

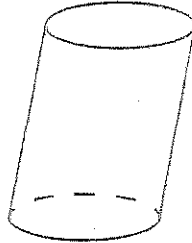
1.3A SURFACE AREA: Nets

Let us now look at other three dimensional figures in geometry; the right rectangular prism, right triangular prism and the right cylinder. We use the word "right" to distinguish geometric figures that are perpendicular to the base.

Example:

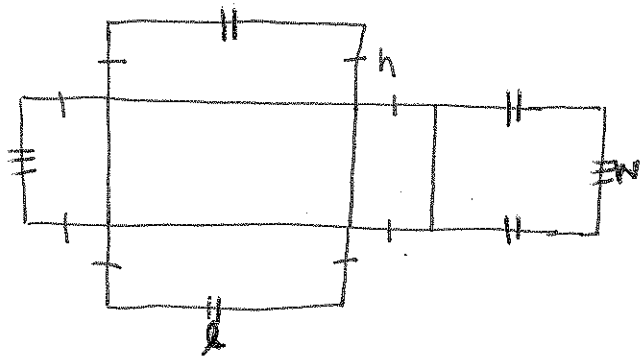
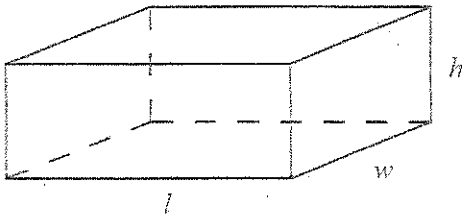


Right Cylinder



Not Right Cylinder

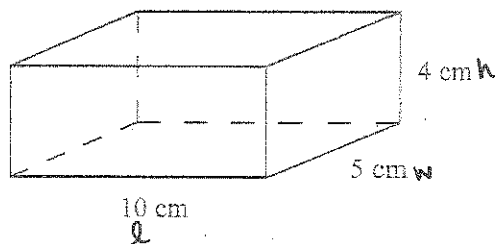
Right Rectangular Prism And Its Net



$$\text{Surface Area} = \underbrace{2 \cdot l \cdot w}_{\substack{\text{top} \\ \text{and bottom}}} + \underbrace{2 \cdot l \cdot h}_{\substack{\text{front} \\ \text{and back}}} + \underbrace{2 \cdot w \cdot h}_{\substack{\text{Left} \\ \text{and right sides}}}$$



Find the surface area of the following figure:



► Solution: Surface Area = $2lw + 2lh + 2wh$

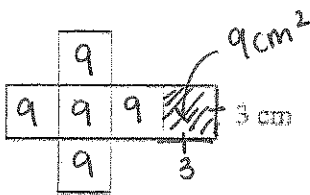
$$= 2 \cdot 10 \cdot 5 + 2 \cdot 10 \cdot 4 + 2 \cdot 5 \cdot 4$$

$$= 100 + 80 + 40$$

$$= \boxed{220 \text{ cm}^2}$$

Determine the surface area of the following nets:

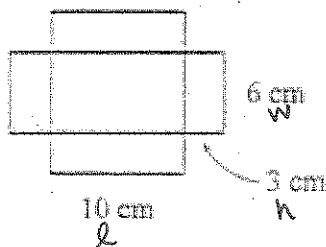
a) A cube



$$\begin{aligned} SA &= 6a^2 \\ &= 6(3^2) \\ &= 6 \cdot 9 = \end{aligned}$$

54 cm²

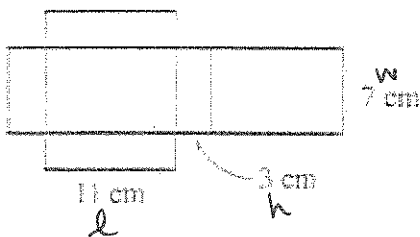
b) An open top box



$$\begin{aligned} SA &= 2lw + 2lh + 2wh \\ &= 1 \cdot 10 \cdot 6 + 2 \cdot 10 \cdot 3 + 2 \cdot 6 \cdot 3 \\ &= 60 + 60 + 36 \Rightarrow \end{aligned}$$

