



Standard #: MAFS.912.G-GMD.1.3

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Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems. ★

Subject Area: Mathematics

Domain-Subdomain: Geometry: Geometric Measurement & Dimension

Cluster: [Explain volume formulas and use them to solve problems. \(Geometry - Additional Cluster\)](#) - Clusters should not be sorted from Major to Supporting and then taught in that order. To do so would strip the coherence of the mathematical ideas and miss the opportunity to enhance the major work of the grade with the supporting clusters.

Content Complexity Rating: [Level 2: Basic Application of Skills & Concepts](#) - [More Information](#)

Status: State Board Approved

Grade: 912

Cluster: Level 2: Basic Application of Skills & Concepts

Date Adopted or Revised: 02/14

Date of Last Rating: 02/14

Assessed: Yes

TEST ITEM SPECIFICATIONS

Item Type(s): This benchmark may be assessed using: [EE](#) item(s)

N/A

Assessment Limits :

Items may require the student to recall the formula for the volume of a sphere.

Items may require the student to find a dimension.

Items that involve cones, cylinders, and spheres should require the student to do more than just find the volume.

Items may include composite figures, including three-dimensional figures previously learned.

Items may not include oblique figures.

Items may require the student to find the volume when one or more dimensions are changed.

Items may require the student to find a dimension when the volume is changed.

Calculator :

Neutral

Clarification :

Students will use volume formulas for cylinders, pyramids, cones, and spheres to solve problems

Stimulus Attributes :

Items must be set in a real-world context.

Items may require the student to apply the basic modeling cycle

Response Attributes :

Items may require the student to use or choose the correct unit of measure.

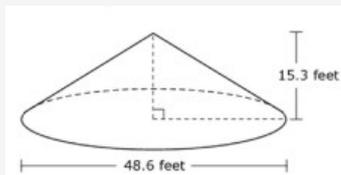
Items may require the student to apply the basic modeling cycle

SAMPLE TEST ITEMS (1)

Test Item #: Sample Item 1

Question:

A phosphate is mined, it moves along a conveyor belt, falling off of the end of the belt into the shape of a right circular cone, as shown.



A shorter conveyor belt also has phosphate falling off of the end into the shape of a right circular cone. The height of the second pile of phosphate is 3.6 feet shorter than the height of the first. The volume of both piles is the same.

To the nearest tenth of a foot, what is the diameter of the second pile of phosphate?

Difficulty: N/A

Type: EE: Equation Editor

Related Courses

Course Number	Course Title
1200400:	Intensive Mathematics (Specifically in versions: 2014 - 2015, 2015 and beyond (current))
1206300:	Informal Geometry (Specifically in versions: 2014 - 2015, 2015 and beyond (current))
1206310:	Geometry (Specifically in versions: 2014 - 2015, 2015 and beyond (current))
1206320:	Geometry Honors (Specifically in versions: 2014 - 2015, 2015 and beyond (current))
2003390:	Physics 1 Honors (Specifically in versions: 2014 - 2015, 2015 and beyond (current))
7912060:	Access Informal Geometry (Specifically in versions: 2014 - 2015 (course terminated))
7912070:	Access Liberal Arts Mathematics (Specifically in versions: 2014 - 2015, 2015 - 2018, 2018 - 2019, 2019 and beyond (current))
1206315:	Geometry for Credit Recovery (Specifically in versions: 2014 - 2015, 2015 and beyond (current))
1207300:	Liberal Arts Mathematics 1 (Specifically in versions: 2014 - 2015, 2015 and beyond (current))
7912065:	Access Geometry (Specifically in versions: 2015 and beyond (current))

Related Access Points

Access Point

Access Points Number	Access Points Title
MAFS.912.G-GMD.1.AP.3a:	Use appropriate formulas to calculate volume for cylinders, pyramids, and cones.

Related Resources

Lesson Plan

Name	Description
Calculating Volumes of Compound Objects:	This lesson unit is intended to help you assess how well students solve problems involving measurement, and in particular, to identify and help students who have the following difficulties: <ul style="list-style-type: none">• Computing measurements using formulas.• Decomposing compound shapes into simpler ones.• Using right triangles and their properties to solve real-world problems.
Cape Florida Lighthouse: Lore and Calculations:	The historic Cape Florida Lighthouse, often described as a conical tower, teems with mathematical applications. This lesson focuses on the change in volume and lateral surface area throughout its storied existence.
Cylinder Volume Lesson Plan:	Using volume in the real world
Evaluating Statements About Enlargements (2D and 3D):	This lesson is intended to help you assess how well students are able to solve problems involving area and volume, and in particular, to help you identify and assist students who have difficulties with the following: <ul style="list-style-type: none">• Computing perimeters, areas and volumes using formulas.• Finding the relationships between perimeters, areas, and volumes of shapes after scaling.
The Cost of Keeping Cool:	Students will find the volumes of objects. After decomposing a model of a house into basic objects students will determine the cost of running the air conditioning.
Volumes about Volume:	This lesson explores the formulas for calculating the volume of cylinders, cones, pyramids, and spheres.
Yogurt Land Container:	The student will assist Yogurt Land on choosing a new size container to offer their customers. The choice of containers are different three dimensional figures. Students will revisit the concepts of volume, surface area, and profit in order to make a decision.

