

# Surface Area of Prisms, Cylinders, and Pyramids

Name: \_\_\_\_\_ Date: \_\_\_\_\_ Score: \_\_\_\_\_ / 24

## Q Quick Review

**Surface area** is the total area of *all* the faces of a solid — imagine unfolding it flat and measuring every piece. For a **rectangular prism**,  $SA = 2(lw + lh + wh)$ . For a **cylinder**,  $SA = 2\pi r^2 + 2\pi rh$  — two circles plus the wrapped-around side. For a **pyramid**, add the base area to the areas of the triangular faces (each face is  $\frac{1}{2} \times \text{base} \times \text{slant height}$ ). Surface area is always measured in *square* units.

◇ **Example:** Find the surface area of a rectangular prism with length 5 cm, width 3 cm, and height 4 cm.  
 ⇒ A rectangular prism has three pairs of matching faces, and the formula  $SA = 2(lw + lh + wh)$  adds them all up. Find each product:  $lw = 5 \times 3 = 15$ ,  $lh = 5 \times 4 = 20$ , and  $wh = 3 \times 4 = 12$ . Add them:  $15 + 20 + 12 = 47$ . Then double for the matching faces:  $2 \times 47 = 94$ . The surface area is 94 square centimeters.

**Answer:**  $SA = 94 \text{ cm}^2$

## PRACTICE

Find each surface area. Leave  $\pi$  in answers where it appears.

- |                                        |       |                                              |       |
|----------------------------------------|-------|----------------------------------------------|-------|
| 1. Rect. prism: $l = 2, w = 3, h = 4$  | _____ | 11. Cylinder: $r = 2, h = 10$                | _____ |
| 2. Rect. prism: $l = 3, w = 4, h = 5$  | _____ | 12. Cylinder: $r = 5, h = 5$                 | _____ |
| 3. Rect. prism: $l = 6, w = 2, h = 3$  | _____ | 13. Cylinder: $r = 6, h = 4$                 | _____ |
| 4. Rect. prism: $l = 8, w = 4, h = 2$  | _____ | 14. Square pyramid: base 6, slant height 5   | _____ |
| 5. Rect. prism: $l = 10, w = 3, h = 4$ | _____ | 15. Square pyramid: base 8, slant height 6   | _____ |
| 6. Cube: side 5                        | _____ | 16. Square pyramid: base 10, slant height 12 | _____ |
| 7. Cube: side 3                        | _____ | 17. Square pyramid: base 4, slant height 3   | _____ |
| 8. Cube: side 10                       | _____ | 18. Rect. prism: $l = 7, w = 1, h = 2$       | _____ |
| 9. Cylinder: $r = 3, h = 5$            | _____ | 19. Cube: side 7                             | _____ |
| 10. Cylinder: $r = 4, h = 6$           | _____ | 20. Cylinder: $r = 3, h = 7$                 | _____ |

## ◆ Word Problems

21. A gift box is a rectangular prism 8 in long, 4 in wide, and 2 in tall. How much wrapping paper is needed to cover it exactly?  
 \_\_\_\_\_
22. A cylindrical paint can has radius 3 in and height 5 in. Find the total surface area in terms of  $\pi$ . \_\_\_\_\_
23. A square pyramid monument has a base edge of 10 m and a slant height of 12 m. What is its total surface area, including the base? \_\_\_\_\_
24. A storage cube measures 7 ft on each edge. How many square feet of material are needed to make all six faces? \_\_\_\_\_



