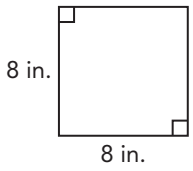
Name: _____ Date: _____

Lesson 12.2 Surface Area of Solids

Find the area of each figure.

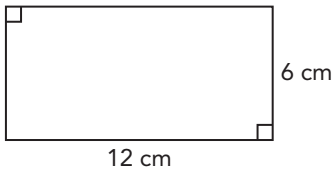
1.



Area = _____ × _____

= _____ $in.^2$

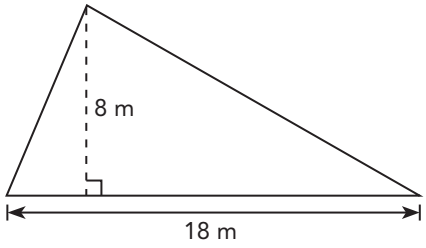
2.



Area = _____ × _____

= _____ cm^2

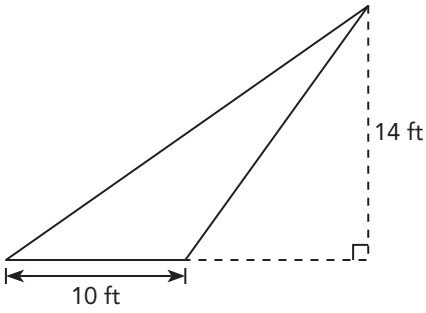
3.



Area = $\frac{1}{2}$ × _____ × _____

= _____ m^2

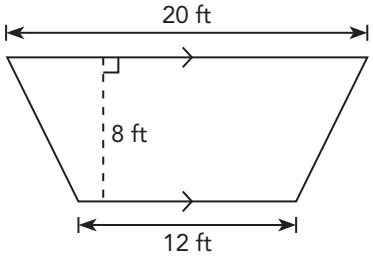
4.



Area = $\frac{1}{2}$ × _____ × _____

= _____ ft^2

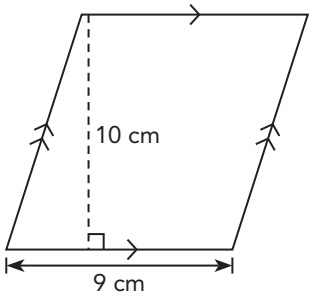
5.



Area = $\frac{1}{2}$ × _____ × (_____ + _____)

= _____ ft^2

6.



Area = _____ × _____

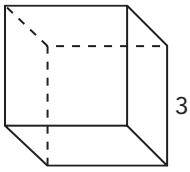
= _____ cm^2

Name: _____ Date: _____

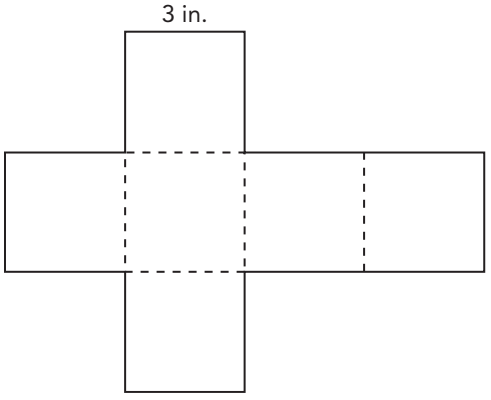
Solve. Show your work.

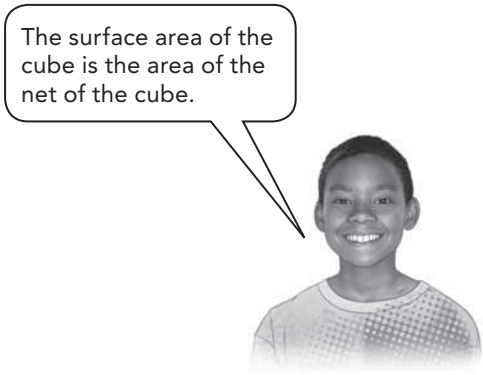
Example

A cube has edges measuring 3 inches. Find the surface area of the cube.



The **surface area** of a solid is the total area of the faces (including the bases) and the curved surfaces of the solid figure.





There are 6 square faces.

