TRIGONOMETRY

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WHAT IS TRIGONOMETRY

- Trigonometry is the study of the relationships between the angles and sides of a right triangle. The three main functions of trigonometry are:
- Sine (SIN)
- Cosine (COS)
- Tangent (TAN)

KEY TO REMEMBERING

- In a right triangle, the trig (trigonometric) functions can be found by remembering:

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- Sine-Opposite-Hypotenuse $\sin\theta = \frac{opposite}{hypotenuse}$
- Cosine-Adjacent-Hypotenuse $\cos\theta = \frac{adjacent}{hypotenuse}$
- Tangent-Opposite-Adjacent $\tan\theta = \frac{opposite}{adjacent}$

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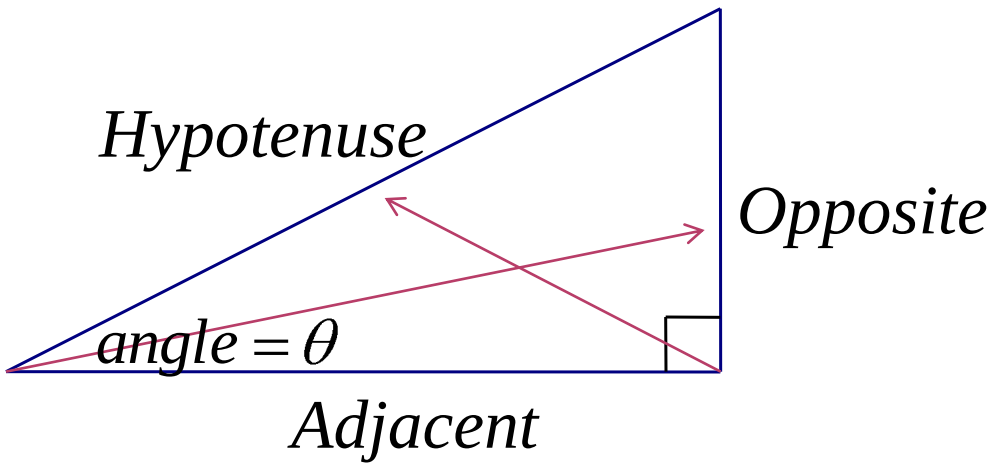
THE TRIGONOMETRIC TRIANGLE



$$\sin\theta = \frac{opposite}{hypotenuse} \qquad \cos\theta = \frac{adjacent}{hypotenuse} \qquad \tan\theta = \frac{opposite}{adjacent}$$

USING TRIG FUNCTIONS ON THE CALCULATOR

Look for the keys SIN, COS, TAN

Solve:

- $\sin 37^{o}$ =

  (type 37 and then press the SIN button)

  = 0.6018
- $\cos 56^{o}$ =

  (type 56 and then press the COS button)

  = 0.5592
- $\tan 82^{o}$ =

  (type 82 and then press the TAN button)

  = 7.1154

EXAMPLE OF SINE

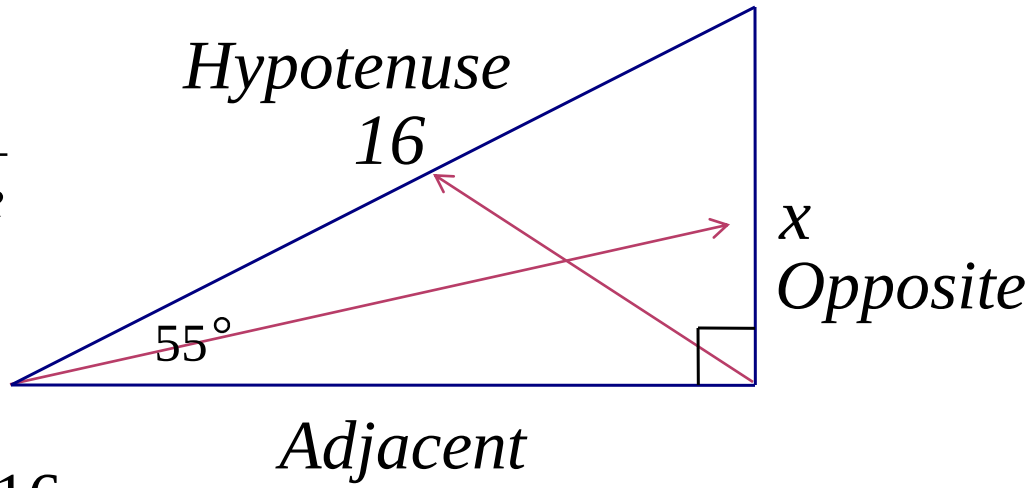
$$\sin\theta = \frac{opposite}{hypotenuse}$$

