Area, Surface Area, & Volume
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1. Abbey is getting new carpet in her living room and hallway. The following diagram shows the two together.

If \(a = 34\) ft, \(b = 14\) ft, \(c = 17\) ft, and \(d = 18\) ft, what is the area of the living room and hallway together?

- A. 83 ft²
- B. 782 ft²
- C. 166 ft²
- D. 374 ft²

2. Vaughn is laying sod in his backyard. A diagram of his backyard is below.

If \(a = 24\) ft, \(b = 34\) ft, and \(c = 36\) ft, what is the area of the backyard?

- A. 29,376 ft²
- B. 94 ft²
- C. 1,224 ft²
- D. 1,020 ft²

3. Ms. Hatcher bought the pencil decoration shown below for her bulletin board.

If \(a = 11\) in and \(b = 23\) in, what is the area of the pencil?
4. Deanna bought the poster shown below for her wall.

If $a = 10$ cm, $b = 29$ cm, $c = 15$ cm, and $d = 18$ cm, what is the area of the poster?

- A. $415$ cm$^2$
- B. $560$ cm$^2$
- C. $365$ cm$^2$
- D. $425$ cm$^2$

5. Corey drew a sketch of a paper hat.

If $a = 4$ in and $b = 3$ in, what is the area of the sketch?

- A. $30.5$ in$^2$
- B. $60$ in$^2$
- C. $84$ in$^2$
- D. $|c^2(b+4)+c+4|$ ft$^2$
If \( X = 4 \) units, \( Y = 4 \) units, and \( Z = 7 \) units, what is the area of the object?

- A. 48 square units
- B. 44 square units
- C. 28 square units
- D. 56 square units

7. 

If \( U = 3 \) units, \( V = 5 \) units, \( W = 7 \) units, \( X = 6 \) units, \( Y = 8 \) units, and \( Z = 4 \) units, what is the area of the object?

- A. 60 square units
- B. 63 square units
- C. 57 square units
- D. 56 square units

8. 

If \( X = 2 \) inches, \( Y = 9 \) inches, \( W = 4 \) inches, and \( Z = 4 \) inches, what is the area of the object?

*Hint: separate the object into rectangles.*

- A. 36 square inches
- B. 20 square inches
- C. 28 square inches
- D. 35 square inches

9. 

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The object above is symmetrical through \( Z \). If \( X = 7 \) inches, \( Y = 14 \) inches, \( Z = 16 \) inches, and \( H = 6 \) inches, what is the area of the object?

- A. 8 square inches
- B. 96 square inches
- C. 192 square inches
- D. 38 square inches

10.

If \( U = 6 \) units, \( V = 8 \) units, \( W = 3 \) units, \( X = 6 \) units, \( Y = 12 \) units, and \( Z = 3 \) units, what is the area of the object?

- A. 72 square units
- B. 54 square units
- C. 69 square units
- D. 120 square units

11.

If \( W = 6 \) units, \( X = 6 \) units, \( Y = 12 \) units, and \( Z = 11 \) units, what is the area of the object?

- A. 87 square units
- B. 72 square units
- C. 51 square units
- D. 102 square units

12.
If \( Y = 15 \) inches, \( Z = 16 \) inches, \( H = 5 \) inches, and \( W = 3 \) inches, what is the area of the object?

- A. 88 square inches
- B. 105 square inches
- C. 192 square inches
- D. 128 square inches

13. Bradley made a house for his dog, Bowser, out of wood with a cube base and a triangular prism top. The dimensions of the dog house are \( a = 5 \) ft, \( b = 1 \) ft, and \( c = 2.7 \) ft.

If Bradley plans to paint the outside of the dog house blue, not including the bottom, how many square feet of paint will he use?

- A. 182 ft\(^2\)
- B. 157 ft\(^2\)
- C. 132 ft\(^2\)
- D. 129.5 ft\(^2\)

14. Lisa made the letter L in her art class using two pieces of wood. She decided to paint it purple, which is her favorite color.

Note: Object not drawn to scale.
The longer piece of wood has dimensions of 1 inch by 1 inch by 9 inches. The shorter piece of wood has dimensions of 1 inch by 1 inch by 4 inches. How many square inches of purple paint will Lisa use to paint her letter L?