Area of each square face

= 3 × 3

= 9 in.^{2}

Surface area
= number of square faces × area of each square face

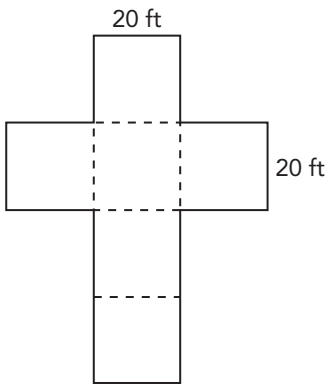
= 6 × 9

= 54 in.^{2}

The surface area of the cube is 54 square inches.

Name: _____ Date: _____

7. A cube has edges measuring 20 feet each. Find the surface area of the cube.



There are _____ square faces.

Area of each square face = _____ × _____

= _____ ft^2

Surface area
= number of square faces × area of each square face

= _____ × _____

= _____ ft^2

The surface area of the cube is _____ square feet.

8. A cube has edges measuring 15 meters each. Find the surface area of the cube.

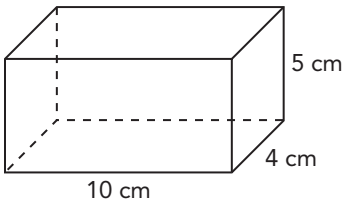
9. A box is shaped like a cube. It has edges measuring 24 centimeters each. Find the surface area of the cube.

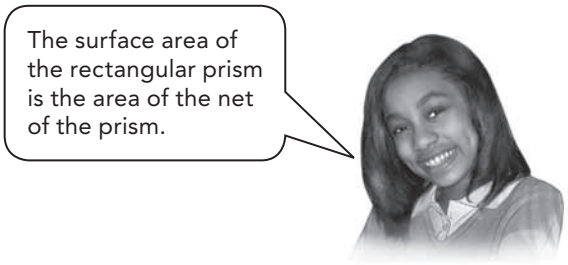
Name: _____ Date: _____

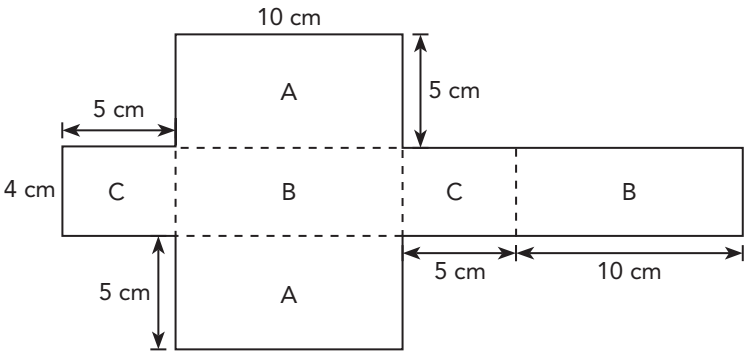
Solve. Show your work.

Example

A rectangular prism has edges measuring 10 centimeters by 4 centimeters by 5 centimeters. Find the surface area of the prism.







There are 2 rectangles, A, 2 rectangles, B, and 2 rectangles, C.

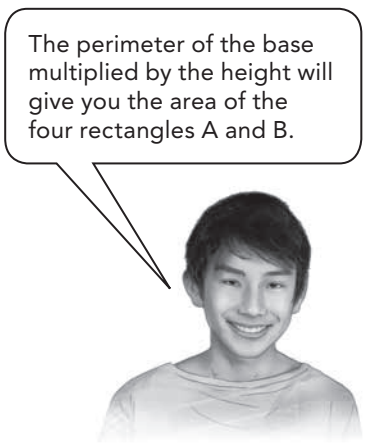
Area of rectangles, A and B

= (5 + 4 + 5 + 4) × 10

= 180 cm^2

Area of two rectangles, C = 2 × 5 × 4

= 40 cm^2



Surface area = total area of rectangles, A, B, and C

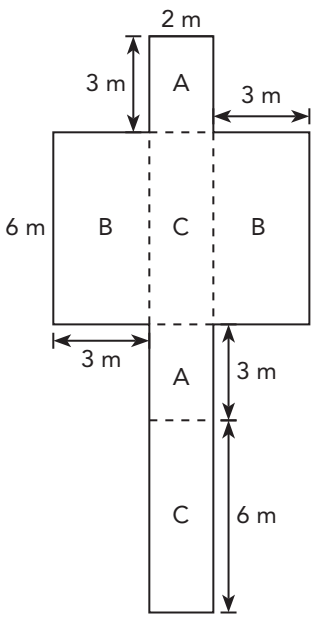
= 180 + 40

= 220 cm^2

The surface area of the prism is 220 square centimeters.

