Surface Area of Prisms, Cylinders, and Pyramids

Name: _____	Date: _____	Score: _____ / 24

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 $\frac{1}{2} \times$ base $\times$ 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: $SA = 94$ cm^2

PRACTICE

Find each surface area. Leave π in answers where it appears.

1. Rect. prism: $l = 2,\ w = 3,\ h = 4$ _____
2. Rect. prism: $l = 3,\ w = 4,\ h = 5$ _____
3. Rect. prism: $l = 6,\ w = 2,\ h = 3$ _____
4. Rect. prism: $l = 8,\ w = 4,\ h = 2$ _____
5. Rect. prism: $l = 10,\ w = 3,\ h = 4$ _____
6. Cube: side 5 _____
7. Cube: side 3 _____
8. Cube: side 10 _____
9. Cylinder: $r = 3,\ h = 5$ _____
10. Cylinder: $r = 4,\ h = 6$ _____
11. Cylinder: $r = 2,\ h = 10$ _____
12. Cylinder: $r = 5,\ h = 5$ _____
13. Cylinder: $r = 6,\ h = 4$ _____
14. Square pyramid: base 6, slant height 5 _____
15. Square pyramid: base 8, slant height 6 _____
16. Square pyramid: base 10, slant height 12 _____
17. Square pyramid: base 4, slant height 3 _____
18. Rect. prism: $l = 7,\ w = 1,\ h = 2$ _____
19. Cube: side 7 _____
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 π. _____
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. $\boxed{52}$
2. $\boxed{94}$
3. $\boxed{72}$
4. $\boxed{112}$
5. $\boxed{164}$
6. $\boxed{150}$
7. $\boxed{54}$
8. $\boxed{600}$
9. $\boxed{48\pi}$
10. $\boxed{80\pi}$
11. $\boxed{48\pi}$
12. $\boxed{100\pi}$
13. $\boxed{120\pi}$
14. $\boxed{96}$
15. $\boxed{160}$
16. $\boxed{340}$
17. $\boxed{40}$
18. $\boxed{46}$
19. $\boxed{294}$
20. $\boxed{60\pi}$
21. $\boxed{112\ \text{in}^2}$
22. $\boxed{48\pi\ \text{in}^2}$
23. $\boxed{340\ \text{m}^2}$
24. $\boxed{294\ \text{ft}^2}$

Step-by-Step Explanations

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

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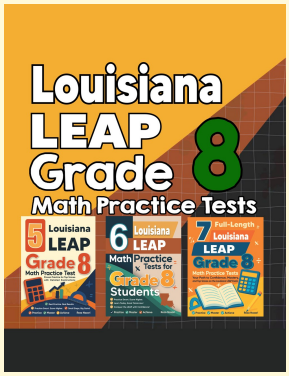

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