Total Surface Area of a Cylinder

Practice Worksheet (Problem Solving)

I Do

A solid cylinder has a radius of 5.4 cm and a height of 12 cm.
Work out the total surface area of the cylinder.
Give your answer correct to 3 significant figures.

..... cm^2

(Total for Question is 3 marks)

We Do

A solid cylinder has a radius of 4.2 cm and a height of 9.5 cm.
Work out the total surface area of the cylinder.
Give your answer correct to 3 significant figures.

..... cm^2

(Total for Question is 3 marks)

You Do 1

A solid cylinder has a radius of 7.1 cm and a height of 15 cm.
Work out the total surface area of the cylinder.
Give your answer correct to 3 significant figures.

..... cm^2

(Total for Question is 3 marks)

Video walkthrough

You Do 2

A solid cylinder has a diameter of 8.6 cm and a height of 10.4 cm.
Work out the total surface area of the cylinder.
Give your answer correct to 3 significant figures.

..... cm^2

(Total for Question is 3 marks)

You Do 3

A solid cylinder has a radius of 6 cm and a height of 15 cm.
Work out the exact total surface area of the cylinder.
Give your answer in terms of π.

..... cm^2

(Total for Question is 3 marks)

Challenge 1

A solid cylinder has a total surface area of 120π cm^2.
The radius of the cylinder is 4 cm.
Work out the height of the cylinder.
Show clear algebraic working.

..... cm

(Total for Question is 4 marks)

Challenge 2

A solid cylinder has a height that is exactly twice its radius.
The total surface area of the cylinder is 150π cm^2.
Find the exact radius of the cylinder.
Show clear algebraic working.

..... cm

(Total for Question is 4 marks)

Extreme Challenge

A solid composite shape is made by attaching a solid hemisphere to the top of a solid cylinder.
The cylinder and the hemisphere both have a radius of 5 cm.
The cylindrical part of the shape has a height of 12 cm.

Work out the total surface area of the entire solid shape.
Give your exact answer in terms of π.

..... cm^2

(Total for Question is 5 marks)

Answers & Worked Solutions

I Do
Total Surface Area $= 2\pi r^2 + 2\pi rh$
Substitute $r = 5.4$ and $h = 12$:
Area $= 2 \times \pi \times (5.4)^2 + 2 \times \pi \times 5.4 \times 12$
Area $= 2\pi(29.16) + 2\pi(64.8)$
Area $= 58.32\pi + 129.6\pi$
Area $= 187.92\pi = 590.368...$ cm^2
Rounding to 3 significant figures gives **590 cm^2**.

We Do
Total Surface Area $= 2\pi r^2 + 2\pi rh$
Substitute $r = 4.2$ and $h = 9.5$:
Area $= 2 \times \pi \times (4.2)^2 + 2 \times \pi \times 4.2 \times 9.5$
Area $= 35.28\pi + 79.8\pi$
Area $= 115.08\pi = 361.534...$ cm^2
Rounding to 3 significant figures gives **362 cm^2**.

You Do 1
Total Surface Area $= 2\pi r^2 + 2\pi rh$
Substitute $r = 7.1$ and $h = 15$:
Area $= 2 \times \pi \times (7.1)^2 + 2 \times \pi \times 7.1 \times 15$
Area $= 100.82\pi + 213\pi$
Area $= 313.82\pi = 985.894...$ cm^2
Rounding to 3 significant figures gives **986 cm^2**.

You Do 2
First, find the radius. Radius = Diameter $\div$ 2 = 8.6 $\div$ 2 = 4.3 cm.
Total Surface Area $= 2\pi r^2 + 2\pi rh$
Substitute $r = 4.3$ and $h = 10.4$:
Area $= 2 \times \pi \times (4.3)^2 + 2 \times \pi \times 4.3 \times 10.4$
Area $= 36.98\pi + 89.44\pi$
Area $= 126.42\pi = 397.160...$ cm^2
Rounding to 3 significant figures gives **397 cm^2**.

You Do 3
Total Surface Area $= 2\pi r^2 + 2\pi rh$
Substitute $r = 6$ and $h = 15$:
Area $= 2\pi(6)^2 + 2\pi(6)(15)$
Area $= 2\pi(36) + 2\pi(90)$
Area $= 72\pi + 180\pi$
Total Surface Area = **252π cm^2**.

Challenge 1
Set up the equation for Total Surface Area: $2\pi r^2 + 2\pi rh = \text{TSA}$.
We are given $r = 4$ and $\text{TSA} = 120\pi$.
$2\pi(4)^2 + 2\pi(4)h = 120\pi$
$2\pi(16) + 8\pi h = 120\pi$
$32\pi + 8\pi h = 120\pi$
Subtract 32π from both sides:
$8\pi h = 88\pi$
Divide both sides by 8π:
$h = \frac{88\pi}{8\pi} = \mathbf{11\ cm}$.

Challenge 2
Let the radius be r. The height is $h = 2r$.
The formula for total surface area is $2\pi r^2 + 2\pi rh$.
Substitute $h = 2r$ into the formula:
$2\pi r^2 + 2\pi r(2r) = 150\pi$
$2\pi r^2 + 4\pi r^2 = 150\pi$
Combine like terms:
$6\pi r^2 = 150\pi$
Divide by 6π:
$r^2 = \frac{150\pi}{6\pi} = 25$
Take the positive square root for a length:
$r = \mathbf{5\ cm}$.

Extreme Challenge
The total surface area of the composite shape is made of three parts:

1. The circular base of the cylinder (bottom only): πr^2
2. The curved surface area of the cylinder: $2\pi rh$
3. The curved surface area of the hemisphere: $2\pi r^2$ (half of a sphere's $4\pi r^2$)

Note: The top circle of the cylinder and the flat base of the hemisphere are hidden inside the solid, so they are not part of the surface area.
Formula for Total Shape Area $= \pi r^2 + 2\pi rh + 2\pi r^2 = \mathbf{3\pi r^2 + 2\pi rh}$.
Substitute $r = 5$ and $h = 12$:
Area $= 3\pi(5)^2 + 2\pi(5)(12)$
Area $= 3\pi(25) + 120\pi$
Area $= 75\pi + 120\pi$
Total Area $= \mathbf{195\pi\ cm^2}$.