- A. 54 in²
- B. 56 in²
- C. 41 in²
- D. 55 in²

15. What is the volume of the figure below if \( a = 9 \) units and \( b = 7 \) units?

![Figure](image)

*Note: Figure is not drawn to scale.*

- A. 760.5 cubic units
- B. 1,296 cubic units
- C. 1,012.5 cubic units
- D. 364.5 cubic units

16. What is the volume of the figure below if \( a = 4.2 \) units, \( b = 5.2 \) units, and \( c = 2 \) units?

![Figure](image)

*Note: Figure is not drawn to scale.*

- A. 114.24 cubic units
- B. 92.4 cubic units
- C. 78.96 cubic units
- D. 254.016 cubic units

17.
If \( a = 3 \) units, \( b = 6 \) units, and \( c = 12 \) units, what is the volume of the three prisms above?

- A. 216 cubic units
- B. 189 cubic units
- C. 171 cubic units
- D. 162 cubic units

18. What is the volume of the figure below, which is composed of two cubes with side lengths of 6 units?

- A. 216 cubic units
- B. 18 cubic units
- C. 432 cubic units
- D. 360 cubic units

19. If \( a = 2.3 \) units, \( b = 4 \) units, \( c = 6 \) units, and \( d = 8 \) units, what is the volume of the two prisms?

- A. 105.34 cubic units
- B. 256 cubic units
- C. 159.74 cubic units
20. What is the volume of the figure composed of two congruent triangular prisms if \(a = 4\) units, \(b = 3\) units, and \(c = 7\) units?

- A. 168 cubic units
- B. 84 cubic units
- C. 56 cubic units
- D. 42 cubic units

21. Kael bought a birthday cake, like the one shown below, for her mother.

If \(a = 4\) inches, \(b = 5\) inches, \(c = 9\) inches, and \(d = 2\) inches, what is the volume of the cake?

- A. 144 cubic inches
- B. 197 cubic inches
- C. 112 cubic inches
- D. \(\frac{1}{2}a^2h + \frac{1}{2}(a^2-a+b)\sqrt{2}b\) cubic inches

22. Linda is filling the mold above with water and freezing it for an ice project. If \(a = 9\) cm and \(b = 8\) cm, what will be the volume of the frozen figure?
23. A piece of chocolate candy, composed of two congruent triangular prisms like the one shown below, is filled with caramel.

![Diagram of a triangular prism](image)

*Note: Picture is not drawn to scale.*

If \( a = 1.6 \text{ cm}, \ b = 1.1 \text{ cm}, \) and \( c = 2 \text{ cm}, \) how much caramel can fit inside the piece of candy?

- A. 4.7 cu cm
- B. 1.76 cu cm
- C. 3.52 cu cm
- D. 2.816 cu cm

24. Bradley cut a square hole out of a block of wood in wood shop. If the block was cube-shaped with side lengths of 11 inches, and the hole had side lengths of 3 inches, how much wood was left after the hole was cut out?

![Diagram of a cube with a square hole](image)

*Note: Picture is not drawn to scale.*

- A. 1,232 cubic inches
- B. 1,304 cubic inches
- C. 112 cubic inches
- D. 1,265 cubic inches

25. A square pyramid is attached to the top of a cube as shown below.

![Diagram of a cube with a pyramid](image)

If \( x = 14 \text{ inches} \) and \( y = 21 \text{ inches} \), where \( y \) is the height of each triangle of the pyramid, what is the surface area of the figure?
26. A cube-shaped hole is cut in a rectangular prism as shown below.

If $x = 5$ cm, $y = 40$ cm, and $z = 30$ cm, what is the surface area of the figure?

- A. 3,000 square centimeters
- B. 3,100 square centimeters
- C. 3,200 square centimeters
- D. 3,150 square centimeters

27. Two same-sized triangular prisms are attached to a rectangular prism as shown below.

If $a = 20$ cm, $b = 13$ cm, $c = 12$ cm, $d = 5$ cm, and $e = 8$ cm, what is the surface area of the figure?

- A. 1,400 square centimeters
- B. 1,592 square centimeters
- C. 1,004 square centimeters
- D. 1,208 square centimeters

28. Three same-sized cubes are attached to the top of a rectangular prism as shown below.

If $a = 9$ cm, $b = 24$ cm, and $c = 3$ cm, what is the surface area of the figure?
29. Three same-sized cubes are glued together as shown below.

If the side length of each cube is 7 inches, what is the surface area of the figure?

- A. 686 square inches
- B. 586 square inches
- C. 735 square inches
- D. 882 square inches

30. A triangular prism is attached to a rectangular prism as shown below.

If \( w = 8 \) inches, \( x = 5 \) inches, \( y = 20 \) inches, and \( z = 11.3 \) inches, what is the surface area of the figure?

