

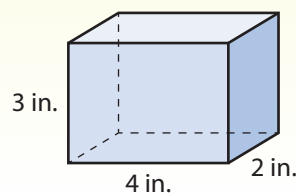
Dear Family,

This week your student is learning about nets and finding the surface area of three-dimensional figures. **Surface area** is the combined area of all the faces, or sides, of a three-dimensional figure.

Imagine cutting a three-dimensional figure along some of its edges and unfolding it. The flat, unfolded figure is called a **net**. You can use the net to find the surface area of the three-dimensional figure.

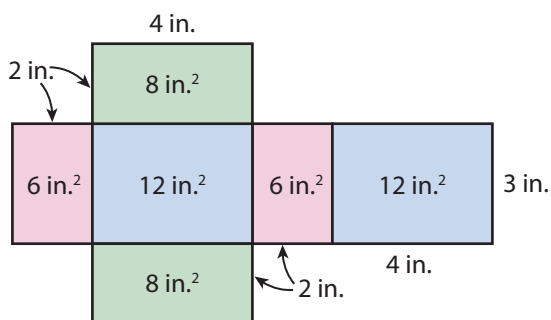
Your student will be learning to solve problems like the one below.

What is the surface area of the right rectangular prism?



- ▶ **ONE WAY** to find the surface area is to make a net.

You can find the area of each rectangular face. Then find the sum of the areas.




$$12 + 12 + 6 + 6 + 8 + 8 = 52$$

- ▶ **ANOTHER WAY** is to write and evaluate an expression.

Notice that the prism has three pairs of identical faces. The faces in each pair have the same area.

$$\begin{aligned} 2(4 \cdot 3) + 2(2 \cdot 3) + 2(4 \cdot 2) &= 24 + 12 + 16 \\ &= 52 \end{aligned}$$

Using either method, the surface area is 52 in.^2 .

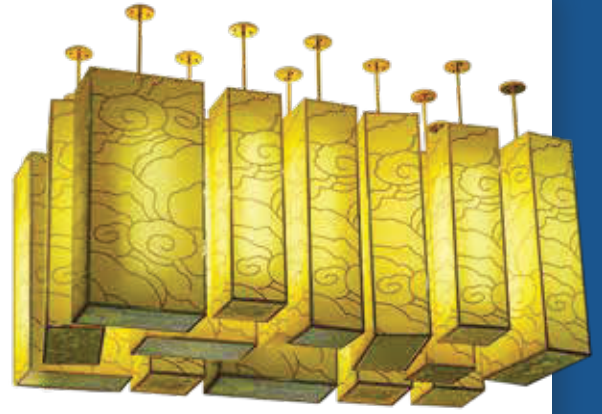
 Use the next page to start a conversation about surface area.

Activity Thinking About Surface Area Around You

- ▶ **Do this activity together to investigate surface area in the real world.**

Have you ever seen lights or lanterns covered in patterned fabric or paper? Have you ever wondered how much fabric or paper is used to cover each lantern?

Surface area is a useful way to find the exact amount of fabric needed to make these types of lights. Without knowing the surface area, you might end up with too much or too little fabric.



? What other shapes around you could you find the surface area for?

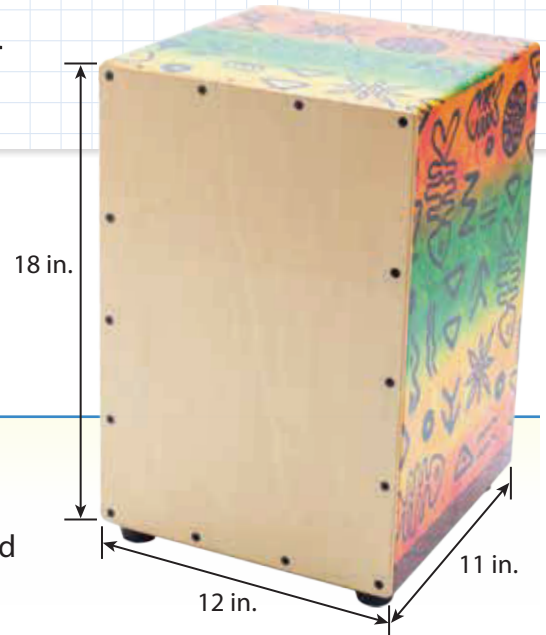
A large grid for writing answers, consisting of a blue border and a light blue grid pattern.

