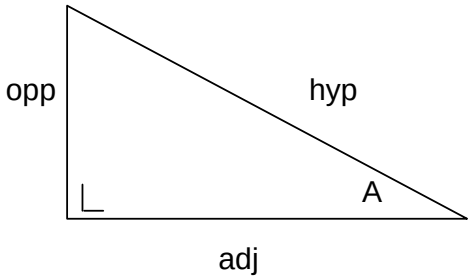
Trigonometry 1

Right angled Triangles

We are going to be dealing with a right - angled triangle which has three important sides called

The hypotenuse (always opposite the right - angle).
The opposite (away from the angle).
The adjacent (beside the angle).



Sin, Cos and Tan

$$\sin A = \frac{opp}{hyp}$$

$$\cos A = \frac{adj}{hyp}$$

$$\tan A = \frac{opp}{adj}$$

Silly old Harry caught a Herring trawling off America.

Oh hell another hour of algebra.

Use of the calculator

Turn on the calculator. Make sure the calculator says deg (or D)

Type 1 To find the sin, cos or tan of a given angle

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Note The DMS button on some calculators is shown as ’’’

Type 2 Given the value of sin, cos or tan to find the angle

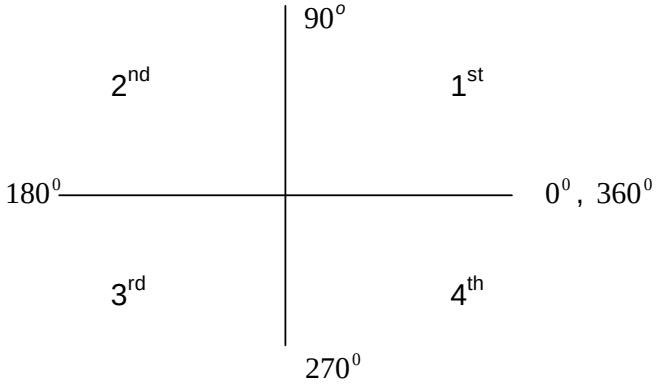
Measure of angles

There are two ways of measuring angle.

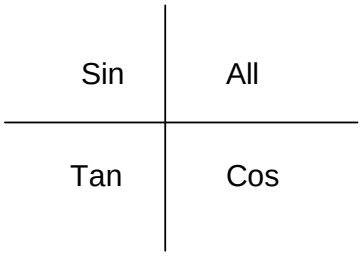
Degrees There are 360^0 in a circle.
Radian There are 2π radians in a circle.

$$\pi = 180^0$$

Unit Circle



To find whether an angle is positive or negative remember
All Silly Tom Cats



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Express in surd form $\cos 135^0$.

Lets answer the by a series of 4 questions and answers

Q. Which quadrant is 135^0 in?

A. Since 135 is between 90 and 180 then 135^0 is in the 2nd quadrant.

Q. What sign (+ or -) is the answer going to have?

A. In the second quadrant sin is positive so cos is going to have a negative answer.

Q. What is the equivalent (reference angle) in the first quadrant?

A. We use the rule below, which you have to learn
A is the angle needed in the first quadrant (reference angle)
B is the angle that we are given.

If B is the angle we are given and A is the required angle in the first quadrant.

$A = 180 - B$	$A = B$
$A = B - 180$	$A = 360 - B$

135^0 is the same as $A = 180^0 - 135^0 = 45^0$

Q. What do we look up in the maths tables?

$45^0 = \frac{\pi}{4}$ so that in the maths tables on page 9 we look in the box. Go across top until we come to $\frac{\pi}{4}$ down to the cos line so that we come up with the answer of $\frac{1}{\sqrt{2}}$.

$$\cos 135^0 = -\frac{1}{\sqrt{2}}$$

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Trigonometry 2

Equations

Solve $\cos\vartheta = -\frac{\sqrt{3}}{2}$ where $0 \le \vartheta \le 360^0$.

Lets answer this by a series of another 3 questions and answers

Q. In which quadrants are the answers?

A. Cos is negative in the 2nd and 3rd quadrants. The minus sign has done its job so for the rest of the question it is ignored.