$$\sin 55^{O} = \frac{X}{16}$$

$$16 \times \sin 55^{O} = \frac{X}{16} \times 16$$

$$16 \times \sin 55^{O} = X$$

$$X = 13.106$$



EXAMPLE OF COSINE

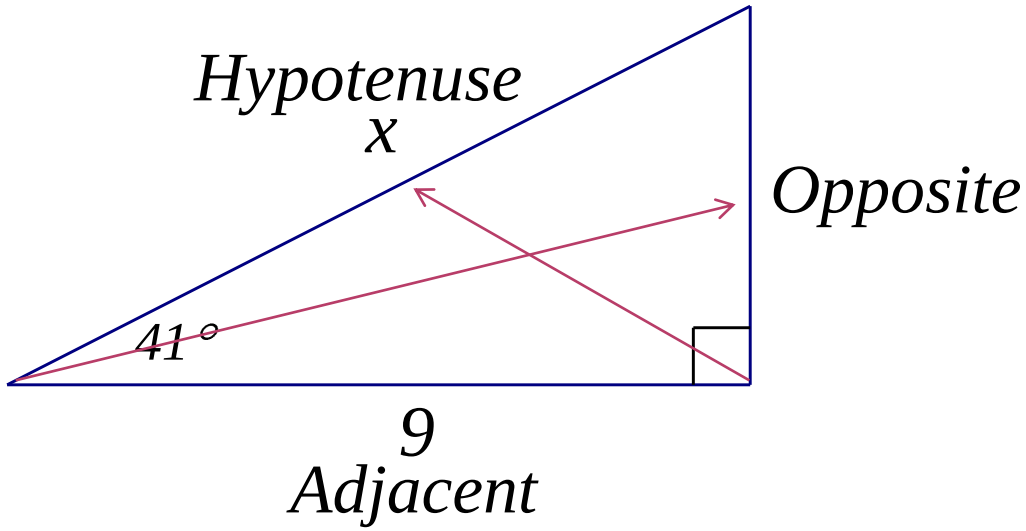
$$\cos\theta = \frac{adjacent}{hypotenuse}$$

$$\cos 41^O = \frac{9}{x}$$

$$x\cos 41^O = \frac{9}{x} \times x$$

$$\frac{x\cos 41^O}{\cos 41^O} = \frac{9}{\cos 41^O}$$

$$x = \frac{9}{0.7547} = 11.9251$$



EXAMPLE OF TANGENT

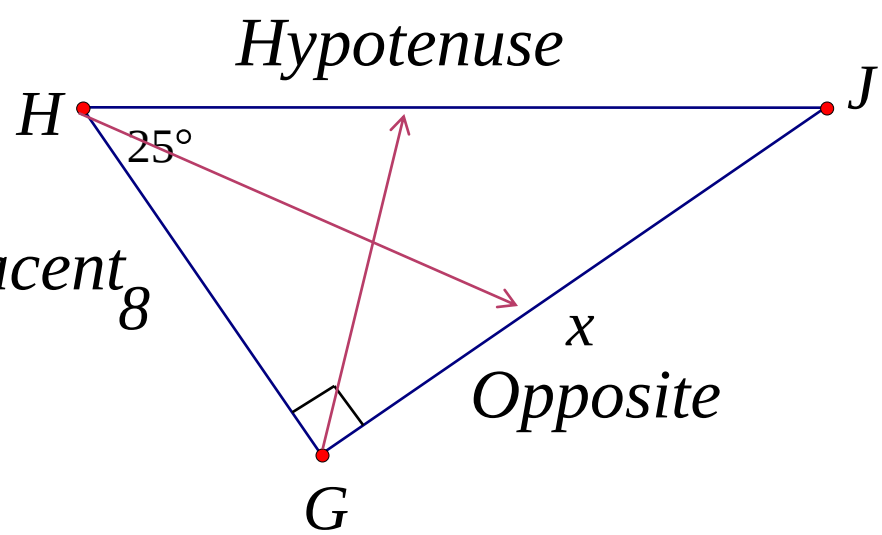
$$\tan\theta = \frac{opposite}{adjacent}$$

