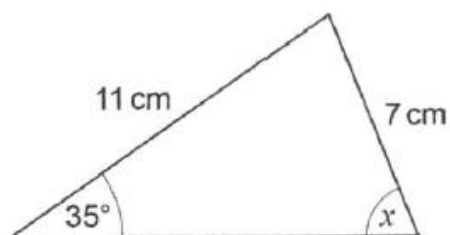
Draw the **side elevation** on this centimetre grid.

$$\begin{aligned}
 \text{volume} &= l \times w \times h \\
 42 \text{ cm}^3 &= 3 \times 2 \times h \\
 42 \text{ cm}^3 &= \frac{6h}{6} \quad [2 \text{ marks}] \\
 h &= \underline{\underline{7}} \text{ (width)}
 \end{aligned}$$



9. No.18

Here is triangle A.

Not drawn
accurately

- (a) Use the sine rule to show that $x = 64^\circ$ to the nearest degree.

[3 marks]

$$\frac{\sin 35^\circ}{7 \text{ cm}} = \frac{\sin x}{11 \text{ cm}}$$

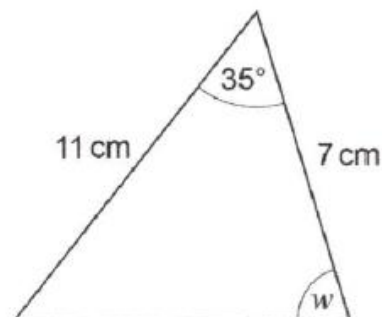
$$\sin x = \frac{11 \sin 35^\circ}{7 \text{ cm}}$$

$$\sin x = 0.9013344$$

$$\sin^{-1}(x) = 64.33$$

$$\approx \underline{\underline{64^\circ}}$$

(b) Here is triangle B.



Not drawn
accurately

Anna thinks that w must be 64° to the nearest degree.

She says,

"This is because triangle B has two sides and one angle the same as triangle A."

Without further calculation, is she correct?

Tick a box.

Yes

☐

No

☒

Give a reason for your answer.

[1 mark]

Different angle between 11 cm and 7 cm,
Thus angles in triangle A and B are
not same, thus not congruent.