Volume of Cylinders, Cones, and Spheres

Name: _____	Date: _____	Score: _____ / 24

Quick Review

Volume measures how much space a solid fills. For a **cylinder**, $V = \pi r^2 h$ — the circle area πr^2 times the height. A **cone** with the same base and height holds exactly *one third* as much: $V = \frac{1}{3}\pi r^2 h$. A **sphere** uses $V = \frac{4}{3}\pi r^3$. Always use the *radius* (half the diameter), and keep your answer in terms of π unless you're told to use $\pi \approx 3.14$. Volume is measured in *cubic* units.

◇ **Example:** Find the volume of a cylinder with radius 3 cm and height 10 cm. Leave your answer in terms of π.
⇒ The formula for a cylinder is $V = \pi r^2 h$. Plug in $r = 3$ and $h = 10$: first square the radius, $3^2 = 9$. Then multiply by the height: $9 \times 10 = 90$. So the volume is 90π cubic centimeters. Keeping the π symbol gives an exact answer.

Answer: $V = 90\pi$ cm^3

PRACTICE

Find each volume. Leave answers in terms of π unless noted.

1. Cylinder: $r = 5,\ h = 8$ _____
2. Cylinder: $r = 2,\ h = 7$ _____
3. Cylinder: $r = 4,\ h = 6$ _____
4. Cylinder: $r = 10,\ h = 10$ _____
5. Cylinder: $r = 6,\ h = 5$ _____
6. Cylinder: $d = 6,\ h = 9$ _____
7. Cone: $r = 3,\ h = 9$ _____
8. Cone: $r = 6,\ h = 10$ _____
9. Cone: $r = 5,\ h = 12$ _____
10. Cone: $r = 2,\ h = 6$ _____
11. Cone: $r = 9,\ h = 4$ _____
12. Cone: $r = 3,\ h = 7$ _____
13. Sphere: $r = 3$ _____
14. Sphere: $r = 6$ _____
15. Sphere: $r = 9$ _____
16. Sphere: $r = 1$ _____
17. Sphere: $d = 12$ _____
18. Cylinder: $r = 1,\ h = 9$ _____
19. Cone: $r = 6,\ h = 5,$ use $\pi \approx 3.14$ _____
20. Cylinder: $r = 2,\ h = 10,$ use $\pi \approx 3.14$ _____

Word Problems

21. A water tank is a cylinder with radius 4 ft and height 6 ft. Find its volume in terms of π. _____
22. An ice cream cone has radius 3 cm and height 9 cm. How much ice cream fills it exactly? Leave your answer in terms of π. _____
23. A basketball is a sphere with radius 6 inches. Find its volume in terms of π. _____
24. A cylindrical can has radius 2 cm and height 10 cm. Using $\pi \approx 3.14$, find its volume to the nearest tenth. _____

Answer Keys

1. $\boxed{200\pi}$
2. $\boxed{28\pi}$
3. $\boxed{96\pi}$
4. $\boxed{1000\pi}$
5. $\boxed{180\pi}$
6. $\boxed{81\pi}$
7. $\boxed{27\pi}$
8. $\boxed{120\pi}$
9. $\boxed{100\pi}$
10. $\boxed{8\pi}$
11. $\boxed{108\pi}$
12. $\boxed{21\pi}$
13. $\boxed{36\pi}$
14. $\boxed{288\pi}$
15. $\boxed{972\pi}$
16. $\boxed{\frac{4}{3}\pi}$
17. $\boxed{288\pi}$
18. $\boxed{9\pi}$
19. $\boxed{188.4}$
20. $\boxed{125.6}$
21. $\boxed{96\pi \text{ ft}^3}$
22. $\boxed{27\pi \text{ cm}^3}$
23. $\boxed{288\pi \text{ in}^3}$
24. $\boxed{125.6 \text{ cm}^3}$

Step-by-Step Explanations

1. $V = \pi r^2 h = \pi(25)(8) = 200\pi$.
2. $V = \pi(4)(7) = 28\pi$.
3. $V = \pi(16)(6) = 96\pi$.
4. $V = \pi(100)(10) = 1000\pi$.
5. $V = \pi(36)(5) = 180\pi$.
6. Radius is 3, so $V = \pi(9)(9) = 81\pi$.
7. $V = \frac{1}{3}\pi r^2 h = \frac{1}{3}\pi(9)(9) = 27\pi$.
8. $V = \frac{1}{3}\pi(36)(10) = 120\pi$.
9. $V = \frac{1}{3}\pi(25)(12) = 100\pi$.
10. $V = \frac{1}{3}\pi(4)(6) = 8\pi$.
11. $V = \frac{1}{3}\pi(81)(4) = 108\pi$.
12. $V = \frac{1}{3}\pi(9)(7) = 21\pi$.
13. $V = \frac{4}{3}\pi r^3 = \frac{4}{3}\pi(27) = 36\pi$.
14. $V = \frac{4}{3}\pi(216) = 288\pi$.
15. $V = \frac{4}{3}\pi(729) = 972\pi$.
16. $V = \frac{4}{3}\pi(1) = \frac{4}{3}\pi$.
17. Radius is 6, so $V = \frac{4}{3}\pi(216) = 288\pi$.
18. $V = \pi(1)(9) = 9\pi$.
19. $V = \frac{1}{3}(3.14)(36)(5) = 188.4$.
20. $V = (3.14)(4)(10) = 125.6$.
21. Use $V = \pi r^2 h = \pi(4^2)(6) = \pi(16)(6) = 96\pi$ cubic feet.
22. A cone's volume is $V = \frac{1}{3}\pi r^2 h = \frac{1}{3}\pi(9)(9) = 27\pi$ cubic centimeters.
23. A sphere's volume is $V = \frac{4}{3}\pi r^3 = \frac{4}{3}\pi(6^3) = \frac{4}{3}\pi(216) = 288\pi$ cubic inches.
24. $V = \pi r^2 h \approx 3.14(2^2)(10) = 3.14(4)(10) = 125.6$ cubic centimeters.

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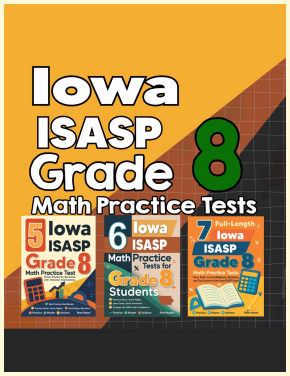

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