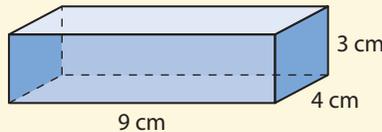


Nets and Surface Area

Use What You Know

You know how to find the areas of rectangles and triangles. In this lesson you will learn how to find the surface area of three-dimensional figures such as prisms and pyramids. Take a look at this problem.

How can you find the sum of the areas of the faces of this box?



Use the math you already know to solve this problem.

Imagine cutting the box open along its edges and laying it flat.

a. How many faces does the box have? _____

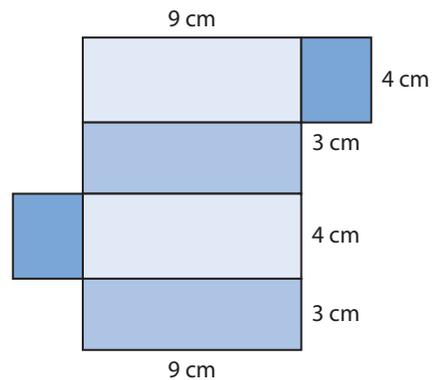
b. What are the dimensions of the different faces?

Front and back: _____ cm by _____ cm

Top and bottom: _____ cm by _____ cm

Left and right sides: _____ cm by _____ cm

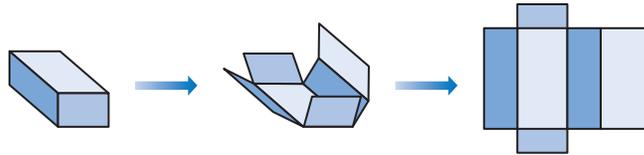
c. Find the area of each face. Write the number of square centimeters of area inside each face shown in the diagram to the right.



d. Suppose you needed to paint the box. Explain how you could find the area you need to cover.

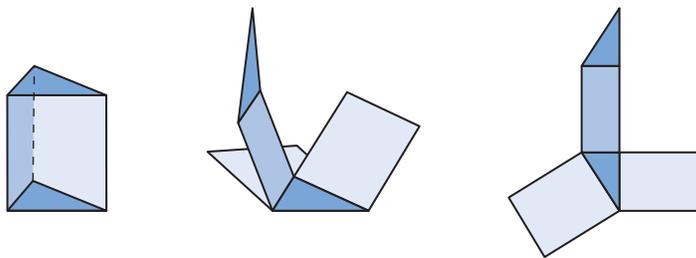
Find Out More

In the problem on the previous page, a rectangular prism is cut and “unfolded” into a flat representation called a **net**. Each face of the prism is shown in the net.

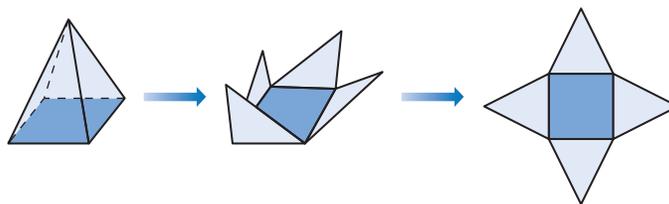


You can use a net to find the surface area of some three-dimensional figures. The **surface area** is the sum of the areas of the faces of the figure.

You can draw nets for other three-dimensional figures. The **triangular prism** below has two parallel triangular faces that are the same size and shape, called **bases**, and three rectangular faces. The rectangular faces can be different sizes.



A **pyramid** is a three-dimensional figure whose base is a polygon and whose other faces are triangles. The square pyramid shown below has a square base and four triangular faces that are the same size and shape.



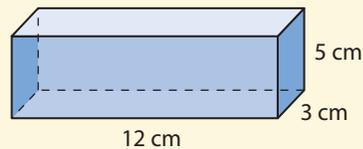
Reflect

- 1 Explain in your own words how to use a net to find the surface area of a three-dimensional figure.