Name: _____ Date: _____

10. A rectangular prism measures 6 meters by 2 meters by 3 meters. Find the surface area of the prism.



There are _____ rectangles, A, _____ rectangles, B,

and _____ rectangles, C.

Area of two rectangles, A = _____ × _____ × _____

= _____ m^2

Area of rectangles, B and C

= (_____ + _____ + _____ + _____) × _____

= _____ m^2

Surface area = total area of rectangles A, B, and C

= _____ + _____

= _____ m^2

The surface area of the prism is _____ square meters.

11. A rectangular prism measures 13 inches by 7 inches by 2 inches. Find the surface area of the prism.

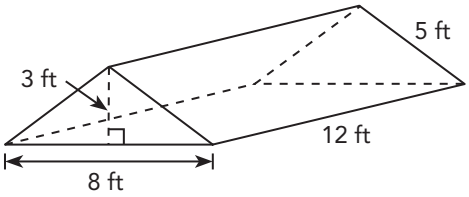
12. A block of ice in the shape of a rectangular prism measures 35 centimeters by 16 centimeters by 17 centimeters. Find the surface area of the prism.

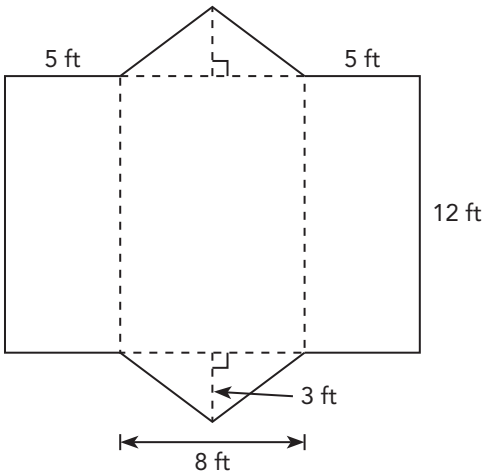
Name: _____ Date: _____

Solve. Show your work.

Example

The triangular prism shown has three rectangular faces. Its bases are congruent isosceles triangles. Find the surface area of the prism.





There are 3 rectangles and 2 triangles.

Area of two triangles = 2 × $\frac{1}{2}$ × 8 × 3

= 24 ft²

Area of three rectangles = (8 + 5 + 5) × 12

= 216 ft²

Surface area = total area of triangles and rectangles

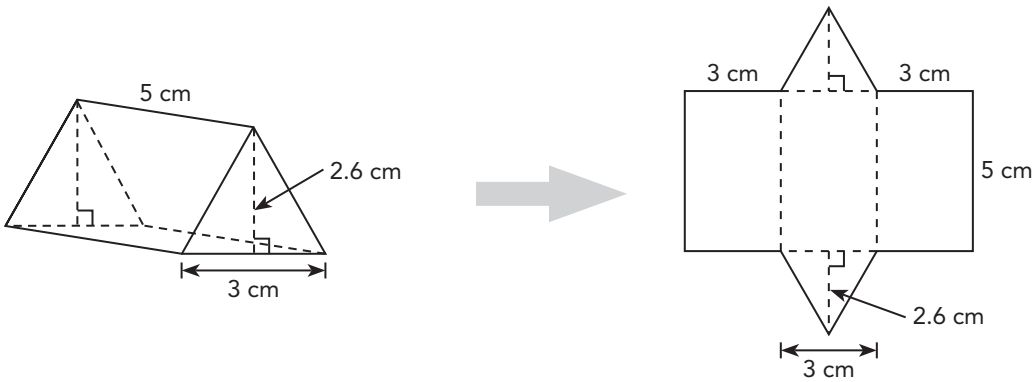
= 24 + 216

= 240 ft²

The surface area of the prism is 240 square feet.

