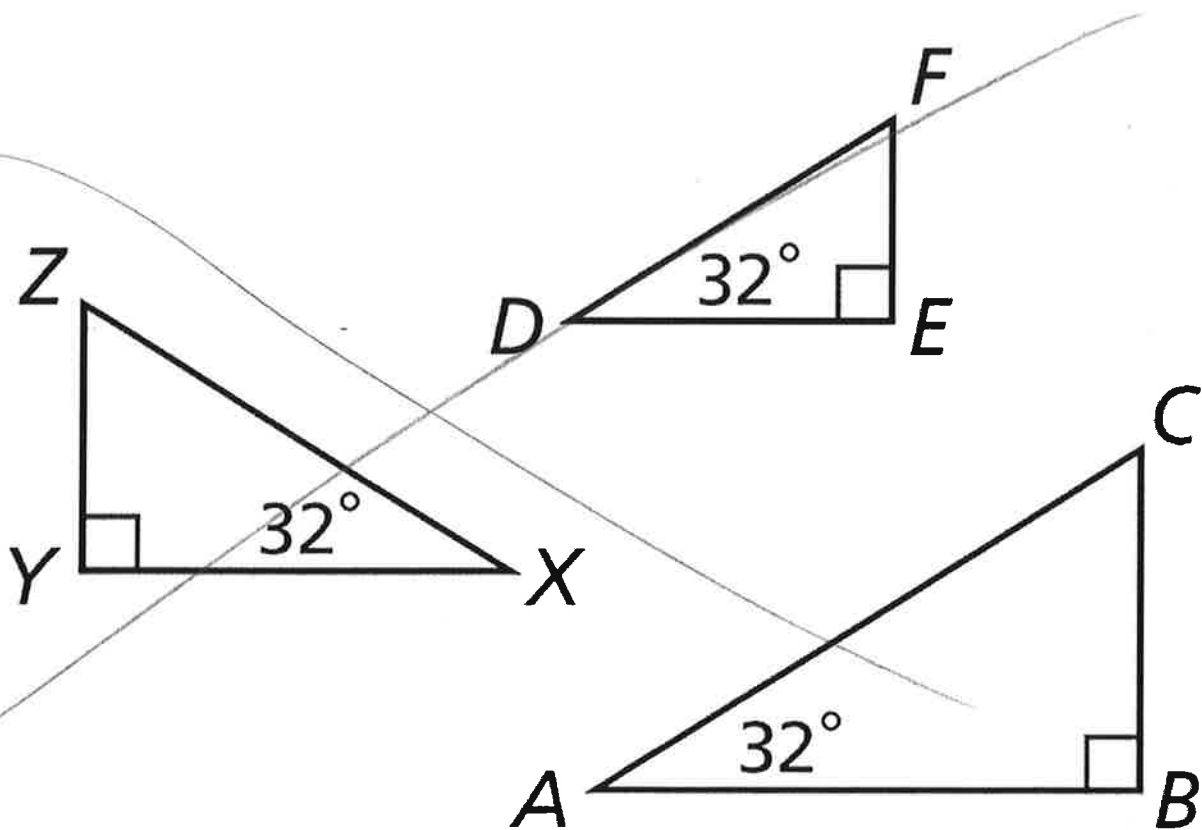


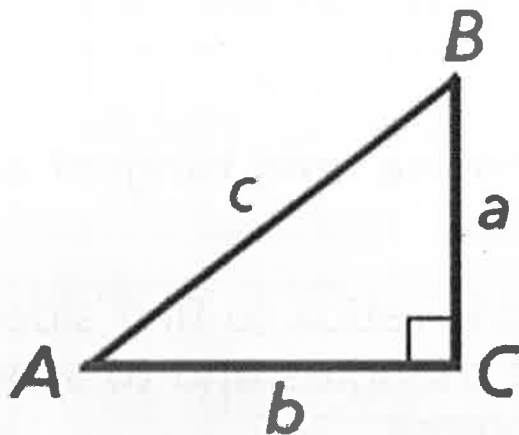
9.4 - 9.5 Trigonometric Ratios

Find the sine, cosine, and tangent of an acute angle.

Use trigonometric ratios to find side lengths in right triangles and to solve real-world problems.

