# Calculators and Trigonometric Functions of an Acute Angle

Definition: 1 degree (1°) is 1/360 of a full rotation.

A degree itself can be broken down further.

If we divide 1° into 60 equal parts, each one of the parts is called 1 minute, denoted 1′. One minute is of a degree; in other words, there are 60 minutes in every degree. $\frac{1}{60}$

The next smaller unit of angle measure is a second. One second, 1″, is of a minute. There are 60 seconds in every minute.

$$1^\circ = 60' \qquad \text{or} \qquad 1' = \left(\frac{1}{60}\right)^\circ$$

$$1' = 60'' \qquad \text{or} \qquad 1'' = \left(\frac{1}{60}\right)'$$

# Example 1

1. Add 48° 49′ and 72° 26′.  2. Subtract 24° 14′ and 90°.

Solution:

1. We can add in columns with degrees in the first column and minutes in the second column.

$$\begin{array}{r} 48^\circ\ 49' \\ +\ 72^\circ\ 26' \\ \hline 120^\circ\ 75' \end{array}$$

Because 60 minutes is equal to 1 degree, we can carry 1 degree from the minutes column to the degrees column.

$$120^\circ\ 75' = 121^\circ\ 15'$$

# Decimal Degrees

An alternative to using minutes and seconds to break down degrees into smaller units is decimal degrees.

For example, 30.5°, 101.75°, and 62.831° are measures of angles written in decimal degrees.

To convert from decimal degrees to degrees and minutes, we simply multiply the fractional part of the angle (the part to the right of the decimal point) by 60 to convert it to minutes.

# Example 3

Change 27.25° to degrees and minutes.

Solution:

Multiplying 0.25 by 60, we have the number of minutes equivalent to 0.25°.

$$27.25^\circ = 27^\circ + 0.25^\circ = 27^\circ + 0.25(60') = 27^\circ + 15' = 27^\circ\ 15'$$

Of course in actual practice, we would not show all these steps. They are shown here simply to indicate why we multiply only the decimal part of the decimal degree by 60 to change to degrees and minutes.

# Decimal Degrees

The process of converting back and forth between decimal degrees and degrees and minutes can become more complicated when we use decimal numbers with more digits or when we convert to degrees, minutes, and seconds.

The angles written in degrees, minutes, and seconds will rarely go beyond the minutes column.

Table below lists the most common conversions between decimal degrees and minutes.

| Decimal Degree | Minutes |
|---|---|
| 0.1° | 6′ |
| 0.2° | 12′ |
| 0.3° | 18′ |
| 0.4° | 24′ |
| 0.5° | 30′ |
| 0.6° | 36′ |
| 0.7° | 42′ |
| 0.8° | 48′ |
| 0.9° | 54′ |
| 1.0° | 60′ |

# Examples

Find : tan 58.75° , cos 37.8° .

Solution:

This time, we use the [tan] key:

| **Scientific Calculator** | **Graphing Calculator** |
| --- | --- |
| 58.75 [tan] | [tan] [(] 58.75 [)] [ENTER] |

Rounding to four places past the decimal point, we have

$$\tan 58.75^\circ = 1.6479$$

See examples 7 through 13 on p76 -⋯