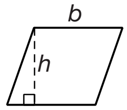
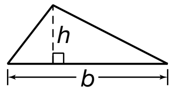
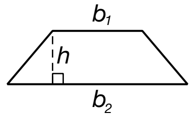
NAME ______________________ DATE ____________ PERIOD _____

7-1 Area of Parallelograms, Triangles, and Trapezoids (pages 314–318)

Any side of a parallelogram or triangle can be used as a **base**. The **altitude** of a parallelogram is a line segment perpendicular to the base with endpoints on the base and the side opposite the base. The altitude of a triangle is a line segment perpendicular to the base from the opposite vertex. The length of the altitude is called the **height**. A **trapezoid** is a quadrilateral with exactly one pair of parallel sides, which are its bases.

Area of a Parallelogram	The area A of a parallelogram is the product of any base b and its height h. $A = bh$	
Area of a Triangle	The area A of a triangle is equal to half the product of its base b and height h. $A = \frac{1}{2}bh$	
Area of a Trapezoid	The area A of a trapezoid is equal to half the product of the height h and the sum of the bases, b_1 and b_2. $A = \frac{1}{2}h(b_1 + b_2)$	

EXAMPLES

A Find the area of a parallelogram that has $b = 14$ in. and $h = 5$ in.

$A = bh$

$A = (14)(5)$ *Replace b with 14 and h with 5.*

$A = 70\ in^2$ *Multiply.*

B Find the area of a trapezoid with bases of 13 cm and 17 cm and a height of 9 cm.

$A = \frac{1}{2}h(b_1 + b_2)$

$A = \frac{1}{2}(9)(13 + 17)$ *Replace the variables.*

$A = 135\ cm^2$ *Multiply.*

Try These Together

1. Find the area of a triangle that has $b = 16$ yd and $h = 12$ yd.
2. Find the area of a parallelogram that has a base of 10.5 m and a height of 4.1 m.

PRACTICE

Find the area of each triangle.

	base	height
3.	16 cm	7 cm
4.	$15\frac{1}{3}$ ft	6 ft
5.	20 cm	22 cm

Find the area of each trapezoid.

	base (b_1)	base (b_2)	height
6.	14 in.	18 in.	6 in.
7.	$20\frac{1}{2}$ m	$7\frac{1}{2}$ m	12 m
8.	8.6 yd	5.2 yd	7 yd

9. **Standardized Test Practice** What is the area of a parallelogram whose base is 4.5 m and whose height is 3.6 m?

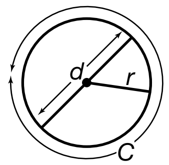
A 5.3 m^2 **B** 8.1 m^2 **C** 10.6 m^2 **D** 16.2 m^2

Answers: **1.** 96 yd^2 **2.** 43.05 m^2 **3.** 56 cm^2 **4.** 46 ft^2 **5.** 220 cm^2 **6.** 96 in^2 **7.** 168 m^2 **8.** 48.3 yd^2 **9.** D

NAME ______________________ DATE ____________ PERIOD _____

7-2 Circumference and Area of Circles (pages 319–323)

The distance from the center to any point on a circle is the **radius** (r). The distance across the circle through the center is the **diameter** (d). The distance around the circle is the **circumference** (C). The diameter is twice the radius, or $d = 2r$.

Circumference of a Circle	The circumference C of a circle is equal to its diameter d times π, or 2 times its radius r times π. $C = \pi d$ or $C = 2\pi r$  Use $\frac{22}{7}$ or 3.14 as an approximate value for π.
Area of a Circle	The area A of a circle is equal to π times the square of the radius r, or $A = \pi r^2$.

EXAMPLES

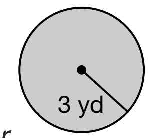
A Find C if the diameter is 4.2 meters.

$C = \pi d$

$C = 3.14(4.2)$ *Replace d with 4.2 and π with 3.14.*

$C = 13.188$ m *Multiply.*

B Find the area of the circle. Round to the nearest tenth.