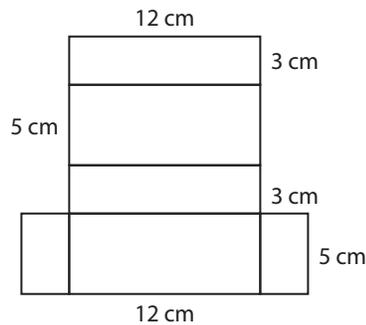
Learn About Surface Area of a Rectangular Prism

Read the problem below. Then use what you know about the area of polygons to find the surface area of a rectangular prism.

A packaging designer wants to find out how much leather is needed to cover the jewelry box shown below. The box is 12 cm long, 3 cm wide, and 5 cm high. Find the surface area of the box.



 **Picture It** You can draw and use a net of the box to help you find the surface area.



 **Model It** You can use a table to organize the information you need.

Face	Length (cm)	Width (cm)	Height (cm)	Area (sq cm)
Top	12	3	—	36
Bottom	12	3	—	36
Front	12	—	5	60
Back	12	—	5	60
Right side	—	3	5	15
Left side	—	3	5	15

Connect It Now you will use what you know about the area of rectangles and your understanding of surface area to solve the problem on the previous page.

2 Look at the table in *Model It*. How could you find the total surface area of the rectangular prism? _____

What is the surface area of the prism? Show your work. _____

3 In a rectangular prism, which pairs of faces have the same areas?

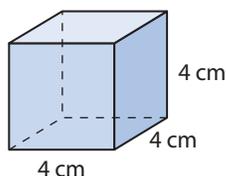
4 How can you use your answer to problem 3 to find the surface area of a prism?

5 Use the method from problem 4 to find the surface area. Show your work.

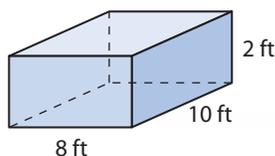
6 Explain how to find the surface area of a rectangular prism.

Try It Use what you learned about finding the surface area of a prism to find the surface area of the rectangular prisms below. Show your work on a separate sheet of paper.

7



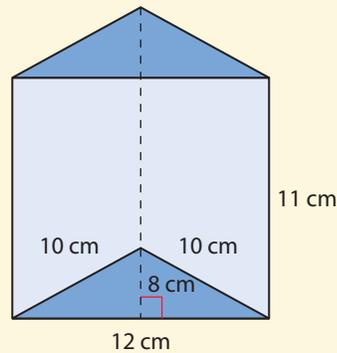
8



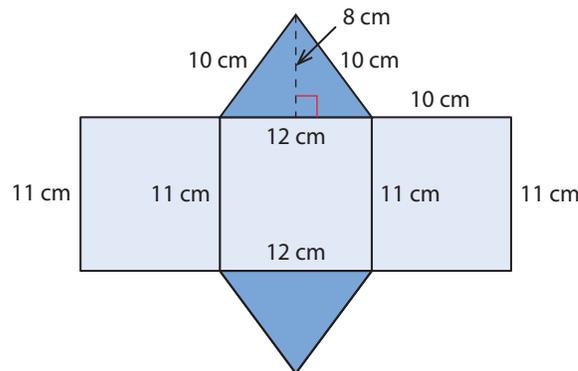
Learn About Surface Area of a Triangular Prism

Read the problem below. Then explore how to find the surface area of a triangular prism.

The triangular prism shown below has a triangular base with length 12 cm and height 8 cm. The height of the prism is 11 cm. What is the surface area of the prism?



 **Picture It** You can draw and label a net of the prism to find its surface area.



 **Model It** You can use a table to organize the information you need.

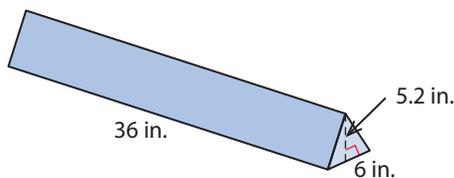
Face	Base (cm)	Height (cm)	Area (cm ²)
Triangle	12	8	48
Triangle	12	8	48
Rectangle	10	11	110
Rectangle	10	11	110
Rectangle	12	11	132

Connect It Now you will use what you know about the area of triangles and rectangles and an understanding of surface area to solve the problem on the previous page.

