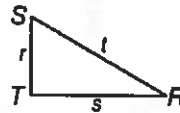


Honors Geometry

8-4 Trigonometry

Name Answer Key Period _____

Trigonometric Ratios The ratio of the lengths of two sides of a right triangle is called a **trigonometric ratio**. The three most common ratios are **sine**, **cosine**, and **tangent**, which are abbreviated *sin*, *cos*, and *tan*, respectively.



$$\sin R = \frac{\text{leg opposite } \angle R}{\text{hypotenuse}}$$

$$= \frac{r}{t}$$

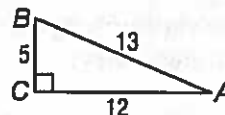
$$\cos R = \frac{\text{leg adjacent to } \angle R}{\text{hypotenuse}}$$

$$= \frac{s}{t}$$

$$\tan R = \frac{\text{leg opposite } \angle R}{\text{leg adjacent to } \angle R}$$

$$= \frac{r}{s}$$

Example: Find $\sin A$, $\cos A$, and $\tan A$. Express each ratio as a fraction and a decimal to the nearest hundredth.



$$\sin A = \frac{\text{opposite leg}}{\text{hypotenuse}}$$

$$= \frac{BC}{BA}$$

$$= \frac{5}{13}$$

$$\approx 0.38$$

$$\cos A = \frac{\text{adjacent leg}}{\text{hypotenuse}}$$

$$= \frac{AC}{AB}$$

$$= \frac{12}{13}$$

$$\approx 0.92$$

$$\tan A = \frac{\text{opposite leg}}{\text{adjacent leg}}$$

$$= \frac{BC}{AC}$$

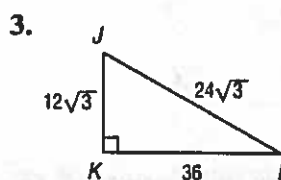
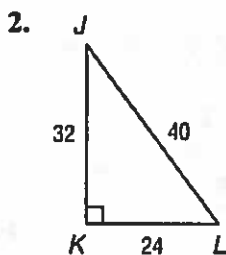
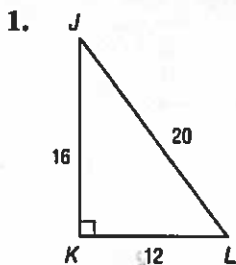
$$= \frac{5}{12}$$

$$\approx 0.42$$

S O C H A T A

Exercises

Find $\sin J$, $\cos J$, $\tan J$, $\sin L$, $\cos L$, and $\tan L$. Express each ratio as a fraction and as a decimal to the nearest hundredth if necessary.



$$\sin J = \frac{16}{20} = \frac{4}{5} = .8$$

$$\cos J = \frac{12}{20} = \frac{3}{5} = .6$$

$$\tan J = \frac{16}{12} = \frac{4}{3} = 1.33$$

$$\sin L = \frac{12}{20} = \frac{3}{5} = .6$$

$$\cos L = \frac{16}{20} = \frac{4}{5} = .8$$

$$\tan L = \frac{12}{16} = \frac{3}{4} = .75$$

$$\sin J = \frac{32}{40} = \frac{4}{5} = .8$$

$$\cos J = \frac{24}{40} = \frac{3}{5} = .6$$

$$\tan J = \frac{32}{24} = \frac{4}{3} = 1.33$$

$$\sin L = \frac{24}{40} = \frac{3}{5} = .6$$

$$\cos L = \frac{32}{40} = \frac{4}{5} = .8$$

$$\tan L = \frac{24}{32} = \frac{3}{4} = .75$$

$$\sin J = \frac{12\sqrt{3}}{24\sqrt{3}} = \frac{12}{24} = \frac{1}{2} = .5$$

$$\cos J = \frac{36}{24\sqrt{3}} = \frac{3\sqrt{3}}{2\sqrt{3}} = \frac{3}{2} = 1.5$$

$$\tan J = \frac{12\sqrt{3}}{36} = \frac{\sqrt{3}}{3} = .58$$

$$\sin L = \frac{36}{24\sqrt{3}} = \frac{3\sqrt{3}}{2\sqrt{3}} = \frac{3}{2} = 1.5$$

$$\cos L = \frac{12\sqrt{3}}{24\sqrt{3}} = \frac{12}{24} = \frac{1}{2} = .5$$

$$\tan L = \frac{12\sqrt{3}}{36} = \frac{\sqrt{3}}{3} = .58$$

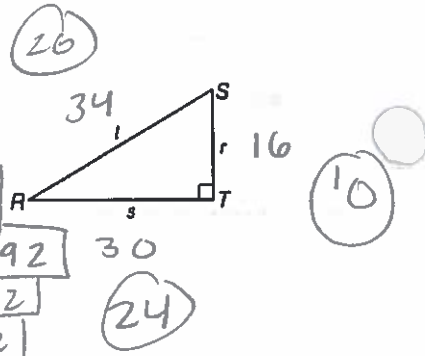
Find $\sin R$, $\cos R$, $\tan R$, $\sin S$, $\cos S$, and $\tan S$. Express each ratio as a fraction and as a decimal to the nearest hundredth.

