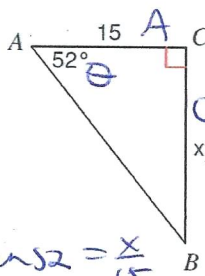
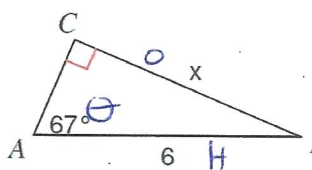
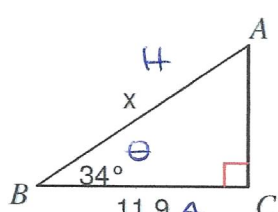
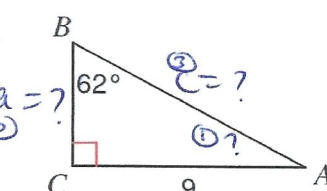


## 6.3 – Inverse Trigonometric Ratios in Right Triangles

### Before Getting Started – Let's Review: Trigonometric Ratios

<p>1.) Find side x.</p>  <p><math>\tan 52 = \frac{x}{15}</math>  <math>x = 15 \tan 52</math>  <math>\boxed{x = 19.2}</math></p>	<p>2.) Find side x.</p>  <p><math>\sin 67 = \frac{x}{6}</math>  <math>x = 6 \sin 67</math>  <math>\boxed{x = 5.5}</math></p>	<p>3.) Find side x.</p>  <p><math>\cos 34 = \frac{11.9}{x}</math>  <math>x = \frac{11.9}{\cos 34}</math>  <math>\boxed{x = 14.4}</math></p>	<p>4.) Solve triangle ABC.</p>  <p>① <math>A = 90 - 62</math>    ② <math>\tan 62 = \frac{9}{a}</math>  <math>\boxed{A = 28^\circ}</math>    <math>a = \frac{9}{\tan 62}</math>          ③ <math>4.8^2 + 9^2 = c^2</math>    <math>\boxed{a = 4.8}</math>  <math>c^2 = 104.64</math>  <math>\boxed{c = 10.2}</math></p>
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### Inverse Trigonometric Ratios: Use ONLY when FINDING AN ANGLE MEASUREMENT!!!

Trigonometric Ratios	Inverse Trigonometric Ratios	Calculator Keys
$\sin \theta = \frac{\text{opposite}}{\text{hypotenuse}}$	$\theta = \sin^{-1} \left( \frac{O}{H} \right)$	2nd sin ( $\frac{\sin^{-1}}{\text{arc sin}}$ )
$\cos \theta = \frac{\text{adjacent}}{\text{hypotenuse}}$	$\theta = \cos^{-1} \left( \frac{A}{H} \right)$	2nd cos ( $\frac{\cos^{-1}}{\text{arc cos}}$ )
$\tan \theta = \frac{\text{opposite}}{\text{adjacent}}$	$\theta = \tan^{-1} \left( \frac{O}{A} \right)$	2nd tan ( $\frac{\tan^{-1}}{\text{arc tan}}$ )

### Example 1: Solve each equation by find the value of angle $\theta$ . Round to tenth place.

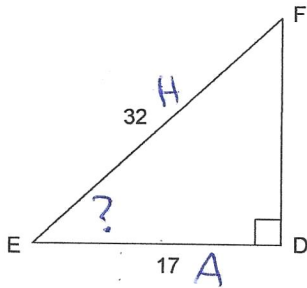
<p>a.) <math>\sin \theta = \frac{\sqrt{3}}{2}</math>  <math>\theta = \sin^{-1} \left( \frac{\sqrt{3}}{2} \right)</math>  <math>\boxed{\theta = 60^\circ}</math></p>	<p>b.) <math>\cos \theta = 0.7498</math>  <math>\theta = \cos^{-1} (0.7498)</math>  <math>\boxed{\theta = 41.4^\circ}</math></p>	<p>c.) <math>\tan \theta = 2</math>  <math>\theta = \tan^{-1} (2)</math>  <math>\boxed{\theta = 63.4^\circ}</math></p>
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### Example 2: Evaluate each expression using the inverse trig ratios' definitions.

<p>a.) <math>\tan \left( \tan^{-1} \frac{6}{4} \right)</math>  <math>= \frac{6}{4}</math>  <math>= \frac{3}{2}</math></p>	<p>b.) <math>\cos (\arcsin 1)</math>  <math>= \cos (\sin^{-1} 1)</math>  <math>= \cos (90^\circ)</math>  <math>= \boxed{0}</math></p>	<p>c.) <math>\sin (\cos^{-1} \frac{\sqrt{3}}{2})</math>  <math>= \sin (30^\circ)</math>  <math>= \boxed{\frac{1}{2}}</math></p>	<p>d.) <math>\tan (\arccos 0)</math>  <math>= \tan (\cos^{-1} 0)</math>  <math>= \tan (90^\circ)</math>  <math>= \boxed{\text{undefined}}</math></p>
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**Example 3: Find the indicated angle. Round to nearest tenth.**

a.) Find angle E.

