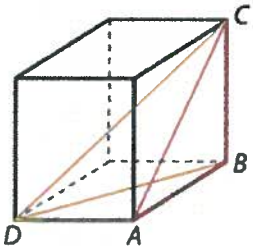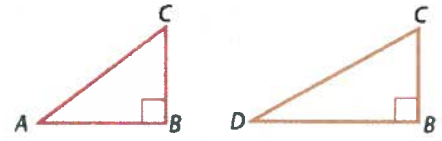# Section 6.7 Application of Three-Dimensional Geometry

Every three-dimensional shape has two-dimensional shapes within it.
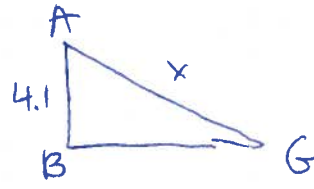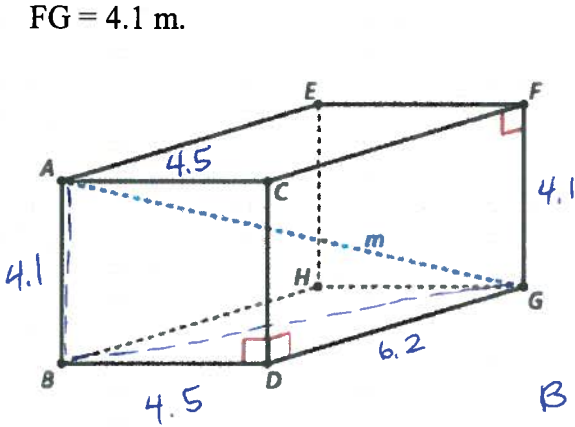
In the prism we can see that triangle ABC is a right-angled triangle, which means we can find the length of AC using Pythagoras.
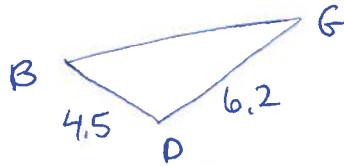
Similarly, we can see that triangle DBC is a right-angled triangle.

Example: Use the diagram below to find the length of AG to the nearest tenth if AC = 4.5 m, DG = 6.2 m, and FG = 4.1 m.
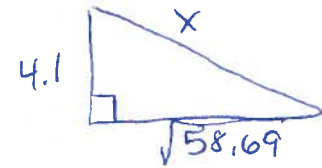
first find BG

$4.5^2 + 6.2^2 = BG^2$

$BG = \sqrt{58.69}$

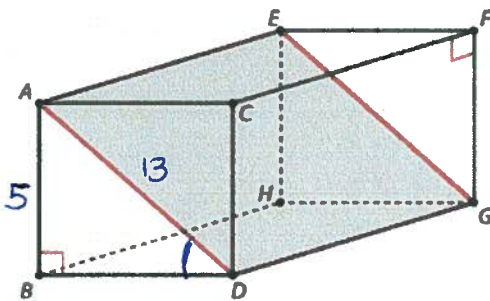$4.1^2 + \left(\sqrt{58.69}\right)^2 = x^2$

$16.81 + 58.69 = x^2$

$x = \sqrt{75.5}$

$x = 8.69 \text{ m}$

Example: Use the diagram below to find the angle between plane AEGD and plane BDGH if AD = 13 cm and AB = 5 cm.

Slanted   bottom
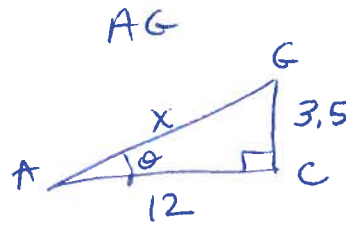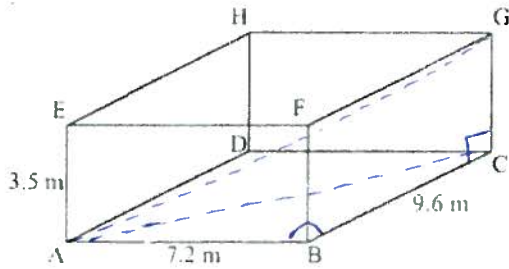
The angle between is θ

$\sin \theta = \frac{5}{13}$

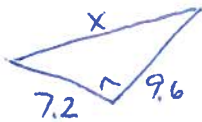$\sin^{-1}\left(\frac{5}{13}\right)$ $\theta = 22.6°$

Use your solutions to help. And once you figure out what you are trying to find, draw a picture to help.

Example: A room is in the shape of a cuboid. Its floor measures 7.2 m by 9.6m and its height is 3.5m. Calculate the length of AC and AG. Then calculate the angle that AG makes with the floor.

