

Volumes of Cylinders, Cones, Pyramids and Spheres

Grade 10 – Geometry math · Worksheet · Standards: G-GMD.A.1, G-GMD.A.3

Name: _____ Date: _____ Class: _____

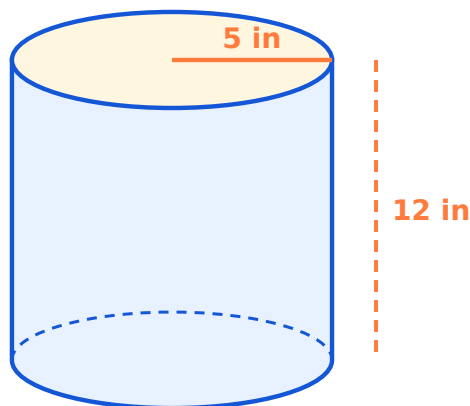
These problems connect dissection and Cavalieri's principle to the volume formulas for cylinders, pyramids, cones and spheres (G-GMD.A.1 and G-GMD.A.3). Early problems substitute into a formula; later ones combine solids or work backward. Silos, tanks, cones and monuments provide the contexts.

Standards: G-GMD.A.1, G-GMD.A.3 · **Level:** Grade 10 Geometry

Problem 1 Area of a Circle from Wedges (easy)

A circle of radius 8 inches is cut into thin wedges that are rearranged into a shape close to a parallelogram. (a) What are its base and height? (b) Use them to find the area, in terms of π .

Problem 2 Volume of a Cylinder (easy)



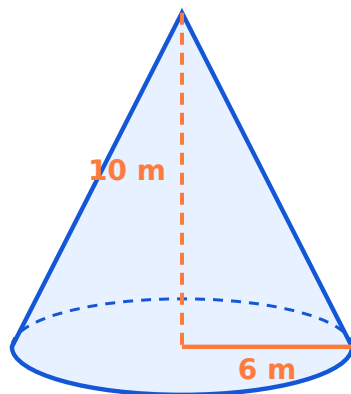
Radius 5 in, height 12 in.

Find the volume of the cylinder. Give an exact answer and a decimal to the nearest tenth.

Problem 3 Cylinder from a Diameter (easy)

A cylindrical can has diameter 14 centimeters and height 9 centimeters. Find its volume to the nearest tenth.

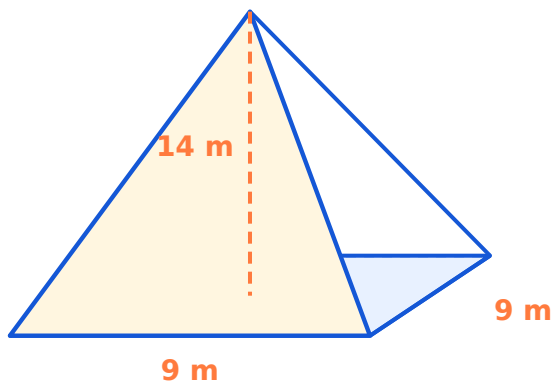
Problem 4 Volume of a Cone (medium)



Radius 6 m, height 10 m.

Find the volume of the cone, exactly and to the nearest tenth.

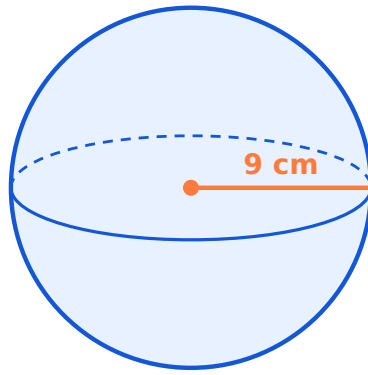
Problem 5 Volume of a Square Pyramid (medium)



Base 9 m by 9 m, height 14 m.

Find the volume of the pyramid.

Problem 6 Volume of a Sphere (medium)



Radius 9 cm.

Find the volume of a sphere with radius 9 centimeters, exactly and to the nearest tenth.

Problem 7 Cavalieri and an Oblique Cylinder (medium)

A right cylinder and an oblique (slanted) cylinder each have a base radius of 4 feet and a perpendicular height of 10 feet. The oblique one has a slant side of 12 feet. (a) Explain why they have equal volumes. (b) Find the volume.

Problem 8 One Third of a Cube (medium)

A cube has edge 6 inches. A square pyramid has the same base as the cube and the same height. (a) Find the cube's volume. (b) Use the fact that three such pyramids fill the cube to find the pyramid's volume, and check it with the pyramid formula.

Problem 9 Height of a Cone (hard)

A cone has volume 96π cubic inches and radius 6 inches. Find its height.

Problem 10 Radius of a Cylinder (hard)

A cylinder with height 6 meters has volume 486π cubic meters. Find its radius.

Problem 11 Radius of a Sphere (hard)

A sphere has volume 288π cubic feet. Find its radius.

Problem 12 Hemisphere Bowl (hard)

A bowl is a hemisphere with inside radius 10 centimeters. Find its capacity in cubic centimeters and in liters, to the nearest tenth. (1 liter = 1,000 cm³.)

Problem 13 Rectangular Pyramid (hard)

A pyramid has a rectangular base measuring 8 feet by 15 feet and a height of 11 feet. Find its volume.

Problem 14 Cone with a Slant Height (hard)

A cone has radius 8 centimeters and slant height 17 centimeters. Find its perpendicular height and its volume, exactly and to the nearest tenth.

Problem 15 Grain Silo (hard)

A silo is a cylinder with radius 6 feet and height 24 feet, topped by a cone of height 5 feet and the same radius. Find the total volume, exactly and to the nearest cubic foot.

Problem 16 Ice Cream Cone (hard)

An ice cream cone has radius 3 centimeters and height 11 centimeters, and a scoop shaped like a hemisphere with the same radius sits on top. Find the total volume, exactly and to the nearest tenth.

Problem 17 Water Tank (hard)

A cylindrical water tank has radius 3 meters and height 4.5 meters. It is filled to 80% of its capacity. How many liters of water does it hold, to the nearest thousand? (1 m³ = 1,000 L.)

Problem 18 Melting a Sphere (hard)

A solid metal sphere of radius 6 centimeters is melted and recast as a solid cylinder with radius 4 centimeters. How tall is the cylinder?

Problem 19 Pyramid Monument (hard)

A monument is a square pyramid with base edge 32 meters and height 21 meters. Find its volume. A model has every dimension reduced to one eighth of the monument; find the model's

volume.

Problem 20 Sand Timer (hard)

A sand timer has a top cone of radius 3 centimeters and height 6 centimeters, full of sand. All the sand falls into a cylindrical jar with radius 3 centimeters. How high does the sand rise in the jar?