$A = \pi r^2$

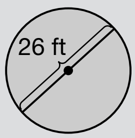
$A = \pi \times 3^2$ $r = 3$

$A = \pi \times 9$

$A \approx 28.3$ yd^2 *Use a calculator.*

Try These Together

1. Find the area of the circle. Use a calculator. Round to the nearest tenth.
HINT: $r = 13$



2. Find C if the radius is 23 centimeters. Round to the nearest tenth.
HINT: Use the formula that contains r.

PRACTICE

Find the circumference of each circle. Round to the nearest tenth. Use $\frac{22}{7}$ or 3.14 for π.

3. radius, 19.65 cm **4.** diameter, 60.2 m **5.** diameter, 11.3 yd **6.** radius, $8\frac{1}{2}$ in.

Find the area of each circle. Use a calculator. Round to the nearest tenth.

7. radius, 16 m **8.** diameter, 16 in. **9.** radius, 10 ft

10. **Standardized Test Practice** A pizza has a diameter of 18 inches. If two of the twelve equal pieces are missing, what is the approximate area of the remaining pizza?

A 254 in^2 **B** 848 in^2 **C** 212 in^2 **D** 424 in^2

Answers: 1. 530.9 ft^2 **2.** 144.4 cm **3.** 123.4 cm **4.** 189.0 m **5.** 35.5 yd **6.** 53.4 in. **7.** 804.2 m^2 **8.** 201.1 in^2 **9.** 314.2 ft^2 **10.** C

7-3 Area of Complex Figures (pages 326–329)

A **complex figure** is made up of two or more shapes. To find the area of a complex figure, separate the figure into shapes whose areas you know how to find. Then find the sum of those areas.

EXAMPLE

Find the area of the complex figure.
The figure can be separated into a trapezoid and a semicircle.

Area of trapezoid

$A = \frac{1}{2}h(a + b)$

$A = \frac{1}{2} \cdot 2(3 + 5)$

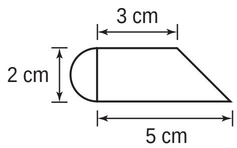
$A = 8$

Area of semicircle

$A = \frac{1}{2}\pi r^2$

$A = \frac{1}{2} \cdot \pi \cdot 1^2$

$A \approx 1.6$

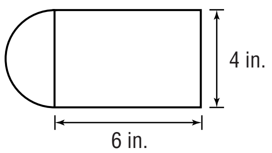


The area of the figure is about 8 + 1.6 or 9.6 square centimeters.

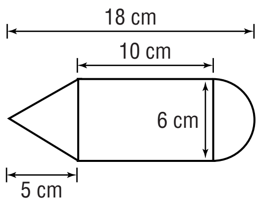
PRACTICE

Find the area of each figure. Round to the nearest tenth if necessary.

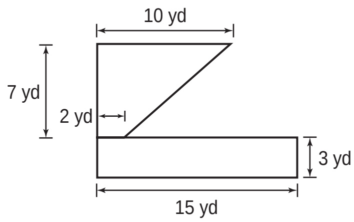
1.



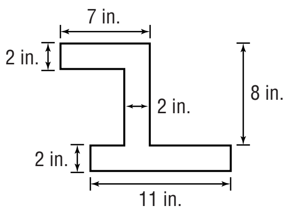
2.



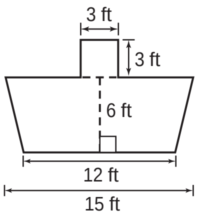
3.



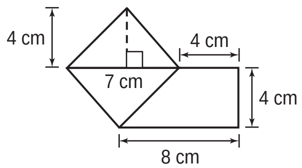
4.



5.



6.

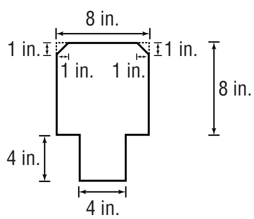


7. What is the area of a figure that is formed with a rectangle with sides 4 inches and 7 inches and a trapezoid with bases 8 inches and 12 inches, and a height of 3 inches?

