October 27, 2017
- continued from October 26

UNIT 3: SQUARE ROOTS AND SURFACE AREA

SECTION 1.3: SURFACE AREAS OF OBJECTS MADE FROM RIGHT RECTANGULAR PRISMS

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MATH 9

WHAT'S THE POINT OF TODAY'S LESSON?

We will continue working on the Math 9 Specific Curriculum Outcome (SCO) "Shape and Space 2" OR "SS2" which states:

SS2: "Determine the surface area of composite 3-D objects to solve problems."

What does THAT mean???

SCO SS2 means that we will stack two or more 3-D objects (right rectangular prisms, right triangular prisms, right cylinders) on top of each other. We will find the area of each face (side) of each object then add them all up to find the total surface area of the object. We will also have to subtract any overlapping sides from the total.

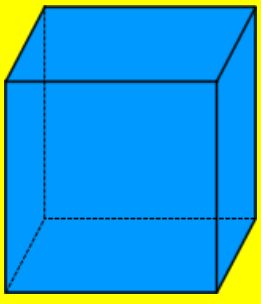
SURFACE AREA - START WHERE YOU ARE: ACTIVATING PRIOR KNOWLEDGE!

Find the surface area of this cube keeping in mind that, by definition, all sides of a cube have the same length:

$A = (b \times h)6$

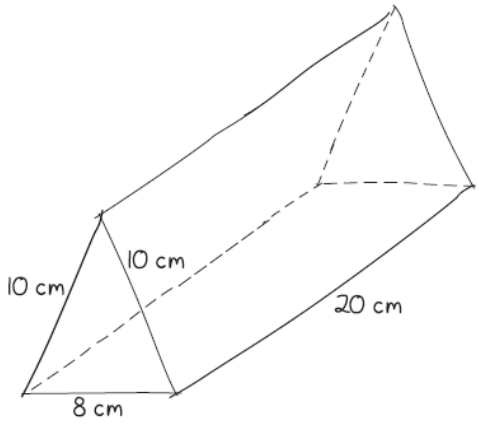
$= (5)(5)(6)$

$= 150\ cm^2$



Surface Area:
How do I begin???

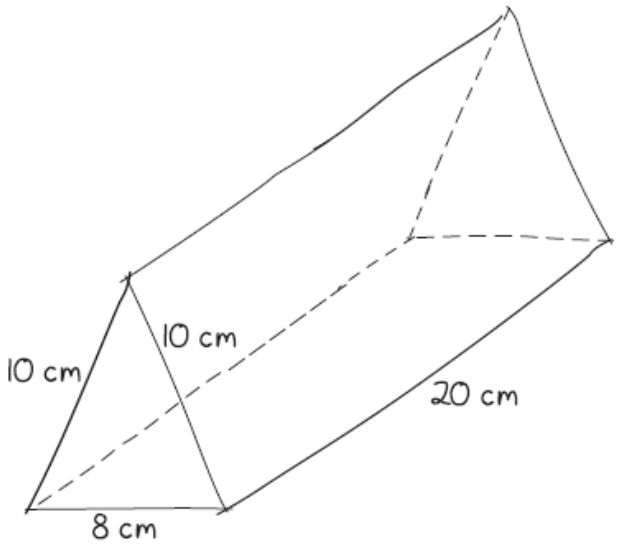
I could...
* **use a model**
* **sketch a diagram**
* **visualize the prism in my mind**



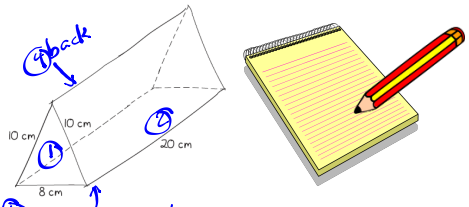
You only need to remember 5 formulas in the surface area section of this unit which you already knew before grade 9:

1. **Area of a rectangle/square:** bh
2. **Area of a triangle:** $\frac{bh}{2}$
3. **Area of a circle:** πr^2
4. **Circumference of a circle:** $2\pi r$ **OR** πd
5. **The Pythagorean Theorem:** $a^2 + b^2 = c^2$

Can you visualize the faces of this triangular prism?



Either individually or in groups of 2, sketch the faces of this triangular prism on a sheet of loose-leaf. You will need this for our next activity.



