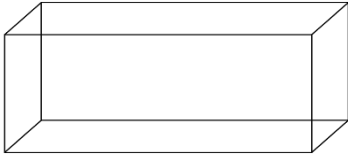


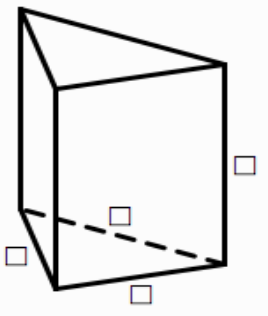
Hi Grade 8!

This week we will turn our attention back to some of what we learned earlier in the year, and apply that knowledge to determining the **surface area** of:

Right rectangular prism

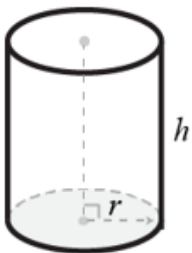


Right triangular prisms *Remember: prisms are named by their bases



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Right cylinders



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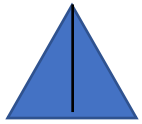
First, we'll start with a review of the formulas of the areas of the basic shapes that make up the faces of the prisms.

Squares & rectangles: $A = \text{base} \times \text{height}$



$$= bh$$

Triangles: $A = \frac{\text{base} \times \text{height}}{2}$



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

2

*Remember the height of a triangle is the length of the line, perpendicular to the base

Circles: $A = \pi r^2$ *Remember: $r^2 = r \times r$



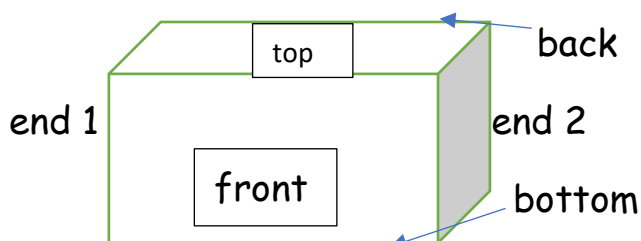
Also, a prism or cylinder is defined as "right" when all the faces, other than the bases, are rectangles and are perpendicular to the bases.

*When we looked at these shapes earlier in the year, we explored their nets. Often the net of the shape is used so we can clearly see each of the faces of the prism.

To find the **surface area** of a prism or cylinder is to find the **sum of the area of all the faces of a 3D object**.

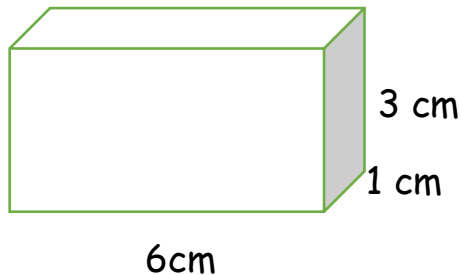
Let's start with a right rectangular prism:

To help you visualize it, find a box that you can label, a kleenex box is a good size. Use a marker and label the top, bottom, front, back, end 1, end 2



If we measure the base and height of each of the 6 rectangular faces and find their area, we simply add all the areas together.

*Remember, opposite faces will have the same measure



Using these dimensions let's find the area of each face:

Front $A = bh$

$$= 6\text{cm} \times 3\text{cm}$$

$$= 18\text{cm}^2$$

Back $A = bh$

$$= 6\text{cm} \times 3\text{cm}$$

$$= 18\text{cm}^2$$

Top $A = bh$

$$= 6\text{cm} \times 1\text{cm}$$

$$= 6\text{cm}^2$$

Bottom $A = bh$

$$= 6\text{cm} \times 1\text{cm}$$

$$= 6\text{cm}^2$$

End 1 $A = bh$

$$= 1\text{cm} \times 3\text{cm}$$

$$= 3\text{cm}^2$$

End 2 $A = bh$

$$= 1\text{cm} \times 3\text{cm}$$

$$= 3\text{cm}^2$$

To find the total surface area, add the areas together

$$SA = \text{Front} + \text{Back} + \text{Top} + \text{Bottom} + \text{End1} + \text{End2}$$

