SURFACE AREA OF PRISMS

Think-Pair-Share: What do you think surface area is? How do you think you can find it?

http://www.mathopenref.com/prism.html

Lateral Surface Area is the sum of the parallelogram faces.

Total Surface Area is the sum of the parallelogram faces and the area of the 2 bases.

$$LSA = p \cdot h \qquad p = \text{perimeter of base} \qquad TSA = LSA + 2A_{Base}$$
$$h = \text{height of prism}$$

Example 1: Toblerone candy is packaged as shown below. What 3-D shape is the box?

Triangular Prism

5 cm   5 cm   24 cm

6 cm   3   4   3

How much material is needed to make the "Toblerone" Label on the 3 faces?

$5 \cdot 4 \Rightarrow \textcircled{a}$

$$A_{\square 1} = 5 \cdot 24 = 120 \qquad \text{height of prism}$$
$$A_{\square 2} = 5 \cdot 24 = 120$$
$$A_{\square 3} = 6 \cdot 24 = 144$$

$$LSA = 120 + 120 + 144$$
$$LSA = (5+5+6) \cdot 24$$
$$\qquad\qquad p \qquad\quad h$$
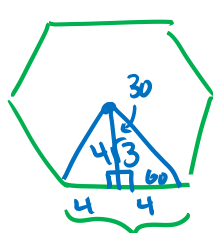
perimeter of base

$$\boxed{LSA = 384 \, cm^2}$$

How much material is needed make the entire package?

$$A_{\triangle Base} = \frac{b \cdot h}{2}$$
$$= \frac{6 \cdot 4}{2}$$
$$= 12 \, cm^2$$

$$TSA = LSA + 2A_{Base}$$
$$= 384 + 2(12)$$
$$\boxed{TSA = 408 \, cm^2}$$

Example 2: A funky shaped cake is shown. What 3-D shape would you call this cake?

Hexagonal Prism

3

8

Assume the base of the cake is regular. If one side length of the cake is 8 inches long and the height of the cake is 3 inches, how much space is there to cover, if we are only icing the sides?

$$A_{\square 1} = 8 \cdot 3 = 24 \qquad \text{or} \qquad LSA = p \cdot h$$
$$\times 6 \, rect. \qquad\qquad\qquad\quad = (48)(3)$$
$$\underline{}144 \, in^2 \qquad\qquad\qquad = 144 \, in^2$$

Using the same assumptions above, find the entire amount of space that needs to be covered with icing (do you normally ice the bottom of a cake?)

30   4√3   60   4   4

$$TSA = LSA + A_{Base}$$
$$A_{Base} = \frac{1}{2}ap$$
$$= \frac{1}{2}(4\sqrt{3})(48)$$
$$= 96\sqrt{3}$$

8

$$TSA = 144 + 96\sqrt{3} \approx 310.28 \, in^2 \text{ of icing}$$

Example 3: What 3-D shape does this tissue box represent?

2 in
3 in
9 in
2 in

Which side would you consider the base?
Does the side matter is you are finding
lateral surface area? Total surface area?

How much cardboard is needed to make the
tissue box, assuming the sides do not overlap?

The bottom ☺
LSA – yes!!!
TSA – no!

$A_{\square 1} = 9 \cdot 2 = 18$
$A_{\square 2} = 9 \cdot 3 = 27$
$A_{\square 3} = 3 \cdot 2 = 6$

$TSA = 2(18) + 2(27) + 2(6)$
$TSA = \underline{102 \text{ in}^2}$

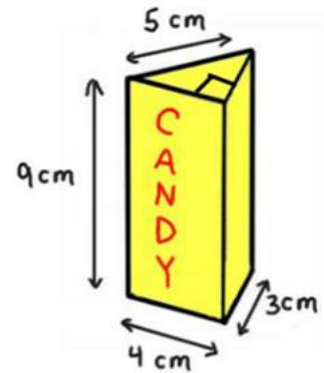or... $LSA = p \cdot h = (9 + 9 + 3 + 3)2$
$= 48$

$TSA = 54 + 2(27) = 102$

If cardboard costs $0.002 per square inch, how much does it cost to make the tissue box?

$102 \text{ in}^2 \times \$0.002 = \$.204 / \text{tissue box}$

$7^2 + 10^2 = c^2$
$149 = c^2$ } 60

Ex 4. Ashley bought a package of candy to give to her friend as a gift.
The candy is shaped like a triangular prism, with the dimensions,
to the right. She has three different sizes of wrapping paper to
choose from. Which will be the best for wrapping the candy –
the paper that is 80 cm², 130 cm², or 180 cm²?

5 cm
9 cm
CANDY
3 cm
4 cm

Ex. 5: Given the cereal box to the right, what is the total amount of
material needed to make the entire box?

8 in
12 in
CEREAL
OATS
2 in