

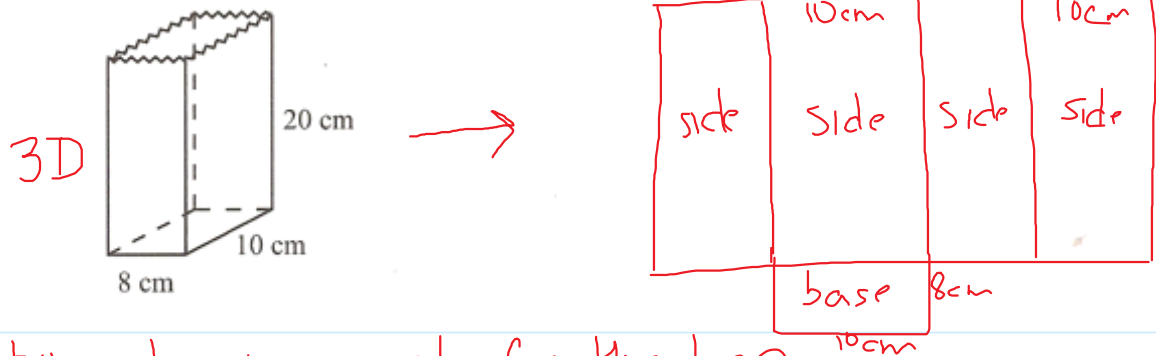
# Nets

February 18, 2015 12:04 PM

## Surface Area of Cubes and Rectangular Solids

The surface area of a solid is the sum of the area of all its faces. Some examples are: the amount of material to build a house, or the amount of material to make a cardboard box, or to make a tin can.

**Example 1** Consider a paper bag. How much paper is needed to make the bag?

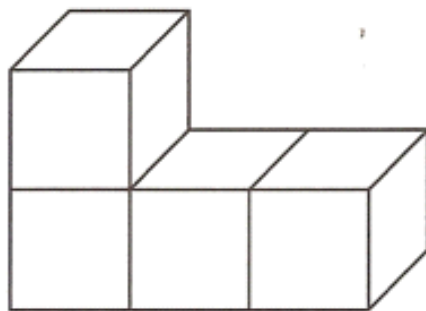


Solution draw a net for the bag

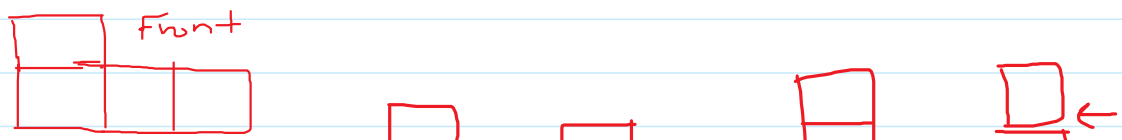
A net is a 2-D figure of the component parts of the 3-D figure

$$\begin{aligned} \text{Surface Area} &= 2 \cdot 8 \cdot 10 + 2 \cdot 8 \cdot 20 + 2 \cdot 10 \cdot 20 \\ &= 800 \text{ cm}^2 \end{aligned}$$

**Example 2** Determine the surface area of the composite of cubes.

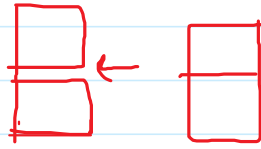


Method 1 Draw a net



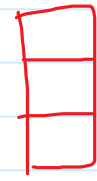


back



right

left



bottom

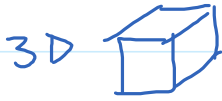


top

$$SA = 4 + 4 + 2 + 2 + 3 + 3$$

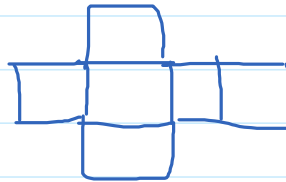
$$= 18 \text{ square units}$$

Method 2: consider each individual cube



3D

2D  
net

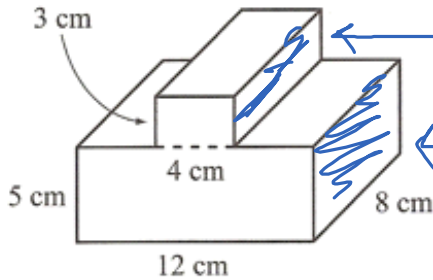


- 4 cubes total
- overlaps

$$SA = \boxed{18} \text{ square units}$$

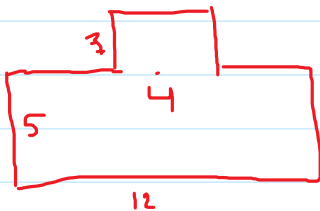
**Example 3**

Determine the surface area of the composite figure.

