LESSON MAKER PRO

Volume Match Lab

Compare cones and spheres with matching cylinders.

GRADE 7 · 7A.GM.B.40

7A.GM.B.40 "Informally derive the formulas for the volume of cones and spheres by experimentally comparing the volumes of cones and spheres with the same radius and height to a cylinder with the same dimensions."

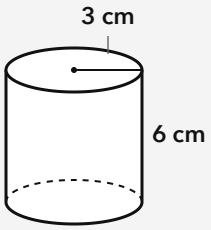
NAME _____ DATE _____

COMPARE THE VOLUMES

Imagine filling shapes with water. Three cones with the same radius and height as a cylinder would fill that cylinder. A sphere fills 2/3 of a cylinder with the same radius and height, where the cylinder's height is the sphere's diameter. Start with the cylinder's volume: $V = \pi r^2 h$.

WORKED EXAMPLE

Find the volume of the cylinder shown. Then find the volumes of a cone and a sphere with the same radius and height.

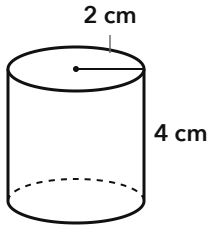


1. Cylinder: $V = \pi(3)^2(6) = 54\pi$ cm^3.
2. Cone: $V = 1/3(54\pi) = 18\pi$ cm^3.
3. Sphere: $V = 2/3(54\pi) = 36\pi$ cm^3.

Answer: Cylinder: 54π cm^3; cone: 18π cm^3; sphere: 36π cm^3.

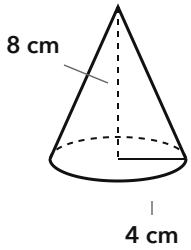
PRACTICE 6 problems

1 Find the volume of a cone with the same radius and height as the cylinder shown.



ANSWER _____

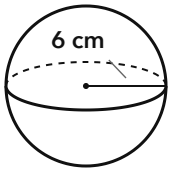
2 How many cones like the one shown would fill a cylinder with the same radius and height? What is the volume of one cone?



ANSWER _____

_____

3 Find the volume of the sphere shown by comparing it with a cylinder of the same radius and height.



ANSWER _____

4 A cylinder holds 90π cm^3. How much does a cone with the same radius and height hold?

ANSWER _____

5 A cylinder holds 120π cm^3. Its height equals the diameter of a sphere with the same radius. What is the sphere's volume?

ANSWER _____

6 A cone holds 42π cm^3. A sphere has the same radius and height. Find the sphere's volume and explain your comparison.

ANSWER _____

_____

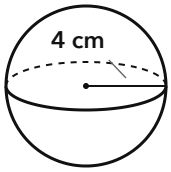
APPLY IT Show your work

1 An art club pours wax into a cylindrical mold that holds 72π cm^3. A cone-shaped mold has the same radius and height. How much wax fills one cone mold? How much fills three?

WORK SPACE

ANSWER _____

2 A round bath bomb is shaped like the sphere shown. A matching cylinder has a height of 8 cm. What is the bath bomb's volume in terms of π?



ANSWER _____

CHALLENGE One step up

A sphere and a cone have the same radius and height. Together, they hold 135π cm^3. Find each volume. Explain using a matching cylinder.

WORK SPACE AND ANSWER

ANSWER KEY # Volume Match Lab

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PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Find the volume of a cone with the same radius and height as the cylinder shown.	**16π/3 cm^3**
2	How many cones like the one shown would fill a cylinder with the same radius and height? What is the volume of one cone?	**3 cones; 128π/3 cm^3**
3	Find the volume of the sphere shown by comparing it with a cylinder of the same radius and height.	**288π cm^3**
4	A cylinder holds 90π cm^3. How much does a cone with the same radius and height hold?	**30π cm^3**
5	A cylinder holds 120π cm^3. Its height equals the diameter of a sphere with the same radius. What is the sphere's volume?	**80π cm^3**
6	A cone holds 42π cm^3. A sphere has the same radius and height. Find the sphere's volume and explain your comparison.	**84π cm^3. The sphere holds twice as much as the cone because they hold 2/3 and 1/3 of a matching cylinder.**

PART 2 · APPLY IT

1. **One cone: 24π cm^3; three cones: 72π cm^3.** One cone holds 1/3 of 72π, or 24π cm^3. Three cones hold 3(24π) = 72π cm^3.
2. **256π/3 cm^3** The matching cylinder holds π(4)^2(8) = 128π cm^3. The sphere holds 2/3 of that, or 256π/3 cm^3.

CHALLENGE

Cone: 45π cm^3; sphere: 90π cm^3. The cone holds 1/3 of a matching cylinder and the sphere holds 2/3, so together they hold one cylinder's volume of 135π cm^3.

Accept equivalent exact forms with π. In explanations, look for comparisons of 1/3 and 2/3 to a cylinder with the same radius and height.