156 cm²

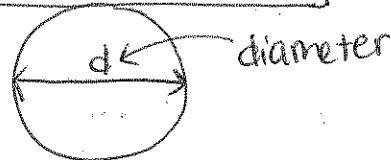
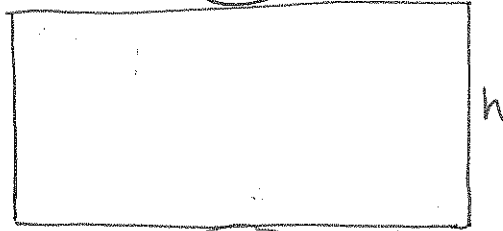
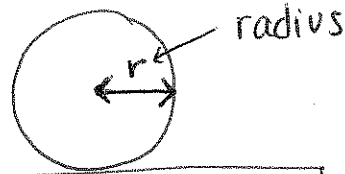
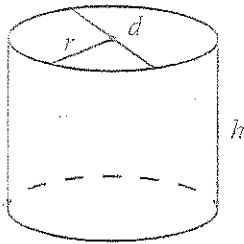
c) A closed top box



$$\begin{aligned} SA &= 2lw + 2lh + 2wh \\ &= 2 \cdot 11 \cdot 7 + 2 \cdot 11 \cdot 3 + 2 \cdot 7 \cdot 3 \\ &= 154 + 66 + 42 \Rightarrow \end{aligned}$$

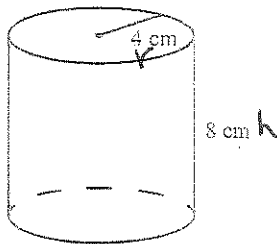
262 cm²

Right Cylinder And Its Net



$$\text{Surface Area} = \underbrace{2\pi r^2}_{\substack{\text{top} \\ \text{and} \\ \text{bottom} \\ \text{circles}}} + \underbrace{2\pi rh}_{\text{cylinder/base}}$$

Find the surface area of the following figure:



► Solution: Surface Area = $2\pi r^2 + 2\pi rh$

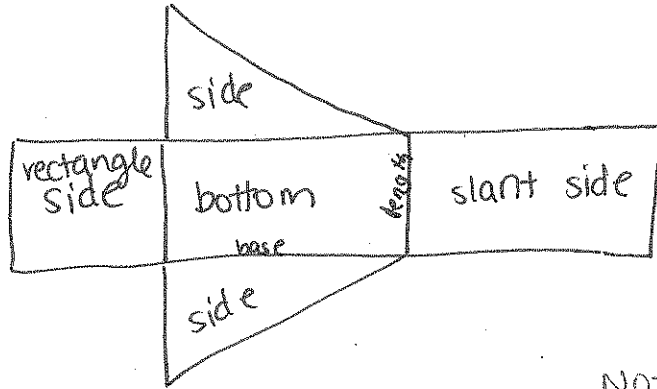
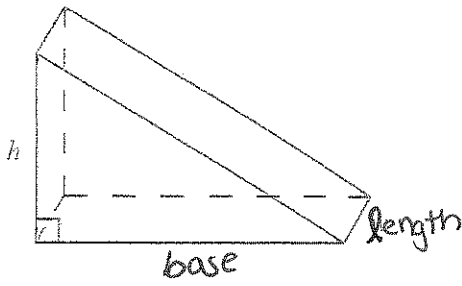
$$= 2\pi 4^2 + 2\pi \cdot 4 \cdot 8$$

$$= 32\pi + 64\pi$$

$$= 100.5309... + 201.061... = 301.59...$$

$$\approx \boxed{301.6 \text{ cm}^2}$$

Right Triangular Prism And Its Net



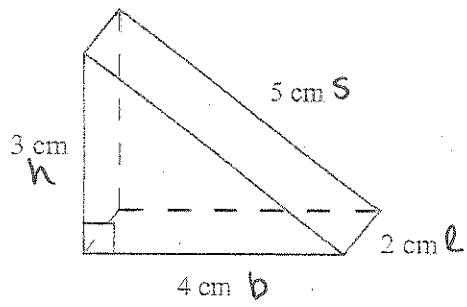
Surface Area = $bl + bh + hl + ls$

\swarrow bottom \swarrow triangular faces \swarrow rectangle side \swarrow slant side.

$2\left(\frac{1}{2}bh\right)$
 $\Rightarrow \frac{2}{2}bh \Rightarrow bh$

Not given slant??
 # use pythagorean theorem
 $a^2 + b^2 = c^2$
 // slant!!

