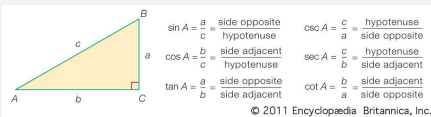


Trigonometric Functions



pythagoras's theorem

$$c^2 = a^2 + b^2 \quad c = \sqrt{a^2 + b^2}$$

$$a^2 = c^2 - b^2 \quad a = \sqrt{c^2 - b^2}$$

$$b^2 = c^2 - a^2 \quad b = \sqrt{c^2 - a^2}$$

c is the hypotenuse whereas a and b can be switched interchangeably

Sine and cosine rule

Sine Rule

$$\frac{a}{\sin(A)} = \frac{b}{\sin(B)} = \frac{c}{\sin(C)} \quad \text{or} \quad \frac{\sin(A)}{a} = \frac{\sin(B)}{b} = \frac{\sin(C)}{c}$$

(for finding sides) (for finding angles)

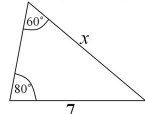
Cosine Rule

$$a^2 = b^2 + c^2 - 2bc \cos(A) \quad \text{or} \quad \cos(A) = \frac{b^2 + c^2 - a^2}{2bc}$$

(for finding sides) (for finding angles)

Sine rule finding side example

Work out the length of x in the diagram below:



Step 1 Start by writing out the Sine Rule formula for finding sides:

$$\frac{a}{\sin(A)} = \frac{b}{\sin(B)}$$

Step 2 Fill in the values you know, and the unknown length:

$$\frac{x}{\sin(60^\circ)} = \frac{7}{\sin(80^\circ)}$$

Remember that each fraction in the Sine Rule formula should contain a side and its opposite angle.

Step 3 Solve the resulting equation to find the unknown side, giving your answer to 3 significant figures:

$$x = \frac{7}{\sin(80^\circ)} \times \sin(60^\circ) \quad (\text{multiply by } \sin(80^\circ) \text{ on both sides})$$

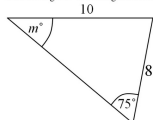
$$x = \frac{7}{\sin(80^\circ)} \times \sin(60^\circ)$$

$$x = 7.96 \text{ (accurate to 3 significant figures)}$$

Note that you should try and keep full accuracy until the end of your calculation to avoid errors.

Sine rule Finding Angles example

Work out angle m° in the diagram below:



Step 1 Start by writing out the Sine Rule formula for finding angles:

$$\frac{\sin(A)}{a} = \frac{\sin(B)}{b}$$

Step 2 Fill in the values you know, and the unknown angle:

$$\frac{\sin(m^\circ)}{8} = \frac{\sin(75^\circ)}{10}$$

Remember that each fraction in the Sine Rule formula should contain a side and its opposite angle.

Step 3 Solve the resulting equation to find the sine of the unknown angle:

$$\frac{\sin(m^\circ)}{8} = \frac{\sin(75^\circ)}{10} \quad (\text{multiply by 8 on both sides})$$

$$\sin(m^\circ) = \frac{\sin(75^\circ)}{10} \times 8$$

$$\sin(m^\circ) = 0.773 \text{ (3 significant figures)}$$

Step 4 Use the inverse-sine function ($\sin^{-1}$) to find the angle:

$$m^\circ = \sin^{-1}(0.773) = 50.6^\circ \text{ (3sf)}$$

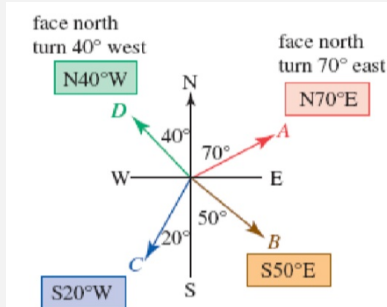
Scale Factor

Scale Factor

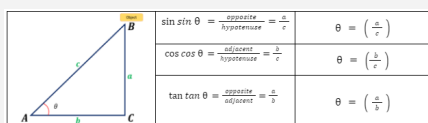
Scale factor is the ratio between the scale of a given original object and a new object, which is its representation but of a different size (bigger or smaller).

