

5.2 Right Triangle Trigonometry

GOALS:

1. Understand and use the Pythagorean Theorem
2. Define trig functions for a right triangle: **soh cah toa**
3. Find values of all the trig functions for a triangle, given any 2 parts of the triangle.
4. Learn how to recognize the special triangles:
 $30^\circ, 60^\circ, 90^\circ$ $45^\circ, 45^\circ, 90^\circ$
5. Evaluate the special triangles using:
 $\sin 30^\circ = 1/2$ $\tan 45^\circ = 1$
6. Find trig functions of an angle given another trig function
7. Learn the Pythagorean Identities; use to simplify

Study 5.2 CVC # 1-7; # 1, 3, 7 -13, 17 - 31;
 37, 39, 45, 49, 51, 55, 59, 63, 65, 73

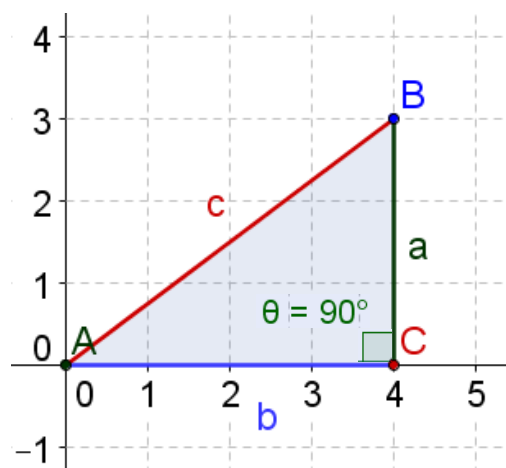
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5.2 Right Triangle Trigonometry

Pythagorean Theorem: $c^2 = a^2 + b^2$

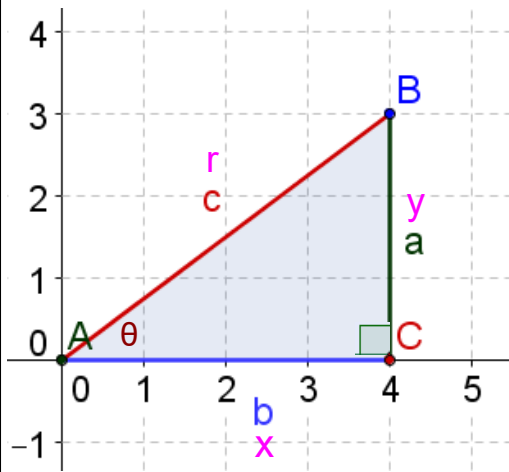


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5.2 Right Triangle Trigonometry



Definitions of Trig. Functions

$\sin \theta = \frac{y}{r}$	$\csc \theta = \frac{r}{y}$
$\cos \theta = \frac{x}{r}$	$\sec \theta = \frac{r}{x}$
$\tan \theta = \frac{y}{x}$	$\cot \theta = \frac{x}{y}$

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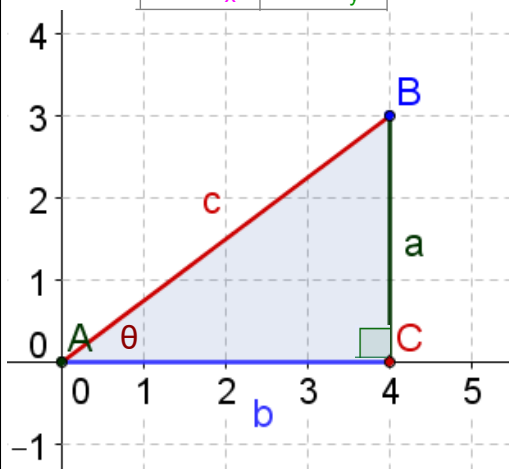
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5.2 Right Triangle Trigonometry

Definitions of Trig. Functions

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$\tan \theta = \frac{y}{x}$	$\cot \theta = \frac{x}{y}$



Definitions of Trig. Functions

$\sin \theta = \frac{\text{opp}}{\text{hyp}}$
$\cos \theta = \frac{\text{adj}}{\text{hyp}}$
$\tan \theta = \frac{\text{opp}}{\text{adj}}$

