

[Podcast by Kimberley Martello]

Degrees, Minutes, Seconds (Page 1 of 2)

- When angles are measured using degrees, the fractional parts of a degree can be expressed in terms of minutes and seconds.
 - A degree is subdivided into 60 equal parts called minutes, denoted by the symbol ($'$).
 - A minute is further subdivided into 60 equal parts called seconds, denoted by the symbol ($''$).

Example: An angle measuring 27 degrees, 14 minutes, and 39 seconds is written as $27^{\circ}14'39''$ in degree-minute-second (DMS) notation.
Also, $27^{\circ}14'39''$ is equivalent to 27.2442° in decimal-degree (DD) notation.

2. Relationship Between Degrees, Minutes, Seconds

$$1^{\circ} = 60' \qquad 1' = 60'' \qquad 1^{\circ} = 60(1') = 60(60'') = 3600''$$

$$1^{\circ} = \frac{1}{60}(1^{\circ}) = \left(\frac{1}{60}\right)' \qquad 1'' = \frac{1}{60}(1') = \left(\frac{1}{60}\right)' \qquad 1'' = \frac{1}{3600}(1^{\circ}) = \left(\frac{1}{3600}\right)^{\circ}$$

- Examples: Convert decimal degrees to degrees, minutes, and seconds (DMS), to the nearest second.

a) $49.5231^{\circ} \rightarrow 49^{\circ} + 0.5231^{\circ}$
 $49^{\circ} + 0.5231(60')$
 $49^{\circ} + 31.386'$
 $49^{\circ} + 31' + 0.386''$
 $49^{\circ} + 31' + 0.386(60'')$
 $49^{\circ} + 31' + 23.16''$ round to the nearest second
 $49^{\circ}31'23''$

b) $17.086^{\circ} \rightarrow 17^{\circ} + 0.086^{\circ}$
 $17^{\circ} + 0.086(60')$
 $17^{\circ} + 5.16'$
 $17^{\circ} + 5' + 0.16''$
 $17^{\circ} + 5' + 0.16(60'')$
 $17^{\circ} + 5' + 9.6''$ round to the nearest second
 $17^{\circ}5'10''$

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4. Examples Convert degrees, minutes, seconds to decimal degrees. Round to the nearest thousandth of a degree.

a) $81^{\circ} 14' 32'' \rightarrow 81^{\circ} + 14' + 32''$ Recall: $1' = \frac{1^{\circ}}{60}$
 $81^{\circ} + 14\left(\frac{1^{\circ}}{60}\right) + 32\left(\frac{1^{\circ}}{3600}\right)$ $1'' = \frac{1^{\circ}}{3600}$
 $81^{\circ} + \frac{14^{\circ}}{60} + \frac{32^{\circ}}{3600}$
 $81^{\circ} + 0.2333^{\circ} + 0.0089^{\circ}$
 81.2422° round to thousandths
 81.242°

b) $57^{\circ} 74' 3'' \rightarrow 57^{\circ} + 74' + 3''$
 $57^{\circ} + 74\left(\frac{1^{\circ}}{60}\right) + 3\left(\frac{1^{\circ}}{3600}\right)$
 $57^{\circ} + \frac{74^{\circ}}{60} + \frac{3^{\circ}}{3600}$
 $57^{\circ} + 1.2333^{\circ} + 0.0008^{\circ}$
 58.2341° round to thousandths
 58.234°

5. Using the Graphing Calculator to Convert DMS \rightarrow DD

a) $13^{\circ} 65' 48'' \rightarrow$ Enter 13 2nd Angle 1 \leftarrow for $^{\circ}$
65 2nd Angle 2 \leftarrow for $'$
48 Alpha $'' \leftarrow$ see above + (ENTER)
 14.0967°

b) $74^{\circ} 28' 59'' \rightarrow$ 74 2nd Angle 1
28 2nd Angle 2
59 Alpha $''$ enter \rightarrow 74.4831°

6. Using the Graphing Calculator to Convert DD \rightarrow DMS

a) 2.548° 2.548 2nd Angle 4 \leftarrow DMS enter
 $2^{\circ} 32' 52.8''$ round to nearest second
 $2^{\circ} 32' 53''$

b) 33.1257° 33.1257 2nd Angle 4
 $33^{\circ} 7' 32.52''$ round to the nearest second
 $33^{\circ} 7' 33''$