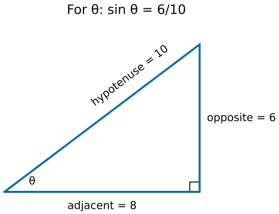
# Geometry and Trigonometry

Original skill preparation; versioned source scope

# Method and conditions




- A scale factor $k$ changes every corresponding length.
- Triangle sum; Pythagoras; length/area/volume units.

# Worked method 1

## Read and reason

A scale factor $k$ changes every corresponding length. $A_2 = k^2 A_1$ and $V_2 = k^3 V_1$ for similar shapes. If $k = 3/2$ and $A_1 = 24\,\mathrm{cm}^2$, $A_2 = (3/2)^2(24\,\mathrm{cm}^2) = 54\,\mathrm{cm}^2$. Changing only one dimension does not justify these similarity rules.

# Original context 1

## Read and reason

# Task context

## Read and reason

Each task below states its own complete data. Values may differ from the worked example.

# Attempt 1.1

## Read and reason

Similar containers have surface areas 96 and 216 square centimetres. The smaller volume is 160 cubic centimetres. Find the larger volume.

# Reasoning 1.1

## Read and reason

$k = \sqrt{A_2/A_1} = \sqrt{216/96} = 3/2$. Volume uses the cube: $V_2 = k^3 V_1 = (3/2)^3(160\,\mathrm{cm}^3) = 540\,\mathrm{cm}^3$. Using area ratio directly would give the wrong volume.

# Attempt 2.1

## Read and reason

A right triangle has hypotenuse 13 cm and one leg 5 cm. Find the other leg, its area, and the sine of the angle opposite the 5 cm leg.

# Reasoning 2.1

## Read and reason

$b = \sqrt{c^2 - a^2} = \sqrt{(13\,\mathrm{cm})^2 - (5\,\mathrm{cm})^2} = 12\,\mathrm{cm}.$
$A = ab/2 = (5\,\mathrm{cm})(12\,\mathrm{cm})/2 = 30\,\mathrm{cm}^2.$ $\sin\theta = a/c = (5\,\mathrm{cm})/(13\,\mathrm{cm}) = 5/13.$

# Attempt 3.1

## Read and reason

Two interior angles of a triangle are $42^\circ$ and $73^\circ$. Find the third angle and its adjacent exterior angle. Would those angles alone determine all side lengths?

# Reasoning 3.1

## Read and reason

Third angle is $180 - 42 - 73 = 65$ degrees. Its adjacent exterior angle is $180 - 65 = 115$ degrees, also $42 + 73$. Angles establish shape, not scale; similar triangles can have different side lengths.

# Attempt 4.1

## Read and reason

Two parallel lines are cut by a transversal. One corresponding angle is $68^\circ$. Find its matching corresponding angle and the adjacent angle on the second line. Explain which given condition justifies each step.

# Reasoning 4.1

## Read and reason

Parallelism gives the matching corresponding angle $68^\circ$. The adjacent pair forms a straight angle, so the other is $180^\circ - 68^\circ = 112^\circ$. Equal corresponding angles require the stated parallel lines; the straight-angle sum uses adjacency on one line. A similar-looking sketch without parallelism would not justify the first equality.

# Transfer and limits

## Read and reason

Triangle sum; Pythagoras; length/area/volume units.

# Check yourself

## Read and reason

Close the worked reasoning. Explain why the method fits the final transfer task, reconstruct its conclusion, and state a condition that would change your answer. Then check the full reasoning in the reference.