SOH CAH TOA

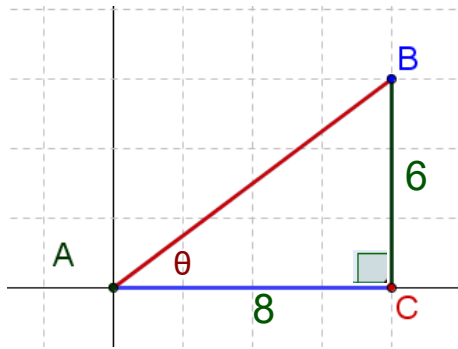
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5.2 Right Triangle Trigonometry

G: Right Triangle below F: value of all 6 trig functions



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$\sin \theta = \underline{\hspace{1cm}}$	$\csc \theta = \underline{\hspace{1cm}}$
$\cos \theta = \underline{\hspace{1cm}}$	$\sec \theta = \underline{\hspace{1cm}}$
$\tan \theta = \underline{\hspace{1cm}}$	$\cot \theta = \underline{\hspace{1cm}}$

Definitions of Trig. Functions

$\sin \theta = \frac{\text{opp}}{\text{hyp}}$
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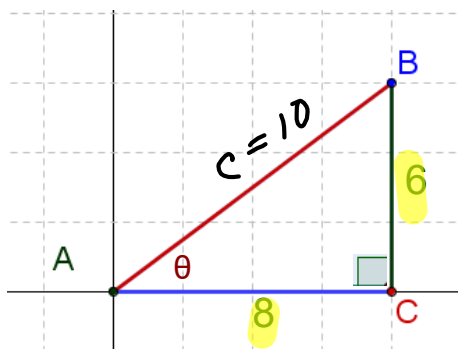
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G: Right Triangle below F: value of all 6 trig functions



$$\begin{aligned}
 c^2 &= a^2 + b^2 \\
 &= 6^2 + 8^2 \\
 &= 36 + 64 = 100 \\
 c &= 10
 \end{aligned}$$

SOH CAH TOA

$\sin \theta = \frac{6}{10} = \frac{3}{5}$	$\csc \theta = \frac{5}{3}$
$\cos \theta = \frac{8}{10} = \frac{4}{5}$	$\sec \theta = \frac{5}{4}$
$\tan \theta = \frac{6}{8} = \frac{3}{4}$	$\cot \theta = \frac{4}{3}$

Definitions of Trig. Functions

$\sin \theta = \frac{\text{opp}}{\text{hyp}}$
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5.2 Right Triangle Trigonometry SOH CAH TOA

G: Right Triangle below F: value of all 6 trig functions

$\sin \theta = \underline{\hspace{1cm}}$	$\csc \theta = \underline{\hspace{1cm}}$
$\cos \theta = \underline{\hspace{1cm}}$	$\sec \theta = \underline{\hspace{1cm}}$
$\tan \theta = \underline{\hspace{1cm}}$	$\cot \theta = \underline{\hspace{1cm}}$

Definitions of Trig. Functions

$\sin \theta = \frac{\text{opp}}{\text{hyp}}$
$\cos \theta = \frac{\text{adj}}{\text{hyp}}$
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5.2 Right Triangle Trigonometry

G: Right Triangle below F: value of all 6 trig functions

$$c^2 = a^2 + b^2$$

$$41^2 = a^2 + 40^2$$

$$a^2 = 41^2 - 40^2$$

$$= 1681 - 1600 = 81$$

$$\therefore a = 9$$

$\sin \theta = \frac{9}{41}$	$\csc \theta = \frac{41}{9}$
$\cos \theta = \frac{40}{41}$	$\sec \theta = \frac{41}{40}$
$\tan \theta = \frac{9}{40}$	$\cot \theta = \frac{40}{9}$

Definitions of Trig. Functions

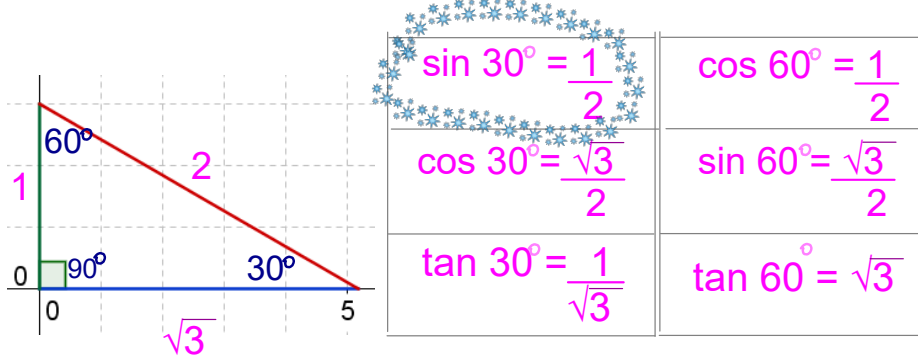
$\sin \theta = \frac{\text{opp}}{\text{hyp}}$
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5.2 Right Triangle Trigonometry