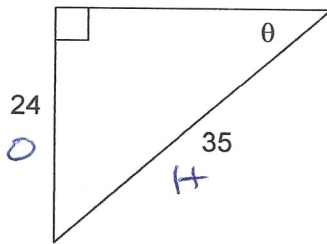


$$\cos E = \frac{17}{32}$$

$$E = \cos^{-1}\left(\frac{17}{32}\right)$$

$$\boxed{E = 57.9^\circ}$$

b.) Find angle  $\theta$ .

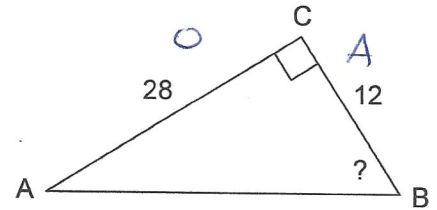


$$\sin \theta = \frac{24}{35}$$

$$\theta = \sin^{-1}\left(\frac{24}{35}\right)$$

$$\boxed{\theta = 43.3^\circ}$$

c.) Find the angle B.



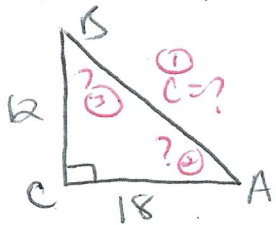
$$\tan B = \frac{28}{12}$$

$$B = \tan^{-1}\left(\frac{28}{12}\right)$$

$$\boxed{B = 66.8^\circ}$$

**Example 4: Solve triangle ABC. Round to tenth place.**

a.)  $a = 12, b = 18$



$$\textcircled{1} 12^2 + 18^2 = c^2$$

$$c^2 = 468$$

$$\boxed{c = 21.6}$$

$$\textcircled{2} \tan A = \frac{12}{18}$$

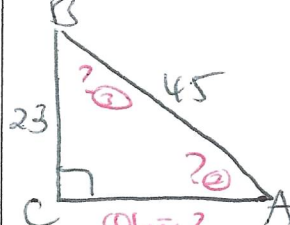
$$A = \tan^{-1}\left(\frac{12}{18}\right)$$

$$\boxed{A = 33.7^\circ}$$

$$\textcircled{3} B = 90 - 33.7$$

$$\boxed{B = 56.3^\circ}$$

b.)  $a = 23, c = 45$



$$\textcircled{1} 23^2 + b^2 = 45^2$$

$$b^2 = 1496$$

$$\boxed{b = 38.7}$$

$$\textcircled{2} \sin A = \frac{23}{45}$$

$$A = \sin^{-1}\left(\frac{23}{45}\right)$$

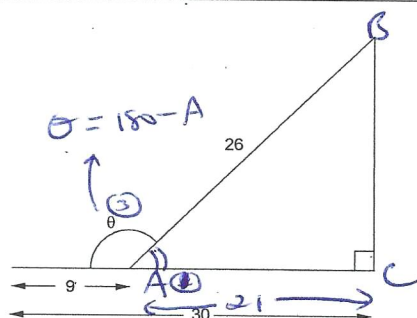
$$\boxed{A = 30.7^\circ}$$

$$\textcircled{3} B = 90 - 30.7$$

$$\boxed{B = 59.3^\circ}$$

**Example 5 – Critical Thinking: Find the value of angle  $\theta$ . Round to tenth place.**

a.)



$$\textcircled{1} \cos A = \frac{21}{26}$$

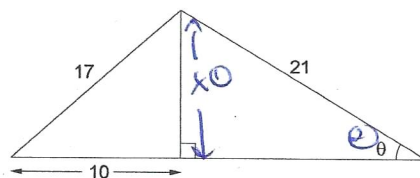
$$A = \cos^{-1}\left(\frac{21}{26}\right)$$

$$A = 36.1^\circ$$

$$\textcircled{2} \theta = 180 - 36.1$$

$$\boxed{\theta = 143.9^\circ}$$

b.)



$$\textcircled{1} 10^2 + x^2 = 17^2$$

$$x^2 = 189$$

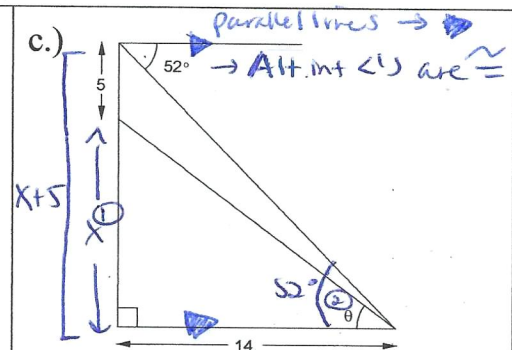
$$x = 13.7$$

$$\textcircled{2} \sin \theta = \frac{13.7}{21}$$

$$\theta = \sin^{-1}\left(\frac{13.7}{21}\right)$$

$$\boxed{\theta = 40.7^\circ}$$

c.)



$$\textcircled{1} \tan 52 = \frac{x+5}{14}$$

$$\frac{x+5}{14} = \tan 52$$

$$x+5 = 14 \tan 52$$

$$x = 12.9$$

$$\textcircled{2} \tan \theta = \frac{12.9}{14}$$

$$\theta = \tan^{-1}\left(\frac{12.9}{14}\right)$$

$$\boxed{\theta = 42.7^\circ}$$