Example Find the surface area of the following figure:



► Solution: Surface Area = $bh + bl + ls + lh$

$= 4 \cdot 3 + 4 \cdot 2 + 2 \cdot 5 + 2 \cdot 3$
 $= 12 + 8 + 10 + 6$
 $= \boxed{36 \text{ cm}^2}$

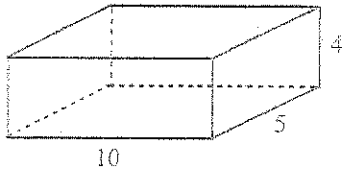
Name: _____

Date: _____

Block: _____

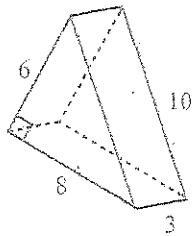
1. Find the surface area of the following figures. All measurements are in centimetres. All prisms are right prisms. Round answers to one decimal place.

a)



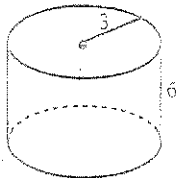
220 cm²

b)



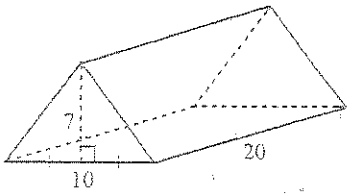
120 cm²

c)



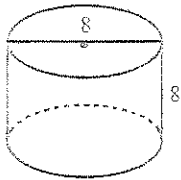
169.6 cm²

d)



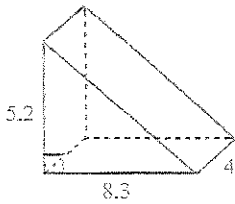
614.1 cm²

e)



301.6 cm²

f)



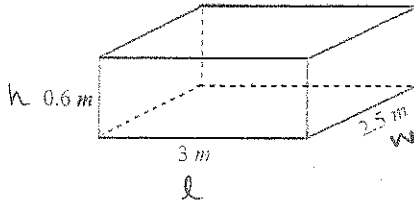
136.3 cm²

Name: _____

Date: _____

Block: _____

2. An outside playpen is placed on the grass. If the walls of the playpen are to be painted inside and outside, what is the total area to be painted?



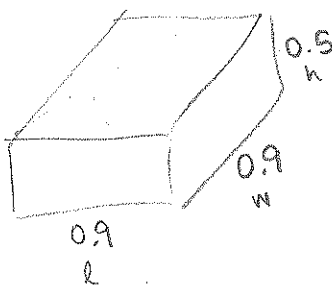
$$\begin{aligned}
 SA &= 2hw + 2lh + \cancel{2lw} \\
 &= 2 \cdot 0.6 \cdot 2.5 + 2 \cdot 3 \cdot 0.6 \\
 &= 3 + 3.6 \\
 &= 6.6
 \end{aligned}$$

← don't need top/bottom

$$\begin{aligned}
 &\underline{\quad \times 2} \quad \leftarrow \text{inside and outside of playpen.} \\
 &13.2
 \end{aligned}$$

13.2 m²

3. A toy box measures $0.9 \text{ m} \times 0.9 \text{ m}$ and 0.5 m high. What is the total area of plywood required to build the open-top box?

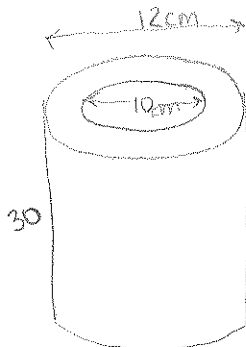


$$\begin{aligned}
 SA &= \underline{2}lw + 2hl + 2wh \\
 &= \underline{1}(0.9 \times 0.9) + 2(0.5 \times 0.9) + 2(0.9 \times 0.5) \\
 &= 0.81 + 0.9 + 0.9 \\
 &= 2.61
 \end{aligned}$$

← open top

2.61 m²

4. A certain type of drainage tile is made from clay. Each tile is a cylindrical shell 30 cm long with an inside and outside diameter of 10 cm and 12 cm . What is the surface area of each clay tile?



$$\begin{aligned}
 SA &= 2\pi r^2 + 2\pi rh \\
 &= 2\pi 6^2 + 2\pi 6 \cdot 30 \\
 &= 226.19 + 1130.97 \\
 &= 1357.17
 \end{aligned}$$

