Lesson 9.3 Trigonometry

Tuesday, March 11, 2025 10:45 PM

Click link below for interactive Pear Deck PowerPoint Lesson:

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Lesson 9.3 Trigonomet...

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Workbook pg 143-147

MA.912.T.1.1

Define trigonometric ratios for acute angles in right triangles.

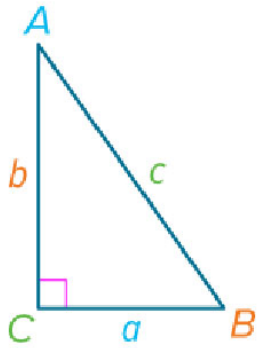
Content Objective

Students will solve problems using the trigonometric ratios and inverse trigonometric ratios for acute angles.

Learn

Key Concept: Trigonometric Ratios

Sine: If $\triangle ABC$ is a right triangle, then the sine of each acute angle in $\triangle ABC$ is the ratio of the length of the leg opposite that angle (opp) to the length of the hypotenuse (hyp).

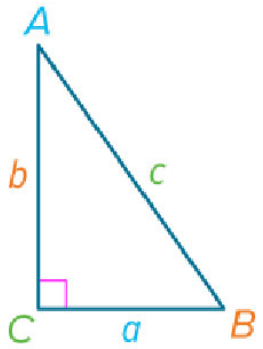


$$\sin A = \frac{\text{opp}}{\text{hyp}} \text{ or } \frac{a}{c};\ \sin B = \frac{\text{opp}}{\text{hyp}} \text{ or } \frac{b}{c}$$

Learn

Trigonometry

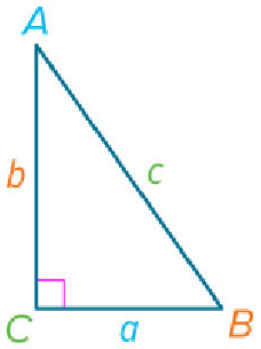
Cosine: If $\triangle ABC$ is a right triangle, then the cosine of each acute angle in $\triangle ABC$ is the ratio of the length of the leg adjacent to that angle (adj) to the length of the hypotenuse (hyp).



$$\cos A = \frac{\text{adj}}{\text{hyp}} \text{ or } \frac{b}{c};\ \cos B = \frac{\text{adj}}{\text{hyp}} \text{ or } \frac{a}{c}$$

Learn
Trigonometry

Tangent: If $\triangle ABC$ is a right triangle, then the tangent of each acute angle in $\triangle ABC$ is the ratio of the length of the leg opposite that angle (opp) to the length of the leg adjacent to that angle (adj).



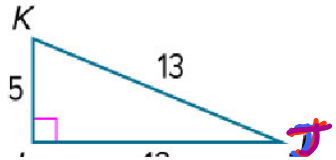
$$\tan A = \frac{\text{opp}}{\text{adj}} \text{ or } \frac{a}{b}; \tan B = \frac{\text{opp}}{\text{adj}} \text{ or } \frac{b}{a}$$

Example 1
Find Trigonometric Ratios

SOH CAH TOA

Find sin *J*, cos *J*, tan *J*, sin *K*, cos *K*, and tan *K*. Express each ratio as a fraction and as a decimal to the nearest hundredth.

Sin = opp/hyp Sin J 5/13 = 0.38 Sin K = 12/13 0.92



cos = adj/hyp cos J 12/13 = 0.92 cos K 5/13 = 0.38

tan = opp/adj Tan J 5/12 = 0.42 tan K 12/5 = 2.4

Example 3

Estimate Measures by Using Trigonometry

SOH CAH TOA

ACCESSIBILITY Mathias builds a ramp so his sister can access the back door of their house. The 12-foot ramp to the house slopes upward from the ground at a 4° angle. What is the horizontal distance between the foot of the ramp and the house? What is the height of the ramp?