- A. 860 square inches
- B. 1,060 square inches
- C. 760 square inches
- D. 960 square inches

**Answers**

1. D
2. D
3. D
4. A
5. B
6. B
7. A
8. C
9. B
10. C
11. A

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Explanations

1. Since this is an unusual shape, break it up into two rectangles.

   Now, find the area of the two rectangles and add them together.

   \[ A_{\text{left rectangle}} = lw \]
   \[ = c \times d \]
   \[ = 17 \text{ ft} \times 18 \text{ ft} \]
   \[ = 306 \text{ ft}^2 \]

   \[ A_{\text{right rectangle}} = lw \]
   \[ = (a - c) \times (d - b) \]
   \[ = (34 \text{ ft} - 17 \text{ ft}) \times (18 \text{ ft} - 14 \text{ ft}) \]
   \[ = 17 \text{ ft} \times 4 \text{ ft} \]
   \[ = 68 \text{ ft}^2 \]

   \[ A_{\text{left rectangle}} + A_{\text{right rectangle}} = 306 \text{ ft}^2 + 68 \text{ ft}^2 \]
   \[ = 374 \text{ ft}^2 \]

2. Since this is an unusual shape, break it up into a rectangle and a triangle.
Now, find the area of the rectangle and the area of the triangle and add them together.

\[
A_{\text{rectangle}} = lw \\
= a \times b \\
= 24 \text{ ft} \times 34 \text{ ft} \\
= 816 \text{ ft}^2 \\
\]

\[
A_{\text{triangle}} = \frac{1}{2}bh \\
= \frac{1}{2} \times b \times (c-a) \\
= \frac{1}{2} \times 34 \text{ ft} \times (36 \text{ ft} - 24 \text{ ft}) \\
= \frac{1}{2} \times 34 \text{ ft} \times 12 \text{ ft} \\
= 17 \text{ ft} \times 12 \text{ ft} \\
= 204 \text{ ft}^2 \\
A_{\text{triangle}} + A_{\text{rectangle}} = 204 \text{ ft}^2 + 816 \text{ ft}^2 \\
= 1,020 \text{ ft}^2 \\
\]

3. Since this is an unusual shape, break it into a rectangle and a triangle.

Now, find the area of the rectangle and the area of the triangle, and add them together.

\[
A_{\text{rectangle}} = lw \\
= (23 \text{ in})(11 \text{ in}) \\
= 253 \text{ in}^2 \\
A_{\text{triangle}} = \frac{1}{2}bh \\
= \frac{1}{2}(11 \text{ in})(11 \text{ in}) \\
= 60.5 \text{ in}^2 \\
A_{\text{rectangle}} + A_{\text{triangle}} = 253 \text{ in}^2 + 60.5 \text{ in}^2 \\
= 313.5 \text{ in}^2 \\
\]
4. Since this is an unusual shape, break it into a rectangle and a triangle.

Now, find the area of the rectangle and the area of the triangle, and add them together.

\[ A_{\text{rectangle}} = lw \]
\[ = (18 \text{ cm})(15 \text{ cm}) \]
\[ = 270 \text{ cm}^2 \]
\[ A_{\text{triangle}} = \frac{1}{2}bh \]
\[ = \frac{1}{2}(29 \text{ cm})(10 \text{ cm}) \]
\[ = 145 \text{ cm}^2 \]
\[ A_{\text{rectangle}} + A_{\text{triangle}} = 270 \text{ cm}^2 + 145 \text{ cm}^2 \]
\[ = 415 \text{ cm}^2 \]

5. Since this is an unusual shape, break it into a trapezoid and a rectangle.

Now, find the area of the trapezoid and the area of the rectangle, and add them together.
\[ A_{\text{trapezoid}} = \frac{\text{Base}_1 + \text{Base}_2}{2} \times \text{height} \]
\[ = \frac{4 \text{ in} + 8 \text{ in}}{2} \times 4 \text{ in} \]
\[ = \frac{12 \text{ in}}{2} \times 4 \text{ in} \]
\[ = 6 \text{ in} \times 4 \text{ in} \]
\[ = 24 \text{ in}^2 \]
\[ A_{\text{rectangle}} = lw \]
\[ = (12 \text{ in})(3 \text{ in}) \]
\[ = 36 \text{ in}^2 \]
\[ A_{\text{trapezoid}} + A_{\text{rectangle}} = 24 \text{ in}^2 + 36 \text{ in}^2 \]
\[ = 60 \text{ in}^2 \]

6. To find the area of the object, divide it into two congruent triangles and two congruent rectangles, as shown below.

First, find the area of one of the rectangles.