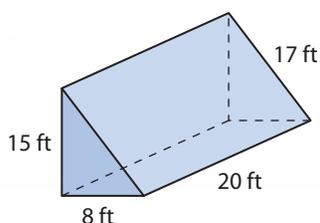
- 9 How many faces of the prism on the previous page are triangles? Explain how to find the area of each triangle. _____
- 10 How many faces of the prism are rectangles? Are they all the same shape and size? _____
- 11 What is the surface area of the triangular prism? Show your work. _____
- 12 Explain how to find the surface area of any triangular prism. _____

Try It Use what you learned about finding the surface area of a triangular prism to solve these problems. Show your work on a separate sheet of paper.

- 13 The mailing tube shown below is 36 inches long, 6 inches wide, and 5.2 inches deep. The bases are equilateral triangles. How much cardboard is used to make the tube?



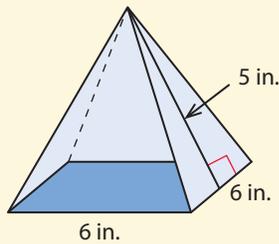
- 14 A display case is shaped like the prism shown below. The bases are right triangles. Find the surface area of the prism.



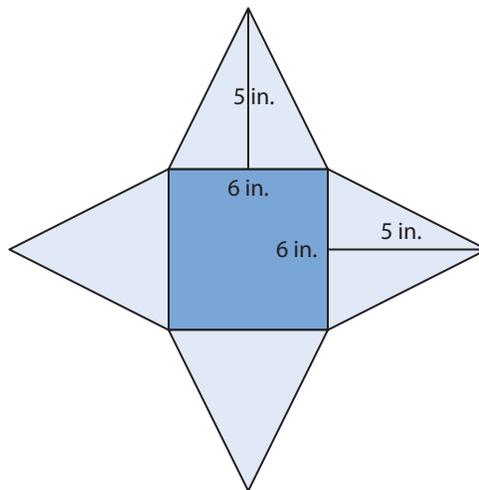
Learn About Surface Area of a Pyramid

Read the problem below. Then explore how to find the surface area of a pyramid.

Rebekah is planning to make a model of a pyramid for a geography project. The length of each edge of the base is 6 in., and the height of each triangular face is 5 in. How much cardboard will Rebekah need to make the pyramid?



 **Picture It** You can label a net of the pyramid to find its surface area.



 **Model It** You can use a table to organize the information you need.

Face	Base (in.)	Height (in.)	Area (in. ²)
Triangle	6	5	15
Triangle	6	5	15
Triangle	6	5	15
Triangle	6	5	15
Square	6	6	36

Connect It Now you will use what you know about the area of triangles and rectangles and surface area to solve the problem on the previous page.

15 How many faces does the pyramid have? Describe them.

16 How do you find the area of the base of the pyramid? _____

17 How do you find the total area of the triangular faces of the pyramid?

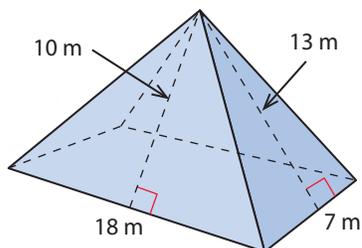
18 What is the surface area of the pyramid? Show your work.

19 Explain how to find the surface area of a rectangular pyramid.

Try It Use what you learned about finding the surface area of a pyramid to solve these problems. Show your work on a separate sheet of paper.

20 Rebekah decides to make her pyramid model much larger, so the length of each edge of the base is 60 in. and the height of each triangular face is 50 in. What is the surface area of this larger pyramid? _____

21 Find the surface area of the pyramid shown below. The base is a rectangle and the opposite triangular faces are the same size and shape.