Explore Nets of Three-Dimensional Figures

Previously, you learned about the area of two-dimensional figures. In this lesson, you will learn about the surface area of three-dimensional figures.

► Use what you know to try to solve the problem below.

Brian learned to build a cajón from his grandfather. A cajón is a box-shaped drum that you play by slapping the front. Brian builds the cajón shown. How much wood will Brian need to build the four vertical sides but not the top or bottom?



TRY IT



Math Toolkit dot paper, geometric solids, grid paper

DISCUSS IT

Ask: How would you explain what the problem is asking in your own words?

Share: The problem is asking . . .



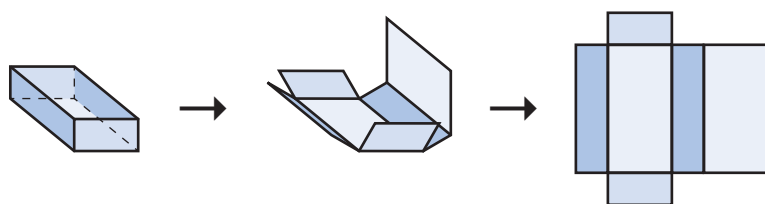
Learning Target SMP 1, SMP 2, SMP 3, SMP 4, SMP 5, SMP 6

Represent three-dimensional figures using nets made up of rectangles and triangles, and use the nets to find the surface area of these figures. Apply these techniques in the context of solving real-world and mathematical problems.

CONNECT IT

1 Look Back How much wood will Brian need to build the four vertical sides of the cajón? How can you find the amount he needs?

2 Look Ahead Brian’s cajón is a **right rectangular prism**. If you cut along some of the edges of a right rectangular prism, you can unfold the **prism** into a **net**.

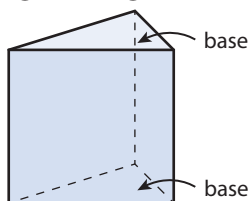


- a. How do the sizes and shapes of the rectangles in the net compare to the faces, or sides, of the right rectangular prism? Explain how you know.

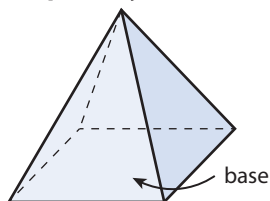
- b. Where in the net do you see the edges of the right rectangular prism?

- c. You can make nets for other three-dimensional figures. Look at the prism and the **pyramid**. How are they alike? How are they different?

Right Triangular Prism



Square Pyramid



3 Reflect How many triangles and how many rectangles are in a net for a right triangular prism? How do you know?

Prepare for Using Nets to Find Surface Area

- 1 Think about what you know about three-dimensional figures. Fill in each box. Use words, numbers, and pictures. Show as many ideas as you can.

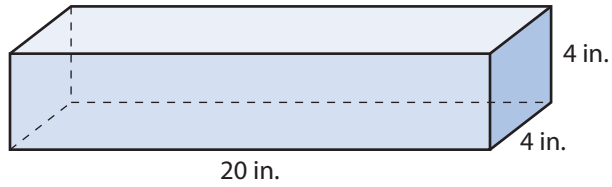
Word	In My Own Words	Example
face		
edge		
vertex		

- 2 Neva writes the following in her math notebook.

A right rectangular prism has 6 rectangular faces. Each rectangle has 4 sides. This means the prism has $6 \cdot 4 = 24$ edges. Each rectangle also has 4 vertices. That means the prism also has $6 \cdot 4 = 24$ vertices.

Do you agree or disagree? Explain.

- 3 Kiara is covering part of this rectangular box with duct tape. She is covering the four sides but not the top or bottom.