\[ A = lw \]
\[ = XY \]
\[ = (4 \text{ units})(4 \text{ units}) \]
\[ = 16 \text{ square units} \]

Next, find the area of one of the triangles.

\[ A = \frac{1}{2}bh \]
\[ = \frac{1}{2}(Z - X)(Y) \]
\[ = \frac{1}{2}(7 \text{ units} - 4 \text{ units})(4 \text{ units}) \]
\[ = \frac{1}{2}(3 \text{ units})(4 \text{ units}) \]
\[ = 6 \text{ square units} \]

Then, add the areas of the triangles and the rectangles.

\[ 2(16 \text{ square units}) + 2(6 \text{ square units}) = 32 \text{ square units} + 12 \text{ square units} \]
\[ = 44 \text{ square units} \]

Therefore, the area of the object is 44 square units.

7. To find the area of the object, divide it into two rectangles and a right triangle, as shown below.
First, find the area of the rectangle on the left.

\[ A = bh \]
\[ = YZ \]
\[ = (8 \text{ units})(4 \text{ units}) \]
\[ = 32 \text{ square units} \]

Next, find the area of the rectangle on the right.

\[ A = lw \]
\[ = (Y)(Y - U) \]
\[ = (5 \text{ units})(5 \text{ units} - 3 \text{ units}) \]
\[ = (5 \text{ units})(2 \text{ units}) \]
\[ = 25 \text{ square units} \]

Then, find the area of the triangle.

\[ A = \frac{1}{2}bh \]
\[ = \frac{1}{2}(Z + V - X)(W + U - Y) \]
\[ = \frac{1}{2}(4 \text{ units} + 5 \text{ units} - 6 \text{ units})(7 \text{ units} + 3 \text{ units} - 8 \text{ units}) \]
\[ = \frac{1}{2}(3 \text{ units})(2 \text{ units}) \]
\[ = 3 \text{ square units} \]

Add the areas of the two rectangles and the triangle.

\[ 32 \text{ square units} + 25 \text{ square units} + 3 \text{ square units} = 60 \text{ square units} \]

Therefore, the area of the object is \textbf{60 square units}.

8. To find the area of the object, divide the object into two rectangles, as shown below.

First, find the area of Rectangle 1.

\[ A = lw \]
\[ = XY \]
\[ = (2 \text{ in})(9 \text{ in}) \]

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Next, find the area of Rectangle 2.

\[ A = lw \]
\[ = (Y - W)(Z - X) \]
\[ = (9 \text{ in} - 4 \text{ in})(4 \text{ in} - 2 \text{ in}) \]
\[ = (5 \text{ in})(2 \text{ in}) \]
\[ = 10 \text{ sq in} \]

Then, add the areas of the rectangles.

\[ 18 \text{ sq in} + 10 \text{ sq in} = 28 \text{ sq in} \]

Therefore, the area of the object is **28 square inches**.

9. First, divide the object into 2 equal-sized triangles.

Find the area of the triangles.

\[ A = \frac{1}{2}bh \]
\[ = \frac{1}{2}(16 \text{ in})(6 \text{ in}) \]
\[ = 48 \text{ sq in} \]

Next, add the areas of the two triangles to find the total area of the object.

\[ 48 \text{ sq in} + 48 \text{ sq in} = 96 \text{ sq in} \]

Therefore, the area of the object is **96 square inches**.

10. To find the area of the object, divide it into smaller rectangles, as shown below.

First, find the area of the top rectangle.

\[ A = lw \]
\[ = (Y - U - W)(V + Z - X) \]
\[ = (12 \text{ units} - 6 \text{ units} - 3 \text{ units})(8 \text{ units} + 3 \text{ units} - 6 \text{ units}) \]
\[ = (3 \text{ units})(5 \text{ units}) \]
\[ = 15 \text{ square units} \]

Next, find the area of the middle rectangle.

\[ A = lw \]
\[ = (Y - U)(X - Z) \]
\[ = (12 \text{ units} - 6 \text{ units})(6 \text{ units} - 3 \text{ units}) \]
\[ = (6 \text{ units})(3 \text{ units}) \]
\[ = 18 \text{ square units} \]

Then, find the area of the bottom rectangle.

\[ A = lw \]
\[ = YZ \]
\[ = (12 \text{ units})(3 \text{ units}) \]
\[ = 36 \text{ square units} \]

Add together the areas of the three rectangles.

\[ 15 \text{ square units} + 18 \text{ square units} + 36 \text{ square units} = 69 \text{ square units} \]

Therefore, the area of the object is **69 square units**.