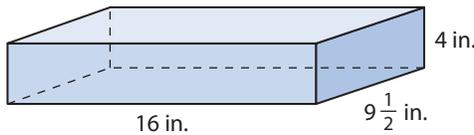
Practice

Using Nets and Finding Surface Area

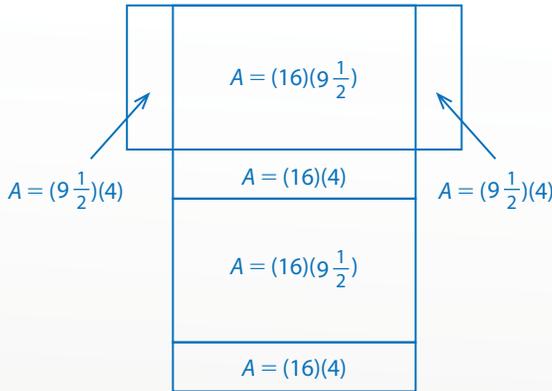
Study the example below. Then solve problems 22–24.

Example

A gift box is 16 in. long, $9\frac{1}{2}$ in. wide, and 4 in. high. How much wrapping paper is needed to cover the box?



You can use a diagram to organize the information.



Solution $2(152) + 2(38) + 2(64) = 508$; 508 square inches of paper

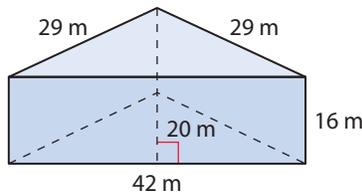


The student wrote the area of each face on the net of the prism.

Pair/Share

Can you find the surface area without using a net?

- 22** What is the surface area of this triangular prism? The base of each triangle is 42 m and the height of the triangular base is 20 m.



Show your work.



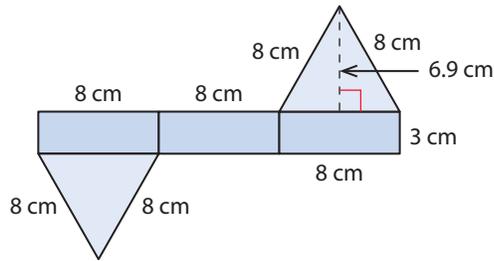
How many faces are rectangles and how many are triangles?

Pair/Share

Did you find the area of each face of the prism separately, or did you use some shortcuts?

Solution _____

- 23** Does the net shown below fold up into a prism or a pyramid? Find the surface area of the figure formed by the net.



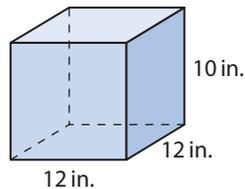
Can a pyramid have just two triangular faces?

Show your work.

Solution _____

Pair/Share
 How can you use the net to find the area of all the rectangular faces?

- 24** An open storage box is shaped like a square prism but without a top face. The base of the box is a square with side length 12 in., and the height of the box is 10 in. What is the surface area of the box?



How is this problem different from the others?

- A** 600 square inches
- B** 624 square inches
- C** 768 square inches
- D** 1,440 square inches

Braden chose **C** as the correct answer. Why is his answer incorrect?

Pair/Share
 Explain what the correct answer should be.

- 4 Two rectangular prisms each have a surface area of 600 square inches. What are the possible dimensions of the prisms?

Show your work.

Prism 1 _____

Prism 2 _____

- 5 In the space below, sketch a prism, using any dimensions that you like. Then sketch a larger prism whose dimensions are **twice** the dimensions of your first prism.

Part A Find the surface area of each prism.

Show your work.

Prism 1 _____

Prism 2 _____

Part B What is the ratio of the surface area of the smaller prism to the surface area of the larger prism?

Show your work.

Answer _____

 **Self Check** Go back and see what you can check off on the Self Check on page 225.