$$\tan 25^O = \frac{x}{8}$$

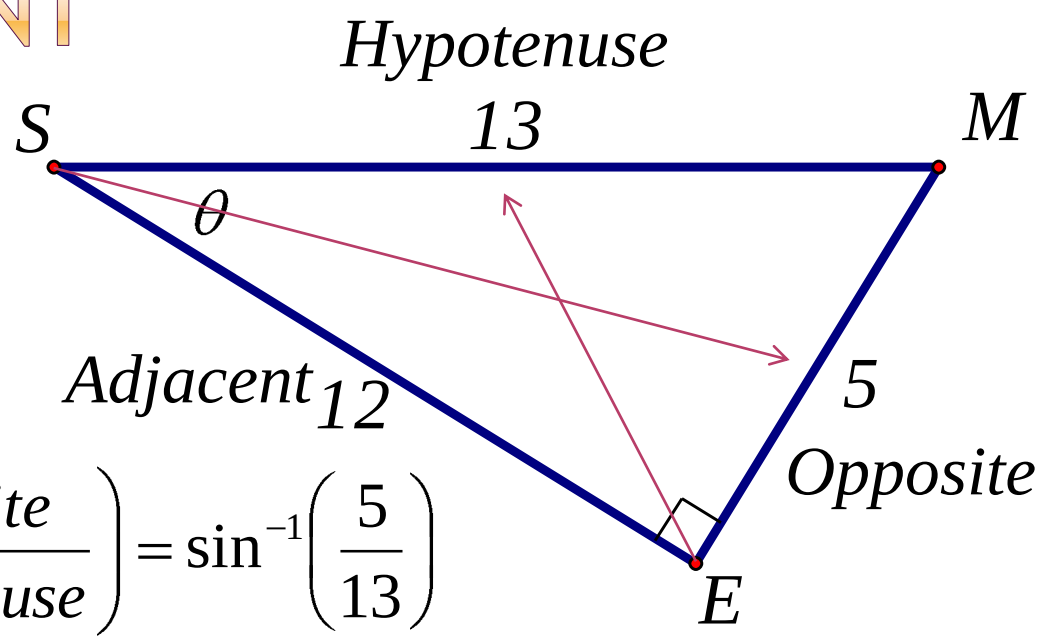
$$8 \times \tan 25^O = \frac{x}{8} \times 8$$

$$8 \times \tan 25^O = x$$

$$x = 3.7305$$



USING ARCSINE, ARCCOSINE, AND ARCTANGENT



$$\theta = \sin^{-1}\left(\frac{opposite}{hypotenuse}\right) = \sin^{-1}\left(\frac{5}{13}\right)$$

$$\theta = \cos^{-1}\left(\frac{adjacent}{hypotenuse}\right) = \cos^{-1}\left(\frac{12}{13}\right)$$

$$\theta = \tan^{-1}\left(\frac{opposite}{adjacent}\right) = \tan^{-1}\left(\frac{5}{12}\right)$$

USING TRIG FUNCTIONS ON THE CALCULATOR

Look for the keys SIN^{-1}, COS^{-1}, TAN^{-1} and see which function key is the same color.

Solve:

- $\sin^{-1}(3/4) =$

  (Divide 3 by 4, hit equal, and then press the same-colored function key and then press the SIN button)

  $= 48.59^{o}$

- $\cos^{-1}(2/3) =$

  (Divide 2 by 3, hit equal, and then press the same-colored function key and then press the COS button)

  $= 48.19^{o}$

- $\tan^{-1}(1/3) =$

  (Divide 1 by 3, hit equal, and then press the same-colored function key and then press the TAN button)

  $= 18.43^{o}$

EXAMPLE OF ARCSINE (SIN^{-1})

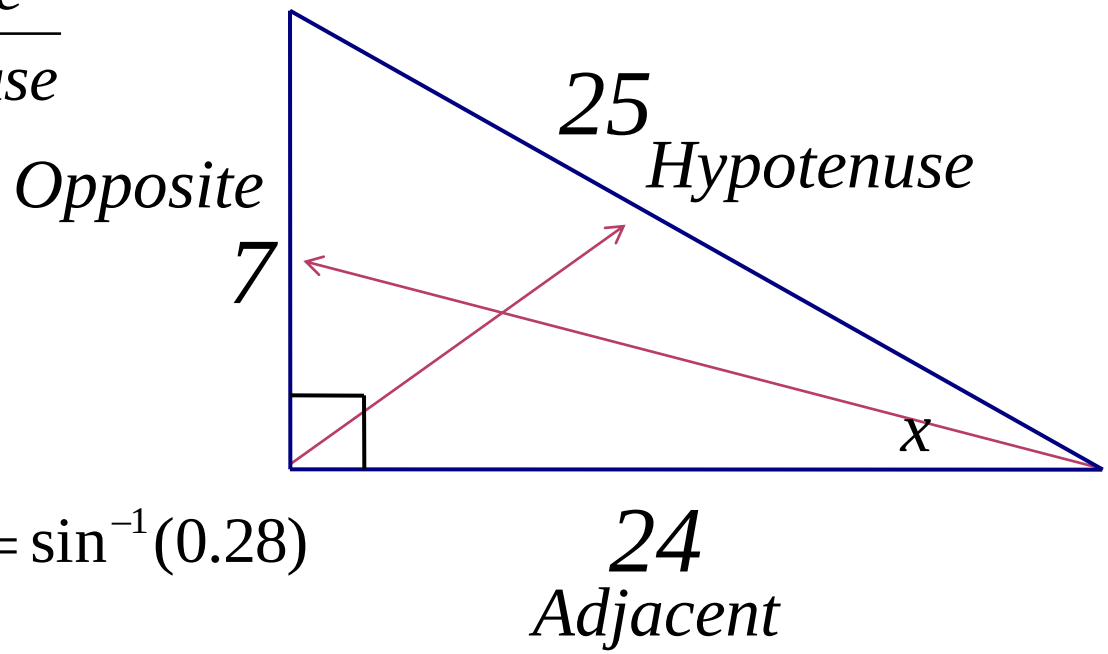
$$\sin x = \frac{opposite}{hypotenuse}$$