$a^2 = c^2 - b^2$

$h^2 = 10^2 - 4^2$

$= 100 - 16$

$= 84$

$h = \sqrt{84}$

$= 9.2\text{cm}$

$A = \frac{bh}{2} \times 2$

$= \frac{8(9.2)}{2} \times 2$

$= 73.6\text{cm}^2$

(2-4)

$A = \text{Bottom} + \text{front} + \text{back}$

$= bh + bh + bh$

$= (20)(8) + (10)(20) + 10(20)$

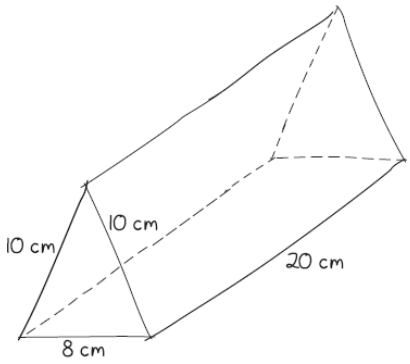
$= 160 + 200 + 200$

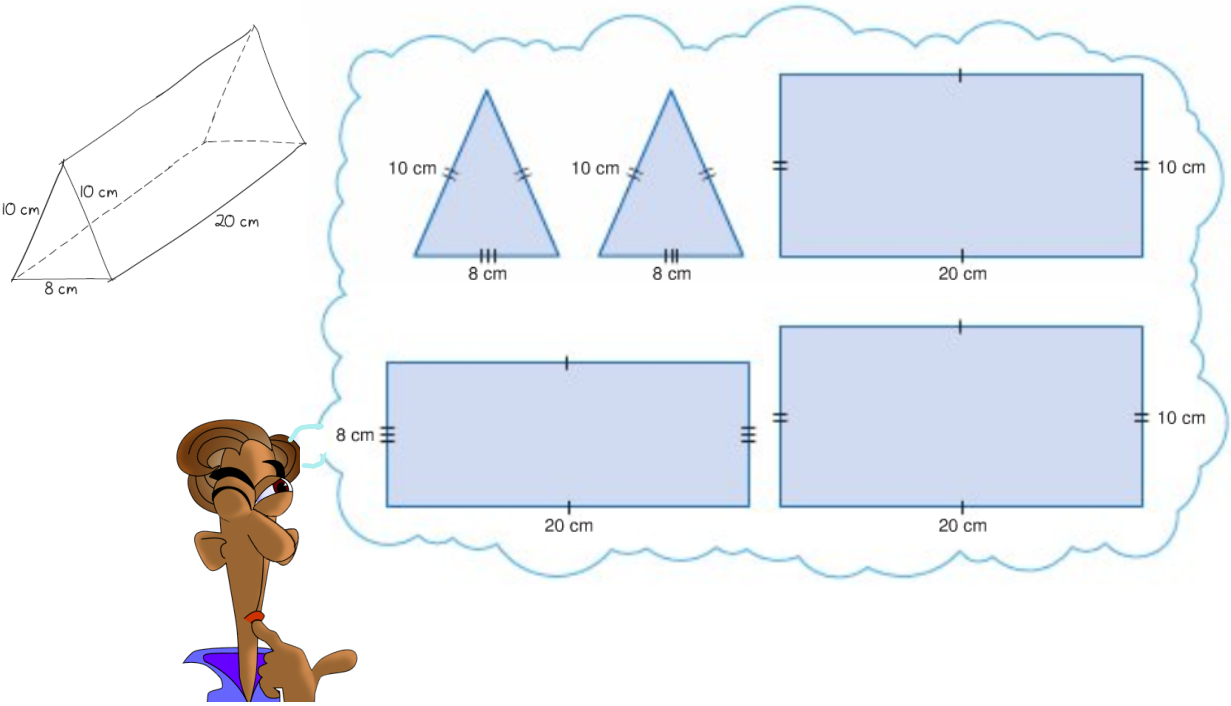
$= 560\text{cm}^2$

$A_{TOTAL} = 560 + 73.6$

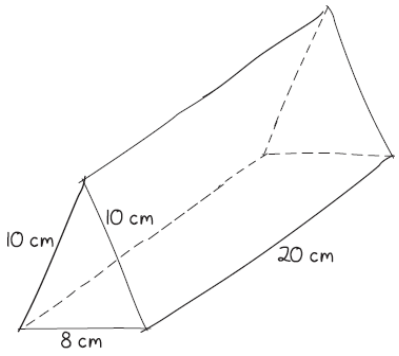
$= 633.6\text{cm}^2$

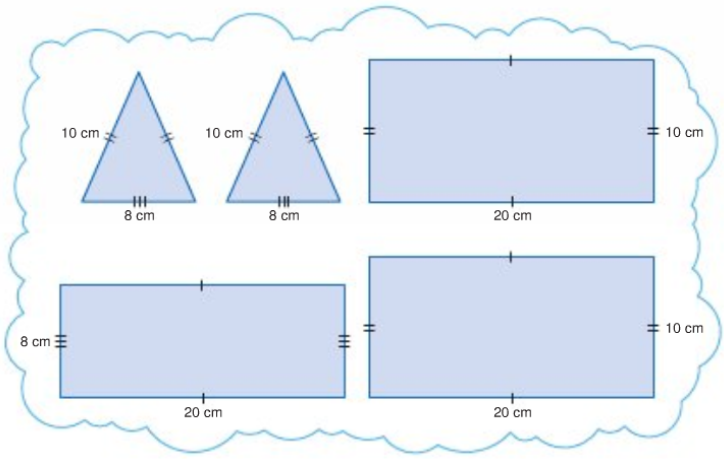
Either individually or in groups of 2, sketch the faces of this triangular prism on a sheet of loose-leaf. You will need this for our next activity.





Using your prior knowledge of surface area and your sketches of the faces of this triangular prism, find its surface area. If you had a partner for the sketch activity, work with the same partner.





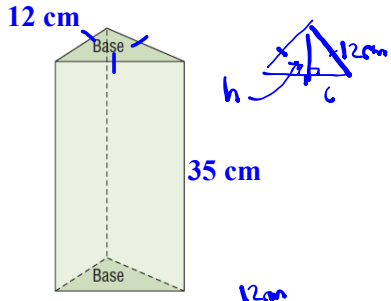
Calculations:

Page 23: Try "Check" #1 on your own.

Check

1. A right triangular prism is 35 cm high. Its bases are equilateral triangles, with side lengths 12 cm. What is the surface area of the prism?

Diagram:



Calculations:

$a^2 = c^2 - b^2$

$h^2 = 12^2 - 6^2$

$= 144 - 36$

$= 108$

$h = \sqrt{108}$

$= 10.4 \text{ cm}$

$A = \frac{bh}{2} \times 2$

$= \frac{(12)(10.4)}{2} \times 2$

$= 124.8 \text{ cm}^2$

$A = bh \times 3$

$= (12)(35)(3)$

$= 1260 \text{ cm}^2$

$A_{TOTAL} = 124.8 + 1260$

