

18. Tuesday 16th June: Surface area of triangular prisms and cylinders

8X1 – Summer Term 2

Today's lesson is about calculating the surface area of rectilinear shapes. I have split the lesson into two parts:

- Part 1: Surface area of triangular prisms
- Part 2: Surface area of cylinders
- Homework: 1 task on mathswatch

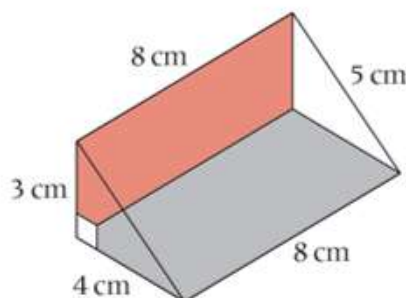
Answers are at the end of the document.

Part 1 – Surface area of triangular prisms

Surface area of a triangular prism:

<https://corbettmaths.com/2018/01/29/surface-area-of-other-prisms/>

EG 1: Find the surface area of a triangular prism



$$\begin{aligned}\text{Front Triangle} - \text{Area} &= \frac{1}{2}bh \\ - \text{Area} &= \frac{1}{2} \times 4 \times 3 \\ - \text{Area} &= \mathbf{6cm^2}\end{aligned}$$

$$\begin{aligned}\text{Back Triangle} - \text{Area} &= \frac{1}{2}bh \\ - \text{Area} &= \frac{1}{2} \times 4 \times 3 \\ - \text{Area} &= \mathbf{6cm^2}\end{aligned}$$

$$\begin{aligned}\text{Base Rectangle} - \text{Area} &= bh \\ - \text{Area} &= 4 \times 8 \\ - \text{Area} &= \mathbf{32cm^2}\end{aligned}$$

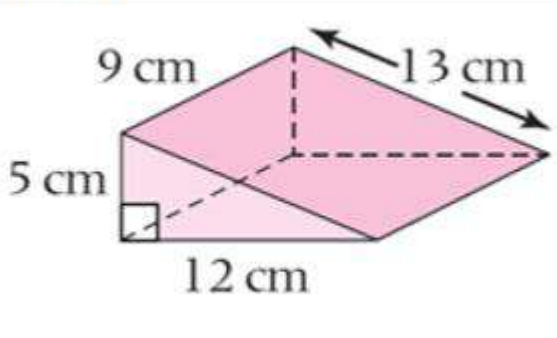
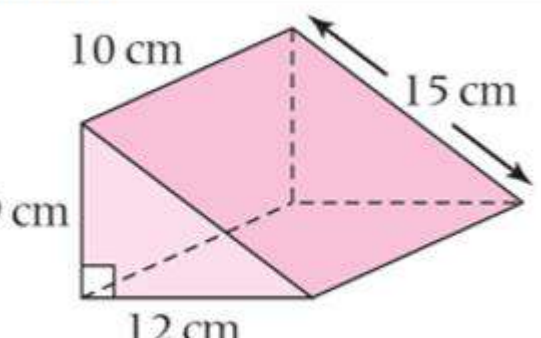
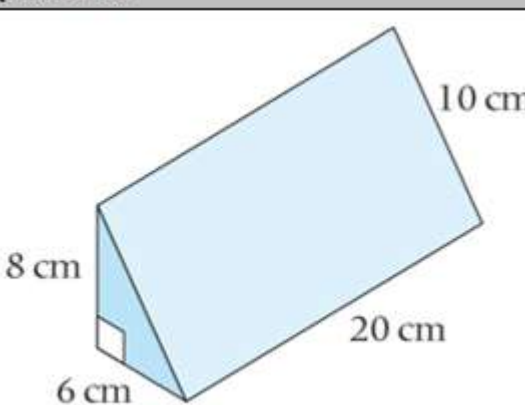
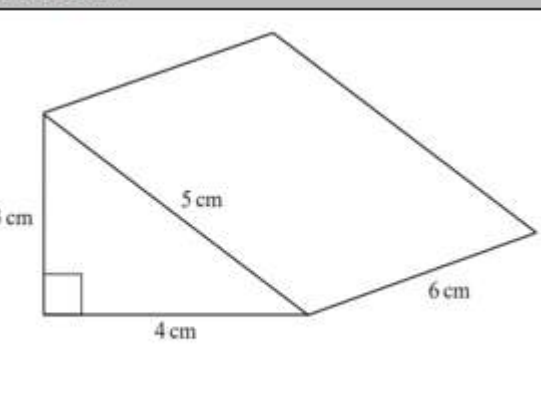
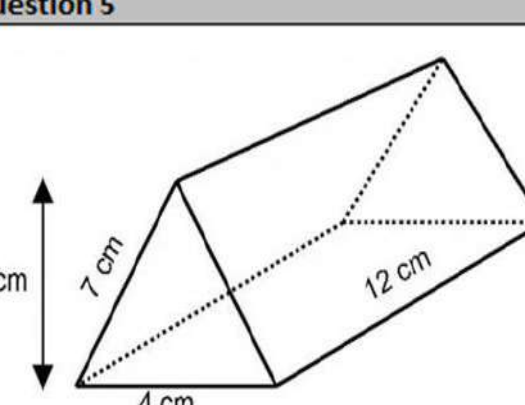
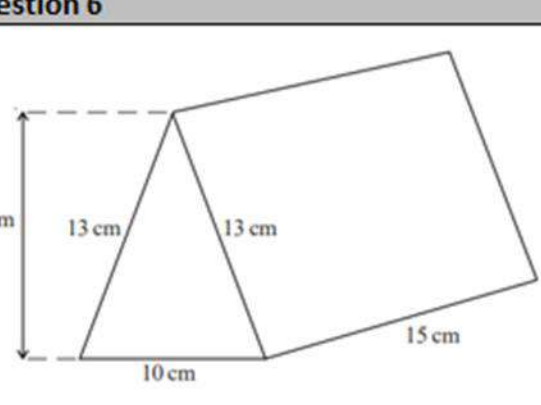
$$\begin{aligned}\text{Side Rectangle} - \text{Area} &= bh \\ - \text{Area} &= 3 \times 8 \\ - \text{Area} &= \mathbf{24cm^2}\end{aligned}$$