*because opposite sides

$$* = 2(18\text{cm}^2) + 2(6\text{cm}^2) + 2(3\text{cm}^2)$$

are the same

$$= 36\text{cm}^2 + 12\text{cm}^2 + 6\text{cm}^2$$

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

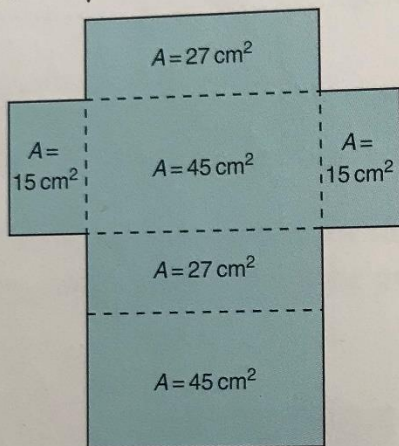
(You have probably noticed then, that for a right rectangular prism, you really only need to find the areas of the three different sides and double their measures.) Let's practice a few with the circled questions from the text. You will see both the nets and 3D shaped being used.
(next page)

Practice

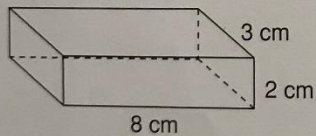
Check

4. Here is the net of a right rectangular prism. The area of each face is given. What is the surface area of the prism? How did you find out?

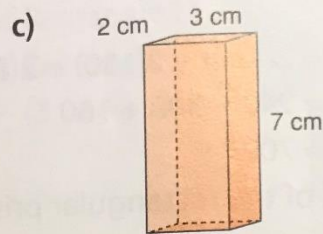
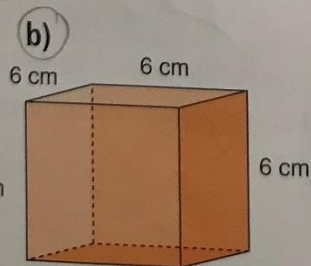
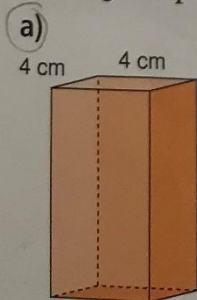
*Hint: they've given you the area, just add!



5. Sketch a net of this right rectangular prism. What is its surface area?



6. Find the surface area of each right rectangular prism.



7. Find the surface area of a right rectangular prism with these dimensions.
- 4 m by 3 m by 10 m
 - 3 cm by 5 cm by 8 cm

Apply

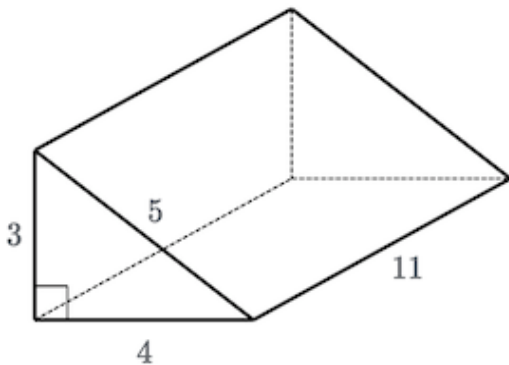
8. Find a right rectangular prism in the classroom. Measure its faces. Find its surface area.
9. Tanya paints the walls of her family room. The room measures 7 m by 4 m by 3 m. The walls need 2 coats of paint. A 4-L can of paint covers 40 m^2 .
- How much paint should Tanya buy?
 - What assumptions do you make? Explain.
10. The surface area of a cube is 54 cm^2 .
- What is the area of one face of the cube?
 - What is the length of one edge of the cube?

Now let's try the surface area of a right triangular prism:

A right triangular prism has 5 faces, two congruent triangular bases and three rectangles.

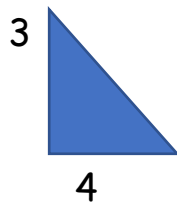
Find the surface area of the right triangular prism shown below.

units²



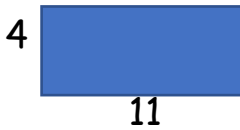
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Notice the prism here is made of 2 congruent triangular bases and three rectangles. To find the surface area, find the area of each face and add them all together.

