

Geometry and trigonometry · supported focus

Supported focus · HL

Supported scope

- Supported HL focus. First assessment 2021; current through 2028.
First-assessment-2029 course is separate.. Remaining guide, assessment and practical requirements retain their recorded holds.
- State model conditions and distinguish fictional data from measurements.

Geometry · 1.1

Reasoning

A model has lengths one third of the real object. How much smaller are its area and volume? This lesson studies scale factor : The multiplier that relates corresponding lengths in similar shapes.

Geometry · 2.1

Reasoning

For similar shapes with length scale factor k , areas scale by k^2 and volumes by k^3 . State angle reasons explicitly. A circle's tangent is perpendicular to the radius at the contact point. State the allowed inputs and units before calculating. An equation should express the relationship, not just record a calculator entry.

Geometry · 3.1

Reasoning

Use the displayed relationship within its stated domain.

$$\frac{A_2}{A_1} = k^2, \quad \frac{V_2}{V_1} = k^3$$

Geometry · 3.2

Reasoning

Check the result against the starting quantities. Substitute into the original relation, or compare the graph and numerical answer where appropriate.

Geometry · 3.3

Reasoning

If model-to-real length factor is 3, a model area of 12 cm^2 gives $12 \times 3^2 = 108 \text{ cm}^2$ and a model volume of 8 cm^3 gives $8 \times 3^3 = 216 \text{ cm}^3$. A cylinder with $r=3, h=5$ has volume $\pi r^2 h = 45\pi$.

Geometry · 4.1

Reasoning

Equal angles alone establish similarity, not equal size. Use corresponding lengths in the same order. Convert linear units before calculating area or volume, or square/cube the conversion factor correctly. When a shortcut fails, identify the assumption it breaks. Keep an exact value until the requested final rounding.

Geometry · 4.2

Reasoning

Doubling every length of a solid doubles its volume. This claim is false. Explain which definition or assumption it violates.

Geometry · 5.1

Reasoning

A geometric proof should name the relevant theorem, identify the equal angle or ratio, and draw the conclusion. A scale drawing is evidence only when the task permits measurement. A complete solution gives the mathematical result and explains what it means. Check that it is possible in the stated context.

Geometry · 6.1

Reasoning

Current first-assessment-2021 Applications and Interpretation HL. This is authored concept support; the full guide is needed to certify every objective. Give the method before the final answer, and use the paper's calculator and formula rules. Review a wrong answer by locating the first invalid step.

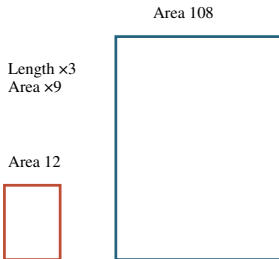
Geometry · 6.2

Reasoning

The multiplier that relates corresponding lengths in similar shapes. Choose the relationship, show the method, check its assumptions and interpret the result.

Geometry · diagram

A length scale factor is squared for area



- Original teaching diagram: Angle reasoning, similarity and mensuration
- Use the labels and the stated model together.

Geometry · original transfer

Your turn

Two similar closed solids have volume ratio 27:8. Find length and area ratios; explain why doubling a length would not double volume.

Geometry · transfer reasoning

Method and interpretation

Length ratio 3:2, area 9:4. Area scales as the square and volume as the cube of the length factor, assuming genuine geometric similarity.

Trig Basic · 1.1

Reasoning

A ladder reaches a height of 4 m while its foot is 3 m from a wall. Which sides are known, and which angle do we need? This lesson studies hypotenuse : The side opposite the right angle in a right-angled triangle.

Trig Basic · 2.1

Reasoning

In a right triangle $a^2 + b^2 = c^2$; $\sin\theta = \text{opposite}/\text{hypotenuse}$, $\cos\theta = \text{adjacent}/\text{hypotenuse}$ and $\tan\theta = \text{opposite}/\text{adjacent}$. For other triangles, use the sine or cosine rule, or $\text{area} = ab \sin C/2$. State the allowed inputs and units before calculating. An equation should express the relationship, not just record a calculator entry.

Trig Basic · 3.1

Reasoning

Use the displayed relationship within its stated domain.

$$a^2 + b^2 = c^2, \quad \tan \theta = \frac{\text{opposite}}{\text{adjacent}}$$

Trig Basic · 3.2

Reasoning

Check the result against the starting quantities. Substitute into the original relation, or compare the graph and numerical answer where appropriate.

Trig Basic · 3.3

Reasoning

The ladder length is $c = \sqrt{3^2 + 4^2} = 5$ m. Its angle to the ground satisfies $\tan\theta = 4/3$, so $\theta \approx 53.1^\circ$. With two sides 6 and 8 enclosing 60° , $c^2 = 6^2 + 8^2 - 2 \times 6 \times 8 \cos 60^\circ = 52$.

Trig Basic · 4.1

Reasoning

Label sides relative to the chosen angle. Pythagoras needs a right angle. A calculator angle mode error can produce a plausible but wrong result. Keep unrounded values for later steps. When a shortcut fails, identify the assumption it breaks. Keep an exact value until the requested final rounding.

