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. 52
2. 94
3. 72
4. 112
5. 164
6. 150
7. 54
8. 600
9. 48π
10. 80π
11. 48π
12. 100π
13. 120π
14. 96
15. 160
16. 340
17. 40
18. 46
19. 294
20. 60π
21. 112 in^2
22. 48π in^2
23. 340 m^2
24. 294 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 $10^2 = 100$ m^2. The four triangular faces total $4 \times \frac{1}{2}(10)(12) = 240$ m^2. Together that is 340 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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