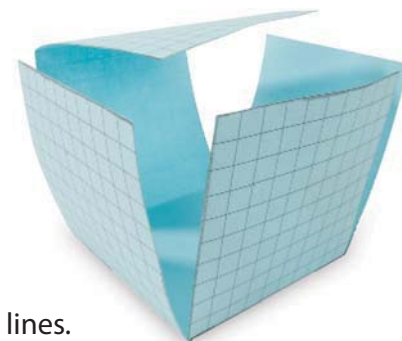# Nets and Surface Area

? ESSENTIAL QUESTION

How can you use nets to find surface areas?
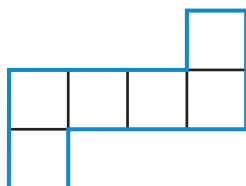
EXPLORE ACTIVITY COMMON CORE 6.G.4

Using a Net

A **net** is a two-dimensional pattern of shapes that can be folded into a three-dimensional figure. The shapes in the net become the faces of the three-dimensional figure.
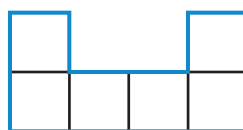
A Copy each net on graph paper. Cut out each net along the blue lines.

Net A

Net B

One of these nets can be folded along the black lines to make a cube.

Which net will NOT make a cube? _____

B On your graph paper, draw a different net that you think will make a cube. Confirm by cutting out and folding your net. Compare results with several of your classmates. How many different nets for a cube did

you and your classmates find? _____

Reflect

How do you know that each net cannot be folded into a cube without actually cutting and folding it?

1.

_____

_____

2.

_____

_____

_____
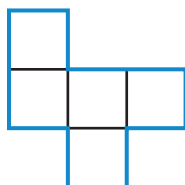
3. What shapes will appear in a net for a rectangular prism that is not a cube? How many of these shapes will there be?

_____

Surface Area of a Pyramid

The **surface area** of a three-dimensional figure is the sum of the areas of its faces. A net can be helpful when finding surface area.

A **pyramid** is a three-dimensional figure whose base is a polygon and whose other faces are triangles that meet at a point. A pyramid is identified by the shape of its base.

EXAMPLE 1

COMMON CORE 6.G.4

Make a net of this square pyramid, and use the net to find the surface area.

17 in.

16 in. 16 in.

STEP 1 Make a net of the pyramid.

Draw the square base.

Draw a triangle on each side.

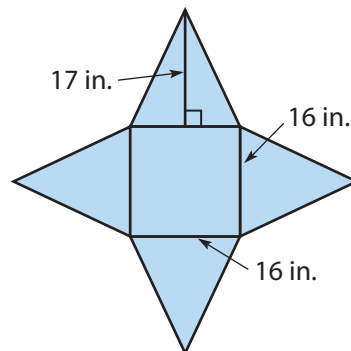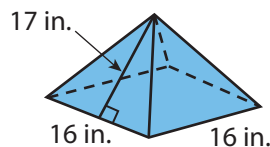Label the dimensions.

17 in.

16 in.

16 in.

STEP 2 Use the net to find the surface area.

There are four triangles with base 16 in. and height 17 in.

The area of the 4 triangles is $4 \times \frac{1}{2}(16)(17) = 544$ in^2.

The area of the base is $16 \times 16 = 256$ in^2.

The surface area is $544 + 256 = 800$ in^2.

Math Talk

Mathematical Practices

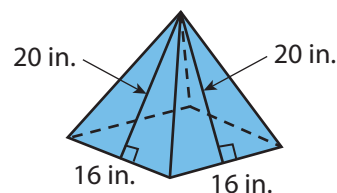How many surfaces does a triangular pyramid have? What shape are they?

YOUR TURN

4. Use a net to find the surface area of the pyramid.

_____

20 in. 20 in.

16 in. 16 in.

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Surface Area of a Prism

A **prism** is a three-dimensional figure with two identical and parallel bases that are polygons. The other faces are rectangles. A prism is identified by the shape of its base.