11. To find the area of the object, divide it into a rectangle and right triangle, as shown below.

First, find the area of the right triangle.

\[ A = \frac{1}{2}bh \]
\[ = \frac{1}{2}(Y - W)(Z - X) \]
\[ = \frac{1}{2}(12 \text{ units} - 6 \text{ units})(11 \text{ units} - 6 \text{ units}) \]
\[ = \frac{1}{2}(6 \text{ units})(5 \text{ units}) \]
\[ = 15 \text{ square units} \]

Next, find the area of the rectangle.

\[ A = lw \]
\[ = YX \]
\[ = (12 \text{ units})(6 \text{ units}) \]
\[ = 72 \text{ square units} \]

Then, add the area of the triangle and the area of the rectangle.

\[ 15 \text{ square units} + 72 \text{ square units} = 87 \text{ square units} \]

Therefore, the area of the object is **87 square units**.
12. First, divide the object into a triangle and a rectangle. Find the area of the triangle.

\[
A = \frac{1}{2}bh \\
= \frac{1}{2}(16 \text{ in})(5 \text{ in}) \\
= 40 \text{ sq in}
\]

Find the area of the rectangle.

\[
A = lw \\
= (16 \text{ in})(3 \text{ in}) \\
= 48 \text{ sq in}
\]

Next, add the area of the triangle and the area of the rectangle to find the area of the object.

\[
40 \text{ sq in} + 48 \text{ sq in} = 88 \text{ sq in}
\]

Therefore, the area of the object is **88 square inches**.

13. To calculate how many square feet of paint Bradley will use, first identify the sides of the dog house to be painted.

Four sides of the base (4 squares) and four sides of the top (2 triangles and 2 rectangles) will be painted.

Next, find the area of those sides.

\[
\text{Area of 4 squares} = 4(5 \text{ ft} \cdot 5 \text{ ft}) = 100 \text{ ft}^2 \\
\text{Area of 2 triangles} = 2\left(\frac{1}{2}(5 \text{ ft} \cdot 1 \text{ ft})\right) = 5 \text{ ft}^2 \\
\text{Area of 2 rectangles} = 2(5 \text{ ft} \cdot 27 \text{ ft}) = 27 \text{ ft}^2
\]

Last, add the areas of those sides.

\[
100 \text{ ft}^2 + 5 \text{ ft}^2 + 27 \text{ ft}^2 = 132 \text{ ft}^2
\]

So, Bradley will use **132 ft\(^2\)** of paint for the dog house.

14. To calculate how many square inches of paint Lias will use, first find the surface area of each piece of wood.

\[
\text{SA of longer piece} = 2(hu) + 2(hw) + 2(lh) \\
= 2(1 \text{ in} \cdot 1 \text{ in}) + 2(2 \text{ in} \cdot 1 \text{ in}) + 2(1 \text{ in} \cdot 9 \text{ in}) \\
= 2 \text{ in}^2 + 18 \text{ in}^2 + 18 \text{ in}^2 \\
= 38 \text{ in}^2
\]

\[
\text{SA of shorter piece} = 2(hu) + 2(hw) + 2(lh) \\
= 2(1 \text{ in} \cdot 1 \text{ in}) + 2(4 \text{ in} \cdot 1 \text{ in}) + 2(1 \text{ in} \cdot 4 \text{ in}) \\
= 2 \text{ in}^2 + 8 \text{ in}^2 + 8 \text{ in}^2 \\
= 18 \text{ in}^2
\]
Next, add the two surface areas together.

\[ 38 \text{ in}^2 + 18 \text{ in}^2 = 56 \text{ in}^2 \]

Last, subtract the area where the two pieces of wood are attached.

Because that section will not be painted on either piece of wood, two times that area must be subtracted.

\[ 56 \text{ in}^2 - 2(1 \text{ in} \cdot 1 \text{ in}) = 56 \text{ in}^2 - 2 \text{ in}^2 = 54 \text{ in}^2 \]

So, Lisa will use 54 in\(^3\) of purple paint to paint her letter L.

15. Find the volume of each prism.

\[ V_{\text{cube}} = s^2 \]
\[ = (9 \text{ units})^2 \]
\[ = 729 \text{ cubic units} \]

\[ V_{\text{tri. prism}} = (bh_{\text{base}} \div 2) \cdot h_{\text{prism}} \]
\[ = (9 \text{ units} \cdot 7 \text{ units} \div 2) \cdot 9 \text{ units} \]
\[ = (31.5 \text{ square units}) \cdot 9 \text{ units} \]
\[ = 283.5 \text{ cubic units} \]

Then, add the volumes.