Trig Basic · 4.2

Reasoning

Pythagoras applies to every triangle, including triangles without a right angle. This claim is false. Explain which definition or assumption it violates.

Trig Basic · 5.1

Reasoning

Use a plan or elevation for a three-dimensional problem before applying a triangle rule. Explain why the chosen triangle contains the required length or angle. A complete solution gives the mathematical result and explains what it means. Check that it is possible in the stated context.

Trig Basic · 6.1

Reasoning

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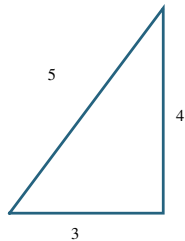
Trig Basic · 6.2

Reasoning

The side opposite the right angle in a right-angled triangle. Choose the relationship, show the method, check its assumptions and interpret the result.

Trig Basic · diagram

Label the known sides before choosing a rule



- Original teaching diagram: Right triangles and non-right triangles
- Use the labels and the stated model together.

Trig Basic · original transfer

Your turn

A triangle has sides $a=7$, $b=10$ and angle $A=30^\circ$. Determine how many triangles are possible and give the possible B angles.

Trig Basic · transfer reasoning

Method and interpretation

Sine rule gives $\sin B = 10 \sin 30^\circ / 7 = 5/7$. $B \approx 45.585^\circ$ or 134.415° ; both leave a positive third angle. The ambiguous SSA case has two solutions, unlike a right-triangle shortcut.

Vectors · 1.1

Reasoning

Walking 4 m east and 3 m north gives a displacement of 5 m, even though the travelled distance is 7 m. This lesson studies resultant : The vector sum representing the combined displacement or force.

Vectors · 2.1

Reasoning

Add corresponding vector components. A displacement from A to B is $\overrightarrow{OB} - \overrightarrow{OA}$. Parallel vectors are scalar multiples. A vector has magnitude and direction; a distance is a scalar. State the allowed inputs and units before calculating. An equation should express the relationship, not just record a calculator entry.

Vectors · 3.1

Reasoning

Use the displayed relationship within its stated domain.

$$\overrightarrow{AB} = \mathbf{b} - \mathbf{a}, \quad |\mathbf{v}| = \sqrt{v_x^2 + v_y^2}$$

Vectors · 3.2

Reasoning

Check the result against the starting quantities. Substitute into the original relation, or compare the graph and numerical answer where appropriate.

Vectors · 3.3

Reasoning

With $a=(4,1)$ and $b=(1,3)$, $a+b=(5,4)$. Their scalar product is $a \cdot b=4 \times 1+1 \times 3=7$. The magnitude of a is $\sqrt{17}$. For $A=(1,2)$, $B=(5,5)$, $AB=(4,3)$ and $|AB|=5$.

Vectors · 4.1

Reasoning

The order of subtraction matters: $\vec{BA} = -\vec{AB}$. Proving parallelism needs a scalar-multiple relation; a sketch alone is insufficient. Negative enlargement reverses position about its centre. When a shortcut fails, identify the assumption it breaks. Keep an exact value until the requested final rounding.

Vectors · 4.2

Reasoning

$\overrightarrow{AB}$ and $\overrightarrow{BA}$ always have the same components. This claim is false. Explain which definition or assumption it violates.

Vectors · 5.1

Reasoning

For a translation, every point uses the same displacement. For advanced line problems, distinguish the position vector from a direction vector and solve parameter equations consistently. A complete solution gives the mathematical result and explains what it means. Check that it is possible in the stated context.

Vectors · 6.1

Reasoning

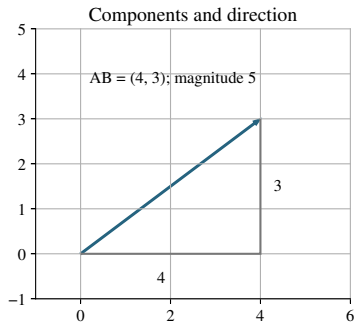
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Vectors · 6.2

Reasoning

The vector sum representing the combined displacement or force. Choose the relationship, show the method, check its assumptions and interpret the result.

Vectors · diagram



- Original teaching diagram: Vectors and transformation geometry
- Use the labels and the stated model together.

Vectors · original transfer

Your turn

Points $A=(1, 2, 0)$, $B=(3, 2, 1)$, $C=(1, 5, 0)$. Find $\overrightarrow{AB} \cdot \overrightarrow{AC}$ and decide whether the angle at A is right; distinguish a zero vector exception.

Vectors · transfer reasoning

Method and interpretation

$\overrightarrow{AB} = (2, 0, 1)$, $\overrightarrow{AC} = (0, 3, 0)$, dot 0. Both nonzero, so angle $\pi/2$. A zero dot product involving a zero vector would not define an angle.

Check yourself

- Explain scale factor using the stated model.
- Explain hypotenuse using the stated model.
- Change one value in the original transfer; explain which assumption still matters.