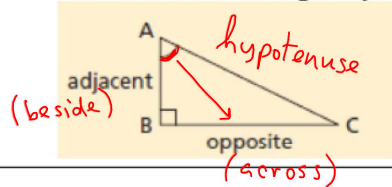


Lesson 1 Tangent Ratio

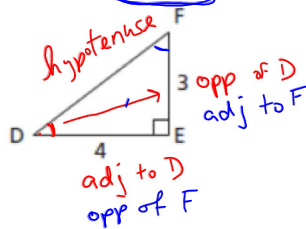
Tangent Ratio: $Tan A = \frac{\text{length of side opposite } \angle A}{\text{length of side adjacent } \angle A}$



The value of the tangent ratio compares the lengths of the sides opposite and adjacent.

Example 1

State the ratios for $\tan D$ and $\tan F$.



$$\tan D = \frac{\text{opp}}{\text{adj}}$$

$$\tan D = \frac{3}{4}$$

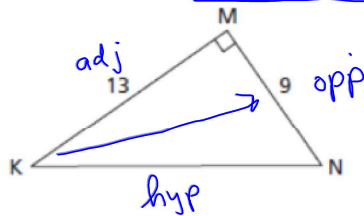
$$\tan F = \frac{\text{opp}}{\text{adj}}$$

$$\tan F = \frac{4}{3}$$



Example 2

Determine the measures of angle K and angle N.



$$\tan K = \frac{9}{13} \left(\frac{\text{opp}}{\text{adj}} \right)$$

$$K = \tan^{-1} \left(\frac{9}{13} \right)$$

$$= 34.695^\circ$$

on calc (*degrees mode)
and or shift $\tan(9 \div 13)$

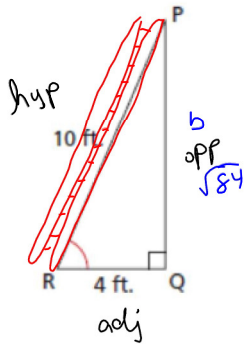
*Recall
 180° in a triangle

$$N = 90^\circ - 34.695^\circ$$

$$= 55.305^\circ$$

Example 3

A 10-ft ladder leans against the side of a building with its base 4 ft. from the wall. ~~What angle, to the nearest degree, does the ladder make with the ground?~~ Determine the measure of the angle that



$$\begin{aligned} \textcircled{1} \quad a^2 + b^2 &= c^2 \\ 4^2 + b^2 &= 10^2 \\ b^2 &= 10^2 - 4^2 \\ b &= \pm\sqrt{84} \\ &\text{Normally } \pm \\ &\text{but } b \text{ is} \\ &\text{a length} \\ \therefore b &= \sqrt{84} \end{aligned}$$

$$\textcircled{2} \quad \tan R = \frac{\sqrt{84}}{4}$$

$$R = \tan^{-1}\left(\frac{\sqrt{84}}{4}\right)$$

$$R = 66.422^\circ$$

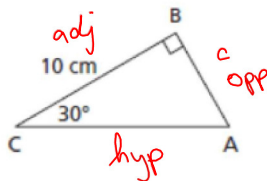
on calc

$$\boxed{2\text{nd}} \boxed{\tan^{-1}} \boxed{(\sqrt{84} \div 4)} =$$

$$\begin{aligned} x^2 &= 9 \\ x &= \pm 3 \end{aligned}$$

Example 4

Determine the length of AB to the nearest tenth of a centimetre.



Note

tan key to find a side
tan⁻¹ key to find an angle

$$\tan C = \frac{c}{10}$$

$$10 \tan 30^\circ = \frac{c}{10}$$

$$5.8 \text{ cm} = c$$

on calc

$$\boxed{10} \boxed{\times} \boxed{\tan} \boxed{30} \boxed{=}$$

* Never write
tan by
itself

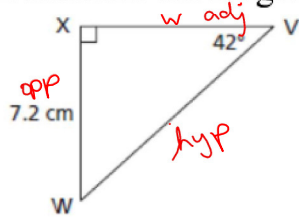
Always
tan C

or tan 30°

or tan θ (theta)

Example 5

Determine the length of VX to the nearest tenth of a centimetre.



$$w \tan 42^\circ = \frac{7.2}{w}$$

$$\frac{w \tan 42^\circ}{\tan 42^\circ} = \frac{7.2}{\tan 42^\circ}$$

$$w = 7.9964\dots$$

$$w = 8.0 \text{ cm}$$

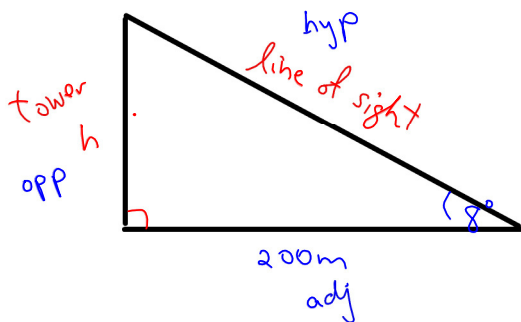
on calc

$$\boxed{7.2} \div \boxed{\tan} \boxed{42}$$

Example 6

At a horizontal distance of 200 m from the base of an observation tower, the angle between the ground and the line of sight to the top of the tower is 8° . How high is the tower to the nearest metre?

Determine the height of



$$\tan 8^\circ = \frac{h}{200}$$

$$200 \tan 8^\circ = h$$

$$28\text{m} = h$$

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1c, f, i, m
2c, f, i, l
3a-d