Perspectives Video: Expert

Name	Description
Carbon Foam and Geometry:	Carbon can take many forms, including foam! Learn more about how geometry and the Monte Carlo Method is important in understanding it.

Problem-Solving Task

Name	Description
Centerpiece:	The purpose of this task is to use geometric and algebraic reasoning to model a real-life scenario. In particular, students are in several places (implicitly or explicitly) to reason as to when making approximations is reasonable and when to round, when to use equalities vs. inequalities, and the choice of units to work with (e.g., mm vs. cm).
Doctor's Appointment:	The purpose of the task is to analyze a plausible real-life scenario using a geometric model. The task requires knowledge of volume formulas for cylinders and cones, some geometric reasoning involving similar triangles, and pays attention to reasonable approximations and maintaining reasonable levels of accuracy throughout.

Formative Assessment

Name	Description
Do Not Spill the Water!:	Students are asked to solve a problem that requires calculating the volumes of a sphere and a cylinder.
Snow Cones:	Students are asked to solve a problem that requires calculating the volumes of a cone and a cylinder.
Sports Drinks:	Students are asked to solve a problem that requires calculating the volume of a large cylindrical sports drink container and comparing it to the combined volumes of 24 individual containers.
The Great Pyramid:	Students are asked to find the height of the Great Pyramid of Giza given its volume and the length of the edge of its square base.

Perspectives Video: Professional/Enthusiast

Name	Description
Estimating Oil Seep Production by Bubble Volume:	You'll need to bring your computer skills and math knowledge to estimate oil volume and rate as it seeps from the ocean floor. Dive in!
KROS Pacific Ocean Kayak Journey: Food Storage Mass and Volume:	What do you do if you don't have room for all your gear on a solo ocean trek? You're gonna need a bigger boat...or pack smarter with math. Related Resources: KROS Pacific Ocean Kayak Journey: GPS Data Set [.XLSX] KROS Pacific Ocean Kayak Journey: Path Visualization for Google Earth [.KML]
Mathematically Optimizing 3D Printing:	Did you know that altering computer code can increase 3D printing efficiency? Check it out!
Volume and Surface Area of Pizza Dough:	Michael McKinnon of Gaines Street Pies explains how when making pizza the volume is conserved but the surface area changes.

Original Student Tutorial

Name	Description
I Scream! You Scream! We All Scream for... Volume!:	Have you ever ordered a scoop of ice cream in a cone and wondered how much ice cream actually fits inside the cone? By the end of this tutorial, you should be able to answer this question and solve other real-world problems by using the formula for the volume of a cone.

Assessment

Name	Description
Sample 1 - High School Geometry State Interim Assessment:	This is a State Interim Assessment for 9th-12th grade.
Sample 3 - High School Geometry State Interim Assessment:	This is a State Interim Assessment for 9th-12th grade.

Unit/Lesson Sequence

Name	Description
Three Dimensional Shapes:	In this interactive, self-guided unit on 3-dimensional shape, students (and teachers) explore 3-dimensional shapes, determine surface area and volume, derive Euler's formula, and investigate Platonic solids. Interactive quizzes and animations are included throughout, including a 15 question quiz for student completion.

Educational Game

Name	Description
Volume of a Cylinder:	Students can play a game to solve for the volume of a cylinder and work backwards using the volume to find measures of a cylinder. Students may select Teach Me to learn how to find the volume of a cylinder or measures of it prior to beginning play. Hints and feedback are provided to players.

Name	Description
Which Holds More? :	This interactive manipulative will let you compare and calculate volumes of different solids.

Student Resources

Name	Description
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Doctor's Appointment:	The purpose of the task is to analyze a plausible real-life scenario using a geometric model. The task requires knowledge of volume formulas for cylinders and cones, some geometric reasoning involving similar triangles, and pays attention to reasonable approximations and maintaining reasonable levels of accuracy throughout.
Estimating Oil Seep Production by Bubble Volume:	You'll need to bring your computer skills and math knowledge to estimate oil volume and rate as it seeps from the ocean floor. Dive in!
I Scream! You Scream! We All Scream for... Volume!:	Have you ever ordered a scoop of ice cream in a cone and wondered how much ice cream actually fits inside the cone? By the end of this tutorial, you should be able to answer this question and solve other real-world problems by using the formula for the volume of a cone.
Volume of a Cylinder:	Students can play a game to solve for the volume of a cylinder and work backwards using the volume to find measures of a cylinder. Students may select Teach Me to learn how to find the volume of a cylinder or measures of it prior to beginning play. Hints and feedback are provided to players.
Which Holds More? :	This interactive manipulative will let you compare and calculate volumes of different solids.

Parent Resources

Name	Description
Centerpiece:	The purpose of this task is to use geometric and algebraic reasoning to model a real-life scenario. In particular, students are in several places (implicitly or explicitly) to reason as to when making approximations is reasonable and when to round, when to use equalities vs. inequalities, and the choice of units to work with (e.g., mm vs. cm).
Doctor's Appointment:	The purpose of the task is to analyze a plausible real-life scenario using a geometric model. The task requires knowledge of volume formulas for cylinders and cones, some geometric reasoning involving similar triangles, and pays attention to reasonable approximations and maintaining reasonable levels of accuracy throughout.
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