$$\sin x = \frac{7}{25}$$

$$\sin x = 0.28$$

$$x = \sin^{-1}\left(\frac{7}{25}\right) = \sin^{-1}(0.28)$$

$$x = 16.2602^{o}$$



EXAMPLE OF ARCCOSINE (COS^{-1})

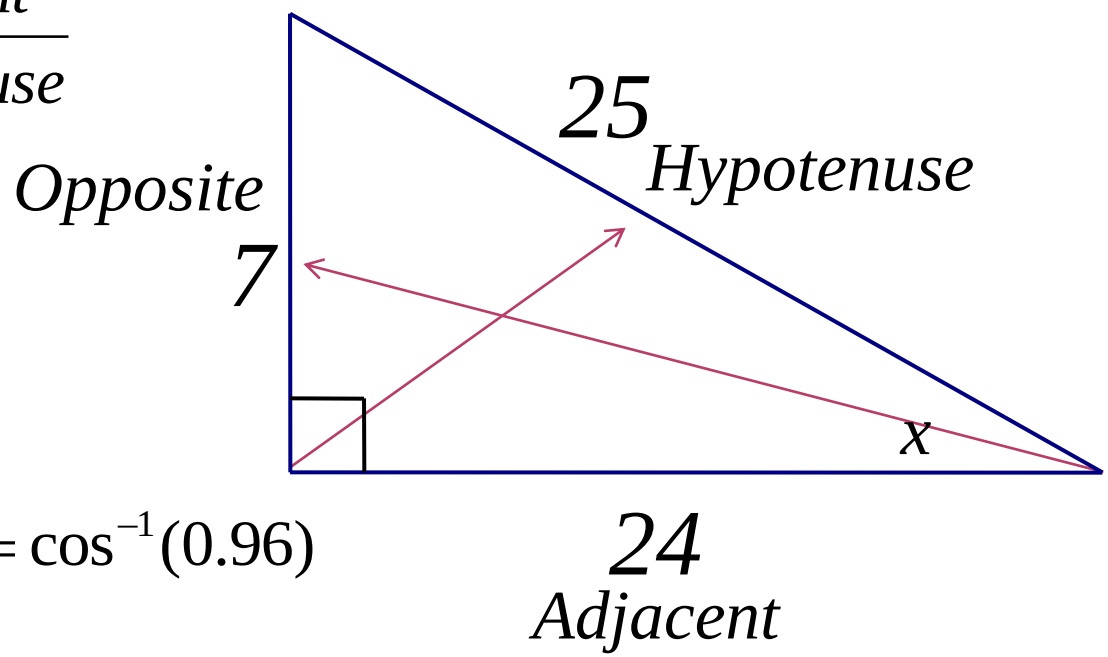
$$\cos x = \frac{adjacent}{hypotenuse}$$

$$\cos x = \frac{24}{25}$$

$$\cos x = 0.96$$

$$x = \cos^{-1}\left(\frac{24}{25}\right) = \cos^{-1}(0.96)$$

$$x = 16.2602^{o}$$



EXAMPLE OF ARCTANGENT (TAN^{-1})

