Name: **Key**
Date: _____

Lesson 2-1: Surface Area of Prisms

> **Learning Goals:** 1. What is the net of a figure? How do I determine a figure from a picture of its net?
> 2. How do I find the surface area of prisms?
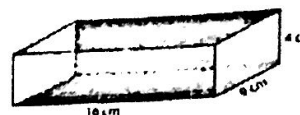
Let's talk vocabulary!

- What is **surface area**?
  - ➢ The sum of the __areas__ of the __surface (faces)__ in a 3-dimensional figure.
    - ↳ add all areas together

- How is surface area related to perimeter? How is it related to area?
  - • finding "outside"   • Find area
  - • adding together   • Units²
  - • different units

- What is a **prism**?
  - ➢ The bases are the surfaces that are __Congruent__ and __parallel__.
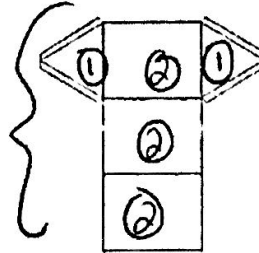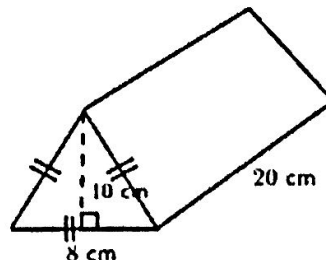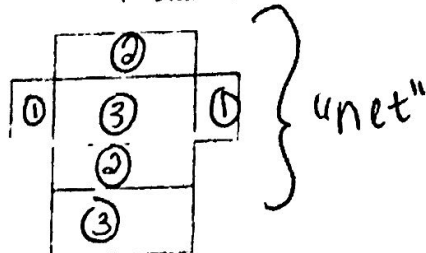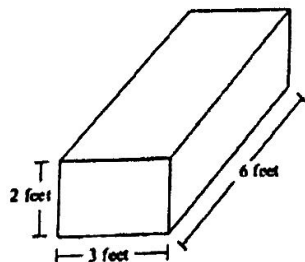   - ▪ Example: The base of the orange figure is a __triangle__.
    - ▪ Example: The base of the pink figure is a __rectangle__.

  ✳ base ≠ bottom

  - ➢ We **name** prisms by their __bases__.
    - ▪ Example: The orange figure is called a __triangular prism__
    - ▪ Example: The pink figure is called a __rectangular prism__

Let's list the polygons that make up the following prisms...

2 feet, 3 feet, 6 feet

•rectangles   {"net"

10 cm, 20 cm, 8 cm

•triangles (2 ≅ △'s)
•rectangles (3 ≅ rectangles)

do you think we'll use what we already know about these polygons to find the <u>surface area</u> of these prisms?

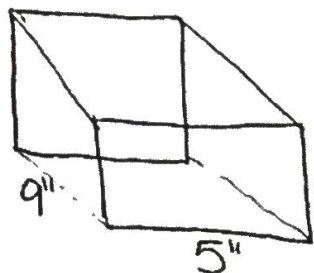Need to know how to find the area of different polygons
(area formulas)

Let's try it! Find the surface area of the following prisms.

Prism	Net (list and draw the polygons that make up the prism)	Surface Area ★add areas together!
① label each edge!		

Row 1 Prism: rectangular prism with edges labeled 3, 6, 2, 3, 6, 2; dimensions 2 feet, 3 feet, 6 feet

Net: rectangles labeled 3×2, 3×2, 6×2, 6×2, 6×3, 6×3

Surface Area:

$$SA = (3 \times 2) \left. \atop + (3 \times 2) \right\} \; 2(3 \times 2) = 12$$

$$+ (2 \times 6) \left. \atop (2 \times 6) \right\} \; 2(2 \times 6) = 24$$

$$+ (3 \times 6) \left. \atop (3 \times 6) \right\} \; 2(3 \times 6) = 36$$

$$\boxed{72 \, ft^2}$$

Row 2 Prism: triangular prism with dimensions 20, 10, 8, 10 cm, 20 cm, 8 cm

Net: two triangles labeled 8, 8, 10, 8 and rectangles labeled 20, 20, 8

Surface Area:

$$SA = \tfrac{1}{2}(b)(h)$$
$$= \tfrac{1}{2}(8)(10) \left. \atop \right\} \; 40$$
$$+ \tfrac{1}{2}(8)(10) \left. \right\} \; 2 \text{ of each } \triangle! \; + 40$$

$$+ (b)(h) \qquad\qquad 160$$
$$(8)(20) \left. \atop (8)(20) \right\} \; 3 \boxed{} \; 160$$
$$(y)(20) \qquad\qquad + 160$$

$$\boxed{560 \, cm^2}$$

Set one example up together! → On the outside! → surface area!