8. **Standardized Test Practice** What is the area of the figure at the right?

A 80 in^2 **B** 79 in^2

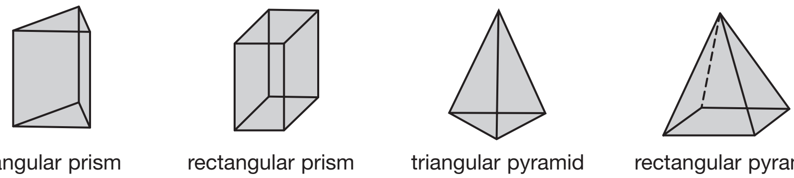
C 74 in^2 **D** 32 in^2



Answers: 1. 30.3 in^2 **2.** 89.1 cm^2 **3.** 87 yd^2 **4.** 48 in^2 **5.** 90 ft^2 **6.** 52 cm^2 **7.** 58 in^2 **8.** B

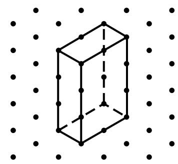
7-4 Three-Dimensional Figures (pages 331–334)

Three-dimensional figures are called **solids**. **Prisms** are solids that have flat surfaces. The surfaces of a prism are called **faces**. All prisms have at least one pair of faces that are parallel and congruent. These are called **bases**, and are used to name the prism.



EXAMPLE

Use isometric dot paper to draw a three-dimensional figure that is 3 units high, 1 unit long, and 2 units wide.

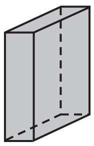


1. *Lightly draw the bottom of the prism 1 unit by 2 units.*
2. *Lightly draw the vertical segments at the vertices of the base. Each segment is three units high.*
3. *Complete the top of the prism.*
4. *Go over your light lines. Use dashed lines for the edges of the prism that you cannot see from your perspective, and solid lines for edges you can see.*

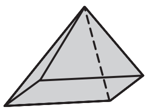
PRACTICE

Identify each solid. Name the number and shapes of the faces. Then name the number of edges and vertices.

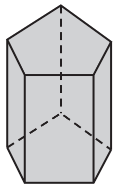
1.



2.



3.



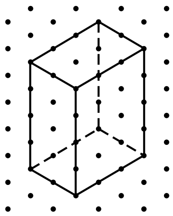
4. a. Name the solid at the right.

b. What is the height of the solid?

c. How many faces does the solid have?

d. How many edges does the solid have?

e. How many vertices does the solid have?



5. **Standardized Test Practice** How many vertices does a triangular prism have?

A 3 **B** 5 **C** 6 **D** 8

Answers: **1.** rectangular prism; 6 faces, all rectangles; 12 edges; 8 vertices **2.** rectangular pyramid; 5 faces, 4 triangles and 1 rectangle; 8 edges; 5 vertices **3.** pentagonal prism; 7 faces, 2 pentagons and 5 rectangles; 15 edges; 10 vertices **4a.** rectangular prism **4b.** 4 **4c.** 6 **4d.** 12 **4e.** 8 **5.** C

7-5 Volume of Prisms and Cylinders (pages 335–339)

Volume is the measure of the space occupied by a solid. It is measured in cubic units. You can use the following formulas to find the volume of prisms and **circular cylinders**. A circular cylinder has circles for its bases.

Volume of a Prism	The volume V of a prism is equal to the area of the base B times the height h, or $V = Bh$. For a rectangular prism, the area of the base B equals the length ℓ times the width w. The formula $V = Bh$ becomes $V = (\ell \cdot w)h$.
Volume of a Cylinder	The volume V of a cylinder is the area of the base B times the height h, or $V = Bh$. Since the area of the base of a cylinder is the area of a circle, or πr^2, the formula for the volume of a cylinder V becomes $V = \pi r^2 h$.