$= 1384.8 \text{ cm}^2$

Section 1.3: Surface Area of Objects Made from Right Rectangular Prisms

If you wanted to determine the surface area of these cube houses, what would you need to know?

Page 25: Investigate

Number of Cubes	Surface Area (square units)
1	6
2	10 (+4)
3	14 (+4)
4	18
5	22 (+4)

What happens to the surface area each time you add a cube?

Why does the surface area change in this way?

As page 26 states, there are 2 strategies for determining the surface area of the prisms we've been working with:

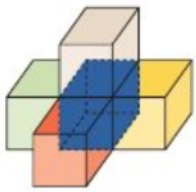
1. **Count the faces of all cubes (in other words, multiply the number of cubes by 6) and subtract 2 faces for every "overlap".**

2. **"6 views": count the faces visible from the top, bottom, front, back, left, and right of the object.**

Page 27: Example 1

Example 1

Determine the surface area of this composite object.
Each cube has edge length 2 cm.



Method 1

5 cubes x 6 sides = 30

overlap = 8 sides

Sides visible 30 − 8 = 22 sides

$A = (2 \times 2) \times 22$

$= 88\ cm^2$

Method 2

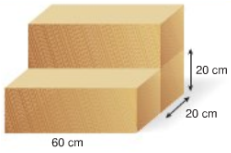
Front	Back	Bot	top	Side	Side	
4	4	4	4	3	3	= 22

$22\ sides \times (2 \times 2) = 88\ cm^2$

Page 28: Example 2

Example 2

Renee uses 3 pieces of foam to make this chair.
Each piece of foam is a right rectangular prism with dimensions 60 cm by 20 cm by 20 cm.
Can Renee cover the chair with 2 m^2 of fabric?
Explain.