A **trigonometric ratio** is a ratio of two sides of a right triangle.





angle =
fraction of
two sides

SINE	COSINE	TANGENT
------	--------	---------

$$\sin = \frac{\text{opposite side}}{\text{hypotenuse}}$$

$$\cos = \frac{\text{adjacent side}}{\text{hypotenuse}}$$

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

of angle A

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

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

$$\tan A = \frac{a}{b}$$

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

$$\cos B = \frac{a}{c}$$

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

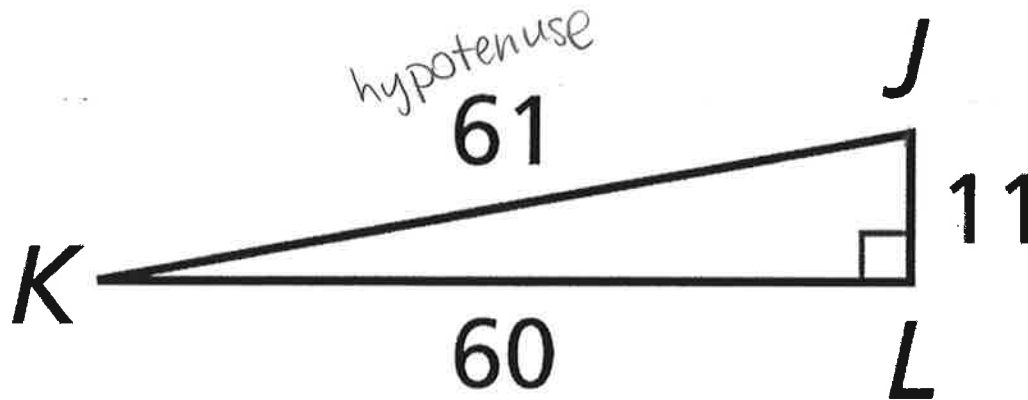
SOH - CAH - TOA

SOH: opposite/hypotenuse
CAH: cosine adjacent/hypotenuse
TOA: tangent opposite/adjacent

Writing Math

In trigonometry, the letter of the vertex of the angle is often used to represent the measure of that angle. For example, the sine of $\angle A$ is written as $\sin A$.

Write the trigonometric ratio as a fraction and as a decimal rounded to the nearest hundredth.



$$\sin J = \frac{60}{61} \approx .98$$

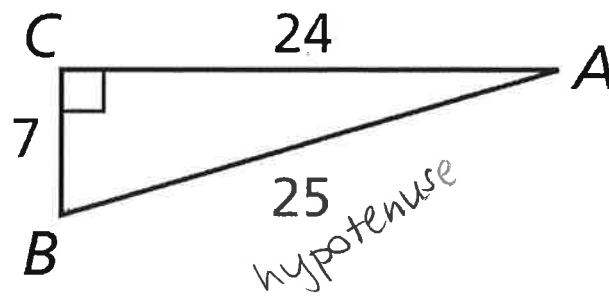
SOH

$$\cos J = \frac{11}{61} \approx .18$$

CAH

$$\tan K = \frac{11}{60} \approx .18$$

TOA



$$\cos A = \frac{24}{25} \approx .96 \quad \tan B = \frac{24}{7} \approx 3.43$$

CAH TOA

$$\sin B = \frac{24}{25} \approx .96$$

SOH

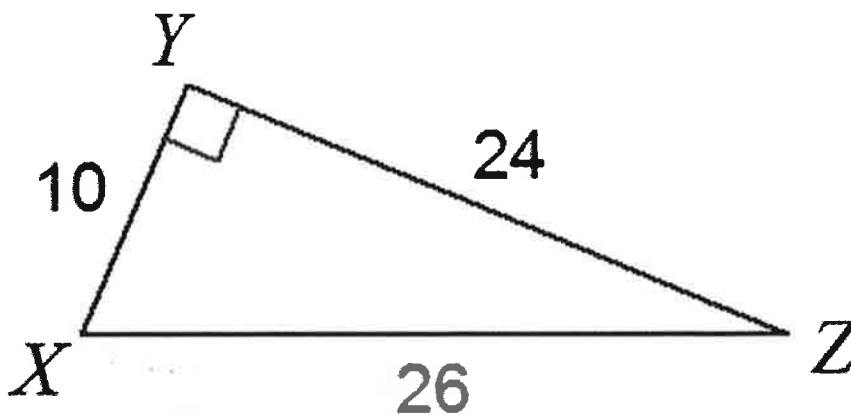
Use your calculator to find the trigonometric ratio. Round to the nearest hundredth.

$$\sin(52^\circ) \approx .79$$

$$\cos(19^\circ) \approx .95$$

$$\tan(65^\circ) \approx 2.14$$

Write each trig ratio as a fraction. Reduce your answer.