EXAMPLES

A Find the volume of a rectangular prism with a length of 4 centimeters, a width of 6 centimeters, and a height of 8 centimeters.

$V = \ell wh$

$V = 4 \cdot 6 \cdot 8$ $\ell = 4, w = 6, h = 8$

$V = 192\ cm^3$

B Find the volume of a cylinder with a radius of 3 inches and a height of 12 inches

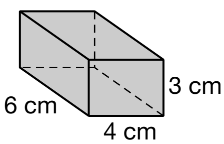
$V = \pi r^2 h$

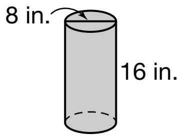
$V = \pi \cdot 3^2 \cdot 12$ $r = 3, h = 12$

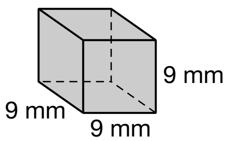
$V \approx 339\ in^3$ *Use a calculator.*

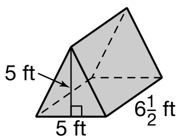
PRACTICE

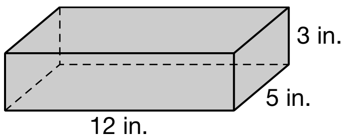
Find the volume of each solid. Round to the nearest tenth if necessary.

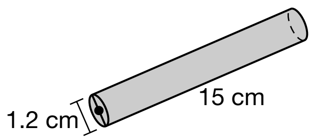
1.


2.


3.


4.


5.


6.


7. **Standardized Test Practice** You just bought a new pot for a plant. The pot is shaped like a cylinder with a diameter of 12 inches and a height of 12 inches. About how much dirt will you need to fill the pot?

A $144\ in^3$ **B** $24\ in^3$ **C** $5{,}428.7\ in^3$ **D** $1{,}357.2\ in^3$

Answers: 1. $72\ cm^3$ **2.** $804.2\ in^3$ **3.** $729\ mm^3$ **4.** $81.3\ ft^3$ **5.** $180\ in^3$ **6.** $17.0\ cm^3$ **7.** D

NAME ______________________________ DATE ____________ PERIOD _____

7-6 Volume of Pyramids and Cones (pages 342–345)

A cone for ice cream is an example of a geometric solid called a **circular cone**. A segment that goes from the vertex of the cone to its base and is perpendicular to the base is called the **altitude**. The height of a cone is measured along its altitude.

Volume of a Cone	The volume V of a cone equals one-third the area of the base B times the height h, or $V = \frac{1}{3}Bh$. Since the base of a cone is a circle, the formula can be rewritten as $V = \frac{1}{3}\pi r^2 h$.
Volume of a Pyramid	The volume V of a pyramid equals one-third the area of the base B times the height h, or $V = \frac{1}{3}Bh$.

EXAMPLES

A Find the volume of a cone that has a radius of 1 centimeter and a height of 6 centimeters.

$V = \frac{1}{3}\pi r^2 h$

$V = \frac{1}{3} \cdot \pi \cdot 1^2 \cdot 6$ *r = 1, h = 6*

$V \approx 6.3 \text{ cm}^3$ *Use a calculator.*

B Find the volume of a pyramid that has an altitude of 10 inches and a square base with sides of 9 inches.

$V = \frac{1}{3}Bh$

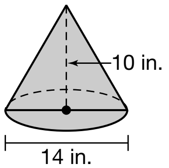
$V = \frac{1}{3} \cdot 9^2 \cdot 10$ *The area of a square base is s^2.*

$V = 270 \text{ in}^3$

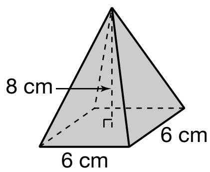
PRACTICE

Find the volume of each solid. Round to the nearest tenth if necessary.

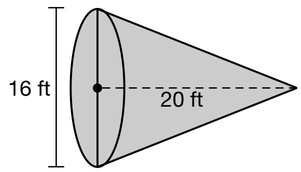
1.