Name: _____ Date: _____

13. The triangular prism shown has three rectangular faces. Its bases are congruent equilateral triangles. Find the surface area of the prism.



There are _____ rectangles and _____ triangles.

Area of two triangles

= _____ × _____ × _____ × _____

= _____ cm^2

Area of three rectangles = (_____ + _____ + _____) × _____

= _____ cm^2

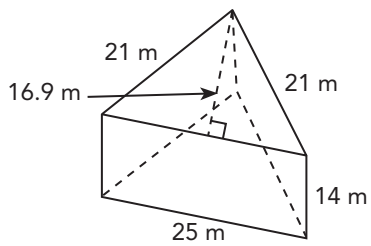
Surface area = total area of triangles and rectangles

= _____ + _____

= _____ cm^2

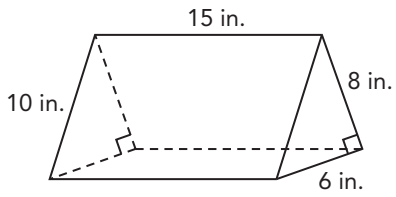
The surface area of the prism is _____ square centimeters.

14. The triangular prism shown has 3 rectangular faces. Its bases are congruent isosceles triangles. Find the surface area of the prism.



Name: _____ Date: _____

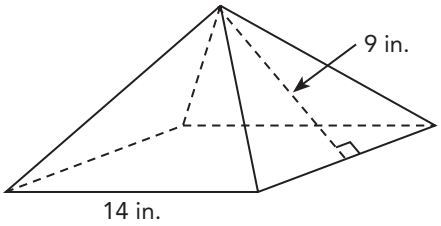
15. The triangular prism shown has three rectangular faces. Its bases are congruent right triangles. Find the surface area of the prism.

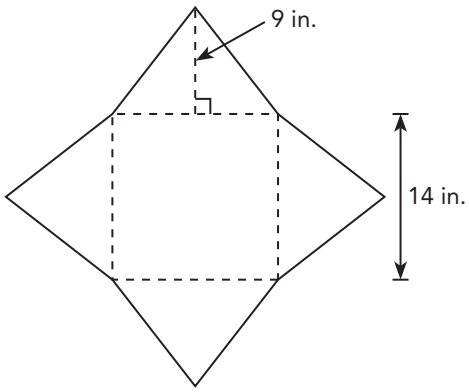


Solve. Show your work.

Example

The pyramid has a square base measuring 14 inches on each side. It has four faces that are congruent isosceles triangles. The height of each triangle is 9 inches. Find the surface area of the pyramid.





Area of square base = 14 × 14

= 196 in.^{2}

Area of four triangles = 4 × $\frac{1}{2}$ × 14 × 9

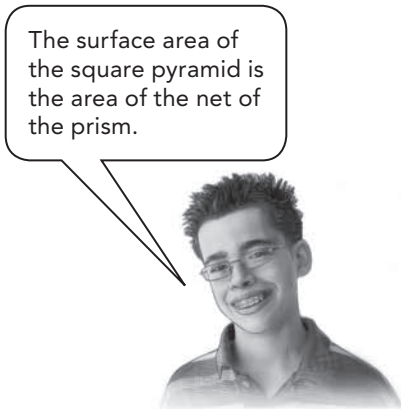
= 252 in.^{2}

Surface area = total area of square base and triangles

= 196 + 252

= 448 in.^{2}

The surface area of the pyramid is 448 square inches.



Name: _____ Date: _____

16. The pyramid has a square base measuring 20 inches on each side. It has four faces that are congruent isosceles triangles. The height of each triangle is 12 inches. Find the surface area of the pyramid.