729 cubic units + 283.5 cubic units = \textbf{1,012.5 cubic units}

16. First, find the volume of the rectangular prisms by multiplying the volume by 2. Then, find the volume of the triangular prism.

\[ V_{\text{rect. prism}} = 2(l \cdot w \cdot h) \]
\[ = 2(4.2 \text{ units} \cdot 2 \text{ units} \cdot 4.2 \text{ units}) \]
\[ = 70.56 \text{ cubic units} \]

\[ V_{\text{tri. prism}} = (bh_{\text{base}} \div 2) \cdot h_{\text{prism}} \]
\[ = (8.4 \text{ units} \cdot 5.2 \text{ units} \div 2) \cdot 2 \text{ units} \]
\[ = (21.84 \text{ square units}) \cdot 2 \text{ units} \]
\[ = 43.68 \text{ cubic units} \]

Last, add the volumes.

70.56 cubic units + 43.68 cubic units = \textbf{114.24 cubic units}

17. Find the volume of each prism.

\[ V_{\text{tri-op}} = l \cdot w \cdot h \]
\[ = 3 \text{ units} \cdot 3 \text{ units} \cdot 3 \text{ units} \]
\[ = 27 \text{ cubic units} \]
\[ V_{\text{middle}} = l \times w \times h \]
\[ = 6 \text{ units} \times 3 \text{ units} \times 3 \text{ units} \]
\[ = 54 \text{ cubic units} \]

\[ V_{\text{bottom}} = l \times w \times h \]
\[ = 12 \text{ units} \times 3 \text{ units} \times 3 \text{ units} \]
\[ = 108 \text{ cubic units} \]

Then, add the volumes.

\[
27 \text{ cubic units} + 54 \text{ cubic units} + 108 \text{ cubic units} = \textbf{189 cubic units}
\]

18. To find the volume of a cube, use \( V = s^3 \). Since there are two cubes, multiply the volume by 2.

\[ V = 2(s^3) \]
\[ = 2(6 \text{ units})^3 \]
\[ = 2(216 \text{ cubic units}) \]
\[ = \textbf{432 cubic units} \]

19. Find the volume of each prism.

\[ V_{\text{bottom}} = l \times w \times h \]
\[ = 6 \text{ units} \times 2.3 \text{ units} \times 2.3 \text{ units} \]
\[ = 31.74 \text{ cubic units} \]

\[ V_{\text{top}} = l \times w \times h \]
\[ = 4 \text{ units} \times 2.3 \text{ units} \times 8 \text{ units} \]
\[ = 73.6 \text{ cubic units} \]

Then, add the volumes.

\[
31.74 \text{ cubic units} + 73.6 \text{ cubic units} = \textbf{105.34 cubic units}
\]

20. Find the volume of one triangular prism.

\[ V_{\text{tri. prism}} = (b \times h_{\text{base}} \div 2) \times h_{\text{prism}} \]
\[ = (4 \text{ units} \times 3 \text{ units} \div 2) \times 7 \text{ units} \]
\[ = (6 \text{ square units}) \times 7 \text{ units} \]
\[ = 42 \text{ cubic units} \]

Then, multiply the volume by two since the prisms are congruent.

\[
42 \text{ cubic units} \times 2 = \textbf{84 cubic units}
\]

21. The cake is composed of two rectangular prisms. Find the volume of each prism.

\[ V_{\text{bottom}} = l \times w \times h \]
\[ = 9 \text{ inches} \times 4 \text{ inches} \times 2 \text{ inches} \]

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\[ V_{\text{cube}} = s^3 \]
\[ = (9 \text{ cm})^3 \]
\[ = 729 \text{ cu cm} \]

\[ V_{\text{tri. prism}} = (bh_{\text{base}} / 2) \times h_{\text{prism}} \]
\[ = (9 \text{ cm} \times 8 \text{ cm} / 2) \times 9 \text{ cm} \]
\[ = (36 \text{ sq cm}) \times 9 \text{ cm} \]
\[ = 324 \text{ cu cm} \]

Then, add the volumes.

\[ 729 \text{ cu cm} + 324 \text{ cu cm} = 1,053 \text{ cu cm} \]

23. The piece of candy is composed of two congruent triangular prisms. Find the volume of one triangular prism.

\[ V_{\text{tri. prism}} = (bh_{\text{base}} / 2) \times h_{\text{prism}} \]
\[ = (1.6 \text{ cm} \times 1.1 \text{ cm} / 2) \times 2 \text{ cm} \]
\[ = 0.88 \text{ sq cm} \times 2 \text{ cm} \]
\[ = 1.76 \text{ cu cm} \]

