Name Student AMDG Ms. Kresovic

Adv Geo 8 9.9: Introduction to Trigonometry Monday, March 24, 2014

Objective

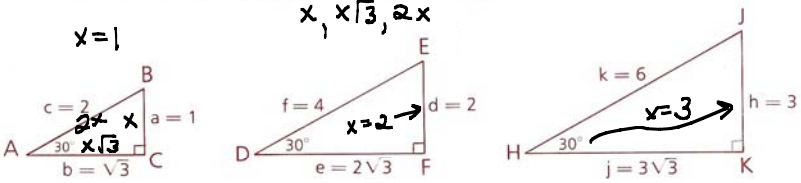
After studying this section, you will be able to

- Understand three basic trigonometric relationships SOH CAH TOA

This section presents the three basic trigonometric ratios ***sine***, ***cosine***, and ***tangent***. The concept of similar triangles and the Pythagorean Theorem can be used to develop the ***trigonometry of right triangles.*** sin∠A cos∠A tan∠A

Consider the following 30°-60°-90° triangles.

x=1 x, x√3, 2x



Compare the length of the leg opposite the 30° angle with the length of the hypotenuse in each triangle. $\frac{Opp}{Hyp} \Rightarrow \sin 30° = \frac{1}{2}$

In △ABC, $\frac{a}{c} = \frac{1}{2} = 0.5$. In △DEF, $\frac{d}{f} = \frac{2}{4} = 0.5$. In △HJK, $\frac{h}{k} = \frac{3}{6} = 0.5$.

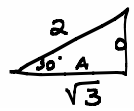
$\frac{1}{2}$ $\frac{3}{6} = \frac{1}{2}$

If you think about similar triangles, you will see that in every 30°-60°-90° triangle,

$$\sin 30° = \frac{\text{leg opposite } 30° \angle}{\text{hypotenuse}} = \frac{1}{2}$$

For each triangle shown, verify that $\frac{\text{leg adjacent to } 30° \angle}{\text{hypotenuse}} = \frac{\sqrt{3}}{2}$. $= \cos 30°$

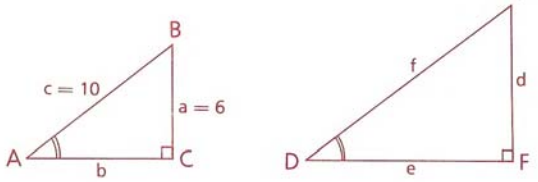
For each triangle shown, find the ratio $\frac{\text{leg opposite } 30° \angle}{\text{leg adjacent to } 30° \angle}$.



$1 = \frac{1}{\sqrt{3}} \frac{\sqrt{3}}{\sqrt{3}} = \frac{\sqrt{3}}{3}$

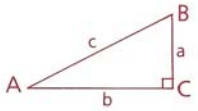
In △ABC and △DEF,

$\frac{a}{c} = \frac{d}{f} = \frac{6}{10} = \frac{3}{5}$



Engineers and scientists have found it convenient to formalize these relationships by naming the ratios of sides. You should memorize these three basic ratios.

Definition **Three Trigonometric Ratios**



sine of $\angle A = \sin \angle A = \frac{\text{opposite leg}}{\text{hypotenuse}}$ SOH

cosine of $\angle A = \cos \angle A = \frac{\text{adjacent leg}}{\text{hypotenuse}}$ CAH

tangent of $\angle A = \tan \angle A = \frac{\text{opposite leg}}{\text{adjacent leg}}$ TOA

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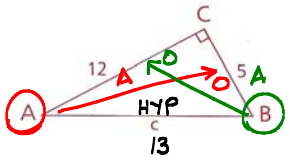
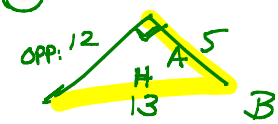
Class Examples

Problem 1 Find: **a** $\cos \angle A$ **b** $\tan \angle B$



TOA

$\tan \angle B = \frac{12}{5}$

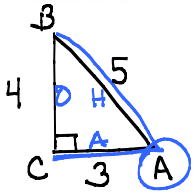


$\cos \angle A = \frac{12}{13}$

CAH

SOH CAH TOA

Problem 2 Find the three trigonometric ratios for $\angle A$ and $\angle B$.



