



CALCULATOR ALLOWED



Advanced level questions

20 min

Mini Test 29: Plane Figures and Solids – Properties and Measurements

1 Gemma is tiling a tabletop. She is using small squares of side length 10 cm, rectangles that are twice as long as they are wide and large squares. She has completed one quarter of the tabletop as shown in the diagram. What is the area of the tabletop in square metres?

_____ m²

2 Which of the following properties does **not** mean that a quadrilateral **must** be a parallelogram?

A Both pairs of opposite sides are equal.
 B One pair of opposite sides are equal and parallel.
 C All four sides are equal.
 D The diagonals are equal.

3 Which figure has the most axes of symmetry?

A B C D

4 The volume of this rectangular prism is 576 cm³. What is its height?

_____ cm

5 Jai made this object by sticking 32 cubes together. He placed the object on a table and then walked around the table studying the object from all sides. How many faces of cubes can Jai **not** see?

A 132 B 92 C 66 D 40

6 This rectangular prism has a piece of ribbon wrapped right around it in two directions as shown in the diagram. What is the minimum length of ribbon required?

_____ cm

7 PQRS is a square. PQTS is a

A parallelogram
 B rhombus
 C trapezium
 D kite

8 This object has been made using 12 blocks. It is viewed from the top, front and back, and both sides. Which view cannot be seen?

A B C D

9 A frame in the shape of a cube has been made from a piece of wire 36 cm long. What is the volume of the cube?

_____ cm³

10 PQST is a rectangle. The area of triangle PQR is 18 cm² and the area of triangle PTR is 32 cm².

What is the area of triangle TRS?

_____ cm²

11 This parallelogram is reflected in the line *m*. What shape is formed by the object and its image?

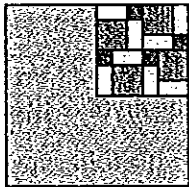
A parallelogram B hexagon
 C rhombus D trapezium

12 This is the net of a die. Which could **not** be the die?

A B C D

- 1 1.44 m² 2 D 3 D 4 6 cm 5 A 6 116 cm
7 C 8 B 9 27 cm³ 10 14 cm² 11 B 12 C

- 1 From the diagram you can see that the rectangle has the same width as the small square, so it is 10 cm wide. It is twice as long as it is wide so the rectangle is 20 cm long. The large square is the same length as the rectangle, so it is 20 cm by 20 cm.



The tiling pattern shown is 60 cm long and 60 cm wide.

So the tabletop is 120 cm or 1.2 metres long and 1.2 metres wide.

$$\text{Area} = (1.2 \times 1.2) \text{ m}^2 = 1.44 \text{ m}^2$$

- 2 Consider the options:

If both pairs of opposite sides of a quadrilateral are equal, the quadrilateral must be a parallelogram.

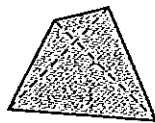
If a pair of opposite sides of a quadrilateral is equal and parallel, the quadrilateral must be a parallelogram.

If all sides of a quadrilateral are equal, it must be a parallelogram.

[It must be a rhombus, but a rhombus is a special parallelogram.]

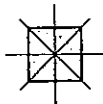
A quadrilateral can have diagonals that are equal and not be a parallelogram.

[The diagonals of a parallelogram are not usually equal.]

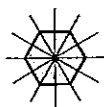


The property that does not mean that a quadrilateral must be a parallelogram is both diagonals being equal.

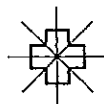
- 3 The square has 4 axes of symmetry.



The regular hexagon has 6 axes of symmetry.



The dodecagon has 4 axes of symmetry.



The regular heptagon has 7 axes of symmetry.



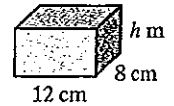
The shape that has the most axes of symmetry is the regular heptagon.

- 4 Volume = length \times width \times height

$$\text{So } 12 \times 8 \times h = 576$$

$$96 \times h = 576$$

$$h = 576 \div 96 = 6$$



The height of the prism is 6 cm.

- 5 Jai can see 16 faces at the front, so there will also be 16 faces at the back.

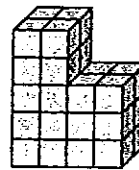
There are 10 faces on the right side, so there will be 10 on the left side.

There are 8 faces at the top.

$$\text{Total visible faces} = 2 \times 16 + 2 \times 10 + 8 = 60$$

$$\text{Total faces on 32 cubes} = 32 \times 6 = 192$$

$$\text{Faces that cannot be seen} = 192 - 60 = 132$$



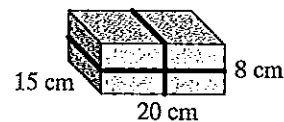
- 6 Horizontal ribbon:

$$\text{length} = (2 \times 20 + 2 \times 15) \text{ cm} = 70 \text{ cm}$$

Second ribbon:

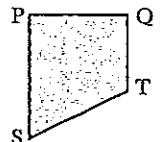
$$\text{length} = (2 \times 15 + 2 \times 8) \text{ cm} = 46 \text{ cm}$$

$$\text{Total length} = (70 + 46) \text{ cm} = 116 \text{ cm}$$

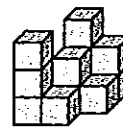


- 7 PQTS is a trapezium.

[A trapezium is a quadrilateral with one pair of sides parallel. Sides PS and QT are parallel because they were (part of) the sides of a square.]



- 8



The view from the top is



The view from the back is



The view from the right side, or from the left side, is



The view that cannot be seen is

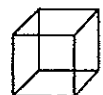


- 9 The cube has 12 edges.

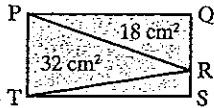
All the edges of a cube are equal.

$$\text{Each edge} = (36 \div 12) \text{ cm} = 3 \text{ cm}$$

$$\text{Volume} = \text{side}^3 = 3^3 \text{ cm}^3 = 27 \text{ cm}^3$$

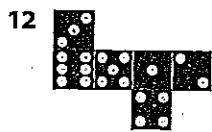
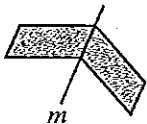


- 10 The area of triangle PRT is half the area of the rectangle. So the area of triangle PQR plus the area of triangle TRS will equal 32 cm^2 .



$$\begin{aligned} \text{Area of triangle TRS} &= (32 - 18) \text{ cm}^2 \\ &= 14 \text{ cm}^2 \end{aligned}$$

- 11 Together the object and its image have six sides. So the shape is a hexagon.



The cube that cannot be made from this net is



[If one is on the top face and five on the right side, three will be on the front face. But, the dots on the three are on the wrong diagonal compared with the net.]