Special Triangle: 30°, 60°, 90°



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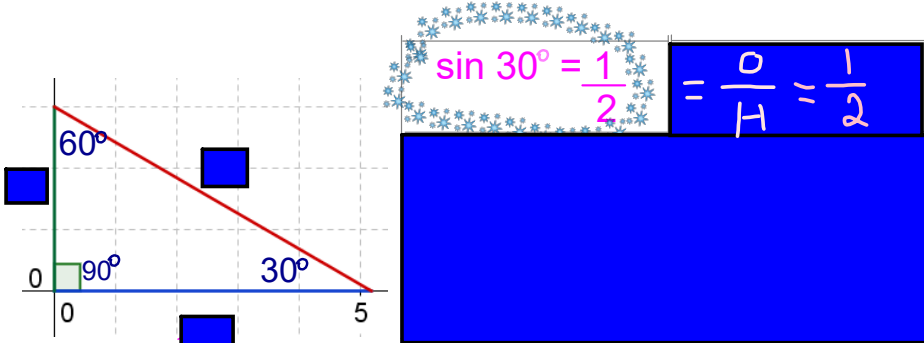
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$\cos \theta = \frac{x}{r}$	$\sec \theta = \frac{r}{x}$
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5.2 Right Triangle Trigonometry

Special Triangle: 30°, 60°, 90°



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Definitions of Trig. Functions

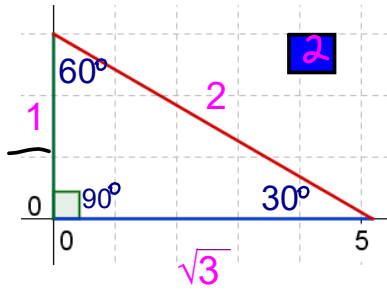
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5.2 Right Triangle Trigonometry

Special Triangle: 30°, 60°, 90°



$\sin 30^\circ = \frac{1}{2}$	$\cos 60^\circ = \frac{1}{2}$
$\cos 30^\circ = \frac{\sqrt{3}}{2}$	$\sin 60^\circ = \frac{\sqrt{3}}{2}$
$\tan 30^\circ = \frac{1}{\sqrt{3}}$	$\tan 60^\circ = \sqrt{3}$

$2^2 = 1^2 + x^2$
 $x^2 = 4 - 1 = 3$
 $x = \sqrt{3}$

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Definitions of Trig. Functions

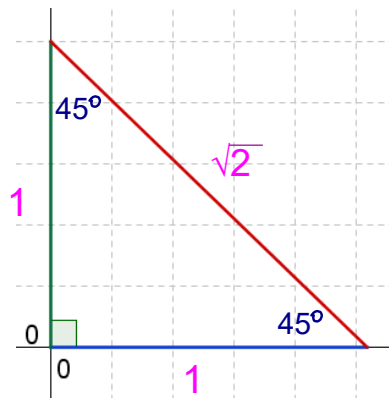
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5.2 Right Triangle Trigonometry

Special Triangle: 45°, 45°, 90°



$\sin 45^\circ = \frac{1}{\sqrt{2}}$
$\cos 45^\circ = \frac{1}{\sqrt{2}}$
$\tan 45^\circ = 1$

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Definitions of Trig. Functions

