

## Decimal Degrees

The following describes the levels of accuracy that are possible when carrying coordinates out to different decimal places.

### **Latitude:**

The earth is not a perfect sphere; it is flattened slightly at the poles. The length of a degree of latitude (a degree of the meridian) will therefore increase slightly as one proceeds from the Equator to either pole. A degree of latitude at the Equator is 110.5673 kilometers (68.703 miles) long, whereas a degree of latitude at the North or South Pole is 111.6993 kilometers (69.407 miles) long.

The northernmost latitude for the state of Texas is 36.5000 degrees North; the southernmost latitude is approximately 25.8368 degrees North. A degree of latitude at 37 degrees North latitude is equal to 110.9656 kilometers (68.951 miles), and is equal to 110.7756 kilometers (68.833 miles) at 26 degrees North latitude. The centralmost latitude for Texas is 31 degrees North; at this latitude, a degree of latitude is equal to 110.8744 kilometers (68.894 miles).

Using the figures for **31 degrees North latitude**, it is possible to construct the following table:

1 degree of latitude	=	1.000000 degree	or	110,874.40 meters
1/10 of a degree of latitude	=	0.100000 degree	or	11,087.44 meters
1/100 of a degree of latitude	=	0.010000 degree	or	1,108.74 meters
1/1000 of a degree of latitude	=	0.001000 degree	or	110.87 meters
1/10000 of a degree of latitude	=	0.000100 degree	or	11.09 meters
1/100000 of a degree of latitude	=	0.000010 degree	or	1.11 meters
1/1000000 of a degree of latitude	=	0.000001 degree	or	.11 meters

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### **Longitude:**

Because meridians of longitude converge as one moves from the Equator to the poles, the length of one degree of longitude (a degree of the parallel) will decrease even more rapidly as one approaches the poles. A degree of longitude at the Equator is 111.321 kilometers (69.172 miles) long, and has a length of zero at either pole.

Within the boundaries of Texas, a degree of longitude at 37 degrees North latitude is equal to 89.014 kilometers (55.311 miles) long, and is equal to 110.119 kilometers (62.212 miles) at 26 degrees North latitude. At 31 degrees North latitude, a degree of longitude is equal to 95.506 kilometers (59.345 miles).

Using the figures for **31 degrees North latitude**, it is possible to construct the following table:

1 degree of longitude	=	1.000000 degree	or	95,506 meters
1/10 of a degree of longitude	=	0.100000 degree	or	9,550.6 meters
1/100 of a degree of longitude	=	0.010000 degree	or	955.06 meters
1/1000 of a degree of longitude	=	0.001000 degree	or	95.506 meters
1/10000 of a degree of longitude	=	0.000100 degree	or	9.551 meters
1/100000 of a degree of longitude	=	0.000010 degree	or	.955 meters
1/1000000 of a degree of longitude	=	0.000001 degree	or	.096 meters

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## **Degrees-Minutes-Seconds**

The following describes the levels of accuracy that are possible when carrying seconds out to different decimal places.

### **Latitude:**

At a latitude of 31 degrees North, a degree of latitude is equal to 110.8744 kilometers (68.894 miles).

Using the figures for **31 degrees North latitude**, it is possible to construct the following table:

1 degree of latitude	=	1.000000 degree	or	110,874.4 meters
1 minute of latitude	=	1/60 of a degree	or	1,847.91 meters
1 second of latitude	=	1/60 of a minute	or	30.7984 meters
1/10 of a second of latitude	=	.10 of one second	or	3.0798 meters
1/100 of a second of latitude	=	.01 of one second	or	0.3080 meters

### **Longitude:**

At 31 degrees North latitude, a degree of longitude is equal to 95.506 kilometers (59.345 miles).

Using the figures for **31 degrees North latitude**, it is possible to construct the following table:

1 degree of longitude	=	1.000000 degree	or	95,506 meters
1 minute of longitude	=	1/60 of a degree	or	1,591.7667 meters
1 second of longitude	=	1/60 of a minute	or	26.5294 meters
1/10 of a second of longitude	=	.10 of one second	or	2.6529 meters
1/100 of a second of longitude	=	.01 of one second	or	0.2653 meters

### **Source:**

Robinson, Arthur H. et al. *Elements of Cartography*, 5th ed. New York: John Wiley & Sons, 1984. (pp 64-66, Appendix B)

As presented: <http://www.tceq.state.tx.us/gis/geocoord.html>