$$\begin{aligned}\text{Slanted Rectangle} - \text{Area} &= bh \\ - \text{Area} &= 5 \times 8 \\ - \text{Area} &= \mathbf{40cm^2}\end{aligned}$$

$$\text{Total Surface Area} = 6cm^2 + 6cm^2 + 32cm^2 + 24cm^2 + 40cm^2 = \mathbf{108cm^2}$$

Questions

Find the surface area of each of the following triangular prisms

<p>Question 1</p>  <p>A pink triangular prism. The base is a right-angled triangle with legs of 5 cm and 12 cm, and a hypotenuse of 13 cm. The height of the prism is 9 cm.</p>	<p>Question 2</p>  <p>A pink triangular prism. The base is a right-angled triangle with legs of 9 cm and 12 cm, and a hypotenuse of 15 cm. The height of the prism is 10 cm.</p>
<p>Question 3</p>  <p>A light blue triangular prism. The base is a right-angled triangle with legs of 6 cm and 8 cm, and a hypotenuse of 10 cm. The length of the prism is 20 cm.</p>	<p>Question 4</p>  <p>A white triangular prism. The base is a right-angled triangle with legs of 3 cm and 4 cm, and a hypotenuse of 5 cm. The length of the prism is 6 cm.</p>
<p>Question 5</p>  <p>A white triangular prism. The base is a triangle with a base of 4 cm and a height of 6 cm. The slant edge of the prism is 7 cm. The length of the prism is 12 cm.</p>	<p>Question 6</p>  <p>A white triangular prism. The base is an isosceles triangle with equal sides of 13 cm and a base of 10 cm. The height of the prism is 12 cm. The length of the prism is 15 cm.</p>

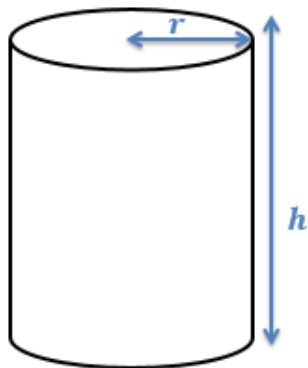
Part 2 – Surface area of cylinders

Two videos to watch to help understanding:

Surface area of cylinders:

<https://corbettmaths.com/2013/04/04/surface-area-of-a-cylinder/>

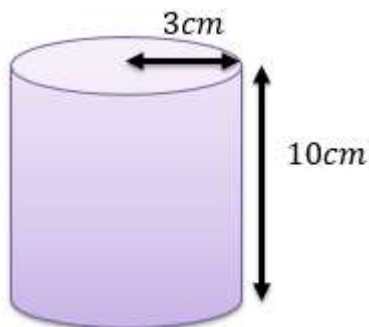
Surface Area of Cylinders



By making a vertical slit and folding out the curved surface of the cylinder so that it is rectangular:

$$\begin{aligned}\text{Curved Surface Area} &= 2\pi rh \\ \text{Total Surface Area} \\ &= 2\pi r^2 + 2\pi rh\end{aligned}$$