$\sin \angle A = \frac{4}{5}$

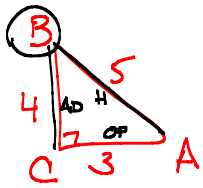
$\cos \angle A = \frac{3}{5}$

$\tan \angle A = \frac{4}{3}$

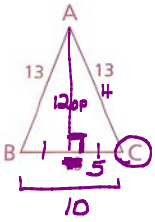
$\sin \angle B = \frac{3}{5}$

$\cos \angle B = \frac{4}{5}$

$\tan \angle B = \frac{3}{4}$



Problem 3 $\triangle ABC$ is an isosceles triangle as marked. Find $\sin \angle C$.

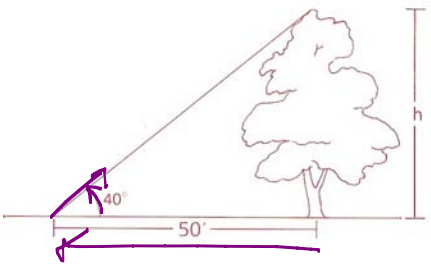


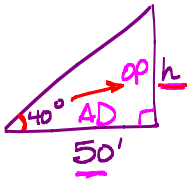
(5, 12, 13)

$\sin \angle C = \frac{12}{13}$

Problem 4 Use the fact that $\tan 40° \approx 0.8391$ to find the height of the tree to the nearest foot.

SOH CAH TOA





$\tan 40° = \frac{h}{50}$

$0.8391 = \frac{h}{50}$

$50(.8391) = h$

$41.955 = h$

$42 \text{ ft} \approx h$

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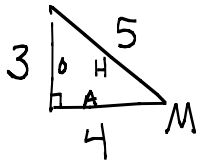
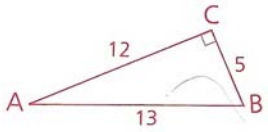
Homework

5 If $\tan \angle M = \frac{3}{4}$, find $\cos \angle M$. (Hint: Start by drawing the triangle.)

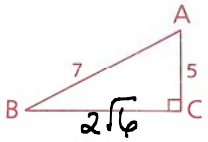


6 Using the figure as marked, name each missing angle.



a $\frac{5}{12} = \tan \angle$? **b** $\frac{12}{13} = \cos \angle$? **c** $\frac{5}{13} = \sin \angle$?

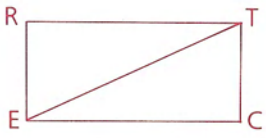
7 Find each quantity.



$BC^2 + 5^2 = 7^2$
$BC = \sqrt{49-25} = \sqrt{24} = \sqrt{4}\cdot\sqrt{6} = 2\sqrt{6}$

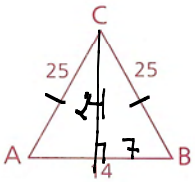
a BC **b** $\sin \angle A$ **c** $\tan \angle B$

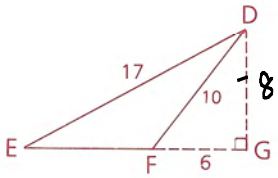
8 Given: RECT is a rectangle.
ET = 26, RT = 24
Find: **a** $\sin \angle RET$ **b** $\cos \angle RET$



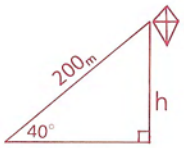
Problem Set B

9 Using the given figures, find
a $\cos \angle A$
b $\sin \angle E$
c $\sin \angle DFG$



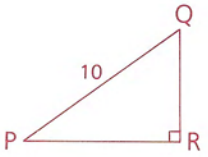


10 Use the fact that $\sin 40° \approx 0.6428$ to find the height of the kite to the nearest meter.

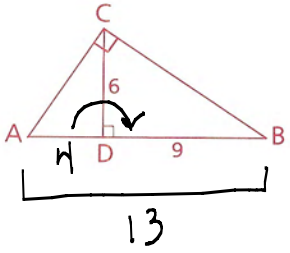


11 **a** If $\tan \angle A = 1$, find $m\angle A$.
b If $\sin \angle P = 0.5$, find $m\angle P$.