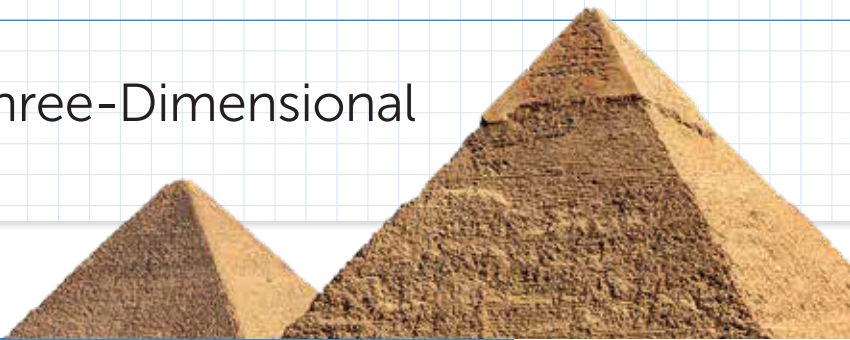


- a. What is the total area that Kiara will cover with duct tape? Show your work.

SOLUTION _____

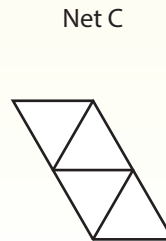
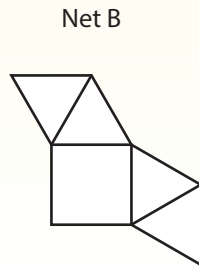
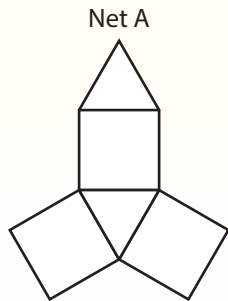
- b. Check your answer to problem 3a. Show your work.

Develop Representing a Three-Dimensional Figure with a Net



► Read and try to solve the problem below.

Amelia wants to make a model of the Great Pyramid of Giza. Her model will be in the shape of a square pyramid. Which of the nets shown can she use to make her model? How do you know?



TRY IT



Math Toolkit geometric solids, grid paper, templates

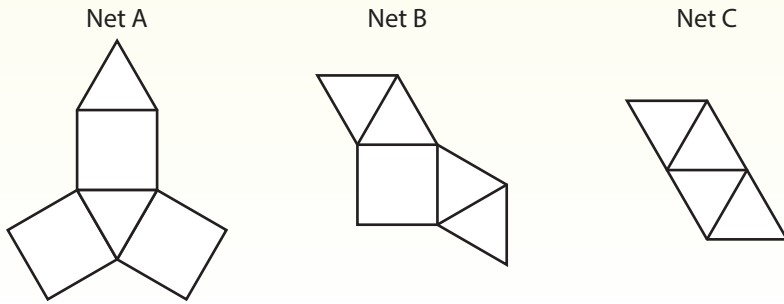
DISCUSS IT

Ask: What did you notice first about the nets?

Share: The first thing I noticed was . . .

► Explore different ways to find a net for a three-dimensional figure.

Amelia wants to make a model of the Great Pyramid of Giza. Her model will be in the shape of a square pyramid. Which of the nets shown can she use to make her model? How do you know?



Analyze It

You can use reasoning to help you identify the net for a three-dimensional figure.

A square pyramid has one square face.

Net C does not include a square, so Net C cannot be used to make the model.

Net A has three squares, which is too many. Net A cannot be used to make the model.

Analyze It

You can make a table to organize information about the shapes.

Figure	Number of Triangles	Number of Squares
Pyramid	4	1
Net A	2	3
Net B	4	1
Net C	4	0

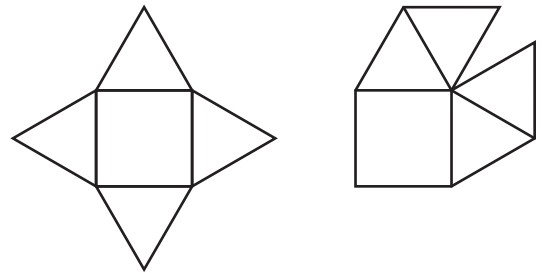


CONNECT IT

► Use the problem from the previous page to help you understand how to find a net for a three-dimensional figure.