EG 2: Find the surface area of the cylinder



Surface Area

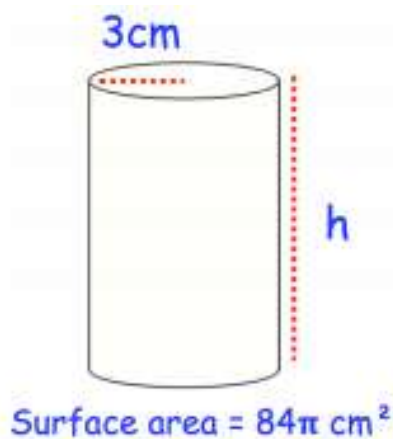
$$\text{Area of top: } \pi \times 3^2 = 9\pi$$

$$\text{Area of base: } 9\pi$$

$$\text{Area of curved surface area: circumference of the circle} \times \text{height: } 6 \times \pi \times 10 = 60\pi$$

$$\text{Total} = 60\pi + 9\pi + 9\pi = 78\pi$$

EG 3: Working backwards, given the surface area



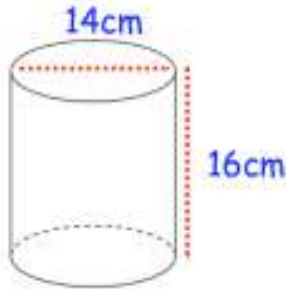
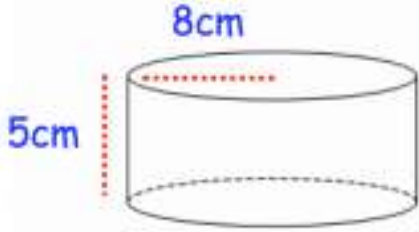
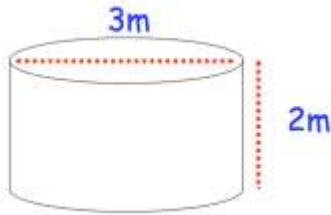
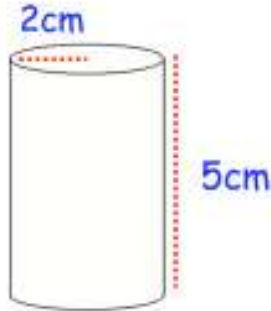
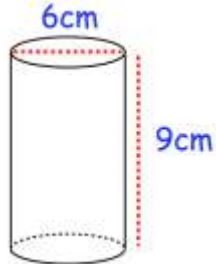
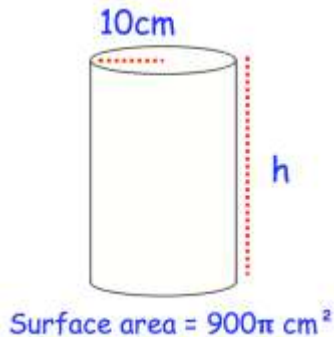
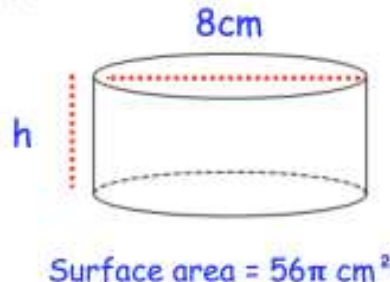
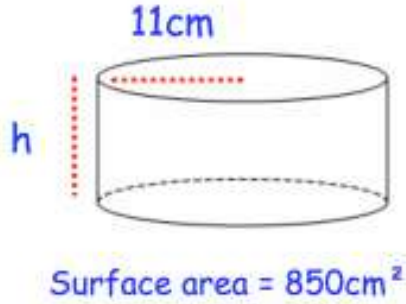
$$\pi \times 3^2 + \pi \times 3^2 + (2 \times 3 \times \pi \times h) = 84\pi$$

$$18\pi + 6\pi h = 84\pi$$

$$6\pi h = 66\pi$$

$$6h = 66$$

$$h = 11$$

Question 1 Calculate the surface area to 2dp 	Question 2 Calculate the surface area to 2dp 
Question 3 Calculate the surface area to 2dp 	Question 4 Calculate the surface area in terms of π 
Question 5 Calculate the surface area in terms of π 	Question 6 Calculate the height 
Question 7 Calculate the height 	Question 8 Calculate the height to 2 dp 

Now complete the mathswatch 😊

Answers – Part 1

- 1) 330cm^2
- 2) 456cm^2
- 3) 528cm^2
- 4) 84cm^2
- 5) 240cm^2
- 6) 660cm^2

Part 2

- 1) 1011.59cm^2
- 2) 653.45cm^2
- 3) 32.99m^2
- 4) $28\pi\text{ cm}^2$
- 5) $72\pi\text{ cm}^2$
- 6) 35cm
- 7) 3cm
- 8) 1.3cm (1.30cm)