box is to be [wrapped] in a shiny red decorative [paper]. The box is 9 inches long, 5 inches wide, and 4 inches high. What is the minimum amount of decorative paper needed to cover the box?

$$SA = 9\boxed{}^4 \cdot \boxed{}^4 \;_5\boxed{}^4 \;_5\boxed{}^4 \;_9\boxed{}^5 \;_9\boxed{}^5$$

$$= \underbrace{(9 \times 4) + (9 \times 4)}_{} + \underbrace{(5 \times 4) + (5 \times 4)}_{} + \underbrace{(9 \times 5) + (9 \times 5)}_{}$$

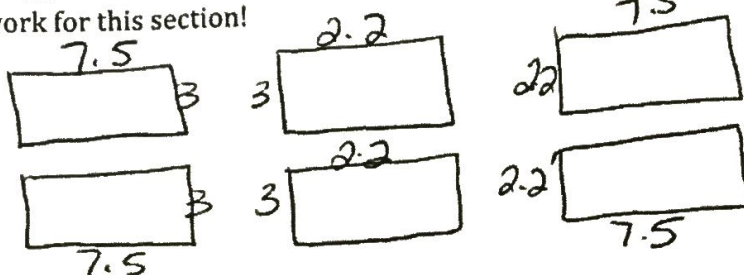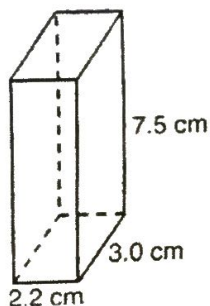$$= 2(9 \times 4) + 2(5 \times 4) + 2(9 \times 5)$$

$$= 2(36) + 2(20) + 2(45)$$

$$= 72 + 40 + 90 = \boxed{202 \text{ in}^2}$$

Are we ready to practice?

Short Cut = 2 of each side! → $SA = 2\ell w + 2wh + 2h\ell$

Draw the _net_ of the following prisms. Be sure to label all dimensions! Raise your hand when you are read and I will check your work for this section!

7.5 cm
3.0 cm
2.2 cm

7.5 / 3 / 7.5
2.2 / 3 / 3 / 2.2 / 7.5
7.5 / 22 / 2.2 / 7.5

4 / 11cm
5 / 11
3 / 11

3 cm / 5 cm / 4 cm / 11 cm
5 / 3

3 / 5 / 4
3 / 5 / 4
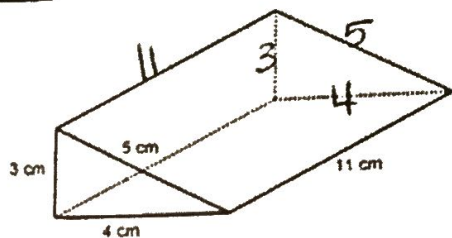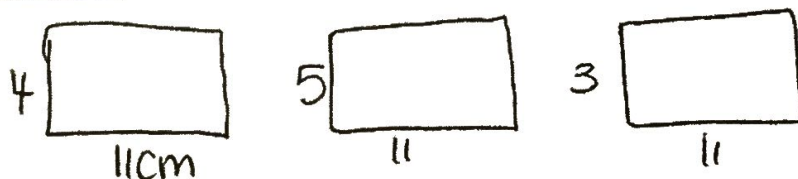
The rectangular prism shown below has a length of 3.0 cm, a width of 2.2 cm, and a height of 7.5 cm. What is the surface area, in square centimeters?
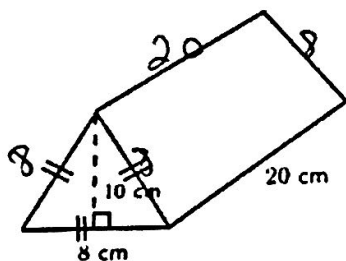
$SA = 2(2.2 \times 3) + 2(3 \times 7.5) + 2 + (2.2 \times 7.5)$

$= 13.2 + 45 + 33$

$= \boxed{91.2 \, cm^2}$

7.5 cm

3.0 cm w

2.2 cm

l
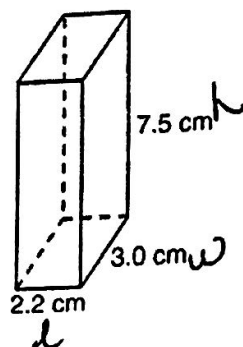
Let's find a shortcut for <u>rectangular prisms</u>!

