

Nets of Prisms and Pyramids

Starter

1. (Review of last lesson)

Find the surface area of cuboid whose dimensions are 4.5 cm by 7 cm by 5.2 cm.

Working: There are 2 faces that are 4.5 cm by 7 cm: $\text{Area} = 2 \times 4.5 \times 7 = 63$
 There are 2 faces that are 7 cm by 5.2 cm: $\text{Area} = 2 \times 7 \times 5.2 = 72.8$
 There are 2 faces that are 5.2 cm by 4.5 cm: $\text{Area} = 2 \times 5.2 \times 4.5 = 46.8$
 Surface area = $63 + 72.8 + 46.8 = 182.6 \text{ cm}^2$.

or use the formula

$$\text{Surface area} = 2(4.5 \times 7 + 7 \times 5.2 + 5.2 \times 4.5) = 182.6 \text{ cm}^2.$$

2. (Review of last lesson) A cuboid has surface area 100 cm^2 . If two dimensions of the cuboid are 4 cm and 3 cm, find the third dimension. Give your answer to 3 s.f.

Working: Let the length of the 3rd side be x .

The sides are then 3, 4 and x .

There are 2 faces that are 3 cm by 4 cm: $\text{Area} = 2 \times 3 \times 4 = 24$

There are 2 faces that are 4 cm by x cm: $\text{Area} = 2 \times 4 \times x = 8x$

There are 2 faces that are x cm by 3 cm: $\text{Area} = 2 \times x \times 3 = 6x$

Surface area: $24 + 8x + 6x = 100$

Collect like terms: $14x = 76$

Divide by 14: $x = \frac{76}{14} = 5.43 \text{ cm (3 s.f.)}$

The 3rd side is 5.43 cm.

or use the formula

Surface area: $2(3 \times 4 + 4 \times x + x \times 3) = 100$

Simplify the bracket: $2(12 + 4x + 3x) = 100$

Collect like terms: $2(12 + 7x) = 100$

Expand the brackets: $24 + 14x = 100$

Collect like terms: $14x = 76$

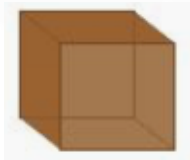
Divide by 14: $x = \frac{76}{14} = 5.43 \text{ cm (3 s.f.)}$

The length of the 3rd side is 5.43 cm

Work in pairs.

2. Look at the diagrams below. Classify the solids as prisms or pyramids

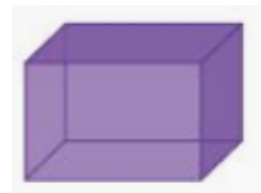
(a)



(b)



(c)



(d)



(e)



(f)



Working: Prism: (a), (c) and (f)

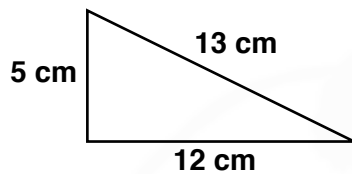
Pyramid: (b), (d) and (e)

2. Explain the difference between a prism and a pyramid.

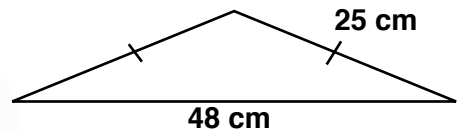
Working: See below.

3. Find the area of the triangles.

(a)



(b)



Working: (a) Area of a triangle = $\frac{\text{base} \times \text{perpendicular height}}{2}$

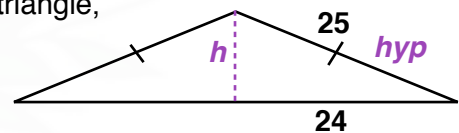
$$= \frac{12 \times 5}{2}$$
$$= 30 \text{ cm}^2$$

(b) Before calculating the area of the triangle, we need to work out its height.

Let height be h .

By Pythagoras:

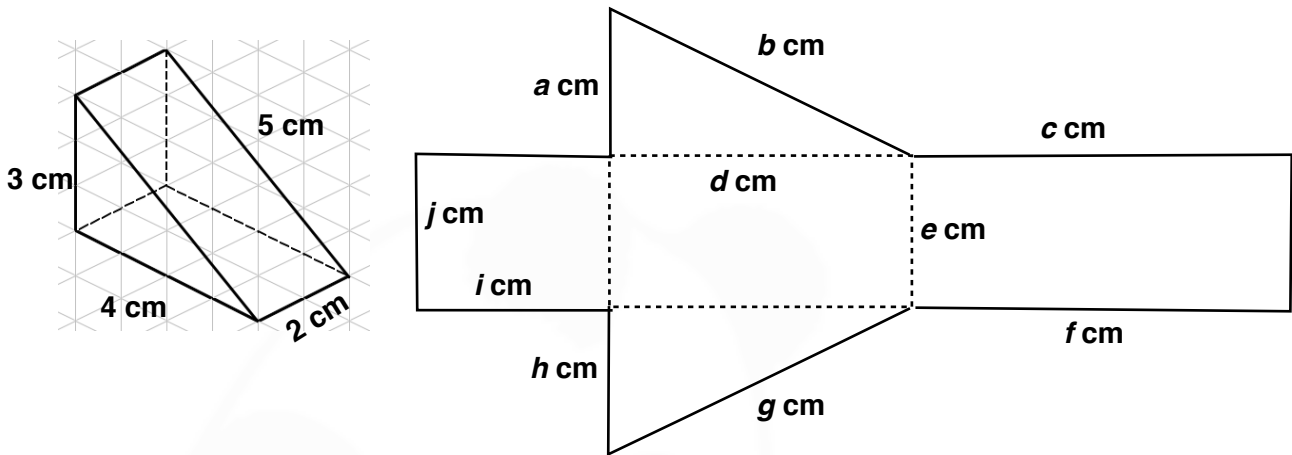
$$h^2 + 24^2 = 25^2$$
$$h^2 + 576 = 625$$
$$h^2 = 49$$
$$h = \sqrt{49} = 7$$



$$\text{Area of a triangle} = \frac{\text{base} \times \text{perpendicular height}}{2}$$
$$= \frac{48 \times 7}{2}$$
$$= 168 \text{ cm}^2.$$

Nets of prisms

- E.g. 1** (a) Copy the net of the triangular prism and write in the lengths $a-j$.
 (b) Hence find the surface area of the triangular prism.



