

How to ...



Interpret Map Measurements

Working with maps frequently involves measurements of one type or another. The units of measurement used on a map vary from different systems of measure and magnitude of units. This guide offers a resource for understanding different units, some in current use and some historical to assist interpretation of measurements of distance and scale represented on maps.

Metric conversions and unit equivalents

Cartographers create maps which are graphic representations of the world around them. To do so, and for readers to understand the expressions of scale on maps, one must understand the units used to measure distances. For example, a representative fraction is one method for the expression of scale. Since this expression is a ratio, the units of measure must be common to both parts. It therefore becomes important to know how many inches there are in a mile. The expression

1	INCHES	FEET	YARDS	MILE	CM	M	KM
INCH	1	0.083			2.54	0.0254	
FOOT	12	1	0.333		30.48	0.3048	
YARD	36	3	1		91.44	0.9144	
MILE	63,360	5280	1760	1	160,934	1609.34	1.6093
CM	0.3937				1	0.01	
M	39.37	3.28	1.094		100	1	0.001
KM	39,370	3280.84	1093.61	0.6214	100,000	1000	1
	INCHES	FEET	YARDS	MILE	CM	M	KM

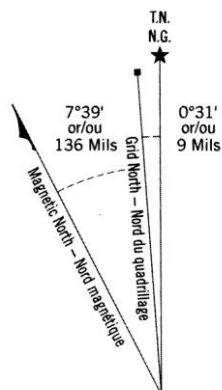
1:63,360 (a common map scale used by the U.K. Ordnance survey) can be interpreted as one inch on the map represents 63,360 inches on the ground, or, 1 inch represents one mile. Also, it is often necessary when working with maps to convert from one system of measurement to another, for example, from Imperial (inches, feet, miles) to Metric (centimeters, metres, kilometers). The table shown above contains several commonly used units of measure, the equivalent units that make up each one and conversion factors between the various units of measure.

Other Measures on Maps and Charts

<i>NAUTICAL MEASURES</i>	<i>DISTANCE AND SURVEY MEASURES</i>	<i>AREA MEASURES</i>
1 nautical mile = 1.1516 statute miles	1 mile = 80 chains = 320 rods	1 square mile = 2.590 square kilometre
1 statute mile = 0.8684 nautical miles	1 chain = 4 rods = 66 feet = 100 links	1 square kilometre = 0.386 square mile
1 nautical mile = 1.852 kilometres	1 rod = 5.5 yards = 16.5 feet = 25 links	1 square mile = 640 acres
1 kilometre = 0.540 nautical miles	1 link = 0.66 feet = 7 7/8 inches	1 acre = 43,560 square feet
1 nautical league = 3 nautical miles	1 furlong = 10 chains = 660 feet	1 acre = 10 square chains = 160 square rods
1 fathom = 6 feet = 1.829 metres	8 furlongs = 1 mile	1 hectare = 2.471 acres
120 fathoms = 1 cable	1 league = 3 miles	1 acre = 0.405 hectares

Angular Measures

Angular measures are also important with map work. All locations on a map are referenced by their position on the globe and angular measures north or south of the equator and east or west of the prime meridian. In addition, when using a compass to measure bearings, angular measures are recorded with reference to map grids and then to north. Magnetic declination diagrams that are shown on topographic maps reference angular measures that are measured in degrees and minutes and also mils. While some map users work in minutes and degrees, some choose to work primarily in mils.



ANGULAR MEASURES

1 degree = 60 minutes		1 minute = 60 seconds	
1 degree	1/360 circle	about 17.8 mils	about 1.1 grad
1 grad	1/400 circle	16.0 mils	0°54' = 0.9°
1 mil	1/6400 circle	0.05625°	0.0625 grad

Ground Distances at Various Map Scales

Maps are scaled representations of the earth's surface. The scale at which they are shown is representative of a ratio of one unit representing a number of the same units on the ground. To assist the interpretation of distances shown on a map, the following table provides these equivalents at some commonly used map scales.

AT THIS SCALE	1 INCH ON THE MAP REPRESENTS A GROUND DISTANCE OF		1 CENTIMETRE ON THE MAP REPRESENTS A GROUND DISTANCE OF	
	Feet	Metres	Feet	Metres
1:500	41.7	12.7	16.4	5
1:1000	83.3	25.4	32.8	10
1:1250	104.2	31.8	41	12.5
1:2500	208.3	63.5	82	25
1:5000	416.7	127.0	164	50
1:10,000	833.3	254	328.1	100
1:12,500	1,041.7	317	410.1	125
1:20,000	1,666.7	508	656.2	200
1:24,000	2000	609.6	767.4	240
1:25,000	2,083.3	635	820.2	250
1:50,000	4,166.7	1,270	1,640.4	500
1:63,360	5,280	1,609.3	2,078.7	633.6
1:100,000	8,333.3	2,540	3,280.8	1,000
1:250,000	20,833	6,350	8,202	2,500
1:500,000	41,667	12,700	16,404	5,000
1:1,000,000	83,333	25,400	32,808	10,000