$SA =$
$2(l \times w) + 2(l \times h) + 2(wh)$

2. Find the surface area of the figure below. *Remember draw the net for triangular prisms!*

20

8

10 cm

20 cm

8 cm

$SA = 2\left(\triangle \begin{array}{c} 10 \\ 8 \end{array}\right) + 3\left(\boxed{\begin{array}{c} 20 \\ 8 \end{array}}\right) \leftarrow$ "net"

$= 2(\tfrac{1}{2}bh) + 2\,lw$

$= 2\left(\tfrac{1}{2}\right)(8)(10) + 2(20)(8)$

$= 80 + 320$

$= \boxed{400 cm^2}$

* Draw net
* find area of each side!
* add areas together!

. Roberts is painting the outside of her son's toy box, including the top and bottom. The toy box measures 3 feet long, 1.5 feet wide, and 2 feet high. What is the total surface area he will paint? *Draw the figure and it's net!*
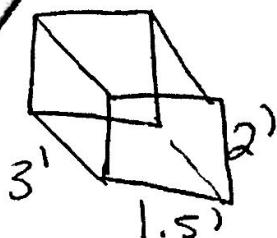
$$SA = 2(3 \times 1.5) + 2(1.5 \times 2) + 2(3 \times 2)$$
$$= 2(4.5) + 2(3) + 2(6)$$
$$= 9 + 6 + 12$$
$$= \boxed{27 ft^2}$$

Shortcut!

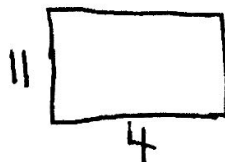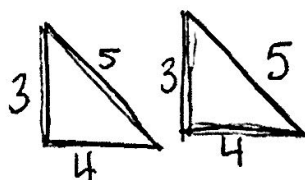4. How many square inches of wrapping paper are needed to entirely cover a box that is 2 inches by 3 inches by 4 inches?
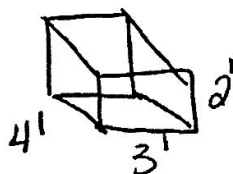
$$SA = 2(4 \times 3) + 2(3 \times 2) + 2(3 \times 4)$$
$$= 2(12) + 2(6) + 2(12)$$
$$= 24 + 12 + 24$$
$$= \boxed{60 ft^2}$$

5. Find the surface area of the figure below.

Net:
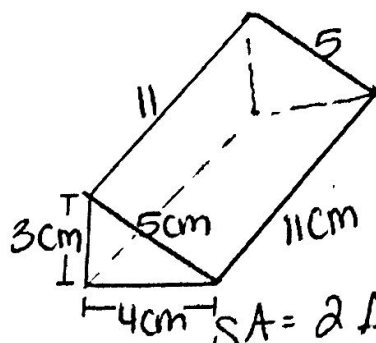
$$SA = 2 \triangle's + rectangle + rectangle + rectangle$$
$$SA = 2(\tfrac{1}{2}(4)(3)) + (11)(5) + (11)(4) + (11)(3)$$
$$= 12 + 55 + 44 + 33 = \boxed{144 cm^2}$$

Name **KEY**

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Lesson 1-12: Homework

1. Find the surface area of the figures below:

a.
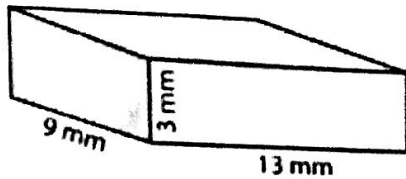
$\ell = 13\ mm$
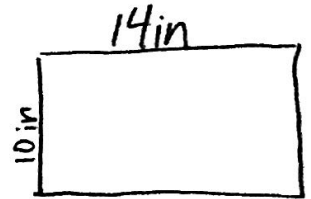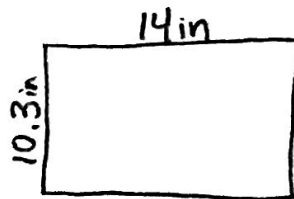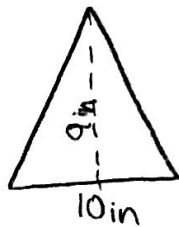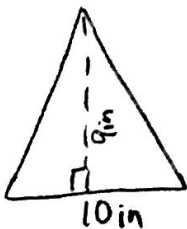$w = 9\ mm$
$h = 3\ mm$

$SA = 2\ell w + 2wh + 2h\ell$
$SA = 2(13)(9) + 2(9)(3) + 2(3)(13)$
$\boxed{SA = 366\ mm^2}$

