Angle Conversions

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How to convert degrees to radians or radians to degrees.

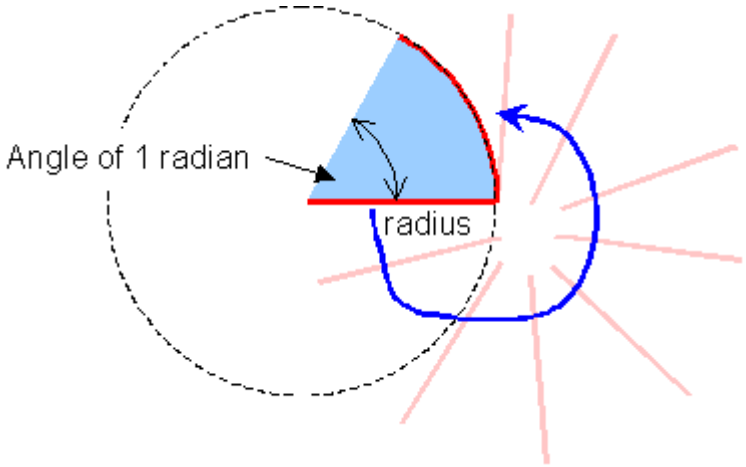
This topic is part of the TCS FREE high school mathematics 'How-to Library', and will help you to convert degrees to radians or radians to degrees.
(See the index page for a list of all available topics in the library.) To make best use of this topic, you need to download the Maths Helper Plus software. Click here for instructions.

Theory:

What are 'radians' ?

One radian is the angle of an arc created by wrapping the radius of a circle around its circumference.

In this diagram, the radius has been wrapped around the circumference to create an angle of 1 radian. The pink lines show the radius being moved from the inside of the circle to the outside:



The radius 'r' fits around the circumference of a circle exactly $2p$ times. That is why the circumference of a circle is given by:

$$\text{circumference} = 2pr$$

So there are $2p$ radians in a complete circle, and p radians in a half circle.

Converting radians to degrees:

To convert radians to degrees, we make use of the fact that p radians equals one half circle, or 180^o.

This means that if we divide radians by p, the answer is the number of half circles. Multiplying this by 180^o will tell us the answer in degrees.

So, to convert radians to degrees, multiply by $^{180}/_{p}$, like this:

$$\text{degrees} = \text{radians} \times \frac{180}{\pi}$$

Converting degrees to radians:

To convert degrees to radians, first find the number of half circles in the answer by dividing by 180º. But each half circle equals p radians, so multiply the number of half circles by p.

So, to convert degrees to radians, multiply by $^{p}/_{180}$, like this:

$$\text{radians} = \text{degrees} \times \frac{\pi}{180}$$

Method:

Maths Helper Plus can show you the working steps for converting your angles between radians and degrees. It also draws the angle as an arc of a circle.

Step 1 Download the free support file... We have created a Maths Helper Plus document to complement this topic. You can use it to practice the steps described below, and as a starting point for solving your own problems.

File name: 'Angle Converter.mhp' File size: 7kb
Click here to download the file.

If you choose 'Open this file from its current location', then Maths Helper Plus **should** open the document immediately. If not, try the other option: 'Save this file to disk', then run Maths Helper Plus and choose the 'Open' command from the 'File' menu. Locate the saved file and open it. **If you do not yet have Maths Helper Plus installed on your computer**, click here for instructions.

Step 2 Enter the angle to convert

Press the F5 key to display the parameters box:

The number in the 'X' edit box changes the type of conversion performed.

If 'X' is 1, then the 'A' value is converted **from degrees to radians**.
If 'X' is 2, then the 'A' value is converted **from radians to degrees**.

If necessary, click on the 'X' edit box and set the value to 1 or 2, depending on the type of conversion you want to perform.
Click on the 'A' edit box and enter the angle to convert. For degrees, just type a number. For radians, you can type a number, or you can enter a value in terms of p by using 'pi' for p.

Click the 'Update' button to update the calculations.