- 1 Look at the first **Analyze It**. How does reasoning help you find the correct net?
- 2 Which of the nets can Amelia use to make her model? How does the table help you choose a net that can be used to make the pyramid?

- 3 The nets at the right each have one square and four identical triangles. A student says that both nets can be used to form a pyramid. Do you agree? Explain.



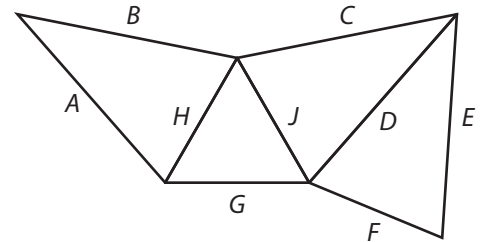
- 4 What must be true about the shapes in a net for a three-dimensional figure?

- 5 **Reflect** Think about all the models and strategies you have discussed today. Describe how one of them helped you better understand nets.

Apply It

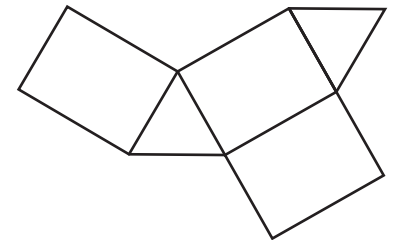
► Use what you learned to solve these problems.

- 6 Each line segment in the net shown is labeled with a letter. The net will be cut out and folded to form a triangular pyramid. Which line segment will match up with segment *A* to form an edge of the pyramid? Show your work.

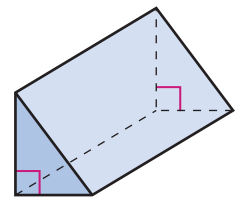


SOLUTION

- 7 Issay cuts out the net shown and folds it to make a three-dimensional shape. Which three-dimensional shape does Issay make?



- A Right triangular prism
 - B Right rectangular prism
 - C Pyramid with a triangular base
 - D Pyramid with a rectangular base
- 8 Sketch a net for the right triangular prism shown. Explain how you know your net represents the prism.



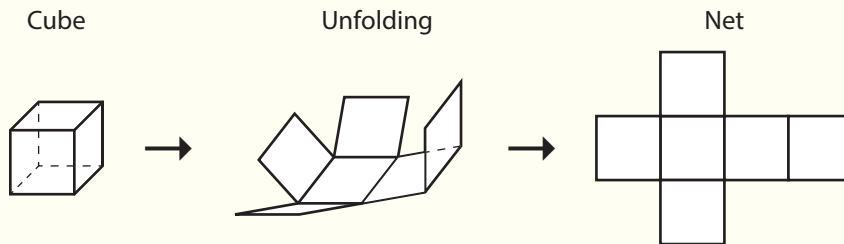
Practice Representing a Three-Dimensional Figure with a Net

- **Study the Example showing how to draw a net for a three-dimensional figure. Then solve problems 1–5.**

Example

An artist needs a sheet of copper that can be bent to form a cube. Draw a net the artist can use to make the cube.

Imagine cutting a cube apart along some of the edges and unfolding it.



This net is one possible net for a cube.

- 1 a. What shapes are in any net for a cube? Explain.

- b. You could cut the cube in the Example along other edges to make a net with a different arrangement of squares. Draw an example of another net for a cube.

- 2 Hai says that every net for a prism is made up of exactly six faces. Explain why Hai’s statement is incorrect.

Vocabulary

cube

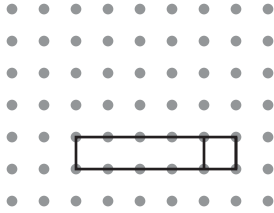
a rectangular prism in which each face of the prism is a square.

prism

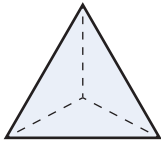
a three-dimensional figure with two parallel bases that are the same size and shape. A prism is named by the shape of the base.