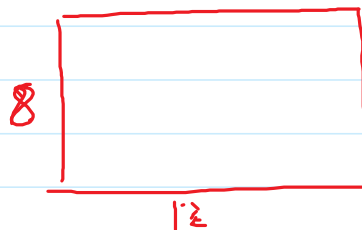


Method 1 Draw a net

front/back



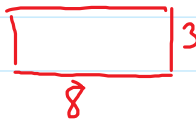
bottom/top



sides



smaller  
sides



$$SA = 2(12 \times 5 + 3 \times 4)$$

$$= 144$$

$$2(12 \times 8)$$

$$= 192$$

$$2(5 \times 8)$$

$$= 80$$

$$2(3 \times 8)$$

$$= 48$$

$$SA = 2(12 \times 5 + 3 \times 4)$$

$$= 144$$

$$= \boxed{464 \text{ cm}^2}$$

$$2(12 \times 8)$$

$$= 192$$

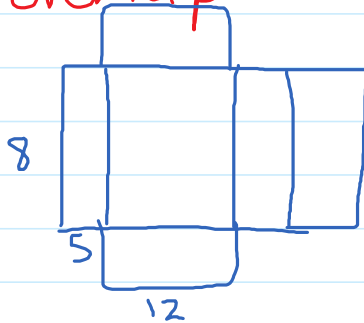
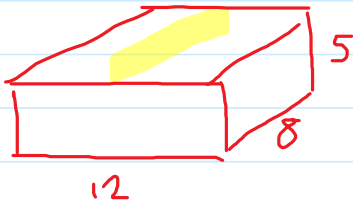
$$2(5 \times 8)$$

$$= 80$$

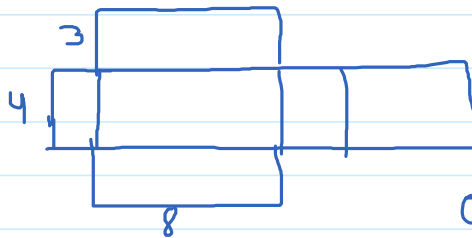
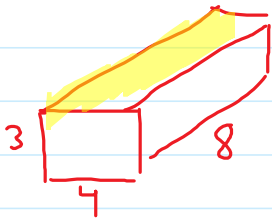
$$2(3 \times 8)$$

$$= 48$$

Method 2: 2 rectangular solids minus the overlap



$$SA = 392$$



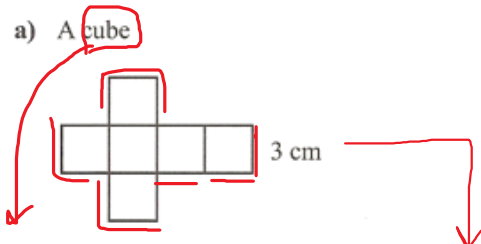
$$SA = 136$$

$$\text{overlap: } (8 \times 4) \times 2$$

$$= \textcircled{64} \text{ minus}$$

2. Determine the surface area of the following nets:

a) A cube



$$SA = 6a^2$$

$$= 6(3^2)$$

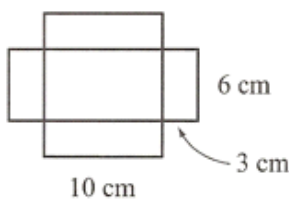
$$= 6(9)$$

$$= \boxed{54 \text{ cm}^2}$$

$$\frac{3 \times 3 + 3 \times 3 + 3 \times 3 + 3 \times 3 + 3 \times 3}{+ 3 \times 3} = 54 \text{ cm}^2$$

$$\boxed{464} \text{ square units}$$

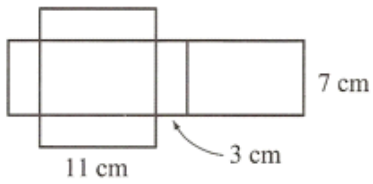
b) An open top box



$$\underline{156 \text{ cm}^2}$$

$$\begin{aligned} SA &= 2(6 \times 3) + 2(10 \times 3) + 1(10 \times 6) \\ &= 36 + 60 + 60 \\ &= 156 \text{ cm}^2 \end{aligned}$$

e) A closed top box



$$\underline{262 \text{ cm}^2}$$