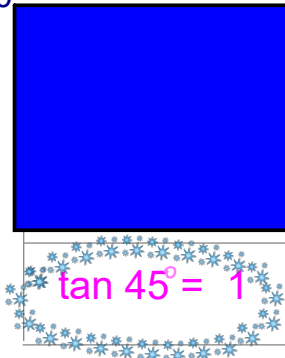
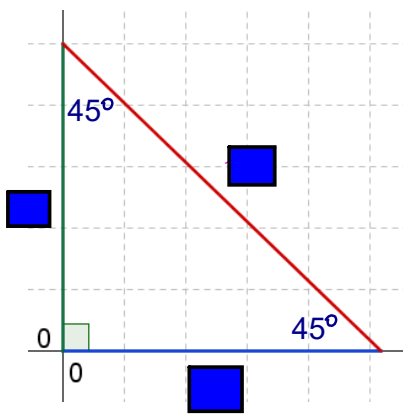
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$\tan \theta = \frac{y}{x}$	$\cot \theta = \frac{x}{y}$

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5.2 Right Triangle Trigonometry

Special Triangle: $45^\circ, 45^\circ, 90^\circ$



$= \frac{A}{O} = \frac{1}{1}$

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Definitions of Trig. Functions

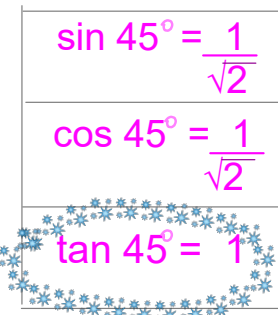
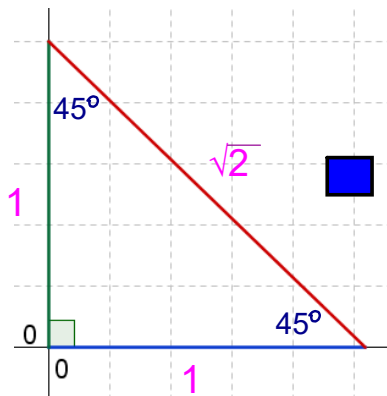
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5.2 Right Triangle Trigonometry

Special Triangle: $45^\circ, 45^\circ, 90^\circ$



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Definitions of Trig. Functions

$\sin \theta = \frac{y}{r}$	$\csc \theta = \frac{r}{y}$
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Evaluate: $\tan \frac{\pi}{4} + \csc \frac{\pi}{6}$

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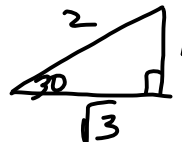
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5.2 Right Triangle Trigonometry

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Evaluate: $\tan \frac{\pi}{4} + \csc \frac{\pi}{6} = \tan 45^\circ + \csc 30^\circ$

$$1 + 2 = 3$$



$$\sin 30^\circ = \frac{1}{2}$$

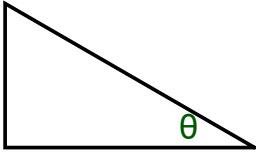
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G: $\sin \theta = \frac{\sqrt{21}}{5}$ F: $\cos \theta$



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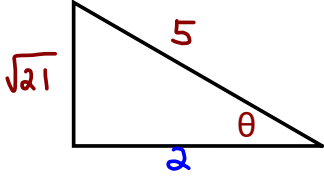
40.
44
46
56
60

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G: $\sin \theta = \frac{\sqrt{21}}{5}$ F: $\cos \theta$

① $\sin \theta = \frac{\sqrt{21}}{5} = \frac{\text{OPP}}{\text{hyp}}$

② 

③ $a^2 + b^2 = c^2$
 $(\sqrt{21})^2 + b^2 = 5^2$
 $21 + b^2 = 25$
 $b^2 = 4$
 $b = \pm 2 \therefore b = 2$

④ $\cos \theta = \frac{\text{adj}}{\text{hyp}}$
 $= \frac{2}{5}$

re) 17

40.
44
46
56
60

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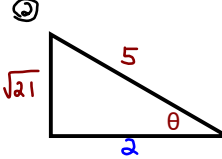
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G: $\sin \theta = \frac{\sqrt{21}}{5}$ F: $\cos \theta$

① $\sin \theta = \frac{\sqrt{21}}{5} = \frac{\text{opp}}{\text{hyp}}$

③ $a^2 + b^2 = c^2$
 $(\sqrt{21})^2 + b^2 = 5^2$
 $21 + b^2 = 25$
 $b^2 = 4$
 $b = \pm 2 \therefore b = 2$

