

Area, Surface Area, and Volume: practice solutions, Grade 6 – download the PDF

Written solutions to the chapter problems. Check each step, then correct yourself.

1 Area of a triangle



Use $A = \frac{1}{2}bh$.

$$A = \frac{1}{2} \times 12 \times 7 = 6 \times 7 = 42.$$

The area of the sail is **42 cm²**.

2 Area of a parallelogram



The area is base times perpendicular height: $A = 15 \times 6 = 90$. The slanted side (8 in) is not needed.

The area is **90 in²**.

3 True or false: triangle area



He is wrong. He found the area of a rectangle $10 \times 6 = 60$. A triangle is half of that rectangle: $\frac{1}{2} \times 10 \times 6 = 30$.

The correct area is **30 m²**.

4 Area of a trapezoid



$$A = \frac{5+9}{2} \times 4 = 7 \times 4 = 28.$$

The area is **28 cm²**.

5 Rectangle on a grid



The sides are horizontal and vertical, so the shape is a rectangle. Length: $8 - 2 = 6$. Width: $5 - 1 = 4$.

$A = 6 \times 4 = 24$. The area is **24 square units**.

6 Name the solid from its net



- a. A **cube**.
- b. A **square pyramid** (the square is the base, the triangles are the lateral faces).
- c. A **triangular prism** (two triangular bases and three rectangular lateral faces).

7 Volume of a box



$$V = \ell \times w \times h = 8 \times 5 \times 3 = 120.$$

The volume is **120 cm³**.

8 Finding a missing height



$$A = \frac{1}{2}bh, \text{ so } 54 = \frac{1}{2} \times 12 \times h = 6h.$$

$h = 54 \div 6 = 9$. The height is **9 m**.

9 Mulch for a flower bed



Area: $3.5 \times 2 = 7 \text{ m}^2$.

Bags: $7 \div 1.75 = 4$.

You need **4 bags** of mulch.

10 A trapezoid sail



$$A = \frac{4 + 6}{2} \times 3.5 = 5 \times 3.5 = 17.5 \text{ ft}^2.$$

Cost: $17.5 \times 4 = 70$.

The fabric costs **\$70**.

11 Carpeting a room



Main room: $9 \times 6 = 54 \text{ m}^2$. Alcove: $4 \times 3 = 12 \text{ m}^2$. Total: $54 + 12 = 66 \text{ m}^2$.

Cost: $66 \times 12 = 792$.

The carpet costs **\$792**.

12 Triangle on the coordinate plane



Take AB as the base: it is horizontal, so $b = 7 - 1 = 6$. The height is the vertical distance from C to the line $y = 2$: $h = 8 - 2 = 6$.

$$A = \frac{1}{2} \times 6 \times 6 = 18. \text{ The area is } \mathbf{18 \text{ square units}}.$$

13 Wrapping a cube



A cube has 6 identical square faces, each of area $7 \times 7 = 49 \text{ cm}^2$.

$SA = 6 \times 49 = 294$. You need **294 cm²** of paper.

14 A box with mixed numbers

$$V = \frac{7}{2} \times 2 \times \frac{3}{2} = 7 \times \frac{3}{2} = \frac{21}{2} = 10.5.$$

The volume is **10.5 in³**.

15 Gift box surface area

a. Face areas: $12 \times 5 = 60$, $12 \times 4 = 48$, $5 \times 4 = 20$.

$$SA = 2(60 + 48 + 20) = 2 \times 128 = 256 \text{ cm}^2.$$

b. The lid and bottom are the two 12×5 faces: $2 \times 60 = 120$. Painted area:

$$256 - 120 = 136 \text{ cm}^2.$$

The surface area is **256 cm²** and the painted area is **136 cm²**.

16 A square pyramid

a. One triangular face: $\frac{1}{2} \times 10 \times 13 = 65 \text{ cm}^2$. Four faces: $4 \times 65 = 260 \text{ cm}^2$.

b. Base: $10 \times 10 = 100 \text{ cm}^2$. $SA = 100 + 260 = 360 \text{ cm}^2$.

The lateral area is **260 cm²** and the surface area is **360 cm²**.

17 The camping tent

a. Each triangle: $\frac{1}{2} \times 6 \times 4 = 12 \text{ ft}^2$, so the two ends are 24 ft^2 . Each sloping side:

$$5 \times 9 = 45 \text{ ft}^2, \text{ so } 90 \text{ ft}^2 \text{ for two. Fabric: } 24 + 90 = 114 \text{ ft}^2.$$

b. The floor is $6 \times 9 = 54 \text{ ft}^2$. $SA = 114 + 54 = 168 \text{ ft}^2$.

The fabric area is **114 ft²** and the total surface area is **168 ft²**.

18 A swallowtail banner

Rectangle: $18 \times 10 = 180 \text{ cm}^2$. Notch: $\frac{1}{2} \times 10 \times 4 = 20 \text{ cm}^2$.

$180 - 20 = 160$. The banner has an area of 160 cm^2 .

19 An L-shaped polygon on the grid

a. $AB = 7 - 1 = 6$; $BC = 4 - 1 = 3$; $CD = 7 - 4 = 3$; $DE = 7 - 4 = 3$; $EF = 4 - 1 = 3$; $FA = 7 - 1 = 6$.

b. Perimeter: $6 + 3 + 3 + 3 + 3 + 6 = 24$ units.

c. Split at $y = 4$: the bottom rectangle is $6 \times 3 = 18$ and the top rectangle is $3 \times 3 = 9$.
A = $18 + 9 = 27$ square units.

The perimeter is **24 units** and the area is **27 square units**.

20 Water in a fish tank

a. $V = \frac{5}{2} \times \frac{3}{2} \times 2 = \frac{15}{2} = 7.5 \text{ ft}^3$.

b. The water height is $\frac{3}{4} \times 2 = \frac{3}{2} = 1.5 \text{ ft}$. $V = \frac{5}{2} \times \frac{3}{2} \times \frac{3}{2} = \frac{45}{8} = 5.625 \text{ ft}^3$.

(Check: $\frac{3}{4} \times 7.5 = 5.625$.)

The tank holds **7.5 ft^3** and the water takes up **5.625 ft^3** (that is $5\frac{5}{8} \text{ ft}^3$).

21 Same base, same height



Both triangles use the segment from $(0, 0)$ to $(8, 0)$ as a base, so $b = 8$. The third vertex of each triangle is 5 units above the x -axis, so both heights equal 5, even though the shapes lean differently.

$$A = \frac{1}{2} \times 8 \times 5 = 20 \text{ for each one.}$$

Both triangles have an area of **20 square units**.



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