SOH
1. $\sin(X)$

$$= \frac{24}{26} = \frac{12}{13}$$

TOA
2. $\tan(Z)$

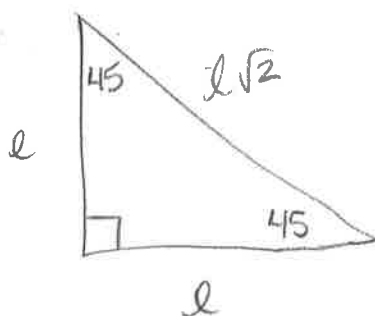
$$= \frac{10}{24} = \frac{5}{12}$$

CAH
3. $\cos(X)$

$$= \frac{10}{26} = \frac{5}{13}$$

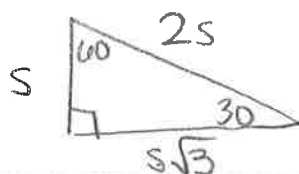
Use a special right triangle to write $\tan 45^\circ$ as a fraction.

*Draw the triangle.



TOA
 $\tan(45) = \frac{l}{l} = 1$

Use a special right triangle to write $\cos 30^\circ$ as a fraction.



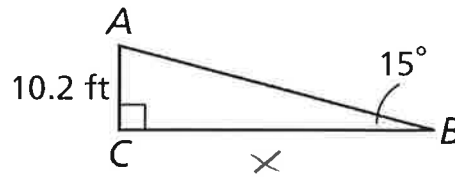
CAH
 $\cos(30) = \frac{s\sqrt{3}}{2s} = \frac{\sqrt{3}}{2}$

Find the length. Round to the nearest hundredth.

Steps

- 1) Look at the angle and the sides given.
- Label the side you are looking for as x.
- 2) Decide whether you have SOH, CAH, or TOA.
- 3) Set up a proportion.
(put a 1 under tan, cos, or sin)

BC



- 1) we are given angle 15° and the side opposite of it. We are looking for the side adjacent to the given angle.
- 2) TOA
- 3) $\frac{\tan(15)}{1} = \frac{10.2}{x}$

$$x \cdot \tan(15) = 10.2$$

$$\frac{x \cdot \tan(15)}{\tan(15)} = \frac{10.2}{\tan(15)}$$

$$x = 38.07 \text{ ft}$$

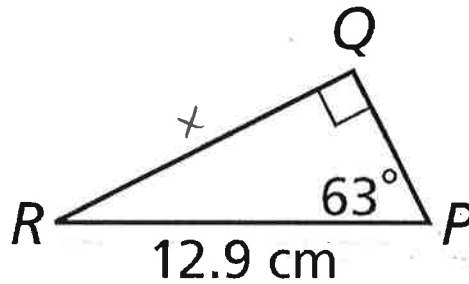


Do not round until the final step of your answer. Use the values of the trigonometric ratios provided by your calculator.