Then, multiply the volume by two since the prisms are congruent.

\[ 1.76 \text{ cu cm} \times 2 = 3.52 \text{ cu cm} \]

24. To find the volume of the remaining wood, first find the volume of the cube-shaped block. To find the volume of a cube use \[ V = s^3 \].

\[ V_{\text{cube}} = s^3 \]
\[ = (11 \text{ inches})^3 \]
\[ = 1,331 \text{ cubic inches} \]

Then, find the volume of the hole using the side lengths of the hole and the same depth as the cube, 11 inches.

\[ V_{\text{hole}} = l \times w \times h \]
\[ = 3 \text{ inches} \times 3 \text{ inches} \times 11 \text{ inches} \]
\[ = 99 \text{ cubic inches} \]
Subtract the volumes.

1,331 cubic inches - 99 cubic inches = 1,232 cubic inches

25. Since the cube and pyramid are attached, some of the faces are not exposed. So, the non-exposed faces are not included when calculating the surface area.

The cube has 5 square faces exposed, and the square pyramid has 4 triangular faces exposed.

First, calculate the surface area of the cube.

\[ SA_{cube} = 5 \text{ square faces} \]
\[ = 5(14 \text{ in})(14 \text{ in}) \]
\[ = 5(196 \text{ sq in}) \]
\[ = 980 \text{ sq in} \]

Next, calculate the surface area of the square pyramid.

\[ SA_{pyramid} = 4 \text{ triangular faces} \]
\[ = 4\left(\frac{1}{2}(14 \text{ in})(21 \text{ in})\right) \]
\[ = 4(47 \text{ sq in}) \]
\[ = 188 \text{ sq in} \]

Finally, calculate the total surface area of the figure.

\[ SA_{total} = \text{cube} + \text{square pyramid} \]
\[ = 980 \text{ sq in} + 188 \text{ sq in} \]
\[ = 1,168 \text{ sq in} \]

Therefore, the surface area of the figure is 1,168 square inches.

26. Since the hole is in the shape of a cube, there are 4 square faces to be included in the surface area.

First, calculate the surface area of the 4 square faces of the hole.

\[ SA_{hole} = 4(5 \text{ cm})(5 \text{ cm}) \]
\[ = 4(25 \text{ sq cm}) \]
\[ = 100 \text{ sq cm} \]

Next, calculate the surface area of the rectangular prism (ignoring the hole, for now).

\[ SA_{rect} = 2(\text{front face}) + 2(\text{side face}) + 2(\text{top face}) \]
\[ = 2(40 \text{ cm})(5 \text{ cm}) + 2(30 \text{ cm})(5 \text{ cm}) + 2(40 \text{ cm})(30 \text{ cm}) \]
\[ = 400 \text{ sq cm} + 300 \text{ sq cm} + 2,400 \text{ sq cm} \]
\[ = 3,100 \text{ sq cm} \]

Since the top and bottom rectangles of the prism have a hole in them, subtract these parts from the surface area of the prism.

\[ SA_{parts} = 2(\text{area of top of hole}) \]

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Finally, calculate the total surface area of the figure.

\[ \text{SA}_{\text{total}} = \text{hole} + \text{rectangular prism - parts} \]
\[ = 100 \text{ sq cm} + 3,100 \text{ sq cm} - 50 \text{ sq cm} \]
\[ = 3,150 \text{ sq cm} \]

Therefore, the surface area of the figure is **3,150 square centimeters**.

27. Since the prisms are attached, some of the faces are not exposed. So, the non-exposed faces are not included when calculating the surface area.

Each triangular prism has 2 triangular faces and 2 rectangular faces exposed, and the rectangular prism has 4 rectangular faces exposed.

First, calculate the surface area of one triangular prism.

\[ \text{SA}_{\text{tri}} = 2 \text{ triangular faces} + 2 \text{ rectangular faces} \]
\[ = 2(\frac{1}{2}(6 \text{ cm})(12 \text{ cm})) + (8 \text{ cm})(13 \text{ cm}) + (8 \text{ cm})(5 \text{ cm}) \]
\[ = 60 \text{ sq cm} + 104 \text{ sq cm} + 40 \text{ sq cm} \]
\[ = 204 \text{ sq cm} \]

Next, calculate the surface area of the rectangular prism.

\[ \text{SA}_{\text{rect}} = 4 \text{ rectangular faces} \]
\[ = 2(20 \text{ cm})(8 \text{ cm}) + 2(20 \text{ cm})(12 \text{ cm}) \]
\[ = 320 \text{ sq cm} + 480 \text{ sq cm} \]
\[ = 800 \text{ sq cm} \]

Finally, calculate the total surface area of the figure.

\[ \text{SA}_{\text{total}} = 2 \text{ triangular prisms} + 1 \text{ rectangular prism} \]
\[ = 2(204 \text{ sq cm}) + 800 \text{ sq cm} \]
\[ = 1,208 \text{ sq cm} \]

Therefore, the surface area of the figure is **1,208 square centimeters**.