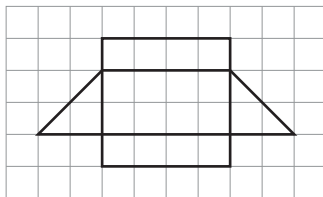
- 3 Shanika is designing a wooden trunk. She wants the trunk to be a right rectangular prism with two square sides. Shanika starts drawing a net on dot paper. Complete Shanika's net.



- 4 Draw a net for the triangular pyramid.



- 5 Salvador draws a figure on grid paper. He says it is a net for a three-dimensional figure. Explain if Salvador is correct. If he is, identify the figure in your explanation.



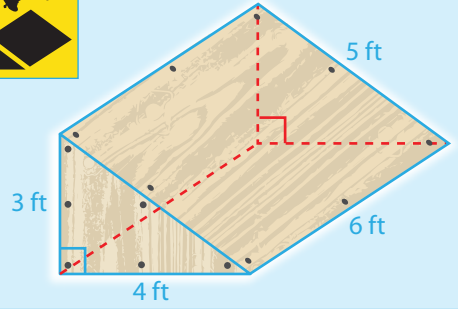
Develop Finding the Surface Area of a Three-Dimensional Figure

► Read and try to solve the problem below.

Oliver is using plywood to build the skateboard ramp shown. Three sides of the ramp are rectangles. How many square feet of plywood does Oliver need to build the ramp?



Build a Skateboard Ramp



things you will need:



TRY IT



Math Toolkit dot paper, geometric solids, grid paper

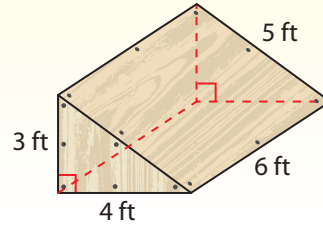
DISCUSS IT

Ask: Why did you choose that strategy to find the square feet of the plywood needed to build the ramp?

Share: My strategy helped me to . . .

► Explore different ways to find the surface area of a three-dimensional figure.

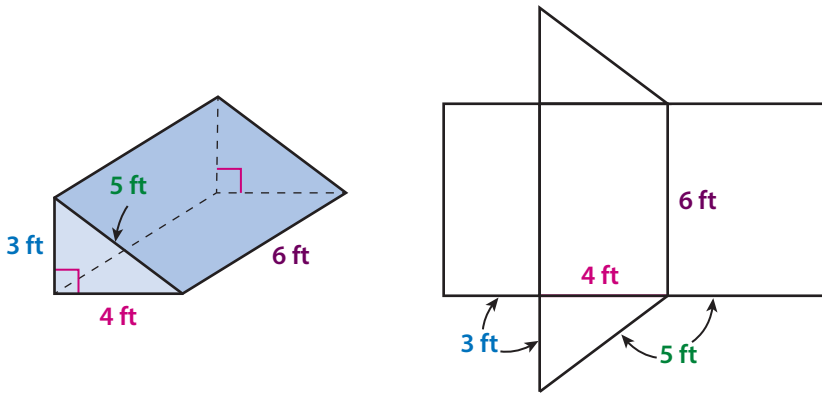
Oliver is using plywood to build the skateboard ramp shown. Three sides of the ramp are rectangles. How many square feet of plywood does Oliver need to build the ramp?



Picture It

You can draw a net to help you find the **surface area** of a three-dimensional figure.

The ramp has two triangular faces and three rectangular faces. Label the net with the dimensions from the triangular prism.



Model It

You can write an expression to find the surface area of a three-dimensional figure.

Use area formulas to write an expression for the sum of the areas of the faces.

$$\frac{1}{2} \cdot (4 \cdot 3) + \frac{1}{2} \cdot (4 \cdot 3) + (3 \cdot 6) + (4 \cdot 6) + (5 \cdot 6)$$



CONNECT IT

► Use the problem from the previous page to help you understand how to find the surface area of a three-dimensional figure.