sf = larger figure dimensions $\div$ smaller figure dimensions

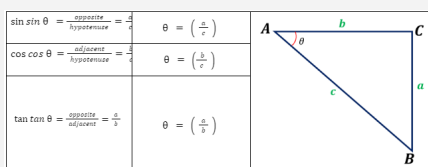
true bearings



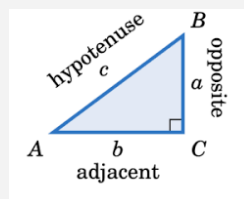
angle of elevation example



angle of depression example



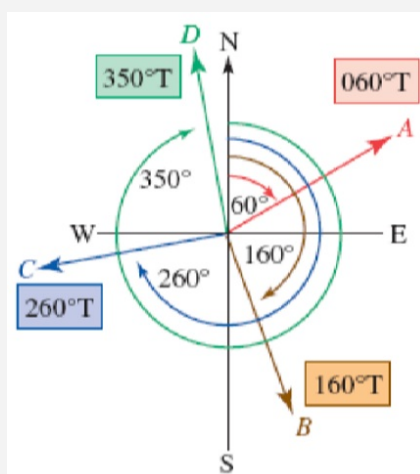
Examples of inverse functions



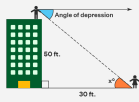
to solve A: $\sin^{-1}(a/c)$ or $\cos^{-1}(\text{adjacent/hypotenuse})$ or $\tan^{-1}(a/b)$

to solve B: $\sin^{-1}(b/c)$ $\cos^{-1}(a/c)$ $\tan^{-1}(b/a)$

conventional bearings

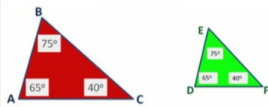


Subtract angles of depression by 90 degrees



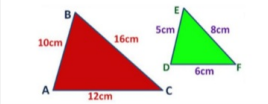
Similarity Test for Similar Triangles

AAA Rule



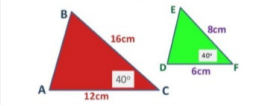
$\angle A = \angle D = 65^\circ$
 $\angle B = \angle E = 75^\circ$
 $\angle C = \angle F = 40^\circ$
 $\triangle ABC \sim \triangle DEF$
 by the **AAA** Rule.

SSS Rule



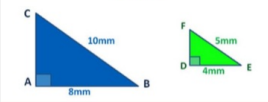
$\frac{AB}{DE} = \frac{10}{5} = 2$
 $\frac{BC}{EF} = \frac{16}{8} = 2$
 $\frac{AC}{DF} = \frac{12}{6} = 2$
 $\triangle ABC \sim \triangle DEF$
 by the **SSS** Rule.

SAS Rule



$\frac{BC}{EF} = \frac{16}{8} = 2$
 $\frac{AC}{DF} = \frac{12}{6} = 2$
 $\angle C = \angle F = 40^\circ$
 $\triangle ABC \sim \triangle DEF$
 by the **SAS** Rule.

RHS Rule



$\angle A = \angle D = 90^\circ$
 $\frac{BC}{EF} = \frac{10}{5} = 2$
 $\frac{AB}{DE} = \frac{8}{4} = 2$
 $\triangle ABC \sim \triangle DEF$
 by the **RHS** Rule.

SINE

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



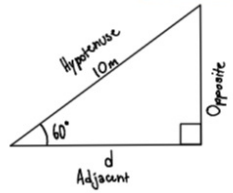
$$\sin 39^\circ = \frac{d}{30}$$

$$d = 30 \times \sin 39^\circ$$

$$d = 18.88 \text{ m}$$

COSINE

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



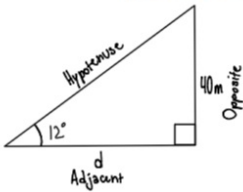
$$\cos 60^\circ = \frac{d}{10}$$

$$d = 10 \times \cos 60^\circ$$

$$d = 5 \text{ m}$$

TANGENT

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



$$\tan 12^\circ = \frac{40}{d}$$

$$d = 40 \div \tan 12^\circ$$

$$d = 188.19 \text{ m}$$



By deathrobotpunch

Published 26th August, 2025.

Last updated 25th August, 2025.

Page 1 of 2.

Sponsored by **Readable.com**

Measure your website readability!

<https://readable.com>

cheatography.com/deathrobotpunch/