Area of square base = _____ × _____

= _____ ft^2

Area of four triangles = _____ × _____ × _____ × _____

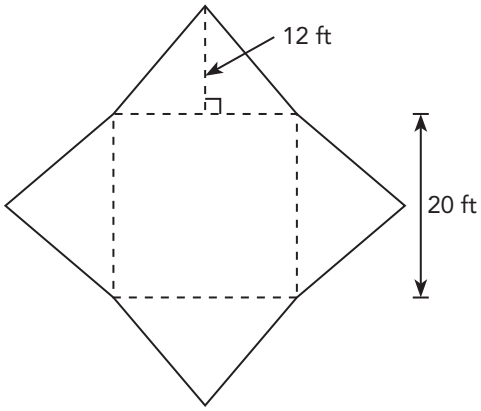
= _____ ft^2

Surface area = total area of square base and triangles

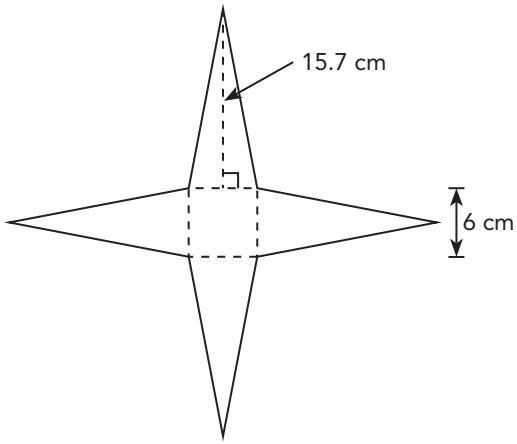
= _____ + _____

= _____ ft^2

The surface area of the pyramid is _____ square feet.

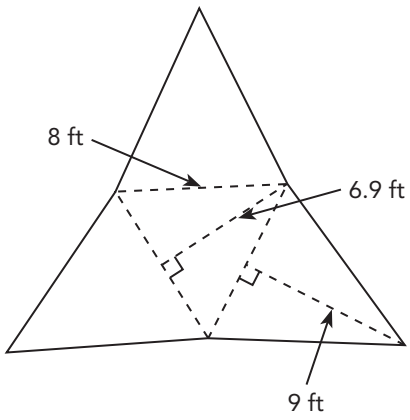


17. Alan makes a pyramid that has a square as its base. The other four faces are congruent isosceles triangles. He measures the lengths shown on the net of his pyramid. Find the surface area of the pyramid.

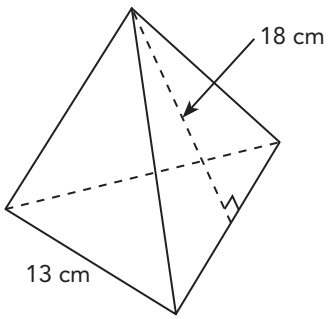


Name: _____ Date: _____

18. The pyramid has an equilateral triangle as its base. The other three faces are congruent isosceles triangles. Find the surface area of the pyramid.



19. Sandra makes a pyramid that has an equilateral triangle as its base. The other three faces are congruent isosceles triangles. The height of the equilateral triangle is 11.3 centimeters. Find the surface area of the pyramid.



10. a) Distance turned by gear A

$= 3 \cdot \pi d$

$\approx 3 \cdot 3.14 \cdot 18$

$= 169.56$ m

Distance each turned by gears B and C is the same as the distance turned by gear A.

Total distance

$= 3 \cdot 169.56$

$= 508.68$ m

≈ 508.7 m

The total distance the three gears turn is approximately 508.7 meters.

b) 150 toys are produced when gear A makes 2.5 revolutions.

150 toys $\rightarrow$ 2.5 revolutions

9,000 toys $\rightarrow \frac{2.5}{150} \times 9{,}000$

$= 150$ revolutions

Gear A will make 150 revolutions.

11. a) 47.1 inches

b) 40.5 minutes

c) 1,440 revolutions

12. a) Area of two large semicircles

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

$\approx 1 \cdot 3.14 \cdot 15 \cdot 15$

$= 706.5$ cm^2

Area of 16 small semicircles

$= 16 \cdot \frac{1}{2} \cdot \pi r^2$

$\approx 8 \cdot 3.14 \cdot 3 \cdot 3$

$= 226.08$ cm^2

Area of rectangle $= \ell w$

$= 2 \cdot$ radius of small semicircle $\cdot 8 \cdot 30$

$= 16 \cdot 3 \cdot 30$

$= 1{,}440$ cm^2

Area of placemat

$= 706.5 + 226.08 + 1{,}440$

$= 2{,}372.58$ cm^2

The area of the placemat is approximately 2,372.58 square centimeters.

b) The designer takes 25 minutes to dye 6 placemats.