AG

$12^2 + 3.5^2 = x^2$

$x^2 = 156.25$

$x = 12.5$ (exact)

$\boxed{AG = 12.5m}$

← Angle with floor is θ

$\tan\theta = \dfrac{3.5}{12}$

$\tan^{-1}\left(\dfrac{3.5}{12}\right)$

$\boxed{\theta = 16.3°}$

AC:

$x^2 = 7.2^2 + 9.6^2$

$x^2 = 144$

$x = 12$

$\boxed{AC = 12m}$

Example: The right pyramid shown in the diagram has a square base with sides of length 40 cm. The height of the pyramid is also 40 cm. Find the length of OB. Then find the size of angle OBP.
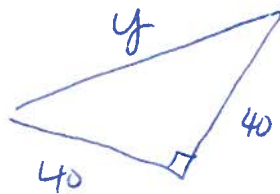

need this!

y

$40^2 + 40^2 = y^2$
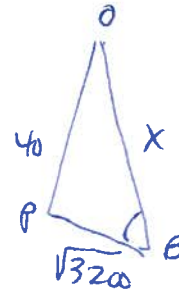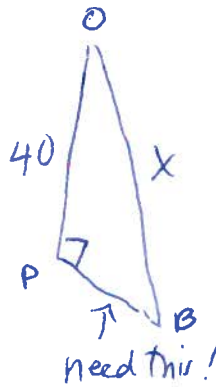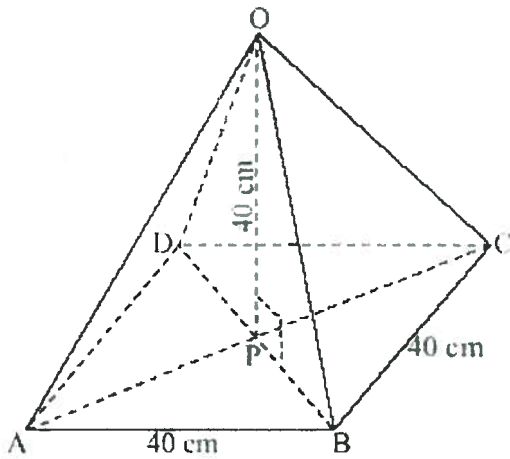
$y^2 = 3200$

$y = \sqrt{3200}$

$40^2 + \left(\sqrt{3200}\right)^2 = x^2$

$1600 + 3200 = x^2$

$x = \sqrt{4800}$

$\boxed{OB = 69.3 \text{ cm}}$

$\tan\theta = \dfrac{40}{\sqrt{4800}}$

$\boxed{\theta = 30°}$

Example: Use the diagram and accompanying pictures to help with homework #4a (find angle between plane FBC and plane FCD).
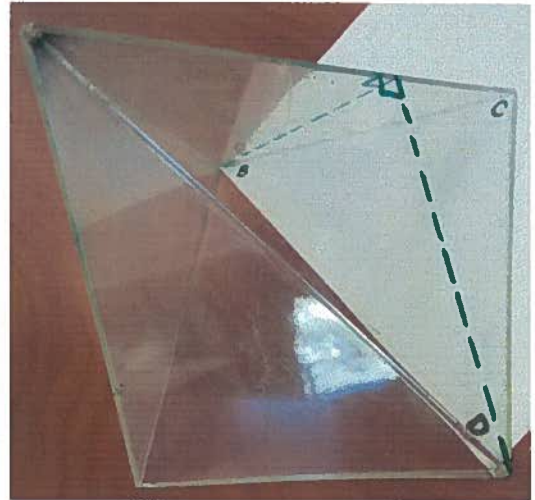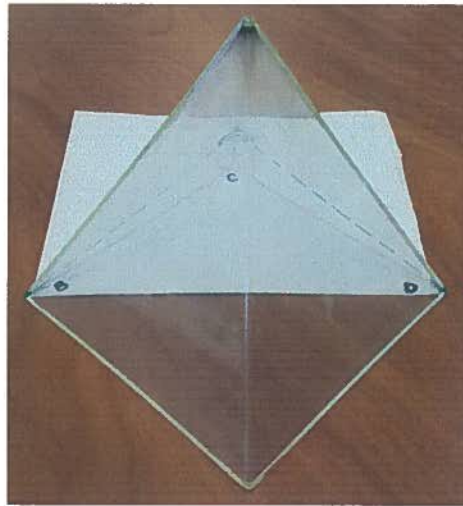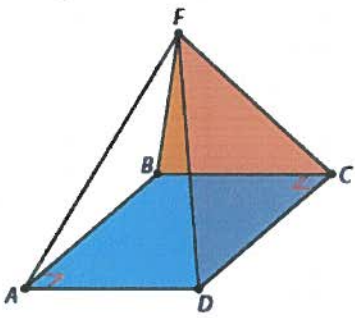
Example: Use the accompanying pictures to help with homework #5a and #5b. Note: M is midpoint of DG.

#5a Find angle AMD

#5b Find angle AMC