④ $\cos \theta = \frac{\text{adj}}{\text{hyp}} = \frac{2}{5}$



TEXAS INSTRUMENTS TI-83 Plus

$\sin^{-1}(\sqrt{21}/5)$
1.159279481
 $\cos(\text{Ans})$
.4

radian mode

TEXAS INSTRUMENTS TI-83 Plus

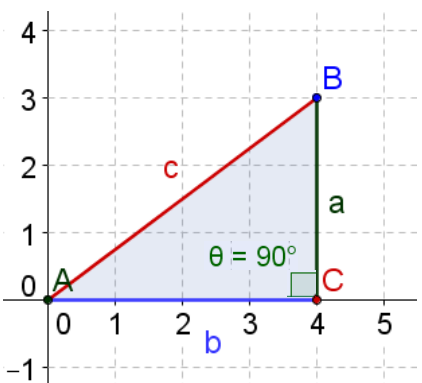
$\sin^{-1}(\sqrt{21}/5)$
66.42182152
 $\cos(\text{Ans})$
.4

degree mode

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5.2 Right Triangle Trigonometry

Pythagorean Theorem: $c^2 = a^2 + b^2$



$$\frac{c^2}{c^2} = \frac{a^2}{c^2} + \frac{b^2}{c^2}$$

$$1 = \left(\frac{a}{c}\right)^2 + \left(\frac{b}{c}\right)^2$$

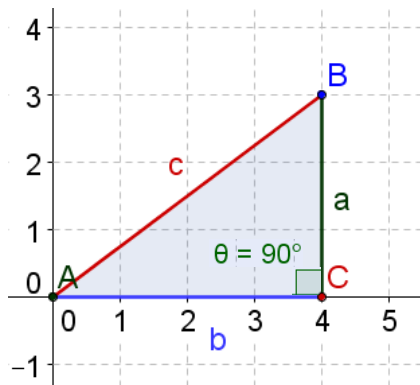
$$1 = (\sin \theta)^2 + (\cos \theta)^2$$

$$1 = \sin^2 \theta + \cos^2 \theta$$

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5.2 Right Triangle Trigonometry

Pythagorean Identity: $\sin^2 \theta + \cos^2 \theta = 1$



Can this identity be used to generate other identities involving $\tan \theta$, $\sec \theta$, $\csc \theta$, $\cot \theta$?

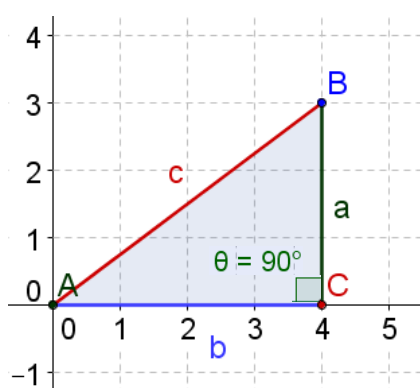
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Pythagorean Identities: $\sin^2 \theta + \cos^2 \theta = 1$



$$\frac{\sin^2 \theta}{\cos^2 \theta} + \frac{\cos^2 \theta}{\cos^2 \theta} = \frac{1}{\cos^2 \theta}$$

$$\tan^2 \theta + 1 = \sec^2 \theta$$

$$\frac{\sin^2 \theta}{\sin^2 \theta} + \frac{\cos^2 \theta}{\sin^2 \theta} = \frac{1}{\sin^2 \theta}$$

$$1 + \cot^2 \theta = \csc^2 \theta$$

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Evaluate:

$$\sin^2 \frac{\pi}{10} + \cos^2 \frac{\pi}{10}$$

Pythagorean Identities:

$$\sin^2 \theta + \cos^2 \theta = 1$$

$$\tan^2 \theta + 1 = \sec^2 \theta$$

$$1 + \cot^2 \theta = \csc^2 \theta$$

Evaluate:

$$\csc^2 63^\circ - \cot^2 63^\circ$$

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5.2 Right Triangle Trigonometry

Evaluate:

$$\sin^2 \frac{\pi}{10} + \cos^2 \frac{\pi}{10} = 1$$

Pythagorean Identities:

$$\sin^2 \theta + \cos^2 \theta = 1$$

$$\tan^2 \theta + 1 = \sec^2 \theta$$

$$1 + \cot^2 \theta = \csc^2 \theta$$

Evaluate:

$$\csc^2 63^\circ - \cot^2 63^\circ$$

$$1 + \cot^2 63^\circ - \cot^2 63^\circ$$

$$= 1$$

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Attachments

basic_angles.mp4

trig_functions_unitCircle.mp4