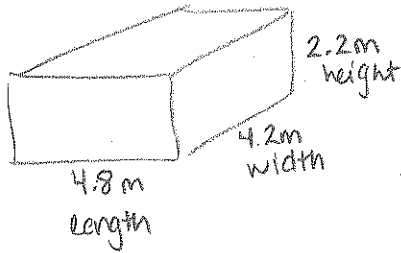
$$\begin{aligned}
 &1357.17 \\
 &+ 1099.557 \\
 &- 157.079 \\
 &\hline
 &- 157.079 \\
 &\hline
 \end{aligned}$$

$$\begin{aligned}
 SA &= 2\pi 5^2 + 2\pi 5 \cdot 30 \\
 &= 157.079 + 942.4777 \\
 &= 1099.557
 \end{aligned}$$

≈ 2142.57 cm²

5. A bedroom has length 4.8 m, width 4.2 m and height 2.2 m.

a) Find the surface area of the walls and ceiling. Assume no doors or windows.



$$SA = 2lw + 2lh + 2wh$$

$$= 1 \times 4.8 \times 4.2 + 2 \times 4.8 \times 2.2 + 2 \times 4.2 \times 2.2$$

$$= 20.16 + 21.12 + 18.48$$

$$= 59.76$$

$$\boxed{59.76 \text{ m}^2}$$

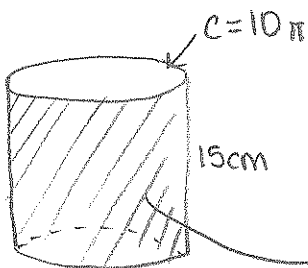
b) If one litre of paint covers 8 m^2 , and Mary applies two coats of paint, how many litres of paint will she need for this room?

$$\frac{59.76 \text{ m}^2}{8 \text{ m}^2} = 7.47 \text{ L} \times 2 \text{ coats of paint}$$

$$= 14.94 \text{ L}$$

$$\boxed{14.96 \text{ L}}$$

6. A can of peas has a height of 15 cm and a circumference of $10\pi \text{ cm}$. What is the amount of paper needed for the label of this can of peas?



$$C = 2\pi r \quad \text{or} \quad C = \pi d$$

$$\frac{10\pi}{2\pi} = \frac{2\pi r}{2\pi}$$

$$5 = r$$

$$SA = 2\pi r h + \cancel{2\pi r^2}$$

$$= 2\pi \cdot 5 \cdot 15$$

$$= 471.2388 \dots$$

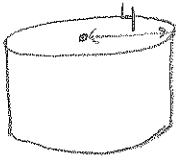
$$\approx \boxed{471.24 \text{ cm}^2}$$

Name: _____

Date: _____

Block: _____

7. If the radius of a right circular cylinder is 4 cm and the total surface area is $72\pi \text{ cm}^2$, what is the height?



$$SA = 2\pi r^2 + 2\pi rh$$

$$72\pi = 2\pi 4^2 + 2\pi \cdot 4 \cdot h$$

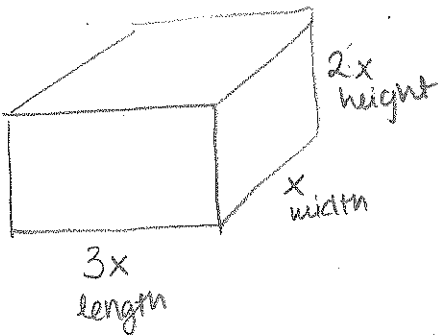
$$\begin{array}{r} 226.19 = 100.53 + 25.13h \\ -100.53 \quad -100.53 \\ \hline \end{array}$$

$$\begin{array}{r} 125.66 = 25.13h \\ \hline 25.13 \quad 25.13 \end{array}$$

$$5 = h$$

5 cm

8. The length of a rectangular solid is three times the width and the height is twice the width. If the surface area is 198 cm^2 , what is the width of the rectangular solid?



$$SA = 2lw + 2lh + 2hw$$

$$= 2 \cdot 3x \cdot x + 2 \cdot 3x \cdot 2x + 2 \cdot 2x \cdot x$$

$$= 6x^2 + 12x^2 + 4x^2$$

$$\begin{array}{r} 198 = 22x^2 \\ \hline 22 \quad 22 \end{array}$$

$$\sqrt{9} = \sqrt{x^2}$$

$$3 = x$$

3 cm

