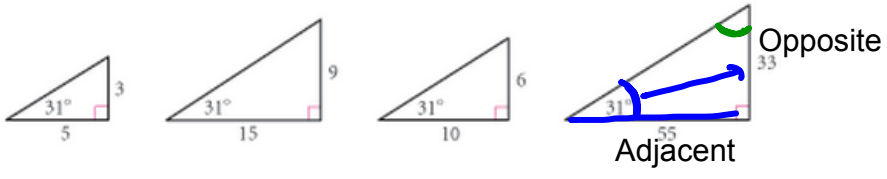
12.1 Trigonometric Ratios

12.1 - **Trigonometry -** the study of the relationships between the sides and the angles of triangles

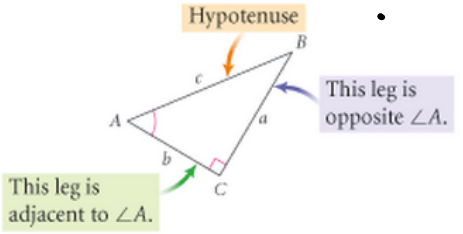
Mathematicians discovered that whenever the ratio of the shorter leg's length to the longer leg's length in a right triangle was close to a specific fraction, the angle opposite the shorter leg was close to a specific measure.

If the ratio of shorter leg/longer leg is 3/5, the angle opposite the shorter leg is always approximately 31 degrees.



Ratio of Opposite/Adjacent = Tangent

Trigonometric Ratios



For any acute angle A in a right triangle:

sine of $\angle A$ = $\frac{\text{length of opposite leg}}{\text{length of hypotenuse}}$

cosine of $\angle A$ = $\frac{\text{length of adjacent leg}}{\text{length of hypotenuse}}$

tangent of $\angle A$ = $\frac{\text{length of opposite leg}}{\text{length of adjacent leg}}$

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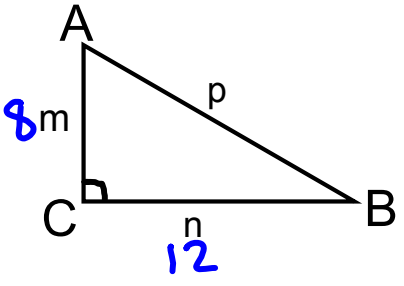
Sin A = $\frac{a}{c}$

Sin B = $\frac{b}{c}$

Cos A = $\frac{b}{c}$

Tan B = $\frac{b}{a}$



Give the fraction in the terms in m, n and p.

Sin A = $\frac{m}{p}$

Cos B = $\frac{m}{p}$

Tan A = $\frac{n}{m}$

Sin B = $\frac{n}{p}$

Tan B = $\frac{n}{m}$

9. $\cos 64° = \frac{x}{28}$ · 28

$\cos(64)\,28 = x$

$x = 12.3$

10. $\sin 24° = \frac{12.1}{x}$ · x

$\frac{x \sin 24}{\sin 24} = \frac{12.1}{\sin(24)}$

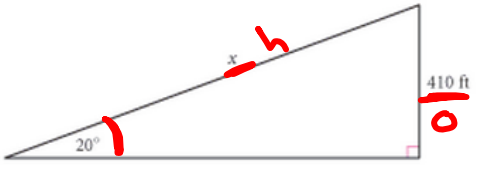
$x = 29.7$

11. $\tan 51° = \frac{x}{14.8}$ · 14.8

$14.8 \cdot \tan(51) = x$

$x = 18.3$

Find the length of the hypotenuse of a right triangle if an acute angle measures 20° and the leg opposite the angle measures 410 feet.



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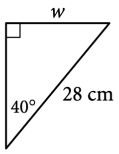
$x \cdot \sin 20° = \frac{410}{x}$ · x

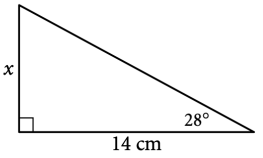
$\frac{x \sin 20}{\sin 20} = \frac{410}{\sin 20}$

$x = 1198.8 \text{ ft}$

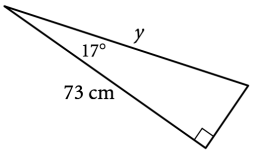
15. $w \approx$ _____



16. $x \approx$ _____

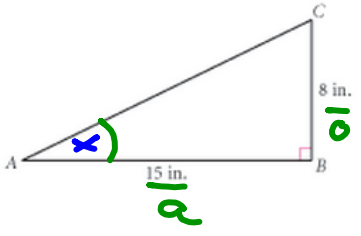


17. $y \approx$ _____



You can also find the angle in a right triangle if you know the ratio of two sides by using the inverse function on your calculator ($\tan^{-1}$)

A right triangle has legs of length 8 inches and 15 inches. Find the measure of the angle opposite the 8-inch leg.

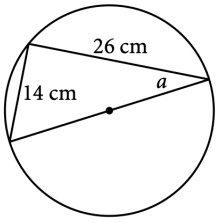


$\tan x = \frac{8}{15}$

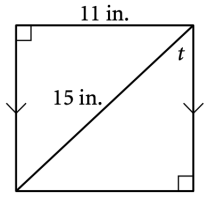
$\tan^{-1}\left(\frac{8}{15}\right)$

28°

18. $a \approx$ _____



19. $t \approx$ _____



20. $z \approx$ _____