

Geometry and Trigonometry

SAT · SAT · SAT

Scope and prerequisites

Digital SAT framework; original paper practice is nonadaptive and gives no scaled-score prediction.

- Use area, volume and similarity
- Apply right-triangle ratios and the Pythagorean theorem
- Use circle equations, arcs and angle relationships

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

Explain and choose the method

Similarity preserves corresponding angles and length ratios. Areas scale by k^2 and volumes by k^3 .

For a right triangle, $\sin$ is opposite/hypotenuse, $\cos$ adjacent/hypotenuse, and $\tan$ opposite/adjacent.

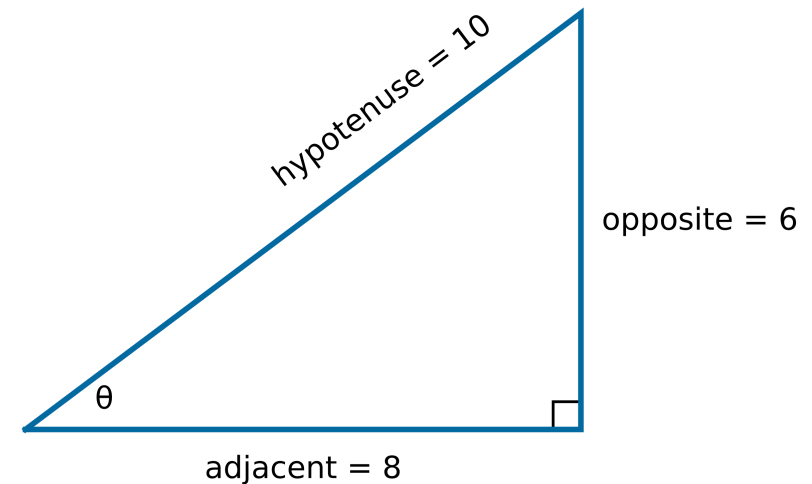
A circle with centre (h,k) and radius r has $(x-h)^2 + (y-k)^2 = r^2$.

A full turn is 360° or 2π radians. Arc length is $r\theta$ only when θ is in radians.

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.

For θ : $\sin \theta = 6/10$



Original worked example from existing native teaching; transfer tasks use their own data.

Existing worked example: A right triangle has legs 6 and 8. $c^2 = 6^2 + 8^2 = 100$, so $c = 10$. For the angle opposite 6, $\sin \theta = 6/10 = 0.6$. A similar triangle enlarged by factor 3 has area nine times the original.

Complete original context

Every transfer question states all data it needs.

Independent practice and checked reasoning

This overview is completed through the detailed skill sequence: 18, 19. Work those references and sheets in order; this orientation does not replace them.

■ Transfer 1

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

Reasoning: $k = \sqrt{A_2/A_1} = \sqrt{216/96} = 3/2$. 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.

■ Transfer 2

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

■ Transfer 3

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: 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.

■ Transfer 4

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: 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.

Limits and next use

Radius and diameter differ by a factor of two. Using diameter in πr^2 makes the area four times too large.

All tasks here are public original practice with authored guidance. They are not official questions or fresh diagnostics. Existing protected tests and mocks remain separate.