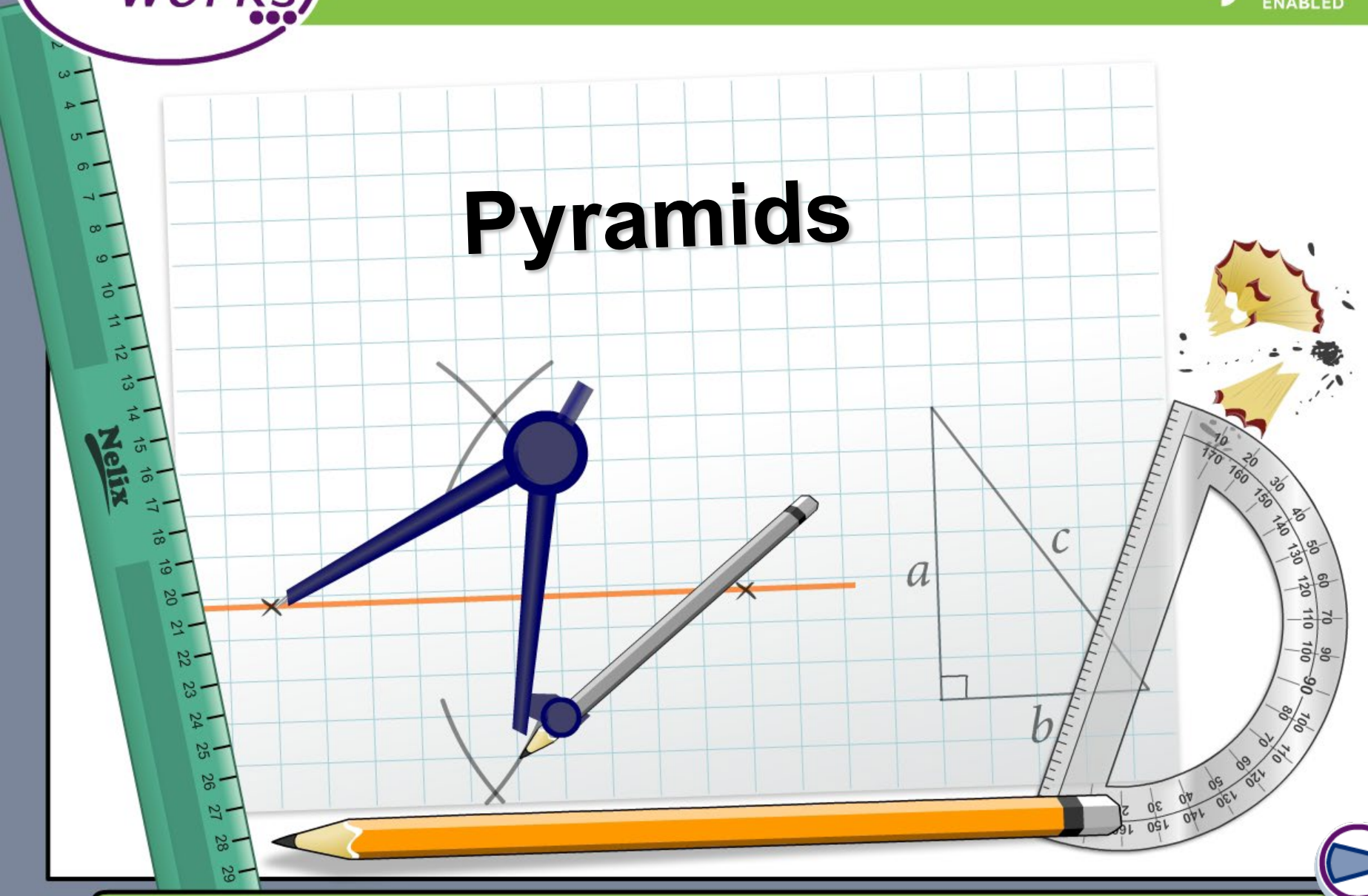
Pyramids



Information

Common core icons

This icon indicates a slide where the Standards for Mathematical Practice are being developed. Details of these are given in the Notes field.

Slides containing examples of mathematical modeling are marked with this stamp.

This icon indicates an opportunity for discussion or group work.

The **Standards for Mathematical Practice** outlined in the Common Core State Standards for Mathematics describe varieties of expertise that mathematics educators at all levels should seek to develop in their students.

These are:

1) Make sense of problems and persevere in solving them.

2) Reason abstractly and quantitatively.

3) Construct viable arguments and critique the reasoning of others.

4) Model with mathematics.

5) Use appropriate tools strategically.

6) Attend to precision.

7) Look for and make use of structure.

8) Look for and express regularity in repeated reasoning.

