# Exploring Cavalieri's Principle

**Time Required**
*15 minutes*

**ID: 12582**

## Activity Overview

*Students will explore Cavalieri's Principle for cross sectional area and volume.*

## Topic: 3-Dimensional Geometry

- *Cavalieri's Principle*

## Teacher Preparation and Notes

- *To complete this activity, students will need to know how to change between pages, and how to grab and move points.*

- *The multiple-choice items are self-check. Students can check their answers by pressing* menu *and selecting* **Check Answer** *(or by pressing* ctrl *+ ▲). If desired, by using the TI-Nspire Teacher Edition software, teachers can change the self-check questions to exam mode so students cannot check their answer. On any question click the Teacher Tool Palette and select Question Properties. Change the Document Type from Self-Check to Exam.*

- ***To download the student TI-Nspire document (.tns file) and student worksheet, go to education.ti.com/exchange and enter "12582" in the keyword search box.***

## Associated Materials

- *CavalierisPrinciple_Student.doc*
- *CavalierisPrinciple.tns*

## Suggested Related Activities

*To download any activity listed, go to education.ti.com/exchange and enter the number in the keyword search box.*

- *Volume (TI-Nspire technology) — 9689*
- *Making Hay While the Sun Shines & Not Losing It in the Rain (The Geometry of the Big Round Bale) (TI-Nspire technology) — 10559*
- *The Painted Cube (TI-Nspire technology) — 17173*

## Problem 1 – Oblique Cylinder

Students will begin this activity by investigating the volume of a cylinder that is not necessarily right. The radius of the base and the height of the cylinder are fixed, but the angle of the cylinder changes when students move point *A*. Students will discover that the volume does not depend on the angle of the cylinder if the cross sectional area remains fixed.
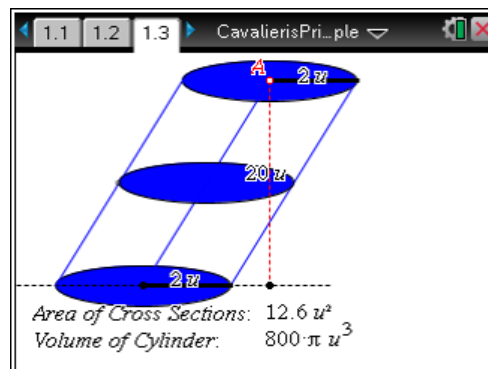
## Problem 2 – Triangular Pyramid

Students will next explore the volume of a triangular pyramid. When students move point *A*, they will discover that the area of the parallel cross sections remain fixed and the volume of the pyramid does not depend on where *A* is as long as the height of the pyramid remains fixed at 10 cm.
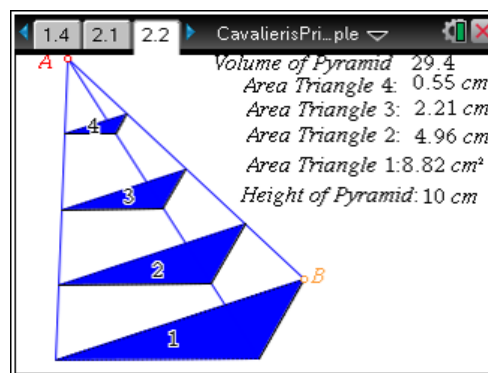
## Problem 3 – Cavalieri's Principle

Finally, students are given Cavalieri's Principle and are asked to explore three prisms with the same volume since the area of the cross sections are all 4 cm$^2$ and the heights are all 5 cm.
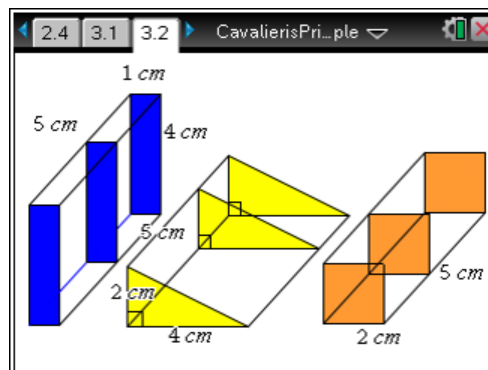
## Student Solutions

1. No matter the angle of the cylinder, the volume remains the same.

2. Cross sectional triangle areas remain the same.

3. The volume remains the same.

4. 4 cm$^2$

5. 20 cm$^3$