EXAMPLE 2

COMMON CORE 6.G.4

My Notes

A sculpture sits on pedestal in the shape of a square prism. The side lengths of a base of the prism are 3 feet. The height of the prism is 4 feet. The museum director wants to cover all but the underside of the pedestal with foil that costs $0.22 per square foot. How much will the foil cost?
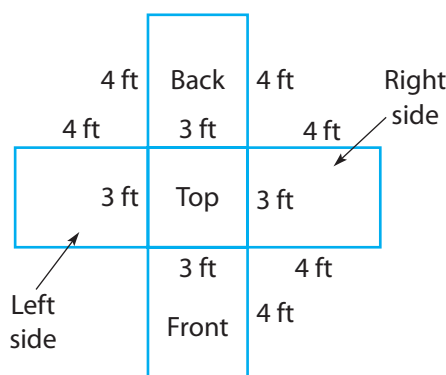
STEP 1 Use a net to show the faces that will be covered with foil.

Draw the top.

Draw the faces of the prism that are connected to the top.

You don't need to include the bottom of the pedestal.

4 ft | Back | 4 ft | Right side
4 ft | 3 ft | 4 ft
3 ft | Top | 3 ft
Left side | 3 ft | 4 ft
| Front | 4 ft

STEP 2 Use the net to find the area that will be covered with foil.

Area of top $= 3 \cdot 3 = 9 \text{ ft}^2$

The other four faces are identical.

Area of four faces $= 4 \cdot 3 \cdot 4 = 48 \text{ ft}^2$

Area to be covered $= 9 + 48 = 57 \text{ ft}^2$

STEP 3 Find the cost of the foil.

$57 \cdot \$0.22 = \$12.54$

The foil will cost $12.54.
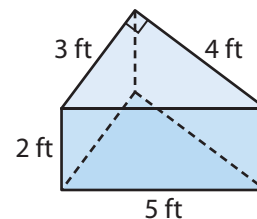
Reflect

5. Critical Thinking What shapes would you see in the net of a triangular prism?

YOUR TURN

6. The figure shown is a triangular prism. How much would it cost to cover the bases and the other three faces with foil that costs $0.22 per square foot?

_____

3 ft 4 ft

2 ft

5 ft

Guided Practice

A square pyramid is shown.

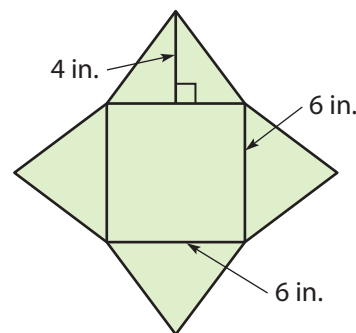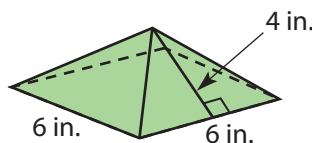**1.** The figure has _____ square base

and _____ triangular faces.
(Explore Activity)

2. Find the surface area. (Example 1)

The area of the base is _____ square inches.

The area of the four faces is _____ square inches.

The surface area is _____ square inches.

4 in.

6 in. 6 in.

4 in.

6 in.

6 in.

6 in.

3. Yolanda makes wooden boxes for a crafts fair. She makes 100 boxes like the one shown, and she wants to paint all the outside faces. (Example 2)
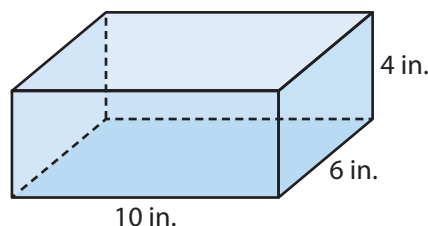
a. Find the surface area of one box.

_____

b. Find the total surface area of 100 boxes.

_____

c. One can of paint will cover 14,000 square inches. How many cans of paint will Yolanda need to buy?

_____

4 in.

6 in.

10 in.