$\sin 4 = \frac{y}{12}$

$12(\sin 4) = y$

$0.84 = y$

Adj

$\cos 4 = \frac{x}{12}$ (Adj / Hyp)

$(12)(\cos 4) = x$

$11.97 = x$

Learn

Inverse Trigonometric Ratios

Key Concept: Inverse Trigonometric Ratios

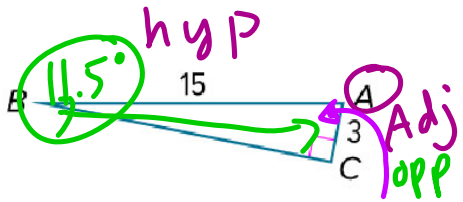
Inverse Sine	Inverse Cosine	Inverse Tangent
Words		
If $\angle A$ is an acute angle and the sine of A is x, then the **inverse sine** of x is the measure of $\angle A$.	If $\angle A$ is an acute angle and the cosine of A is x, then the **inverse cosine** of x is the measure of $\angle A$.	If $\angle A$ is an acute angle and the tangent of A is x, then the **inverse tangent** of x is the measure of $\angle A$.
Symbols		
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 4

Find Angle Measures by Using Inverse Trigonometric Ratios

SOH CAH TOA

Use a calculator to find $m\angle A$ to the nearest tenth.



$\cos = \frac{Adj}{Hyp}$

$\cos^{-1} \frac{3}{15} = 78.5°$

$\angle B$

$\sin^{-1} = \frac{3}{15} = 11.5°$

Example 4

Find Angle Measures by Using Inverse Trigonometric Ratios

Check

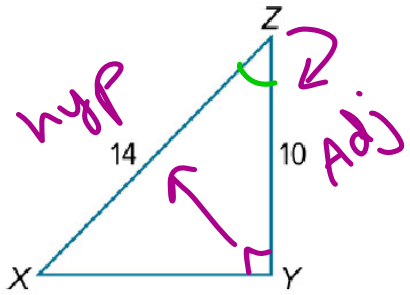
Use a calculator to find $m\angle Z$ to the nearest tenth.

SOH CAH TOA

$\cos = \frac{Adj}{Hyp}$

$\cos^{-1} = \frac{10}{14} = 44.4^\circ$

$\angle Z = 44.4^\circ$

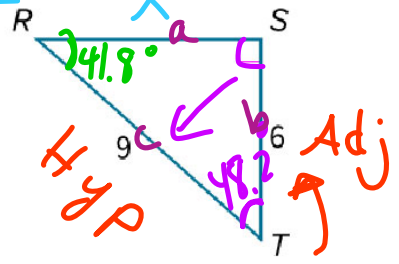


Example 5

Solve a Right Triangle

SOH CAH TOA

Solve the right triangle. Round side and angle measures to the nearest tenth.



$\angle T$ $\cos^{-1}$ $\frac{6}{9}$ $\frac{Adj}{Hyp} = 48.2^\circ$

2nd Button

$\angle R$ $\sin^{-1}$ $\frac{6}{9}$ $\frac{opp}{Hyp} = 41.8^\circ$

2nd Button

$6(\tan 48.2^\circ = \frac{x}{6})6$ $\frac{opp}{Adj}$

$(\angle T)$

$6(\tan 48.2^\circ) = x$

$(6.71 = x)$ RS

$a^2+b^2=c^2$ $x^2+6^2=9^2$ $x+36=81$ $x^2=45$ $x=\sqrt{45}=6.71$ $\frac{\sqrt{45}}{\sqrt{9}\cdot\sqrt{5}}=3\sqrt{5}$

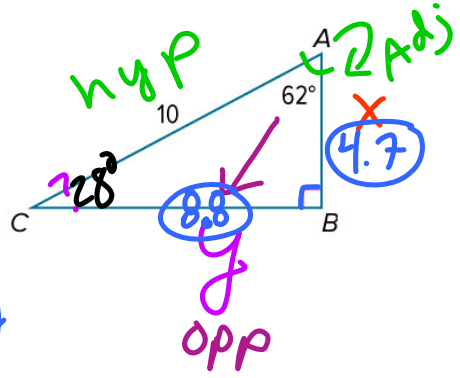
Example 5

Solve a Right Triangle

SOH CAH TOA

Check

Solve the right triangle by finding $m\angle C$, AB, and BC. Round side and angle measures to the nearest tenth.



$\overline{AB}=10(\cos 62=\frac{x}{10})10$ Adj/Hyp $10(\cos 62)=x$ $4.7=x$

$\overline{BC}=10(\sin 62=\frac{y}{10})10$ Opp/Hyp $10(\sin 62)=y$ $8.8=y$

$\angle C=\cos^{-1}=\frac{8.8}{10}$ Adj/Hyp $\angle C=28^\circ$