Q. What is the angle in the 1st quadrant (reference angle)?

A. Need to find where $\cos\vartheta = \frac{\sqrt{3}}{2}$.
Go to the box on page 9. Start on the cos line, go over until we get to $\frac{\sqrt{3}}{2}$ and then up to get an answer of $\frac{\pi}{6} = 30^0$

Q. What are the required answers?

A. We use the rule below, which you have to learn
A is the angle in the first quadrant (reference angle)
B is the angle required.

If A is the angle we are given and B is the required angle in the other quadrants then

$B = 180 - A$	$A = B$
$B = 180 + A$	$B = 360 - A$

$\vartheta = 180^0 - 30^0 = 150^0$

$\vartheta = 180^0 + 30^0 = 210^0$

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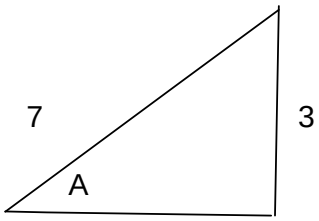
To draw an angle given its cos, sin or tan.

First thing to do is to draw what is called a shadow diagram, which is any sort of rough right angles triangle.



We are given $\sin A = \frac{3}{7}$ but we already know that $\sin A = \frac{opp}{hyp}$

This must mean that in the right-angled triangle we are going to draw that the opposite length will be 3cm long and the hypotenuse will be 7cm long.
Now on graph paper draw a right angle

Solving Triangles

This is by far the most important part of this chapter. No matter what type of question we are asked it comes down to either a right angles or a non right-angled triangle.

Method

Step 1 Read the question (several times).
Step 2 Draw out a diagram for yourself and FILL in as much information as possible.
Step 3 Ask a simple question ***"is it right angled"***

If the answer is **YES** then use sin, cos, or tan or Pythagoras' Theorem.

If the answer is **NO** the use sin rule or area.

Right angled triangles - need only two pieces of information to be able to find a third using

(a) Silly old Harry Caught a Herring trawling off America

(b) Pythagoras' Theorem.

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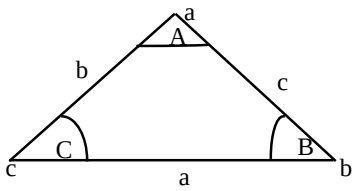
Non right-angled triangles -



Formula 1. Area of a triangle - used to find

(i) area of a triangle given two lengths and include angle

(ii) length or angle given area

Formula 2. Sin Rule - used to find length or angle. We must be given at least one angle and it's opposite length.

Note All of the above formulae are in the maths tables so find them now.

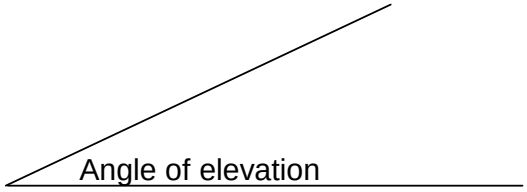
Note You should know your theorems but especially that the angles in a triangle sum to 180^0.

Words of importance

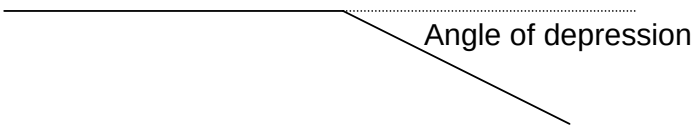
Horizontal : - lying flat on the ground.

Vertical: - standing straight

Angle of elevation: - the angle we look up to the sky from the ground



Angle of depression: - angle we look down from cliff face



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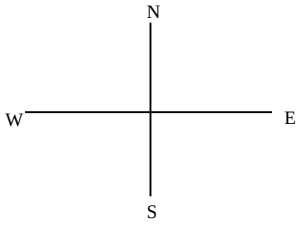
Direction: - north, south, east and west



Trigonometry 3

Right angled Triangles

Going to use sin, cos or tan or Pythagoras' Theorem.

Trigonometry 4

Area of a Triangle and a Sector

Area of a triangle $= \frac{1}{2}ab\sin C$ which means we multiply one length by another by sin of the angle between the two lengths.

Sector of a circle

The best way to do this is not to use any trigonometry but to use the methods from the area and volume section.

Make a fraction by using $\frac{\text{Given angle}}{360}$

Trigonometry 5

Non right angled triangles

Is the triangle right angled ? No so must move on.

Have we an angle and it's opposite length so then we can use the sin rule ? Yes.

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