- 1 Look at the **Picture It**. Two line segments in the net are labeled as being 5 ft long. Where do you see these line segments in the prism?
- 2 The length of one line segment in the net is labeled as 6 ft. Which other line segments in the net could be labeled as 6 ft? How do you know?
- 3 Aisha wrote the expression $2\left(\frac{1}{2}\right)(4 \cdot 3) + 6(3 + 4 + 5)$ for the area of the net. Explain why the expression represents the area of the net.
- 4 What is the area of the plywood Oliver needs for the ramp? Explain how a net can help you find the ramp's surface area.
- 5 How can you use what you know about two-dimensional shapes to find the surface area of a three-dimensional figure?
- 6 **Reflect** Think about all the models and strategies you have discussed today. Describe how one of them helped you better understand how to solve the **Try It** problem.

Apply It

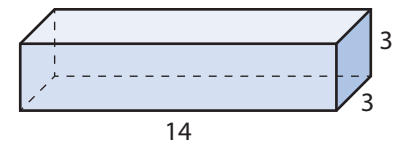
► Use what you learned to solve these problems.

- 7 What is the surface area of the cereal box? Show your work.

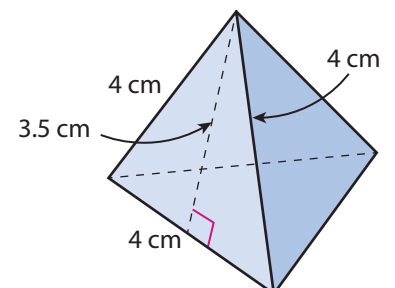


SOLUTION

- 8 Which expressions can be used to find the surface area of the right rectangular prism? Select all that apply.



- A $14(3 + 3 + 3 + 3) + (3 \cdot 3) + (3 \cdot 3)$
- B $(4 \cdot 14 \cdot 3) + (2 \cdot 3 \cdot 3)$
- C $(14 \cdot 3) + (14 \cdot 3) + (14 \cdot 3) + (14 \cdot 3)$
- D $14 \cdot 3 \cdot 3$
- E $2(14 \cdot 3) + 2(14 \cdot 3) + 2(3 \cdot 3)$
- 9 All of the faces of the triangular pyramid are identical. What is the surface area of the pyramid? Show your work.



SOLUTION

Practice Finding the Surface Area of a Three-Dimensional Figure

► Study the Example showing how to find the surface area of a three-dimensional figure. Then solve problems 1–5.

Example

Maya uses clay to make an earring in the shape of a square pyramid. She plans to cover the earring with glitter. What is the area Maya will cover with glitter?

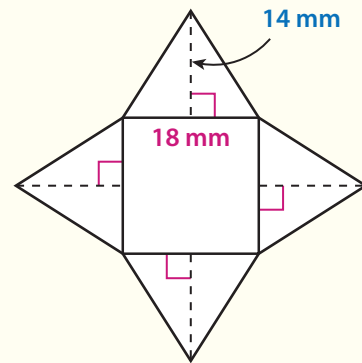
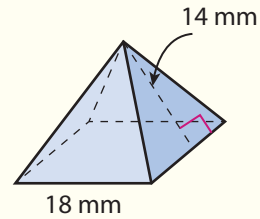
Use a net to help you find the surface area of the pyramid.

The pyramid has five faces: one square base and four identical triangles.

Find the sum of the areas of the faces.

$$\begin{aligned}
 18 \cdot 18 + 4\left(\frac{1}{2}\right)(18 \cdot 14) &= 324 + 2(18 \cdot 14) \\
 &= 324 + 2(252) \\
 &= 324 + 504 \\
 &= 828
 \end{aligned}$$

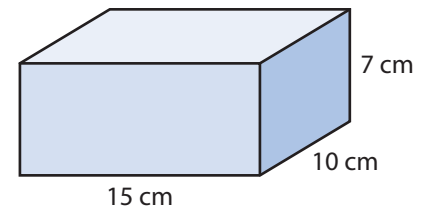
The area Maya will cover with glitter is 828 mm².