	Homework Scale	
Score	**Description** (must complete all components to earn score)	
3	• Homework Complete • Use different color to check work • Mark correct answers with check mark ✓ • For incorrect answers, circle specific mistakes • Incorrect answers should have thorough corrections	
2.5	• Corrections made but not in a different color	
2	• Homework complete • Marked answers right/wrong, but no corrections made	
1.5	• Completed but not checked	
1	• Homework Incomplete	
0	• Homework missing/no effort or attempt	

b.
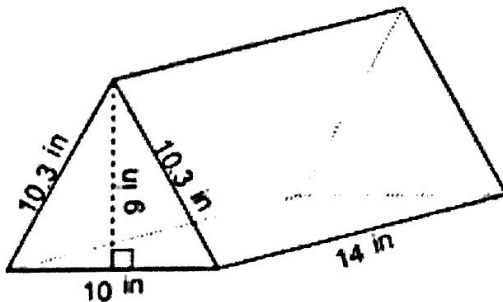
$A = \frac{1}{2}(10)(9)$
$A = 45\ in^2$

$A = \frac{1}{2}(10)(9)$
$A = 45\ in^2$

$A = (10.3)(14)$
$A = 144.2\ in^2$

$A = (10.3)(14)$
$A = 144.2\ in^2$

$A = (10)(14)$
$A = 140\ in^2$

Total S.A. $= 45 + 45 + 144.2 + 144.2 + 140$

$\boxed{S.A. = 518.4\ in^2}$

c.
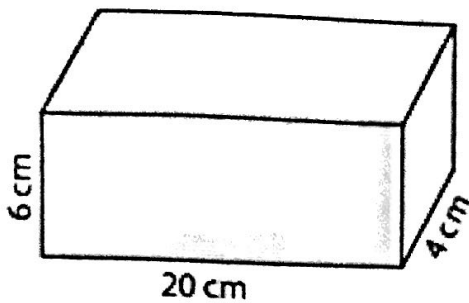
$SA = 2lw + 2wh + 2hl$

$SA = 2(20)(4) + 2(4)(6) + 2(6)(20)$
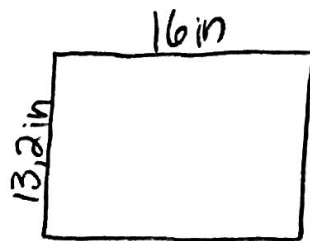
$SA = 448 cm^2$

$l = 20$
$w = 4$
$h = 6$

d.

153 in   13 in   13.2 in   16 in   10 in

16 in   16 in   16 in

13.2 in   10 in   15.3 in

13 in   13 in   10 in   10 in
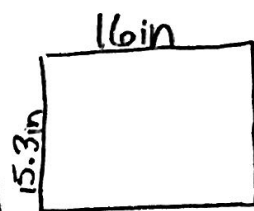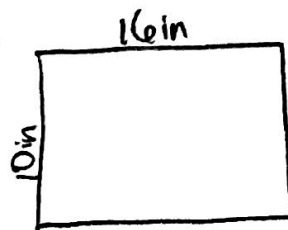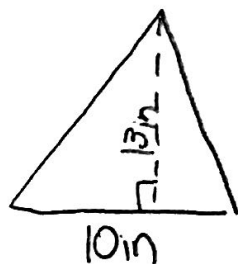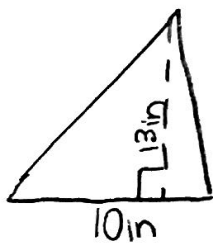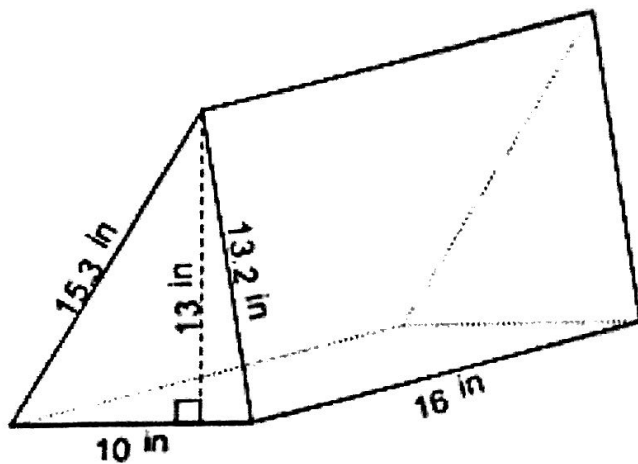
$A = \frac{1}{2}(10)(13)$

$A = 65 in^2$

$A = \frac{1}{2}(10)(13)$

$A = 65 in^2$

$A = (13.2)(16)$

$A = 211.2 in^2$

$A = (10)(16)$

$A = 160 in^2$

$A = (13.5)(16)$

$A = 216 in^2$

$A = 65 + 65 + 211.2 + 160 + 216$

$A = 717.2 in^2$