12 Given: $\sin \angle P = \frac{3}{5}$, PQ = 10
Find: $\cos \angle P$



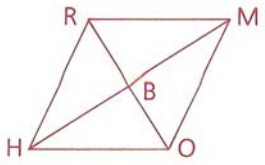
13 Using the figure, find
a $\tan \angle ACD$
b $\sin \angle A$



$\frac{AD}{6} = \frac{6}{9} \rightarrow 9(AD) = 36 \rightarrow AD = 4$

Problem Set B, *continued*

14 Given: RHOM is a rhombus.
RO = 18, HM = 24
Find: **a** cos ∠BRM **b** tan ∠BHO

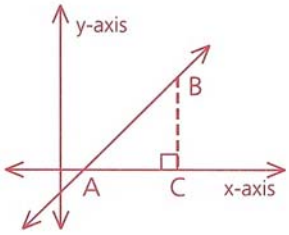


15 Given a trapezoid with sides 5, 10, 17, and 10, find the sine of one of the acute angles.

16 Given △ABC with ∠C = 90°, indicate whether each statement is true Always (A), Sometimes (S), or Never (N).
a sin ∠A = cos ∠B **b** sin ∠A = tan ∠A **c** sin ∠A = cos ∠

17 If △EQU is equilateral and △RAT is a right triangle with RA = 2, RT = 1, and ∠T = 90°, show that sin ∠E = cos ∠A.

18 If the slope of $\overleftrightarrow{AB}$ is $\frac{5}{8}$, find the tangent of ∠BAC.



Problem Set C C → Challenge

19 Use the definitions of the trigonometric ratios to verify the following relationships, given △ABC in which ∠C = 90°.

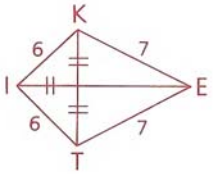
a $(\sin \angle A)^2 + (\cos \angle A)^2 = 1$

b $\frac{a}{\sin \angle A} = \frac{b}{\sin \angle B}$

c $\frac{\sin \angle A}{\cos \angle A} = \tan \angle A$

d $\sin \angle A = \cos (90° - \angle A)$

22 Given: KITE is a kite with sides as marked.
Find: tan ∠KEI



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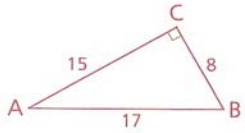
Classwork

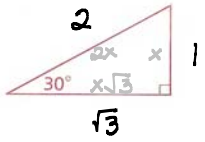
1 Find each ratio.

a $\sin \angle A$
b $\cos \angle A$
c $\tan \angle A$
d $\sin \angle B$
e $\cos \angle B$
f $\tan \angle B$



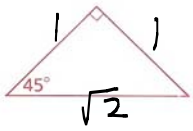
2 Find each ratio.

a $\sin 30° = \frac{x}{2x} = \frac{1}{2}$
b $\cos 30°$
c $\tan 30°$
d $\sin 60°$
e $\cos 60°$
f $\tan 60°$



3 Find each ratio.

a $\sin 45°$
b $\cos 45°$
c $\tan 45°$

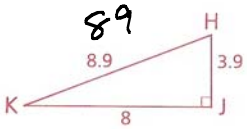


$\frac{1}{\sqrt{2}} \frac{\sqrt{2}}{\sqrt{2}} = \frac{\sqrt{2}}{2}$

4 Find each ratio.

a $\cos \angle H$
b $\tan \angle K$

89



39

80

1a	$8/17$
1b	$15/17$
1c	$8/15$
1d	$15/17$
1e	$8/17$
1f	$15/8$
2a	$1/2$
2b	$\sqrt{3}/2$
2c	$\sqrt{3}/3$
2d	$\sqrt{3}/2$
2e	$1/2$
2f	$\sqrt{3}$
3a	$\sqrt{2}/2$
3b	$\sqrt{2}/2$
3c	1
4a	$39/89$
4b	$39/80$