2.



3.



4. The height of a rectangular pyramid is 10 meters. The base is 6 meters by 8.5 meters.

a. Find the volume of the pyramid.

b. Suppose the height is cut in half and the base remains the same. What is the volume of the new pyramid?

5. **Standardized Test Practice** You are creating a model of the Egyptian Pyramids for Social Studies class. You make a pyramid with a height of 5 feet and a 2.5-foot by 2.5-foot square base. What is the volume of your pyramid?

A 4.1 ft^3 **B** 5.2 ft^3 **C** 6.3 ft^3 **D** 10.4 ft^3

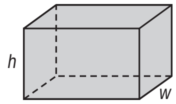
Answers: 1. 513.1 in^3 **2.** 96 cm^3 **3.** 1,340.4 ft^3 **4a.** 170 m^3 **4b.** 85 m^3 **5.** D

NAME ______________________ DATE __________ PERIOD _____

7-7 Surface Area of Prisms and Cylinders

(pages 347–351)

Surface area is the sum of the areas of all faces or surfaces of a solid.

Surface Area of a Prism	The surface area S of a rectangular prism with length ℓ, width w, and height h is the sum of the areas of the faces. $S = 2\ell w + 2\ell h + 2wh$ 
Surface Area of a Cylinder	The surface area of a cylinder equals two times the area of the circular bases ($2\pi r^2$) plus the area of the curved surface ($2\pi rh$). $S = 2\pi r^2 + 2\pi rh$

EXAMPLES

A Find the surface area of a cube that has a side length of 8 centimeters.

A cube has six sides, or faces, that are squares. The area of one side is 8^2, or 64 cm^2.

Since there are 6 sides, multiply the area of one side by 6. So, $64 \cdot 6 = 384$.

The surface area of a cube with a side length of 8 cm is 384 square centimeters.

B Find the surface area of a cylinder with a radius of 2 centimeters and a height of 20 centimeters. Round to the nearest tenth.

$S = 2\pi r^2 + 2\pi rh$

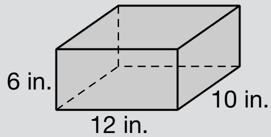
$S = 2\pi(2^2) + 2\pi(2)(20)$ *$r = 2$, $h = 20$*

$S \approx 276.5\ cm^2$ *Use a calculator.*

Try These Together

1. Find the surface area, to the nearest tenth of a cylinder with a radius of 3 inches and a height of 5 inches.

2.

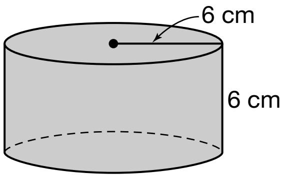


HINT: Find the surface area of each face, then add.

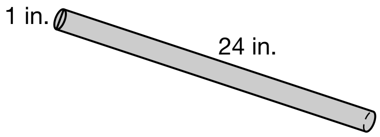
PRACTICE

Find the surface area of each cylinder. Round to the nearest tenth if necessary.

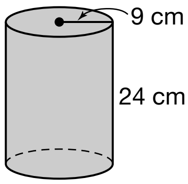
3.



4.



5.



6. **Standardized Test Practice** Selma is wrapping a gift for her friend's birthday. She uses a rectangular box that is 20 inches long, 3 inches high, and 9 inches deep. Find the surface area of the box so she can buy enough wrapping paper.