QR

- looking for opp. side
- given hypotenuse

SOH



$$\frac{\sin(63)}{1} = \frac{x}{12.9}$$

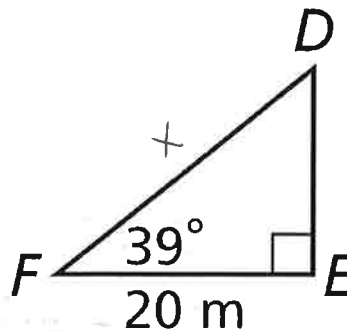
$$x = 12.9 \cdot \sin(63)$$

$$x = 11.49 \text{ cm}$$

FD

- given adjacent
- looking for hypotenuse

CAH



$$\frac{\cos(39)}{1} = \frac{20}{x}$$

$$\frac{x \cdot \cos(39)}{\cos(39)} = \frac{20}{\cos(39)}$$

$$x = \frac{20}{\cos(39)}$$

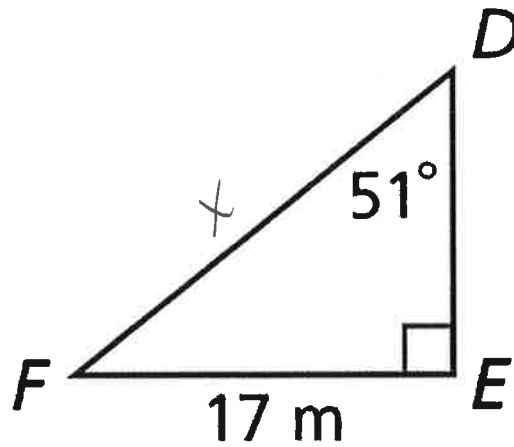
$$x = 25.74 \text{ m}$$

DF

$$\frac{\sin(51)}{1} = \frac{17}{x}$$

$$\frac{x \cdot \sin(51)}{\sin(51)} = \frac{17}{\sin(51)}$$

$x = 21.87 \text{ m}$

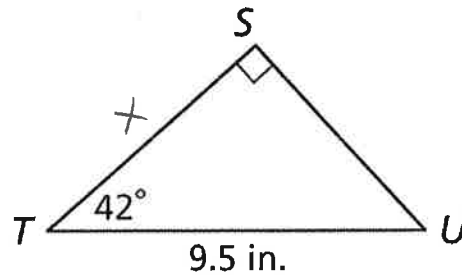


ST

$$\frac{\cos(42)}{1} = \frac{x}{9.5}$$

$$x = 9.5 \cdot \cos(42)$$

$x = 7.06 \text{ in.}$

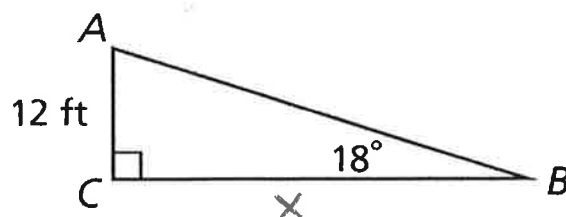


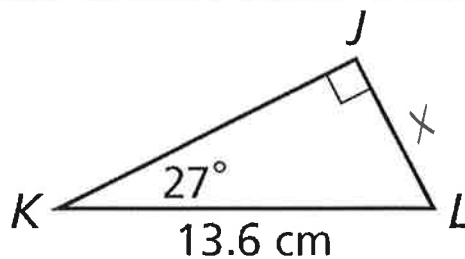
BC

$$\frac{\tan(18)}{1} = \frac{12}{x}$$

$$\frac{x \cdot \tan(18)}{\tan(18)} = \frac{12}{\tan(18)}$$

$x = 36.93 \text{ ft}$



JL

$$\frac{\sin(27)}{1} = \frac{x}{13.6}$$

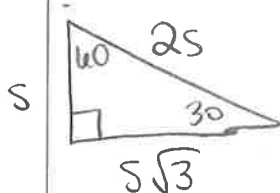
$$x = 13.6 \cdot \sin(27)$$

$$x = 6.17 \text{ cm}$$

Use a special right triangle to write each trigonometric ratio as a fraction.

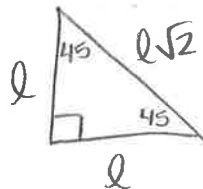
SOH

$$1. \sin 60^\circ = \frac{\cancel{8}\sqrt{3}}{\cancel{2}8} = \boxed{\frac{\sqrt{3}}{2}}$$



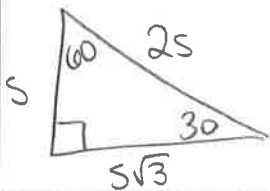
CAH

$$2. \cos 45^\circ = \frac{\cancel{l}}{\cancel{l}\sqrt{2}} = \frac{1 \cdot \sqrt{2}}{\sqrt{2} \cdot \sqrt{2}} = \boxed{\frac{\sqrt{2}}{2}}$$

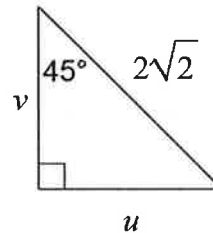
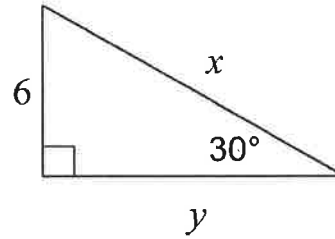


TOA

$$3. \tan 60^\circ = \frac{\cancel{8}\sqrt{3}}{\cancel{8}} = \boxed{\sqrt{3}}$$

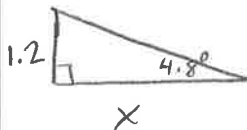


Find the exact area of the triangle.



Problem Solving Application

A contractor is building a wheelchair ramp for a doorway that is 1.2 ft above the ground. To meet ADA guidelines, the ramp will make an angle of 4.8° with the ground. To the nearest hundredth of a foot, what is the horizontal distance covered by the ramp?



$$\frac{\tan(4.8)}{1} = \frac{1.2}{x}$$

$$\frac{x \tan(4.8)}{\tan(4.8)} = \frac{1.2}{\tan(4.8)}$$

$$x = 14.29 \text{ ft}$$

Homework:

WS 9.4 Trigonometric Ratios