6 placemats $\rightarrow$ 25 min

1,500 placemats $\rightarrow \frac{25}{6} \times 1{,}500$

$= 6{,}250$ min

He needs at least 6,250 minutes.

13. a) 8,139 square feet

b) 8 hours

Chapter 12

Lesson 12.1

1. Answers vary. Sample:
Base = *MNO*
Face = *JKNM*
Edge = $\overline{MO}$
Vertex = *J*

2. Answers vary. Sample:
Base = *PQRS*
Face = *TUVW*
Edge = $\overline{WV}$
Vertex = *P*

3. Answers vary. Sample:
Base = *EFGH*
Face = *HGCD*
Edge = $\overline{AE}$
Vertex = *B*

4. Answers vary. Sample:
Base = *ABCD*
Face = *XBC*
Edge = $\overline{AX}$
Vertex = *X*

5. Answers vary. Sample:
Base = *PQR*
Face = *YPQ*
Edge = $\overline{YR}$
Vertex = *Y*

6. b, f; c, d; a, e

7. b, c; a

8. cube

9. triangular prism

10. rectangular prism

11. triangular pyramid

12. triangular prism

13. square pyramid

Lesson 12.2

1. Area $= 8 \times 8$

$= 64$ in.^{2}

2. Area $= 12 \times 6$

$= 72$ cm^2

3. Area $= \frac{1}{2} \times 18 \times 8$

$= 72$ m^2

4. Area $= \frac{1}{2} \times 10 \times 14$

$= 70$ ft^2

5. Area $= \frac{1}{2} \times 8 \times (20 + 12)$

$= 128$ ft^2

6. Area = 9 × 10
= 90 cm²

7. There are 6 square faces.
Area of each square face
= 20 × 20
= 400 ft²
Surface area
= number of square faces × area of each square face
= 6 × 400
= 2,400 ft²
The surface area of the cube is 2,400 square feet.

8. 1,350 square meters

9. 3,456 square centimeters

10. There are 2 rectangles, A, 2 rectangles, B, and 2 rectangles, C.
Area of two rectangles, A
= 2 × 3 × 2
= 12 m²
Area of rectangles, B and C
= (2 + 3 + 2 + 3)× 6
= 60 m²
Surface area
= total area of rectangles, A, B and C
= 12 + 60
= 72 m²
The surface area of the prism is 72 square meters.

11. 262 square inches

12. 2,854 square centimeters

13. There are 3 rectangles and 2 triangles.
Area of two triangles.
$= 2 \times \frac{1}{2} \times 3 \times 2.6$
= 7.8 cm²
Area of three rectangles
= (3 + 3 + 3) × 5
= 45 cm²
Surface area
= total area of triangles and rectangles
= 7.8 + 45
= 52.8 cm²
The surface area of the prism is 52.8 square centimeters.

14. 1,360.5 square meters

15. 408 square inches

16. Area of square base
= 20 × 20
= 400 ft²
Area of four triangles
$= 4 \times \frac{1}{2} \times 20 \times 12$
= 480 ft²
Surface area
= total area of square base and triangles
= 400 + 480
= 880 ft²
The surface area of the pyramid is 880 square feet.

17. 224.4 square centimeters

18. 135.6 square feet

19. 424.45 square centimeters

Lesson 12.3

1. Volume
= 7 × 7 × 7
= 343 in.³

2. Volume
= 14 × 7 × 5
= 490 cm³

3. Length = 8 in.
Width = $6\frac{1}{2}$ in.
Height = 12 in.
Volume = ℓwh
$= 8 \times 6\frac{1}{2} \times 12$
= 624 in.³
The volume of the rectangular prism is 624 cubic inches.

4. $1{,}220\frac{1}{10}$ cm³

5. $14\frac{2}{9}$ m³

6. forms

7. does not form; The rectangle has different dimensions with other cuts.

8. The slice does not form a uniform cross section. The triangle has different dimensions with other cuts.

9. The slice does not form a uniform cross section. The triangle has different dimensions with other cuts.

10. Volume
= area of base · height
= 48 · 14
= 672 cm³
The volume of the prism is 672 cubic centimeters.

11. 3,600 cubic feet