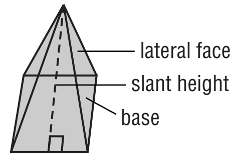
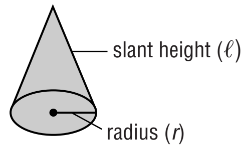
A 267 in^2 **B** 534 in^2 **C** 540 in^2 **D** 32 in^2

Answers: 1. 150.8 in^2 **2.** 504 in^2 **3.** 452.4 cm^2 **4.** 77.0 in^2 **5.** 1,866.1 cm^2 **6.** B

NAME ______________________ DATE ____________ PERIOD _____

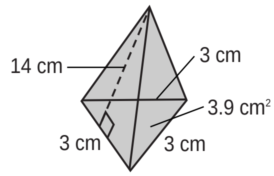
7-8 Surface Area of Pyramids and Cones

(pages 352–355)

Surface Area of a Pyramid	The triangular sides of a pyramid are called **lateral faces**. The altitude or height of each lateral face is called the **slant height**. The sum of the areas of the lateral faces is the **lateral area**. The surface area of a pyramid is the lateral area plus the area of the base.	**Model of Square Pyramid** 
Surface Area of a Cone	The surface area of a cone with radius r and slant height ℓ is given by $S = \pi r\ell + \pi r^2$.	**Model of Cone** 

EXAMPLE

Find the surface area of the pyramid.



Area of each lateral face

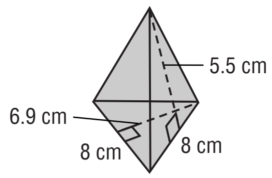
$A = \frac{1}{2}bh = \frac{1}{2}(3)(14) = 21$

There are 3 faces, so the lateral area is 3(21) or 63 square centimeters. The area of the base is given as 3.9 square centimeters. The surface area of the pyramid is the sum of the lateral area and the area of the base, 63 + 3.9 or 66.9 square centimeters.

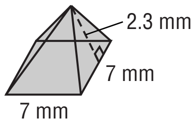
PRACTICE

Find the surface area of each solid. Round to the nearest tenth if necessary.

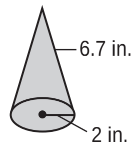
1.



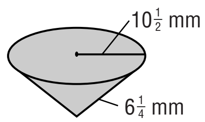
2.



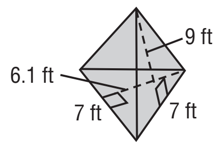
3.



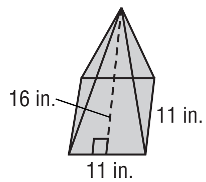
4.



5.



6.

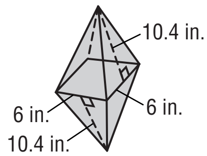


7. cone: radius 6.4 in.; slant height, 12 in.

8. triangular pyramid: base area, 10.8 m^2; base length, 5 m; slant height, 2.5 m

9. square pyramid: base side length, $2\frac{1}{3}$ ft; slant height 4 ft

10. **Standardized Test Practice** Find the surface area of the complex solid at the right.



A 285.6 in^2 **B** 187.2 in^2
C 250.0 in^2 **D** 249.6 in^2

Answers: 1. 93.6 cm^2 **2.** 81.2 mm^2 **3.** 54.7 in^2 **4.** 552.5 mm^2 **5.** 115.9 ft^2 **6.** 473 in^2 **7.** 370.0 in^2 **8.** 29.6 m^2 **9.** 24.1 ft^2 **10.** D

NAME ______________________ DATE __________ PERIOD _____

7-9 Precision and Significant Digits (pages 358–362)

The **precision** of a measurement is the exactness to which a measurement is made. Precision depends upon the smallest unit of measure being used, or the **precision unit**. The digits you record are **significant digits**. These digits indicate the precision of the measurement. When adding, subtracting, multiplying, or dividing measurements, the result should have the same precision as the least precise measurement.

There are special rules for determining significant digits in a given measurement. Numbers are analyzed for significant digits by counting digits from left to right, starting with the first nonzero digit.

Number	Number of Significant Digits	Rule
2.45	3	All nonzero digits are significant.
140.06	5	Zeros between two significant digits are significant.
0.013	2	Zeros used to show place value of the decimal are not significant.
120.0	4	In a number with a decimal point, all zeros to the right of a nonzero digit are significant.
350	2	In a number without a decimal point, any zeros to the right of the last nonzero digit are *not* significant.