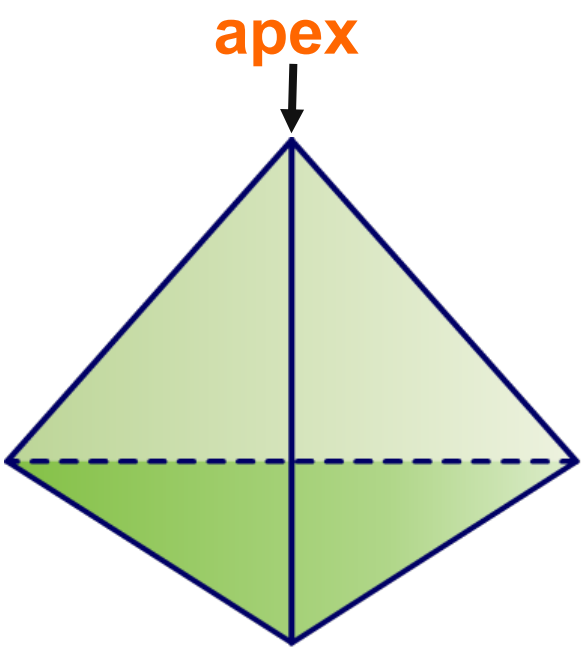
This icon indicates that the slide contains activities created in Flash. These activities are not editable.

This icon indicates teacher's notes in the Notes field.

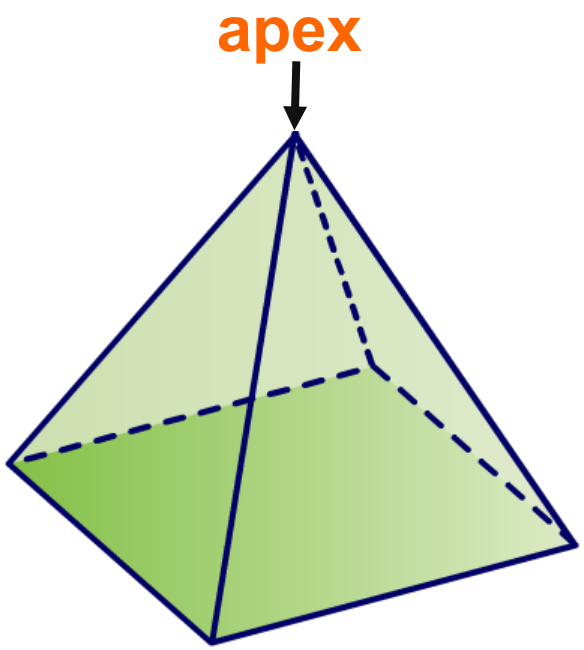
Pyramids

A **pyramid** is a polyhedron in which the base is a polygon. It has triangular lateral faces that meet at an **apex**.

The most common pyramids are:



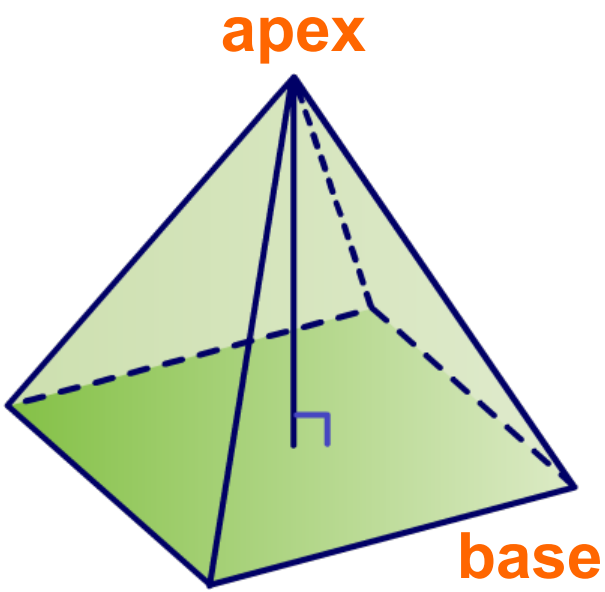
tetrahedron or
triangular pyramid



square pyramid

Volume of a pyramid

The volume of a pyramid is found by multiplying the area of its base A by its perpendicular height h and dividing by 3.



Volume of a pyramid

$$= \frac{1}{3} \times \text{area of base} \times \text{height}$$

$$= \frac{1}{3}Ah$$

Volume of a pyramid

What is the volume of this tetrahedron?

