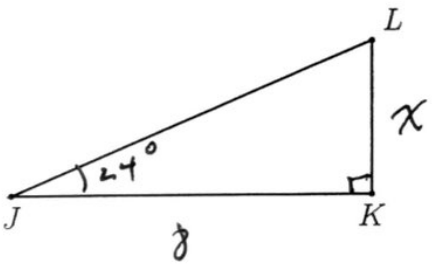
BECA / Dr. Huson / Geometry
Unit 10: Trigonometry
14 March 2023

Name: Solutions

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

Write an equation expressing $\tan\theta$ as a ratio of *opposite* over *adjacent*, then solve for the missing length.

1. Given right $\triangle JKL$ with $\overline{JK} \perp \overline{KL}$, $JK = 8$, $m\angle J = 24°$. Let x be the length of the side opposite $\angle J$, $x = KL$.



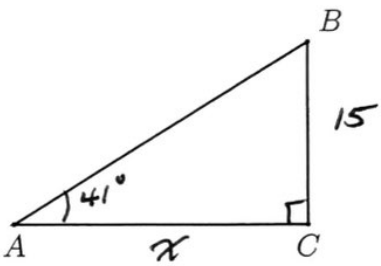
$\tan 24 = \frac{x}{8}$

$8 \tan 24 = x$

$x = 3.5618\ldots$

≈ 3.56

2. Given right $\triangle ABC$ with $m\angle C = 90°$, $BC = 15$, $m\angle A = 41°$.
   (a) Solve for $x = AC$.
   (b) Find the length of the hypotenuse AB using the Pythagorean theorem.



$\tan 41 = \frac{15}{x}$

$x \tan 41 = 15$

$x = \frac{15}{\tan 41}$

$= 17.2555\ldots$

≈ 17.3

$AB = \sqrt{15^2 + 17.255\ldots^2}$

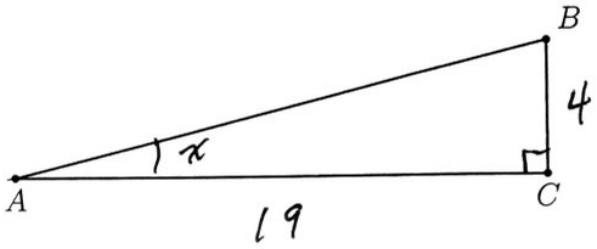
$= 22.86377\ldots$

≈ 22.9

BECA / Dr. Huson / Geometry
Unit 10: Trigonometry
14 March 2023

Name:

3. Given right $\triangle ABC$ with $m\angle C = 90°$, $BC = 4$, $AC = 19$, and $m\angle A = x°$.



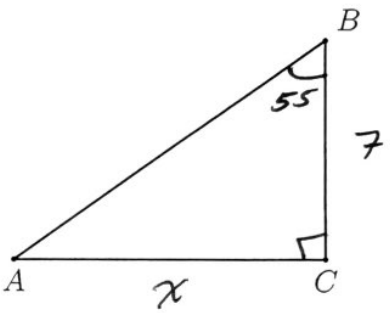
$\tan x = \frac{4}{19}$

$x = \tan^{-1}\left(\frac{4}{19}\right)$

$= 11.88865\ldots$

≈ 11.9

4. Given right $\triangle ABC$ with $\overline{AC} \perp \overline{BC}$, $BC = 7$, $m\angle B = 55°$. Let $x = AC$.



$\tan 55 = \frac{x}{7}$

$x = 7 \tan 55$

$= 9.99703\ldots$

$\approx$ ~~9.~~ 10.0

Mastery topic: Algebraic solution

5. Solve each equation for x, rounding to the nearest hundredth.

(a) $\tan 63° = \frac{x}{14}$

$14 \tan 63 = x$

$x = 27.4765...$

≈ 27.48

(c) $\tan 46° = \frac{x}{3.5}$

$x = 3.5 \tan 46$

$= 3.624356...$

≈ 3.62

(b) $\tan 77° = \frac{10}{x}$

$x \tan 77 = 10$

$x = \frac{10}{\tan 77}$

$= 2.308681...$

≈ 2.31

(d) $\tan 35° = \frac{21}{x}$

$x = \frac{21}{\tan 35}$

$= 29.9911...$

≈ 29.99

6. Solve for x, rounding to the nearest whole degree.

(a) $\theta = \tan^{-1}(\frac{12}{5})$

$= 67.38...$

$\approx 67°$

(b) $\tan\theta = \frac{3.2}{4.8}$

$\theta = \tan^{-1}\left(\frac{3.2}{4.8}\right)$

$= 33.6900...$

$\approx$ ~~64~~ $34°$

BECA / Dr. Huson / Geometry
Unit 10: Trigonometry
14 March 2023

Name:

