LESSON MAKER PRO

Volume Family Match

Compare solids with matching bases and heights.

GRADE 8 · 8.MG.2.c

8.MG.2.c "Examine and explain the relationship between the volume of cones and cylinders, and the volume of rectangular prisms and square based pyramids."

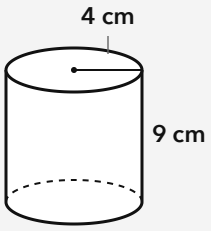
NAME _____ DATE _____

ONE-THIRD SOLIDS

When a cone and cylinder have the same base and height, the cone has 1/3 the cylinder's volume. When a square pyramid and rectangular prism have the same base area and height, the pyramid has 1/3 the prism's volume. Find the base area times height, then divide by 3 for a cone or pyramid.

WORKED EXAMPLE

The cylinder is shown. A cone has the same radius and height. Find the cone's volume.



1. Base area = $\pi(4)^2 = 16\pi$ cm^2.
2. Cylinder volume = $16\pi \times 9 = 144\pi$ cm^3.
3. Cone volume = $1/3 \times 144\pi = 48\pi$ cm^3.
4. A cone is 1/3 of its matching cylinder.

Answer: 48π cm^3

PRACTICE 4 problems

1 A cylinder has radius 2 cm and height 12 cm. A cone has the same radius and height. Find both volumes.

ANSWER _____

2 A square-based pyramid has a base edge of 6 cm and a perpendicular height of 5 cm. Find its volume.

ANSWER _____

3 A rectangular prism is 7 cm by 4 cm by 3 cm. A square pyramid has the same base area and height. Find both volumes.

ANSWER _____

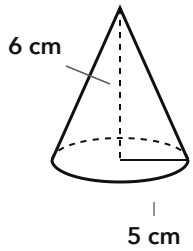
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4 A cone has volume 75π cm^3. A cylinder has the same radius and height. Find the cylinder's volume.

ANSWER _____

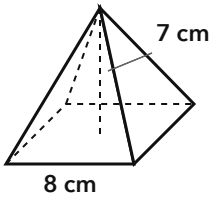
APPLY IT Show your work

1 At an esports night, snack mix is served in the cone cup shown. The cone cup has radius 5 cm and perpendicular height 6 cm. A cylindrical container has the same radius and height. How much more snack mix does the cylinder hold?



ANSWER _____

2 A robotics club makes the square-pyramid trophy shown. The square base has edge length 8 cm, and the perpendicular height is 7 cm. Its shipping box is a rectangular prism with the same square base and height. Find the difference in their volumes.



ANSWER _____

CHALLENGE One step up

A square pyramid and a rectangular prism each have a square base with side length 6 cm. The pyramid's height is 18 cm, and the prism's height is 6 cm. Do they have equal volumes? Explain.

WORK SPACE AND ANSWER

ANSWER KEY # Volume Family Match

GRADE 8 · 8.MG.2.c

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	A cylinder has radius 2 cm and height 12 cm. A cone has the same radius and height. Find both volumes.	**Cylinder: 48π cm^3; cone: 16π cm^3**
2	A square-based pyramid has a base edge of 6 cm and a perpendicular height of 5 cm. Find its volume.	**60 cm^3**
3	A rectangular prism is 7 cm by 4 cm by 3 cm. A square pyramid has the same base area and height. Find both volumes.	**Prism: 84 cm^3; pyramid: 28 cm^3**
4	A cone has volume 75π cm^3. A cylinder has the same radius and height. Find the cylinder's volume.	**225π cm^3**

PART 2 · APPLY IT

1. **100π cm^3** The cylinder holds $\pi(5)^2(6) = 150\pi$ cm^3. The cone holds 50π cm^3, so the difference is 100π cm^3.
2. **896/3 cm^3** The prism volume is $8 \times 8 \times 7 = 448$ cm^3. The pyramid is 448/3 cm^3, so the difference is 896/3 cm^3.

CHALLENGE

Yes. The pyramid volume is $1/3 \times 6 \times 6 \times 18 = 216$ cm^3, and the prism volume is $6 \times 6 \times 6 = 216$ cm^3. The pyramid's height is three times the prism's height, which offsets the 1/3 factor.

Accept equivalent volume forms, including 298 2/3 cm^3 for 896/3 cm^3. For the challenge, accept an explanation that the pyramid's triple height offsets its 1/3 volume relationship.