find the height of base: $(h_{base})^2 = 4^2 + 3^2$

$h_{base} = 5$

find the area of base: $A = \frac{1}{2}(b \times h_{base})$

$A = \frac{1}{2}(8 \times 5)$

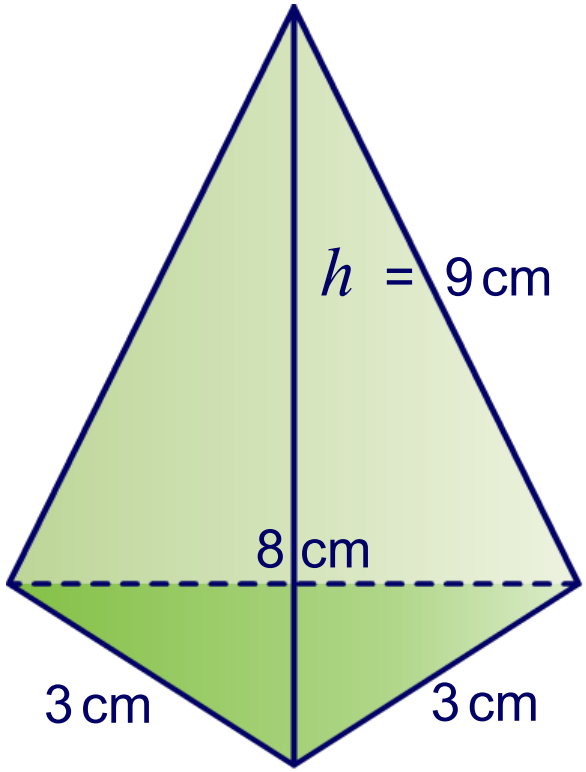
$A = 20\,\text{cm}^2$

use the formula for the volume of pyramid:

$V = \frac{1}{3}Ah$

$V = \frac{1}{3} \times 20 \times 9$

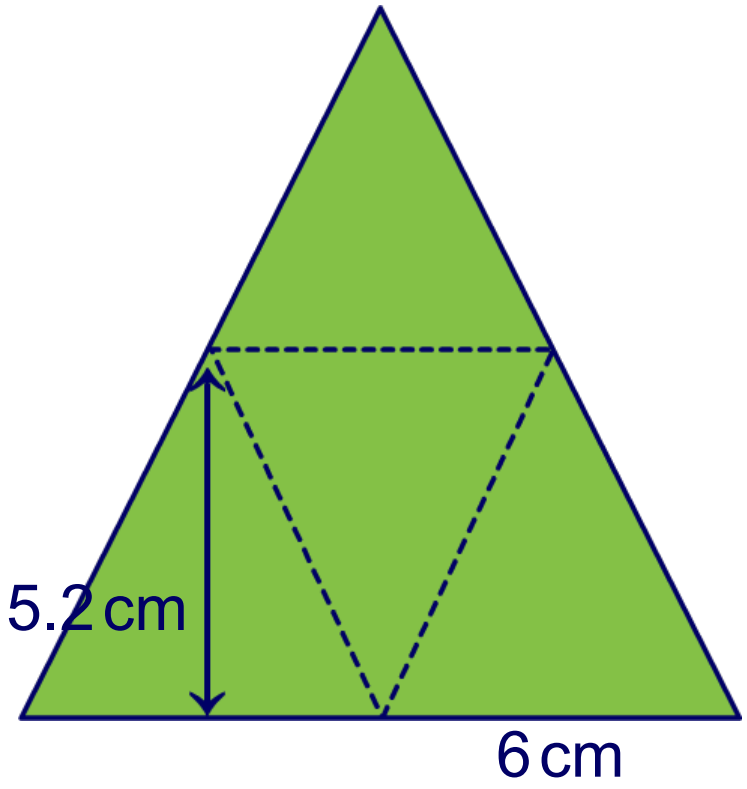
$V = \mathbf{60\,cm^3}$



Surface area of a pyramid

Here is the net of a regular tetrahedron.

What is its surface area?



find the area of each face:

$$A = \frac{1}{2} b h$$

$$A = \frac{1}{2} \times 6\,\text{cm} \times 5.2\,\text{cm}$$

$$A = 15.6\,\text{cm}^2$$

find the surface area

$$SA = 4 \times 15.6\,\text{cm}^2$$

$$SA = \mathbf{62.4\,cm^2}$$

Volume of a pyramid

The Ancient Egyptians built the Pyramids at Giza. The most famous is the Great Pyramid. When it was built, it stood 146.59 m high and had square base lengths of 230.33 m.

What would have been the volume of the original pyramid when it was built? Show your work.

New pyramids

Imagine that the Egyptian government wants to build three new similar square pyramids:

- the volume of the largest is 1,000,000 m^3
- the length of the medium's square base is 100 m
- the ratio of the smallest's to largest's lengths is 1:3
- the ratio of the smallest's to medium's lengths is 1:2.

Find the square base length, area of base, and volume for each pyramid.

start

Round to the nearest whole number.

New pyramids

The builders need to know how high the pyramids will be so they can order cranes.

The cranes can reach:

- 54.9 m
- 70.1m
- 72.2 m
- 85.3 m
- 91.4 m
- 115.8 m.

Will these cranes be able to reach the top of the pyramids?

rearrange the formula for volume: $h = 3V \div A$

height of small pyramid = $(37{,}037\,m^3 \times 3) \div 2500\,m^2$ **= 44.4m**

height of medium pyramid = $(296{,}296\,m^3 \times 3) \div 10\,000\,m^2$ **= 88.9m**

height of large pyramid = $(1{,}000{,}000\,m^3 \times 3) \div 22\,500\,m^2$ **= 133m**