LESSON MAKER PRO

Volume Matchups

Compare cones and spheres with matching cylinders.

GRADE 8 · 8.GM.D.29

8.GM.D.29 "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."

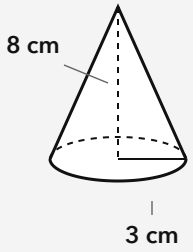
NAME _____ DATE _____

COMPARE TO A CYLINDER

Three full cones fill a cylinder with the same radius and height, so a cone holds 1/3 as much. A sphere holds 2/3 as much as a cylinder with the same radius and a height equal to the sphere's diameter. Find the cylinder's volume with $V = \pi r^2 h$, then use the fraction.

WORKED EXAMPLE

Use the cone shown to find its volume.



1. Matching cylinder: $V = \pi(3)^2(8)$
2. Cylinder volume = 72π cm^3
3. Cone volume = $1/3(72\pi) = 24\pi$ cm^3

Answer: 24π cm^3

PRACTICE 4 problems

1 A cone has radius 2 cm and height 6 cm. Find its volume.

ANSWER _____

2 A sphere has radius 4 cm. Find its volume using a matching cylinder.

ANSWER _____

3 A cylinder has radius 5 cm and height 12 cm. How much more does it hold than a matching cone?

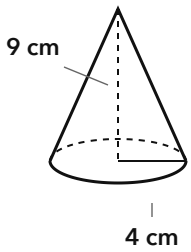
ANSWER _____

4 A sphere has radius 9 cm. Find its volume using a matching cylinder.

ANSWER _____

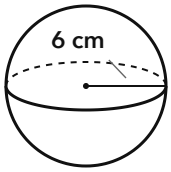
APPLY IT Show your work

1 A frozen yogurt shop fills the cone shown. How much yogurt does it hold? Give an exact volume.



ANSWER _____

2 A water balloon has the shape shown. Find the volume of a matching cylinder, then the balloon's volume.



ANSWER _____

CHALLENGE One step up

A cone and cylinder each have radius 10 cm and height 20 cm. A sphere has radius 10 cm. Find the cone's and sphere's combined volume. Explain how it compares with the cylinder's volume.

WORK SPACE AND ANSWER

ANSWER KEY

Volume Matchups

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PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	A cone has radius 2 cm and height 6 cm. Find its volume.	**8π cm³**
2	A sphere has radius 4 cm. Find its volume using a matching cylinder.	**256π/3 cm³**
3	A cylinder has radius 5 cm and height 12 cm. How much more does it hold than a matching cone?	**200π cm³**
4	A sphere has radius 9 cm. Find its volume using a matching cylinder.	**972π cm³**

PART 2 · APPLY IT

1. **48π cm³** The matching cylinder holds $\pi(4)^2(9) = 144\pi$ cm³. The cone holds 1/3 of that, or 48π cm³.
2. **Cylinder: 432π cm³; balloon: 288π cm³** The matching cylinder has height 12 cm, so its volume is $\pi(6)^2(12) = 432\pi$ cm³. The sphere holds 2/3 of that, or 288π cm³.

CHALLENGE

The cone holds 2000π/3 cm³ and the sphere holds 4000π/3 cm³. Together they hold 2000π cm³, exactly the cylinder's volume, because 1/3 + 2/3 = 1.

Accept equivalent exact forms with π. For the challenge, accept a comparison based on the volume fractions or on calculated volumes.