1. $r = 16, s = 30, t = 34$

$$\begin{aligned} \sin R &= \frac{16}{34} = \frac{8}{17} = .47 \\ \cos R &= \frac{30}{34} = \frac{15}{17} = .88 \\ \tan R &= \frac{16}{30} = \frac{8}{15} = .53 \\ \sin S &= \frac{30}{34} = \frac{15}{17} = .88 \\ \cos S &= \frac{16}{34} = \frac{8}{17} = .47 \\ \tan S &= \frac{30}{16} = \frac{15}{8} = 1.88 \end{aligned}$$

2. $r = 10, s = 24, t = 26$

$$\begin{aligned} \sin R &= \frac{10}{26} = \frac{5}{13} = .38 \\ \cos R &= \frac{24}{26} = \frac{12}{13} = .92 \\ \tan R &= \frac{10}{24} = \frac{5}{12} = .42 \\ \sin S &= \frac{24}{26} = \frac{12}{13} = .92 \\ \cos S &= \frac{10}{26} = \frac{5}{13} = .38 \\ \tan S &= \frac{24}{10} = \frac{12}{5} = 2.4 \end{aligned}$$



Use a special right triangle to express each trigonometric ratio as a fraction and as a decimal to the nearest hundredth if necessary.

3. $\sin 30^\circ = \frac{1}{2} = .5000$

4. $\tan 45^\circ = 1$

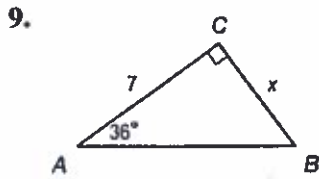
5. $\cos 60^\circ = \frac{1}{2} = .50$

6. $\sin 24^\circ = 0.4067$

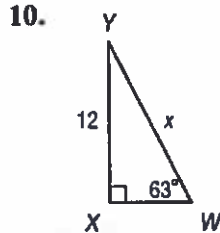
7. $\tan 53^\circ = 1.3270$

8. $\cos 86^\circ = 0.0698$

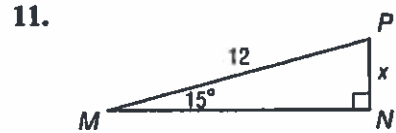
Find x . Round to the nearest hundredth if necessary.



$$\begin{aligned} \tan 36 &= \frac{x}{7} \\ 7 \times (.7265) &= x \\ \boxed{5.09} &= x \end{aligned}$$

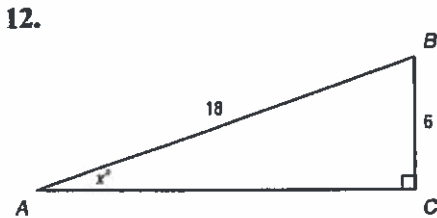


$$\begin{aligned} \sin 63 &= \frac{12}{x} \\ x &= 12 / .8910 \\ \boxed{x} &= \boxed{13.47} \end{aligned}$$



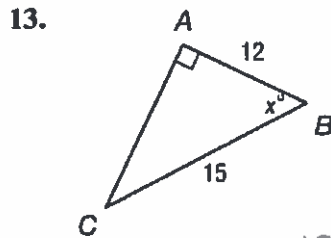
$$\begin{aligned} \sin 15 &= \frac{x}{12} \\ 12 (.2588) &= x \\ \boxed{x} &= \boxed{3.11} \end{aligned}$$

Use the table to find the measure of $\angle B$ to the nearest degree.



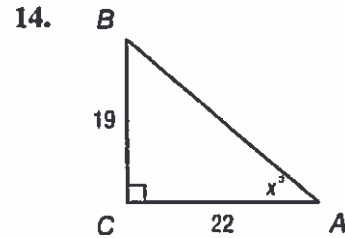
$$\begin{aligned} \sin x &= \frac{6}{18} \\ \sin x &= .3333 \\ x &= 19^\circ \end{aligned}$$

$\boxed{m\angle B = 71^\circ}$



$$\begin{aligned} \cos x &= \frac{12}{15} \\ \cos x &= .8 \\ x &= 37^\circ \end{aligned}$$

$\boxed{m\angle B} = \boxed{37^\circ}$



$$\begin{aligned} \tan x &= \frac{19}{22} = .8636 \\ x &= 41^\circ \end{aligned}$$

$\boxed{m\angle B = 49^\circ}$