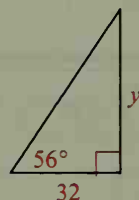


Since the tangent of an angle depends only on the measure of the angle, we can write $\tan 10^\circ$, for example, to stand for the tangent of any angle with a degree measure of 10. The table on page 311 lists the values of the tangents of some angles with measures between 0 and 90. Most of the values are approximations, rounded to four decimal places. Suppose you want the approximate value of $\tan 33^\circ$. Locate 33° in the angle column. Go across to the tangent column. Read .6494. You write $\tan 33^\circ \approx 0.6494$, where the symbol \approx means “is approximately equal to.” You can also use a scientific calculator to find $\tan 33^\circ \approx 0.649407593$. Your calculator may give more or fewer decimal places than the nine that are shown.

Example 2 Find the value of y to the nearest tenth.

Solution

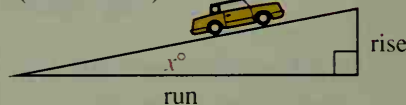
$$\begin{aligned}\tan 56^\circ &= \frac{y}{32} \\ y &= 32(\tan 56^\circ) \\ y &\approx 32(1.4826) \\ y &\approx 47.4432, \text{ or } 47.4\end{aligned}$$



You can find the approximate degree measure of an angle with a given tangent by reading the table from the tangent column across to the angle column, or by using the inverse tangent key(s) of a calculator.

Example 3 The grade of a road is the ratio of its rise to its run and is usually given as a decimal or percent. Find the angle that the road makes with the horizontal if its grade is 4% ($\frac{4}{100}$ or 0.04).

(Not to scale)



Solution

$$\begin{aligned}\tan x^\circ &= 0.0400 \\ x^\circ &\approx 2^\circ\end{aligned}$$

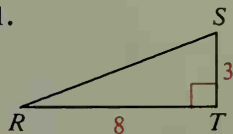
$$\text{grade} = \frac{\text{rise}}{\text{run}}$$

If you use the table on page 311, notice that 0.0400 falls between two values in the tangent column: $\tan 2^\circ \approx 0.0349$ and $\tan 3^\circ \approx 0.0524$. Since 0.0349 is closer to 0.0400, we use 2° as an approximate value for x° .

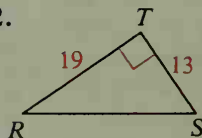
Classroom Exercises

In Exercises 1–3 express $\tan R$ as a ratio.

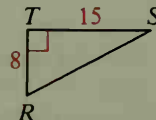
1.



2.



3.



4–6. Express $\tan S$ as a ratio for each triangle above.

7. Use the table on page 311 to complete the statements.

a. $\tan 24^\circ \approx \underline{\quad ? \quad}$

b. $\tan 41^\circ \approx \underline{\quad ? \quad}$

c. $\tan 88^\circ \approx \underline{\quad ? \quad}$

d. $\tan \underline{\quad ? \quad} \approx 2.4751$

e. $\tan \underline{\quad ? \quad} \approx 0.3057$

f. $\tan \underline{\quad ? \quad} \approx 0.8098$