1 Ayana wrote the expression below. Does this expression represent the surface area of Maya’s earring in the Example? Explain.

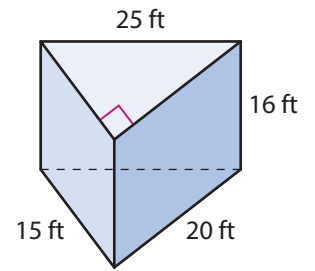
$$2(18 \cdot 18) + 2\left(\frac{1}{2}\right)(18 \cdot 14) + 2\left(\frac{1}{2}\right)(18 \cdot 14)$$

2 What is the surface area of the right rectangular prism? Show your work.



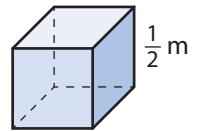
SOLUTION

- 3 What is the surface area of the right triangular prism? Show your work.



SOLUTION _____

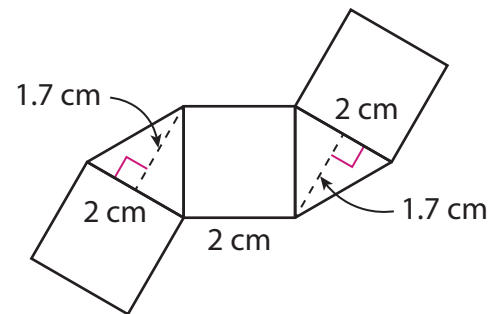
- 4 An artist uses metal to make a sculpture in the shape of a cube. What is the total amount of metal, in square meters, used in the sculpture? Show your work.



SOLUTION _____

- 5 The figure shows a net for a three-dimensional figure. The net includes three squares.

- a. What is the three-dimensional figure?
- b. What is the surface area of the figure? Show your work.



SOLUTION _____

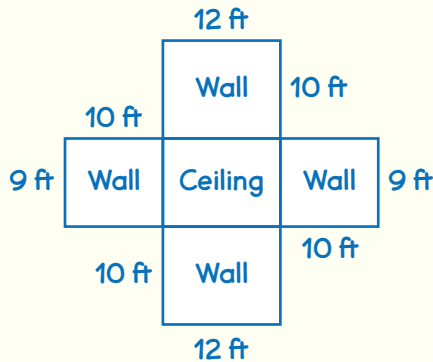
Refine Using Nets to Find Surface Area

► Complete the Example below. Then solve problems 1–7.

Example

Alyssa paints the ceiling and the walls of a storage room. The ceiling is a rectangle that is 12 feet long and 9 feet wide. The walls are 10 feet tall, with no windows. What is the area Alyssa paints?

Look at how you could show your work using a net.



$$2(9 \cdot 10) + 2(10 \cdot 12) + 9 \cdot 12$$

SOLUTION _____

CONSIDER THIS . . .

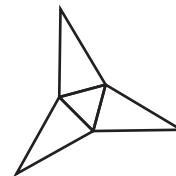
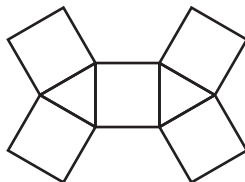
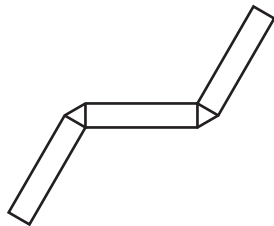
Alyssa is inside a right rectangular prism, but she is only painting five of the faces.

PAIR/SHARE

What is a different expression you can write to find the surface area?

Apply It

1 Circle the net for a right triangular prism. Explain how you know.



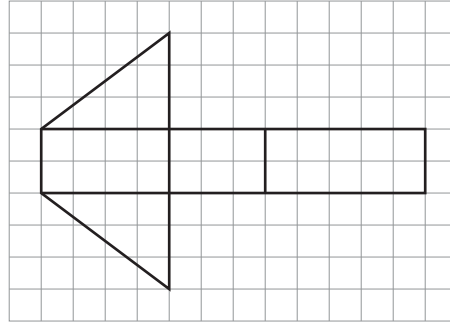
CONSIDER THIS . . .