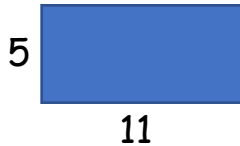


$$\begin{aligned} A &= \frac{bh}{2} \\ &= \frac{4\text{cm} \times 3\text{cm}}{2} \\ &= \frac{12\text{cm}^2}{2} \\ &= 6\text{cm}^2 \end{aligned}$$

*There are 2 equal triangles



$$\begin{aligned} A &= bh \\ &= 11\text{cm} \times 4\text{cm} \\ &= 44\text{cm}^2 \end{aligned}$$



$$\begin{aligned} A &= bh \\ &= 11\text{cm} \times 5\text{cm} \\ &= 55\text{cm}^2 \end{aligned}$$



$$\begin{aligned} A &= bh \\ &= 11\text{cm} \times 3\text{cm} \\ &= 33\text{cm}^2 \end{aligned}$$

The total surface area will be:

$$\begin{aligned} SA &= 2(\text{triangle base}) + \text{rectangle 1} + \text{rectangle 2} + \text{rectangle 3} \\ &= 2(6\text{cm}^2) + 44\text{cm}^2 + 55\text{cm}^2 + 33\text{cm}^2 \\ &= 12\text{cm}^2 + 44\text{cm}^2 + 55\text{cm}^2 + 33\text{cm}^2 \\ &= 144\text{cm}^2 \end{aligned}$$

*Remember: the above triangles were right triangles. If the triangles are not right triangles don't forget the height is the length of the line perpendicular to the base.

Let's use an example from the text to show the solution when the bases are not right triangles. (see next page)

Example 1

Find the surface area of this prism.

Each dimension is given to the nearest centimetre.

▶ A Solution

Draw a net. Label its dimensions.

The prism is 40 cm tall, so each rectangle has height 40 cm.

The width of each rectangle is a side length of the triangular base.

One rectangle has area: $40 \times 20 = 800$

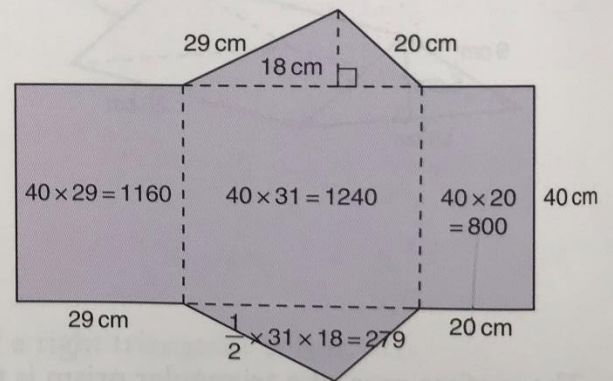
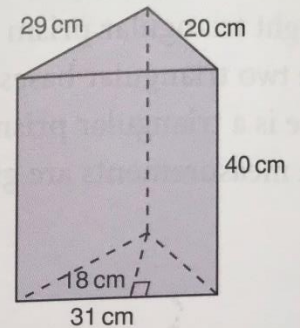
Another rectangle has area: $40 \times 31 = 1240$

The third rectangle has area: $40 \times 29 = 1160$

The triangular base has area: $\frac{1}{2} \times 31 \times 18 = 279$

The surface area = $800 + 1240 + 1160 + 2 \times 279$
 $= 3758$

The surface area of the prism is 3758 cm^2 .



Instead of drawing a net, we can visualize each face as we calculate its area.

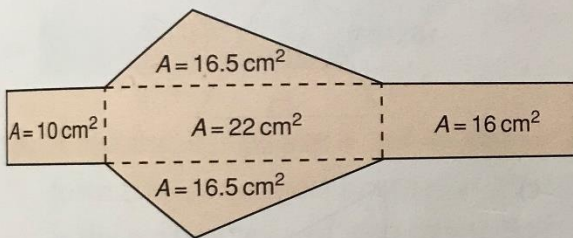
Let's practice a few with the circled questions from the text. (see next page)

Practice

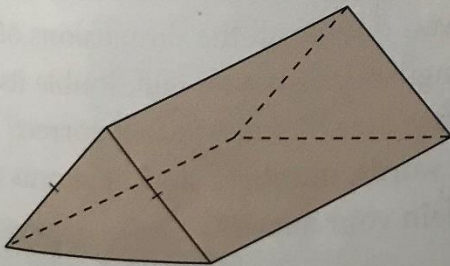
Check

Use a calculator when you need to.