28. Since the three cubes are the same size, the area of each square face of the cubes is \(3 \text{ cm} \times 3 \text{ cm} = 9 \text{ sq cm}\).

Since the cubes are attached to the top of the rectangular prism, some faces are not exposed. So, the non-exposed faces are not included when calculating the surface area.

Each cube has 5 square faces exposed, and the rectangular prism has 2 square faces and 4 rectangular faces exposed, minus parts of the top rectangle.

First, calculate the surface area of the three cubes.

\[ \text{SA}_{\text{cubes}} = 3[5 \text{ faces}] \]
\[ = 3[5(9 \text{ sq cm})] \]
\[ = 3[45 \text{ sq cm}] \]

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Next, calculate the surface area of the rectangular prism.

\[ \text{SA}_{\text{rect}} = 2 \text{ square faces} + 4 \text{ rectangular faces} - 3 \text{ parts} \]
\[ = 2(9 \text{ cm})(9 \text{ cm}) + 4(9 \text{ cm})(24 \text{ cm}) - 3(9 \text{ sq cm}) \]
\[ = 162 \text{ sq cm} + 864 \text{ sq cm} - 27 \text{ sq cm} \]
\[ = 999 \text{ sq cm} \]

Finally, calculate the total surface area of the figure.

\[ \text{SA}_{\text{total}} = \text{cubes} + \text{rectangular prism} \]
\[ = 135 \text{ sq cm} + 999 \text{ sq cm} \]
\[ = 1,134 \text{ sq cm} \]

Therefore, the surface area of the figure is **1,134 square centimeters**.

29. Since the three cubes are the same size, the area of each square face is 7 in \( \times \) 7 in = 49 sq in.

Since the cubes are glued together, some of the faces of the cubes are not exposed. So, the non-exposed faces are not included when calculating the surface area.

The top cube has 5 square faces exposed, the bottom left cube has 4 square faces exposed, and the bottom right cube has 5 square faces exposed.

Calculate the total surface area of the figure.

\[ \text{SA}_{\text{total}} = 5 \text{ faces} + 4 \text{ faces} + 5 \text{ faces} \]
\[ = 14 \text{ faces} \]
\[ = 14(49 \text{ sq in}) \]
\[ = 686 \text{ sq in} \]

Therefore, the surface area of the figure is **686 square inches**.

30. Since the prisms are attached, some of the faces are not exposed. So, the non-exposed faces are not included when calculating the surface area.

The triangular prism has 2 triangular faces and 3 rectangular faces exposed, minus a part of the bottom rectangle, and the rectangular prism has 2 square faces and 3 rectangular faces exposed.

First, calculate the surface area of the triangular prism.

\[ \text{SA}_{\text{tri}} = 2 \text{ triangular faces} + 3 \text{ rectangular faces} - 1 \text{ part} \]
\[ = 2\left[\frac{1}{2}(8 \text{ in})(8 \text{ in})\right] + 2(6 \text{ in})(20 \text{ in}) + (11.3 \text{ in})(20 \text{ in}) - (5 \text{ in})(20 \text{ in}) \]
\[ = 64 \text{ sq in} + 240 \text{ sq in} + 226 \text{ sq in} - 100 \text{ sq in} \]
\[ = 510 \text{ sq in} \]

Next, calculate the surface area of the rectangular prism.

\[ \text{SA}_{\text{rect}} = 2 \text{ square faces} + 3 \text{ rectangular faces} \]
\[ = 2(5 \text{ in})(5 \text{ in}) + 3(5 \text{ in})(20 \text{ in}) \]
\[ = 50 \text{ sq in} + 300 \text{ sq in} \]
\[ = 350 \text{ sq in} \]
Finally, calculate the total surface area of the figure.

\[
S_{\text{total}} = \text{triangular prism} + \text{rectangular prism} \\
= 510 \text{ sq in} + 350 \text{ sq in} \\
= 860 \text{ sq in}
\]

Therefore, the surface area of the figure is \textbf{860 square inches}.