

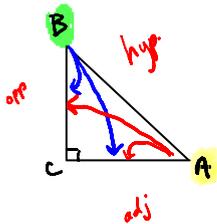
3.1 The Tangent Ratio

Chapter 3: Trigonometry (Three angle measurement)

3.1 The Tangent Ratio

A trigonometric ratio is a ratio of the measures of two sides of a right triangle.

One trigonometric ratio is the **tangent ratio**.



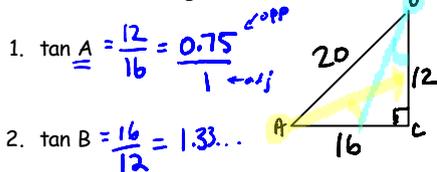
$$\text{Tangent}(A) = \frac{\text{length of side opposite } A}{\text{length of side adjacent } A}$$

Read: The tan ratio of angle 'A' is...

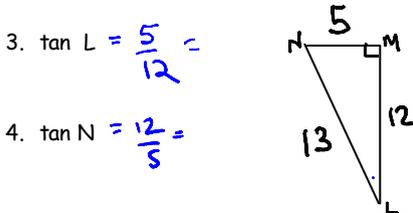
$$\tan A = \frac{BC}{CA} \quad \tan B = \frac{CA}{BC}$$

think... The $\tan A$ will always be the reciprocals of the $\tan B$.

• Write each trig ratio.

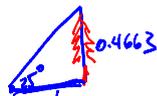


• Write each trig ratio.



5. Calculate $\tan 25^\circ$ to four decimal places. What does this number represent?

$$\tan 25^\circ = 0.4663$$



Could you find side length of a triangle if you knew one angle of a right triangle is 25° ?



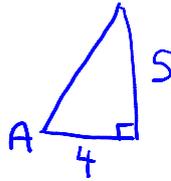
• Try:
 $\tan 45^\circ = 1$

$$\tan 57^\circ = 1.54$$

If we are given the legs of a right triangle, we can find the tangent ratio and use this ratio to calculate an angle. We use the **tan inverse** (\tan^{-1}) of the ratio to find the angle.

Finding the angle given two sides.

- Draw a triangle to represent $\tan A = 5/4$



Find angle A

$$\tan A = 5/4$$

$$\angle A = \tan^{-1}(5 \div 4)$$

- Find the angle θ ← "theta"

$$\tan \theta = 0.5095$$

$$\theta = \tan^{-1}(0.5095) = 27^\circ$$

$$\tan \theta = 1.4653$$

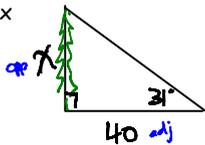
$$\theta = \tan^{-1}(1.4653) = 55.7^\circ$$

B

If given an angle and one of the legs of a right triangle, we can use the tangent ratio to solve for the other missing leg.

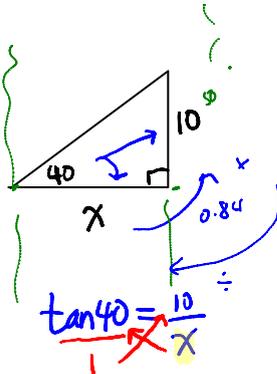
Finding a side length

- Find x



$$40 \cdot \tan 31 = \frac{x}{40} \cdot 40$$

$$24 = x$$



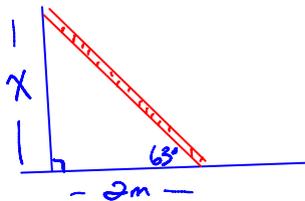
$$\tan 40 = \frac{10}{x}$$

$$x \tan 40 = \frac{10}{\tan 40}$$

$$x = 11.9$$

46°
x
a

- A ladder leaning against a wall forms an angle of 63 degrees with the ground. How far up the wall will the ladder reach if the foot of the ladder is 2 m from the wall?



$$\tan 63^\circ = \frac{x}{2}$$

$$x = 2 \tan 63^\circ$$

$$x = 3.9 \text{ m}$$

- What is the difference between these two questions?

a) Find $\tan \theta$? ← Ratio

b) Find θ ? ← angle



$$a) \tan \theta = \frac{36}{95} \approx 0.3789$$

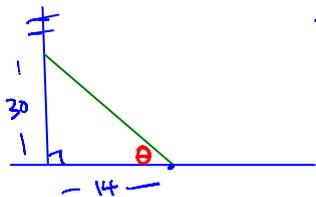
about 5 to 4 decimals

$$b) \theta = \tan^{-1}(36 \div 95)$$

$$\theta = 20.75^\circ$$

A radio transmission tower is to be supported by a guy wire. The wire reaches

30 m up the tower and is attached to the ground a horizontal distance of 14 m from the base of the tower. What angle does the guy wire form with the ground, to the nearest degree?



$$\tan \theta = \frac{30}{14}$$

$$\theta = \tan^{-1}(30 \div 14)$$

$$\theta = 65^\circ$$

Assignment p107 #1-9,12,13