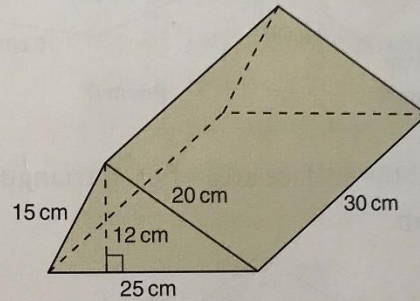
4. Here is the net of a right triangular prism. The area of each face is given. What is the surface area of the prism? How did you find out?



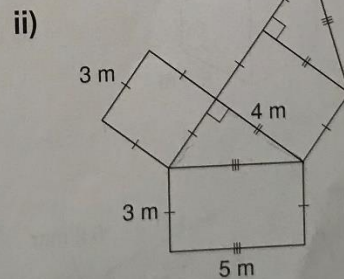
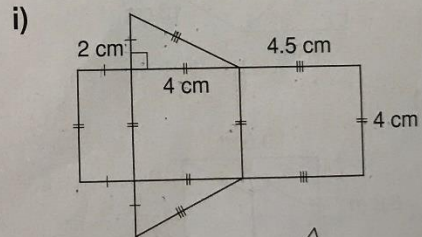
5. Here is a right isosceles triangular prism. Which faces are congruent and share the same area? How do you know?



6. Sketch a net of this triangular prism. What is its surface area?



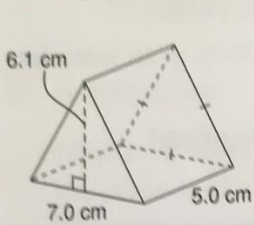
7. a) Calculate the area of each net.



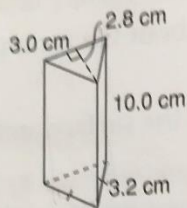
- b) How does the area of each net compare to the surface area of the prism formed by the net?

Apply

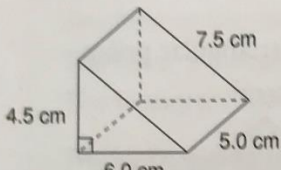
8. Calculate the surface area of each prism. Order the prisms from greatest to least surface area. Show your work.



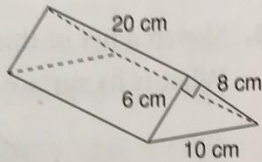
Prism A



Prism B



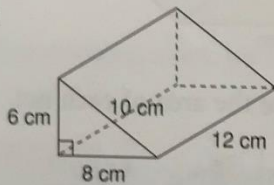
Prism C



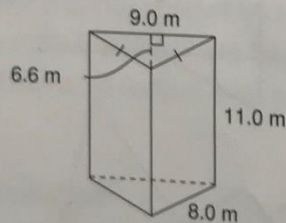
Prism D

9. Find the surface area of each triangular prism.

a)



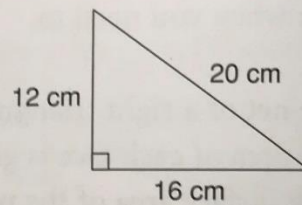
b)



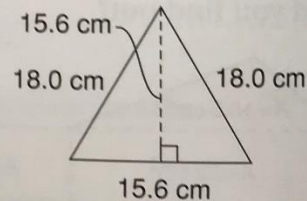
10. The 3 rectangular faces of a triangular prism have areas 30 cm^2 , 40 cm^2 , and 50 cm^2 . The 2 triangular bases have a combined area of 12 cm^2 . What are the dimensions of the triangular prism? Explain your thinking using diagrams, numbers, and words.

11. Suppose you want to construct a right triangular prism 15 cm long with the greatest surface area. Which of these triangles should you choose for its base? Explain your choice.

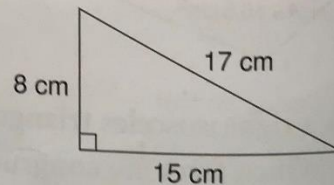
a)



b)



c)



12. **Assessment Focus** A student said, "If you double the length of a right triangular prism, the surface area of the prism will double."

Lastly, to follow up on Netmath www.netmath.ca try:

Calculating the total area of right prisms 1

Have a great week! 😊