How many faces of a triangular prism are triangles?

PAIR/SHARE

Is one of the other two figures a net for a pyramid? How do you know?

- 2 A net for a three-dimensional figure is shown on grid paper. Each square of the grid paper represents one square foot. What is the surface area of the three-dimensional figure? Show your work.

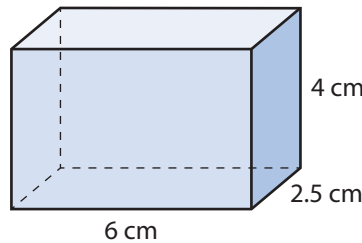


CONSIDER THIS ...

What shapes make up the net?

SOLUTION

- 3 Elisa has a rectangular block of wood with the dimensions shown. She plans to cover it with paper to make a piece of dollhouse furniture. What is the total surface area to be covered with paper?



PAIR/SHARE

Is the three-dimensional figure a *prism* or a *pyramid*? How do you know?

CONSIDER THIS ...

The block of wood is in the shape of a right rectangular prism.

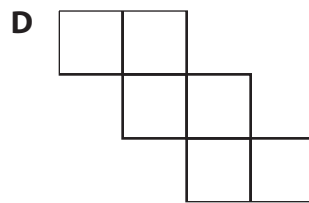
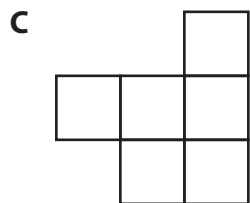
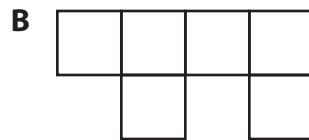
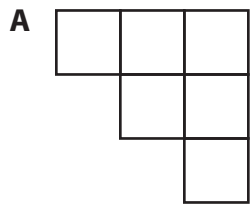
- A 49 cm^2
- B 60 cm^2
- C 78 cm^2
- D 98 cm^2

Kyle chose B as the correct answer. How might he have gotten that answer?

PAIR/SHARE

How can you estimate to see if your answer is reasonable?

4 Which figure is a net for a cube?



5 Pedro uses cardboard to make a model of a square pyramid. The edges of the base of the model are 5 in. long. The height of each triangular face is 4 in. What is the area of the cardboard in Pedro's model? Show your work.

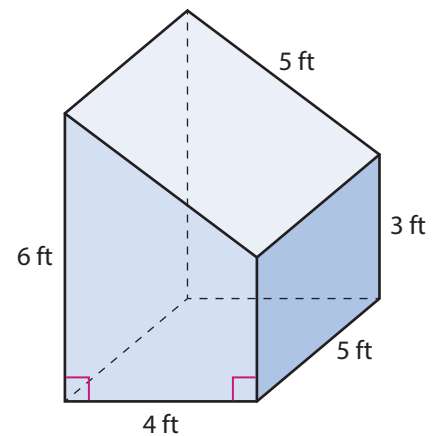


Pyramid of the Sun, Teotihuacán, Mexico

SOLUTION

- 6 The figure shows the dimensions of a compost bin. Can the expression below be used to find the surface area of the compost bin? Explain. Include a net in your explanation.

$$6 \cdot 5 + 4 \cdot 5 + 3 \cdot 5 + 5 \cdot 5 + 2 \left[3 \cdot 4 + \frac{1}{2}(3 \cdot 4) \right]$$



- 7 **Math Journal** Write a real-world problem that involves finding the surface area of a right rectangular prism. Show how to find the surface area of your prism.

✓ End of Lesson Checklist

- INTERACTIVE GLOSSARY** Find the entry for *surface area*. Write the definition in your own words using the word *area*.
- SELF CHECK** Go back to the Unit 1 Opener and see what you can check off.