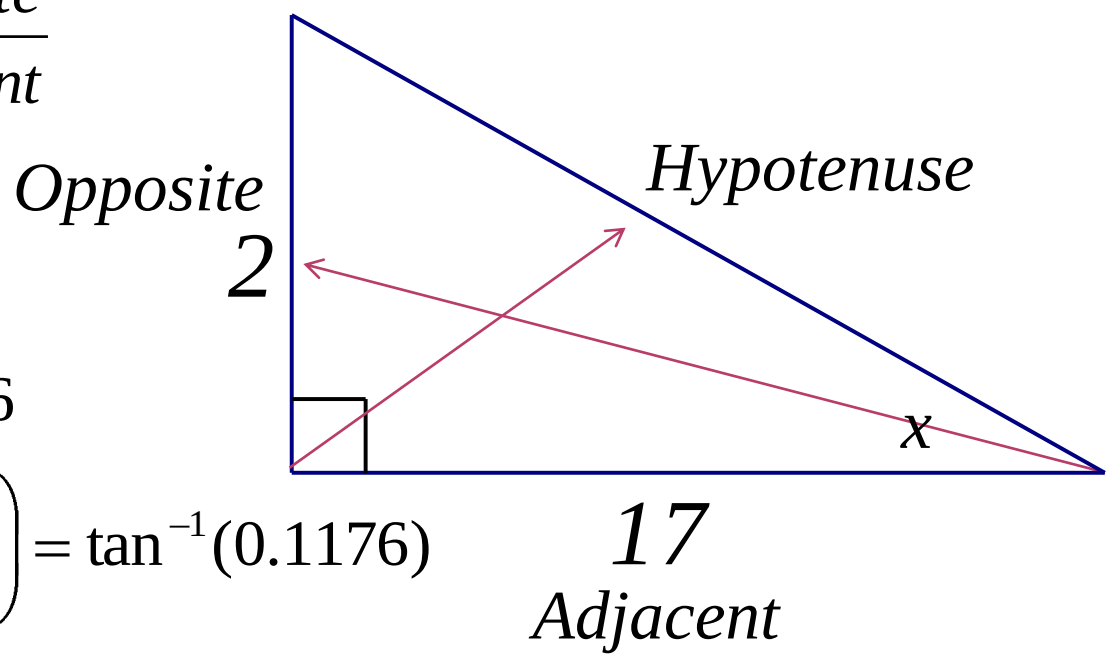
$$\tan x = \frac{opposite}{adjacent}$$

$$\tan x = \frac{2}{17}$$

$$\tan x = 0.1176$$

$$x = \tan^{-1}\left(\frac{2}{17}\right) = \tan^{-1}(0.1176)$$

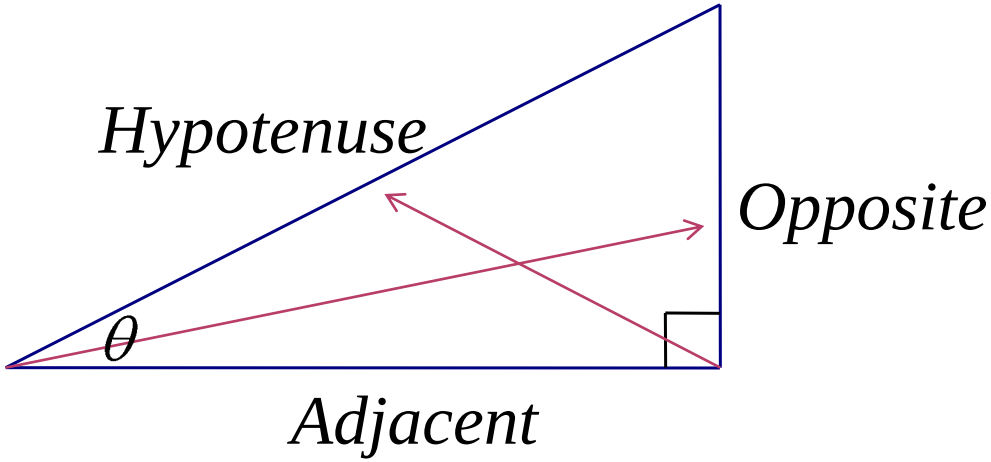
$$x = 6.7098^{o}$$



WHAT YOU LEARNED ABOUT THE TRIGONOMETRIC TRIANGLE

$$\sin\theta = \frac{opposite}{hypotenuse}$$

$$\theta = \sin^{-1}\left(\frac{opposite}{hypotenuse}\right)$$



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$$\cos\theta = \frac{adjacent}{hypotenuse}$$

$$\theta = \cos^{-1}\left(\frac{adjacent}{hypotenuse}\right)$$

$$\tan\theta = \frac{opposite}{adjacent}$$

$$\theta = \tan^{-1}\left(\frac{opposite}{adjacent}\right)$$