❓ ESSENTIAL QUESTION CHECK-IN

4. How is a net useful when finding the surface area of prisms and pyramids?
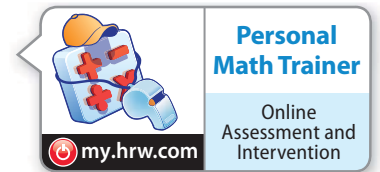
_____

_____

_____

15.1 Independent Practice

COMMON CORE 6.G.4

5. Use a net to find the surface area of the cereal box.

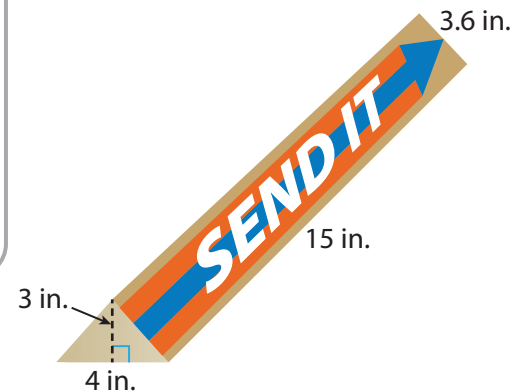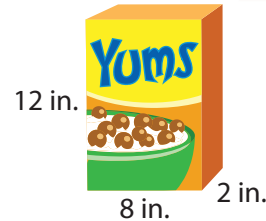Total surface area: _____

12 in.

8 in.   2 in.

6. Inez bought a shipping container at a packaging store. She measured the dimensions shown to the nearest tenth.

a. Sketch a net of the container, and label the dimensions.

3.6 in.

SEND IT

15 in.

3 in.

4 in.

b. Find the surface area of the shipping container.

_____

7. Raj builds a side table in the shape of a cube. Each edge of the cube measures 20 inches. Raj wants to cover the top and four sides of the table with ceramic tiles. Each tile has an edge length of 5 inches. How many tiles will he need?

_____

8. Santana wants to cover a gift box shaped like a rectangular prism with foil. The foil costs $0.03 per square inch. Santana has a choice between Box A which is 8 inches long, 3 inches wide, and 6 inches high, and Box B which is 10 inches long, 3 inches wide, and 4 inches high. Which box will be less expensive to cover with foil, and by how much?
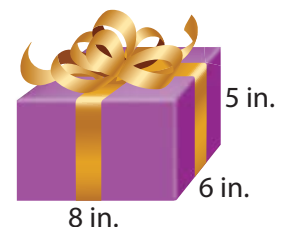
_____

9. **Vocabulary** Name a three-dimensional shape that has four triangular faces and one rectangular face. Name a three-dimensional shape that has three rectangular faces and two triangular faces.

_____

10. Victor wrapped the gift box shown with adhesive paper (with no overlaps). How much paper did he use?

5 in.

6 in.

8 in.

_____

11. Communicate Mathematical Ideas Describe how you approach a problem involving surface area. What do you do first? What are some strategies you can use?

_____

_____

_____

_____

_____

Work Area

12. Persevere in Problem Solving A pedestal in a craft store is in the shape of a triangular prism. The bases are right triangles with side lengths of 12 centimeters, 16 centimeters, and 20 centimeters. The store owner wraps a piece of rectangular cloth around the pedestal, but does not cover the identical bases of the pedestal with cloth. The area of the cloth is 192 square centimeters.

a. What is the distance around the base of the pedestal? How do you know?

_____

_____

b. What is the height of the pedestal? How did you find your answer?

_____

_____

_____

13. Critique Reasoning Robert sketches two rectangular prisms, A and B. Prism A's side lengths are 5 centimeters, 6 centimeters, and 7 centimeters. Prism B's side lengths were twice those of prism A's: 10 centimeters, 12 centimeters, and 14 centimeters. Robert says the surface area of prism B is twice the surface area of prism A. Is he correct? If he is not, how many times as great as prism A's surface area is prism B's surface area? Show your work.

_____

_____

_____

_____