## Answer Keys

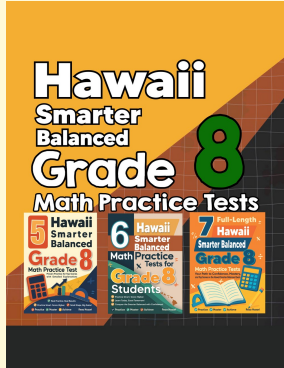
- |                                       |                                                                 |
|---------------------------------------|-----------------------------------------------------------------|
| 1. <input type="text" value="52"/>    | 13. <input type="text" value="120π"/>                           |
| 2. <input type="text" value="94"/>    | 14. <input type="text" value="96"/>                             |
| 3. <input type="text" value="72"/>    | 15. <input type="text" value="160"/>                            |
| 4. <input type="text" value="112"/>   | 16. <input type="text" value="340"/>                            |
| 5. <input type="text" value="164"/>   | 17. <input type="text" value="40"/>                             |
| 6. <input type="text" value="150"/>   | 18. <input type="text" value="46"/>                             |
| 7. <input type="text" value="54"/>    | 19. <input type="text" value="294"/>                            |
| 8. <input type="text" value="600"/>   | 20. <input type="text" value="60π"/>                            |
| 9. <input type="text" value="48π"/>   | 21. <input type="text" value="112 in&lt;sup&gt;2&lt;/sup&gt;"/> |
| 10. <input type="text" value="80π"/>  | 22. <input type="text" value="48π in&lt;sup&gt;2&lt;/sup&gt;"/> |
| 11. <input type="text" value="48π"/>  | 23. <input type="text" value="340 m&lt;sup&gt;2&lt;/sup&gt;"/>  |
| 12. <input type="text" value="100π"/> | 24. <input type="text" value="294 ft&lt;sup&gt;2&lt;/sup&gt;"/> |

### Step-by-Step Explanations

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|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>1. <math>SA = 2(6 + 8 + 12) = 2(26) = 52</math>.</p> <p>2. <math>SA = 2(12 + 15 + 20) = 2(47) = 94</math>.</p> <p>3. <math>SA = 2(12 + 18 + 6) = 2(36) = 72</math>.</p> <p>4. <math>SA = 2(32 + 16 + 8) = 2(56) = 112</math>.</p> <p>5. <math>SA = 2(30 + 40 + 12) = 2(82) = 164</math>.</p> <p>6. A cube has 6 equal faces: <math>6(5^2) = 6(25) = 150</math>.</p> <p>7. <math>6(3^2) = 6(9) = 54</math>.</p> <p>8. <math>6(10^2) = 6(100) = 600</math>.</p> <p>9. <math>SA = 2\pi r^2 + 2\pi rh = 2\pi(9) + 2\pi(15) = 18\pi + 30\pi = 48\pi</math>.</p> <p>10. <math>SA = 2\pi(16) + 2\pi(24) = 32\pi + 48\pi = 80\pi</math>.</p> <p>11. <math>SA = 2\pi(4) + 2\pi(20) = 8\pi + 40\pi = 48\pi</math>.</p> <p>12. <math>SA = 2\pi(25) + 2\pi(25) = 50\pi + 50\pi = 100\pi</math>.</p> <p>13. <math>SA = 2\pi(36) + 2\pi(24) = 72\pi + 48\pi = 120\pi</math>.</p> <p>14. Base = 36; 4 triangles = <math>4(\frac{1}{2} \cdot 6 \cdot 5) = 60</math>; total 96.</p> | <p>15. Base = 64; 4 triangles = <math>4(\frac{1}{2} \cdot 8 \cdot 6) = 96</math>; total 160.</p> <p>16. Base = 100; 4 triangles = <math>4(\frac{1}{2} \cdot 10 \cdot 12) = 240</math>; total 340.</p> <p>17. Base = 16; 4 triangles = <math>4(\frac{1}{2} \cdot 4 \cdot 3) = 24</math>; total 40.</p> <p>18. <math>SA = 2(7 + 14 + 2) = 2(23) = 46</math>.</p> <p>19. <math>6(7^2) = 6(49) = 294</math>.</p> <p>20. <math>SA = 2\pi(9) + 2\pi(21) = 18\pi + 42\pi = 60\pi</math>.</p> <p>21. <math>SA = 2(lw + lh + wh) = 2(32 + 16 + 8) = 2(56) = 112</math> square inches.</p> <p>22. <math>SA = 2\pi r^2 + 2\pi rh = 2\pi(9) + 2\pi(15) = 18\pi + 30\pi = 48\pi</math> square inches.</p> <p>23. The base area is <math>10^2 = 100</math> m<sup>2</sup>. The four triangular faces total <math>4 \times \frac{1}{2}(10)(12) = 240</math> m<sup>2</sup>. Together that is 340 m<sup>2</sup>.</p> <p>24. A cube has 6 equal square faces, so <math>SA = 6 \times 7^2 = 6 \times 49 = 294</math> square feet.</p> |
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