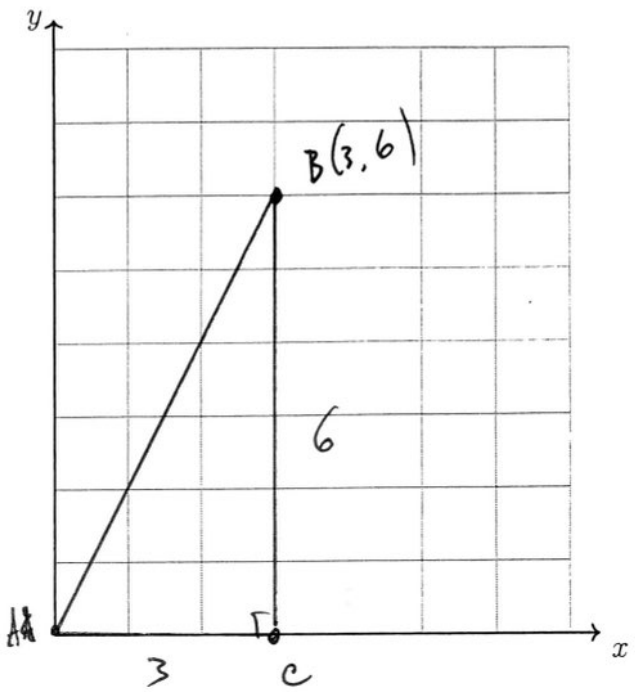
10.2 Classwork: Tangent inverse **CCSS.HSG.SRT.C.8**

1. Graph and label $\triangle ABC$ with $A(0,0)$, $B(3,6)$, and $C(3,0)$. Calculate each value:



(a) $AC = 3$

(b) $BC = 6$

(c) Express first as a radical, then approximate with a decimal rounded to two decimal places.

$AB = \sqrt{3^2+6^2}$

$= \sqrt{9+36}$

$= \sqrt{45}$

$= \sqrt{9}\sqrt{5}$

$= 3\sqrt{5} = 6.7082\ldots$

≈ 6.71

(d) Use a protractor to measure $m\angle BAC = \theta$ in degrees.

$63°$

(e) The tangent of an angle is the ratio of the side lengths *opposite* over *adjacent* to the angle. Write down the value as a fraction.

$\tan\theta = \frac{6}{3} = 2$

(f) Find $m\angle BAC = \theta$ in degrees with a calculator's inverse tangent function.

$\theta = \tan^{-1}(\frac{opp}{adj})$

$= \tan^{-1}(2) = 63.4349\ldots°$

(g) Convert θ to radians. ($180° = \pi$ radians)

$63.43\ldots \times \frac{\pi}{180} = 1.10714\ldots$ radians

Mastery topic: Calculator use

2. Express the result to the nearest thousandth.

(a) $\tan 22° = 0.404026...$
≈ 0.404

(c) $\tan 15° = 0.267949...$
≈ 0.268

(b) $\tan 81° = 3.3137...$
≈ 3.314

(d) $\tan 65° = 2.14450...$
≈ 2.145

3. Round each value to the nearest degree.

(a) $\tan^{-1}(2) = 63.4349...$
$\approx 63°$

(c) $\tan^{-1}(1) = 45°$

(b) $\tan^{-1}(0.5) = 26.5650...$
$\approx$ ~~67~~
$27°$

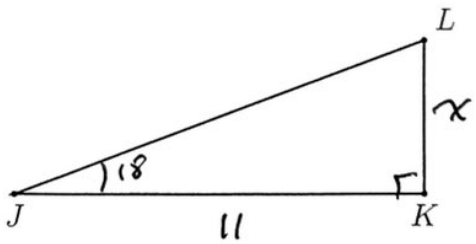
(d) $\tan^{-1}(\frac{1}{\sqrt{3}}) = 30°$

Mastery topic: Modeling. Do Not Solve

4. Given right $\triangle JKL$ with $\overline{JK} \perp \overline{KL}$, $JK = 11$, $m\angle J = 18°$. (mark the diagram)

Let x be the length of the side opposite $\angle J$, $x = KL$. Write an equation expressing $\tan \angle J$ as a ratio of *opposite* over *adjacent*.

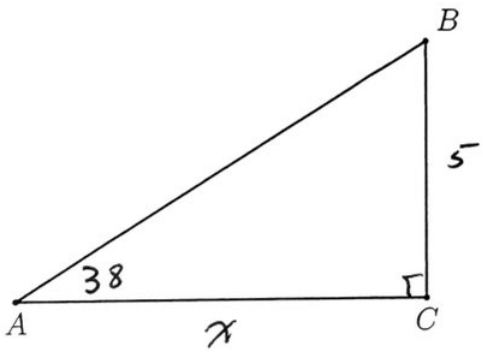
$\tan 18 = \frac{x}{11}$



5. Given right $\triangle ABC$ with $m\angle C = 90°$, $BC = 5$, $m\angle A = 38°$. (mark the diagram)

   Let x be the length of the side adjacent to $\angle A$, $x = AC$. Write an equation expressing $\tan\angle A$ as a ratio of *opposite* over *adjacent*.

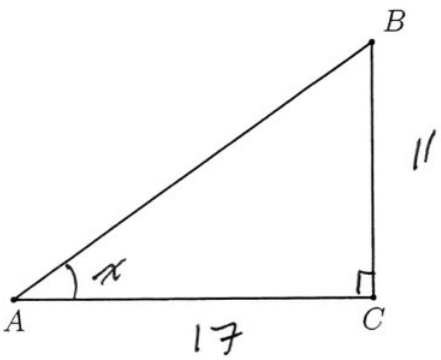
$\tan 38 = \frac{5}{x}$



6. Given right $\triangle ABC$ with $m\angle C = 90°$, $BC = 11$, $AC = 17$, and $m\angle A = x°$. (mark the diagram)

   Write an equation expressing $\tan x$ as a ratio of *opposite* over *adjacent*.

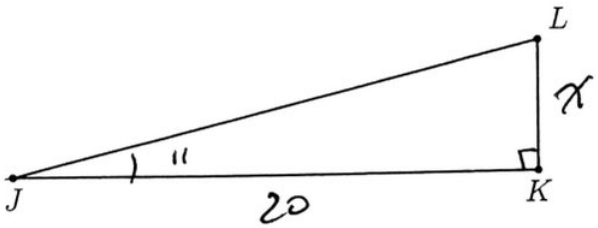
$\tan x = \frac{11}{17}$



7. Given right $\triangle JKL$ with $\overline{JK} \perp \overline{KL}$, $JK = 20$, $m\angle J = 11°$. (mark the diagram)

   Let x be the length of the side opposite $\angle J$, $x = KL$. Write an equation expressing $\tan\angle J$ as a ratio of *opposite* over *adjacent*.

$\tan 11° = \frac{x}{20}$



Mastery topic: Algebraic solution

Use your calculator and solve each equation for x, rounding to the nearest tenth.

8. $\tan 75° = \frac{x}{15}$

$15 \tan 75 = x$

$x = 55.980762\ldots$

$\approx$ ~~55~~ 56.0

9. $\tan 26° = \frac{4}{x}$

$x \tan 26 = 4$

$x = \frac{4}{\tan 26°}$

$= 8.201215\ldots \approx 8.2$

10. $x = \tan^{-1}(\frac{2}{3.5})$

$= 29.74488\ldots$

$\approx 29.7°$

11. $\tan x° = \frac{17}{9}$

$x = \tan^{-1}\left(\frac{17}{9}\right)$

$= 62.10272\ldots$

$\approx 62.1°$