$A_{foams} = [2lw + 2lh + 2wh] \times 3$

$= [2(60)(20) + 2(60)(20) + 2(20)(20)] \times 3$

$= (2400 + 2400 + 800) \times 3$

$= (5600)3$

$= 16\,800\ cm^2$

Overlap $(60)(20)(4) = 4800$

$A_{TOTAL} = 16800 - 4800$

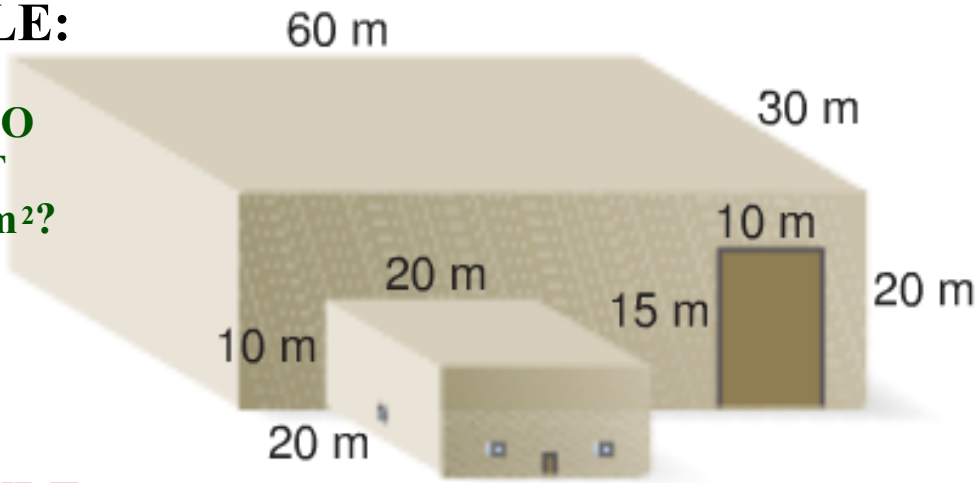
$= 12000\ cm^2$

Conversion $= 12000\ cm^2 \times \frac{1m}{100cm} \times \frac{1m}{100cm}$

$= 1.2\ m^2$

EXAMPLE:

COST TO PAINT @ $2.50/m²?



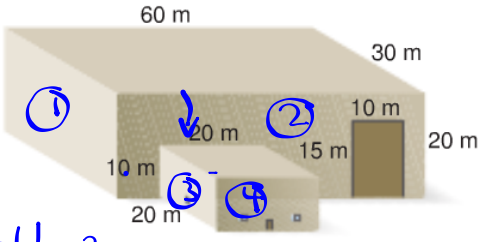
EXCLUDE:

roofs / bottoms

1. **office door with area 2m²**
2. **3 loading doors, each measuring 10m by 15m**
3. **4 windows, each with area 1m²**

$150 \times 3 = 450 m^2$

$\times 4 = 4 m^2$



① $A = bh \times 2$
$= (30)(20) \times 2$
$= 1200 m^2$

② $A = bh \times 2$
$= 60(20) \times 2$
$= 2400 m^2$

③ $A = bh \times 2$
$= (20)(10) \times 2$
$= 400 m^2$

④ $A = bh \times 2$
$= (20)(10) \times 2$
$= 400 m^2$

Overlap
$A = bh \times 2$
$= 20(10)(2)$
$= 400 m^2$

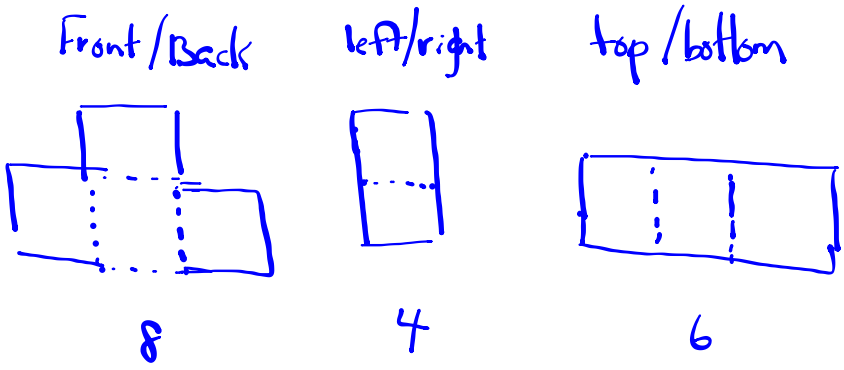
$A_{total} = 1200 + 2400 + 400 + 400 - 400 - 2 - 4 - 450$
$= 3544 m^2$

$Cost = 3544 m^2 \times \$2.50/m^2$
$= \$8860$

Page 30: Discuss the Ideas

1.

2.



3.

CONCEPT REINFORCEMENT:

MMS9
PAGE 30: #5 and 6
PAGE 31: #7, 8, 10 and 11