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Similarity: Problems Involving Right Angles

Special Right Triangles

A right triangle is any triangle composed of a 90 degree angle and two complimentary angles. As you have most likely learned, the sides of a triangle can be compared using trigonometric ratios (sine, cosine, tangent). For special right triangles, we can predict these constant ratios based on the following data:

Special Triangle	sin *A*	cos *A*
45-45-90	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{2}}{2}$
30-60-90	$\sin 30 = \frac{1}{2}$ $\sin 60 = \sqrt{3}/2$	$\cos 30 = \sqrt{3}/2$ $\cos 60 = \frac{1}{2}$

If the angle is unknown, use the inverse trigonometric function, listed here:

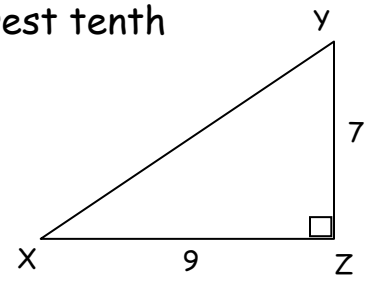
Inverse Trigonometric Functions

If $\sin A = x$, then $\sin^{-1} x = m\angle A$

If $\cos A = x$, then $\cos^{-1} x = m\angle A$

If $\tan A = x$, then $\tan^{-1} x = m\angle A$

Example: Find the unknown measures. Round to the nearest tenth degree or angle.



Step 1: Use the Pythagorean Theorem.

$XY^2 = XZ^2 + YZ^2$

$XY^2 = 7^2 + 9^2$

$XY^2 = 130$

$XY \approx 11.4$

Step2: Use trigonometric ratios to find $m\angle X$ and $m\angle Y$

$m\angle X = \tan^{-1}(7/9) \approx 37.9$

$m\angle X = 90 - 37.9 = 52.1$

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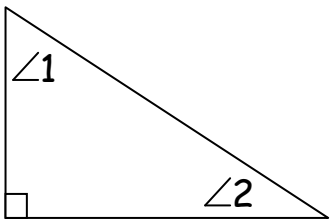
1-4. Given the trigonometric ratios, identify which is $\angle A$.



1. $\tan A = {}^{5}/_{12}$

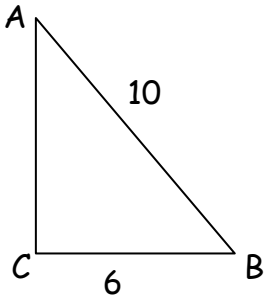
2. $\tan A = 2.4$

3. $\cos A = {}^{5}/_{13}$

4. $\sin A = {}^{5}/_{13}$

5-8. Identify the missing measurements.

5.



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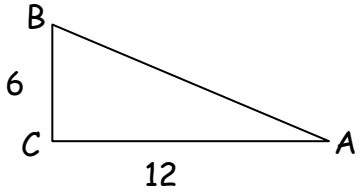

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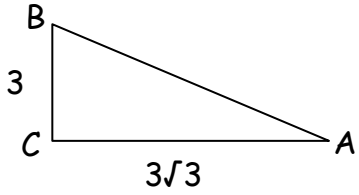

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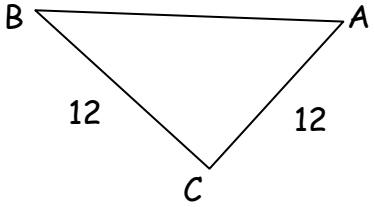


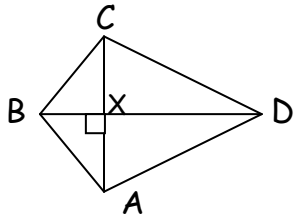
9-11. Complete each statement.

9. $\sin^{-1}(\_\_\_) \approx 18^{\circ}$

10. $\tan \_\_\_ \approx 3.5^{\circ}$

11. $\_\_\_^{-1}\ 0.8 = 37^{\circ}$

12. A kite maker is assembling kite X so that BD bisects CA. BX is half the length of XD. Determine whether $\Delta AXB \sim \Delta CXB$.
Defend your answer.



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Answer Key

Similarity: Problems Involving Right Triangles

1. $\angle 2$
2. $\angle 1$
3. $\angle 1$
4. $\angle 2$
5. 8; $\angle A \approx 36.9$; $\angle B \approx 53.1$
6. $6\sqrt{5}$; $\angle A \approx 26.6$; $\angle B \approx 63.4$
7. 6; $\angle A = 30$; $\angle B = 60$
8. $12\sqrt{2}$; $\angle A = 45$; $\angle B = 45$
9. 0.31
10. 74°
11. cos
12. Yes. SAS Similarity Theorem