EXAMPLES

A Determine the number of significant digits in 12.08 cm.

The zero is between two significant digits, and nonzero digits are significant, so there are 4 significant digits in 12.08 cm.

B Find 36.5 g ÷ 12.24 g using the correct number of significant digits.

36.5 has the least number of significant digits, 3. Round the quotient so that it has 3 significant digits. The result is 2.98 g.

PRACTICE

Determine the number of significant digits in each measure.

1. 20.50 **2.** 16.8 **3.** 0.073

Find each sum or difference using the correct precision.

4. 48.25 ft − 14.5 ft **5.** 3.8 cm + 24.05 cm **6.** 6.7 yd − 0.95 yd

Find each product or quotient using the correct number of significant digits.

7. 3.24 lb ÷ 0.75 lb **8.** 1.6 mi · 2.08 mi **9.** 12.40 m · 5.36 m

10. **Standardized Test Practice** Television ratings are based on the number of viewers. A game show had 31.6 million viewers in one evening. How many significant digits are used in this number?

A 8 **B** 5 **C** 3 **D** 2

Answers: 1. 4 **2.** 3 **3.** 2 **4.** 33.8 ft **5.** 28 cm **6.** 5.8 yd **7.** 4.3 lb **8.** 3.3 mi **9.** 66.5 m **10.** C

NAME ________________ DATE __________ PERIOD _____

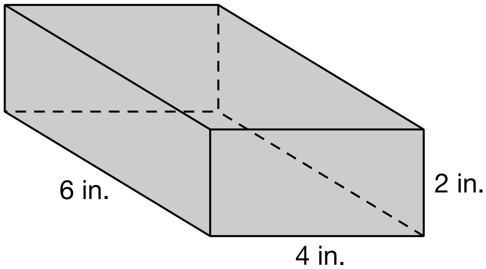
Chapter 7 Review

Cut-It-Out!

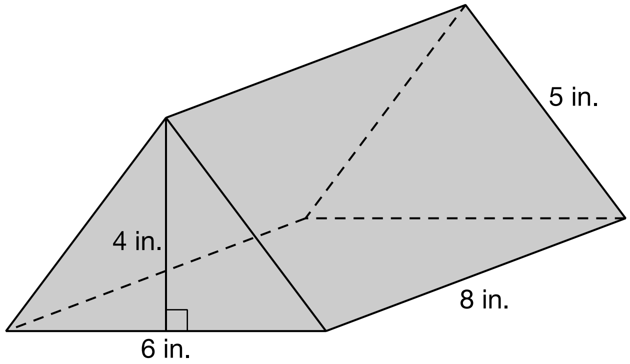
To do this activity, you will need a ruler, scissors, pencil, clear tape, and a piece of poster board or other thick paper or thin cardboard. Complete the activity with a parent.

To find the surface area of a prism, you must find the area of each face of the prism, and then add the areas. Use the materials above to draw and cut out each face of the prisms below. Once you have cut out the faces, label them with their individual surface areas. Tape the pieces together to form the prism. Then add the surface areas from the labels to find the total surface area of the prism.

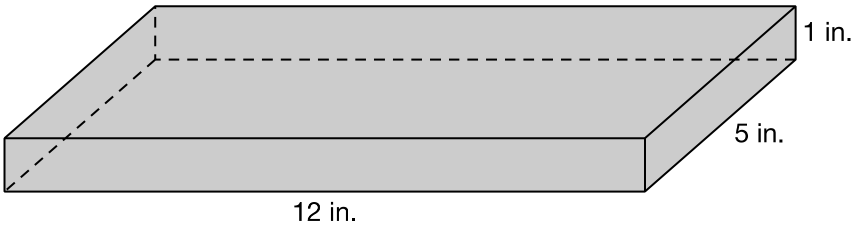
1.



2.



3.



4. Which prism requires the most paper or cardboard to make?

Answers are located on page 109.