Mastery topic: Calculator use

7. Express the result to the nearest thousandth. Angle measures are in radians.

(a) $\tan\frac{\pi}{4} =$ 1.000

(c) $\tan\frac{\pi}{6} =$ $\frac{\sqrt{3}}{3} = 0.577350\ldots \approx 0.577$

(b) $\tan\frac{\pi}{3} =$ $\sqrt{3} = 1.73205\ldots \approx 1.732$

(d) $\tan\frac{\pi}{12} =$ $2-\sqrt{3} = 0.267949\ldots \approx 0.268$

8. Find each value in radians, rounding to the nearest thousandths.

(a) $\tan^{-1}(1) =$ $\frac{\pi}{4} = 0.78539\ldots \approx 0.785$

(b) $\tan^{-1}(\sqrt{3}) =$ $\frac{\pi}{3} = 1.047197\ldots \approx 1.047$

9. Convert between radians and degrees. Leave radians in terms of π.

(a) $45° =$ $45 * \frac{\pi}{180} = \frac{\pi}{4}$

(b) $\frac{\pi}{6} =$ $\frac{\pi}{6} \cdot \frac{180°}{\pi} = 30°$

10. Round each value to the nearest hundredth.

(a) $AB = \sqrt{11^2 + 7^2}$

$= 13.03840\ldots$
≈ 13.04

(c) $AB = \sqrt{(-8.0)^2 + (14.5)^2}$

(b) $AB = \sqrt{3.2^2 + 1.9^2}$

$= 3.7215588\ldots$
≈ 3.72

(d) $AB = \sqrt{(4-3)^2 + (7-11)^2}$

$= \sqrt{17}$
$= 4.1231056\ldots$
≈ 4.12

11. Express the result to the nearest thousandth. Angle measures are in degrees.

(a) $\tan 33° =$ 0.649407...
≈ 0.649

(b) $\tan 81° =$ 6.313751...
≈ 6.314

12. Find the tangent of each radian angle measure. Round to the nearest thousandth.

(a) $\tan 1.1 =$ 1.964759...
≈ 1.965

(b) $\tan \frac{\pi}{5} =$ 0.72654...
≈ 0.727

13. Find each angle measure, to the nearest whole degree.

(a) $\tan^{-1}(\frac{7}{4}) =$

(b) $\tan^{-1}(0.75) =$

14. Convert between radians and degrees. Leave radians in terms of π.

(a) $60° =$

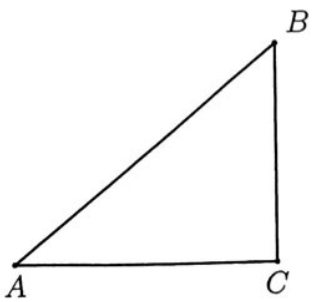
(b) $\frac{\pi}{8} =$

15. Find the value, rounding to the nearest hundredth.

$AB = \sqrt{(-7.7)^2 + (26.4)^2}$

16. Mark and label the diagram to reflect the equation:

$\tan 41° = \frac{12}{14}$



BECA / Dr. Huson / Geometry
Unit 10: Trigonometry
14 March 2023

Name:

17. Solve each equation, rounding to the nearest tenth.

(a) $\tan 53° = \frac{x}{11}$

$x = 11 \tan 53$
$= 14.5924...$
≈ 14.6

(b) $\tan 47° = \frac{19}{x}$

$x = \frac{19}{\tan 47}$
$= 17.7177... \approx 17.7$

(c) $\tan\theta = \frac{5.7}{4.4}$

$\theta = \tan^{-1}\left(\frac{5.7}{4.4}\right) = 52.33437...$
$\approx 52.3°$

(d) $41 = \sqrt{x^2 + 40^2}$

$41^2 = x^2 + 40^2$
$x^2 = 41^2 - 40^2 = 81$
$\sqrt{x^2} = \sqrt{81}$
$x = 9$
≈ 9.0

Radian degree conversion practice

Express the result to the nearest hundredth. (Degree measures to whole degrees)

18. $\tan 25° =$ 0.466307...
$\approx$ 0.47

19. $\tan 1.25$ radians $=$ 3.00956...
$\approx$ 3.01

20. $\tan^{-1}(\frac{7}{5}) =$ 54.462... degrees
$\approx$ 54°

21. $\tan^{-1}(\frac{20}{13}) =$ 0.99442... radians
$\approx$ 0.99

22. Convert radians and degrees. (nearest whole degree, nearest hundredth radian).

(a) $35° =$ $35 \times \frac{\pi}{180}$
$= 0.610865...$
$\approx$ 0.61 radian

(b) $0.45 =$ $0.45 \times \frac{180}{\pi}$
$= 25.7831...$
$\approx 26°$

Challenge

23. Find the value, rounding to the nearest hundredth.

$c = \sqrt{(-7.625)^2 + (\sqrt{83})^2}$

$= 83.34950$
≈ 83.35

24. Solve for x

$5 = \sqrt{8x - 15}$

$25 = 8x - 15$
$40 = 8x$
$x = 5$

check $5 \stackrel{?}{=} \sqrt{8(5) - 15}$
$5 = \sqrt{40 - 15}$ ✓