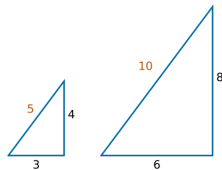


Scale factors, angle relationships and triangles

Original skill preparation; versioned source scope

Method and conditions

Length $\times 2$; area $\times 4$ for similar triangles



- 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 $A_1 = 24 \text{ cm}^2$, $A_2 = (3/2)^2(24 \text{ cm}^2) = 54 \text{ cm}^2$. 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:

$V_2 = k^3 V_1 = (3/2)^3 (160 \text{ cm}^3) = 540 \text{ cm}^3$. 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

$$b = \sqrt{c^2 - a^2} = \sqrt{(13 \text{ cm})^2 - (5 \text{ cm})^2} = 12 \text{ cm}.$$

$$A = ab/2 = (5 \text{ cm})(12 \text{ cm})/2 = 30 \text{ cm}^2. \quad \sin \theta = a/c = (5 \text{ cm})/(13 \text{ cm}) = 5/13.$$

Attempt 3.1

Read and reason

Two interior angles of a triangle are 42° and 73° . 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° . 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° . 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.