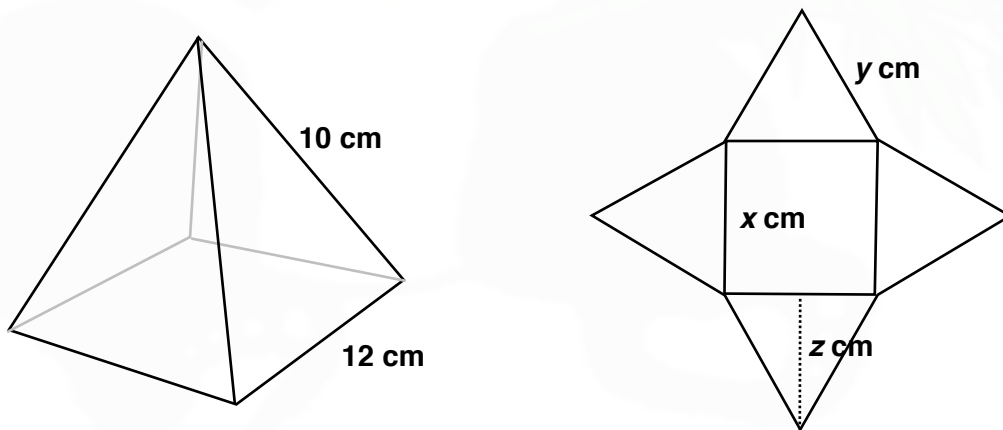
Working:

- (a) $a = 3$ $b = 5$ $c = 5$ $d = 4$ $e = 2$
 $f = 5$ $g = 5$ $h = 3$ $i = 3$ $j = 2$
- (b) 6 (triangle) + 6 (triangle) + 6 (vertical rectangle) + 10 (sloping rectangle) + 8 (base rectangle)
 Total = 36 cm^2

Graphic of 2-D to 3-D prism and vice versa

Nets of pyramids

- E.g. 2** (a) Copy the net of the square-based pyramid and write in the lengths x, y and z .
 (b) Hence find the surface area of the triangular prism.



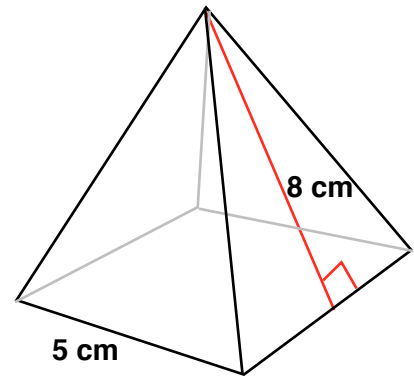
- Working:** (a) $x = 12$ $y = 10$ $z = 8$
 (b) Square = 144
 Each triangle = $\frac{8 \times 12}{2} = 48$
 Total surface area = $144 + 4 \times 48 = 336 \text{ cm}^2$

Graphic of 2-D to 3-D pyramid and vice versa

E.g. 3 Calculate the area of the square-based pyramid.

Working:

$$\begin{aligned} \text{Area of base} &= 5^2 = 25 \\ \text{Each triangular face} &= \frac{8 \times 5}{2} = 20 \\ \text{Surface area} &= 25 + 4 \times 20 = 105 \text{ mm}^2 \end{aligned}$$



E.g. 4 Calculate the surface area of this prism

Hint: Let h be the perpendicular height of the triangular ends.

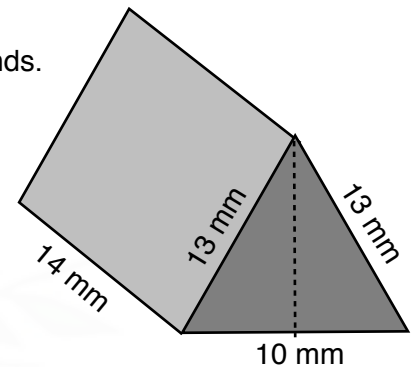
Working: There are 2 rectangular faces each 13 by 14

The base rectangle is 10 by 14.

To calculate the area of the triangular ends, we need to calculate the height, h , of the triangle.

By Pythagoras:

$$\begin{aligned} h^2 + 5^2 &= 13^2 \\ h^2 + 25 &= 169 \\ h^2 &= 144 \\ h &= \sqrt{144} = 12 \end{aligned}$$



$$\begin{aligned} \text{Area of each triangular face} &= \frac{\text{base} \times \text{perpendicular height}}{2} \\ &= \frac{10 \times 12}{2} \\ &= 60 \text{ cm}^2. \end{aligned}$$

$$\begin{aligned} \text{Surface area} &= 2 \text{ rectangles (13 by 14)} + 1 \text{ rectangle (10 by 14)} + 2 \text{ triangles} \\ &= (2 \times 13 \times 14) + (10 \times 14) + (2 \times 60) \\ &= 624 \text{ mm}^2 \end{aligned}$$

Video: [Surface area of prisms](#)
Video: [Surface area of L-shaped prism](#)

[Solutions to Starter and E.g.s](#)

Exercise

p112 Ex 6.5 Qu 1-9

[Textbook answers \(only available during a lockdown\)](#)