

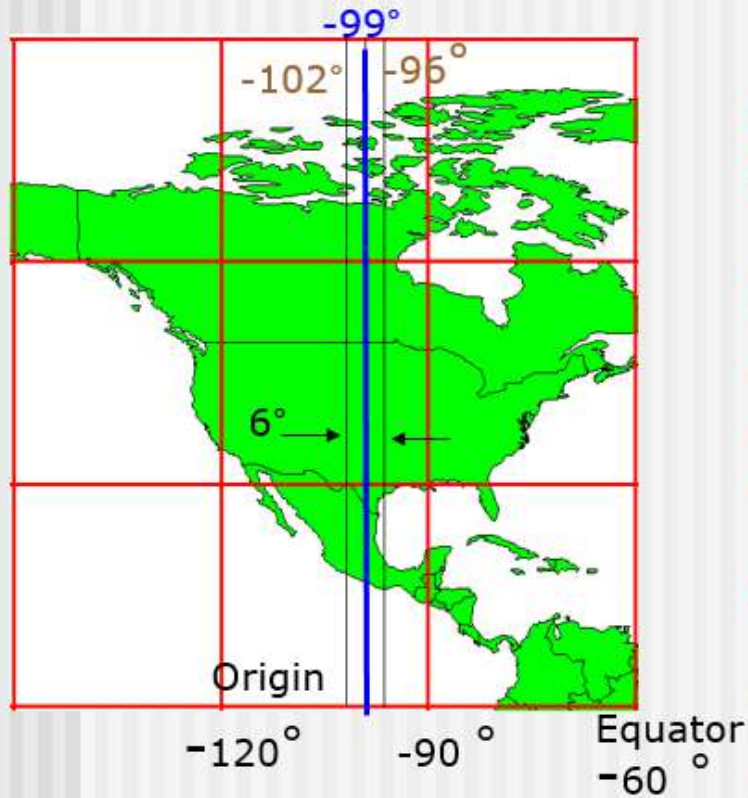
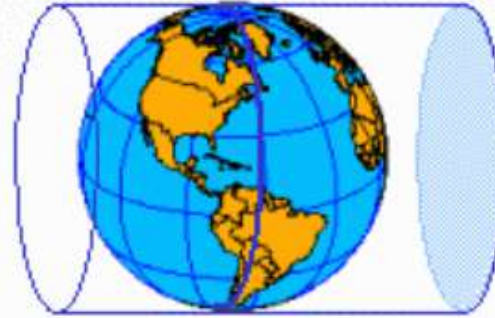
UNIVERSAL TRANSVERSE MERCATORS' PROJECTION

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UTM Projection

UTM Zone 14



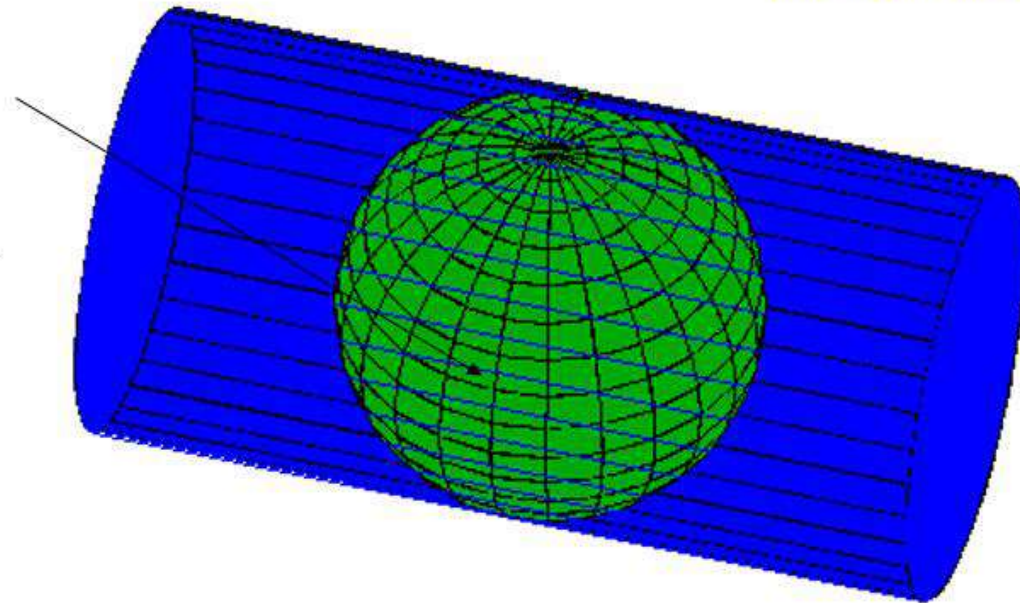
- Universal Transverse Mercator
- Conformal projection (shapes are preserved)
- Cylindrical surface
- Two standard meridians
- Zones are 6 degrees of longitude wide
- Scale distortion is 0.9996 along the central meridian of a zone
- There is no scale distortion along the standard meridians
- Scale is no more than 0.1% in the zone
- Scale distortion gets to unacceptable levels beyond the edges of the zones

Universal Transverse Mercator Grid System (UTM)

A transverse cylindrical projection is used:

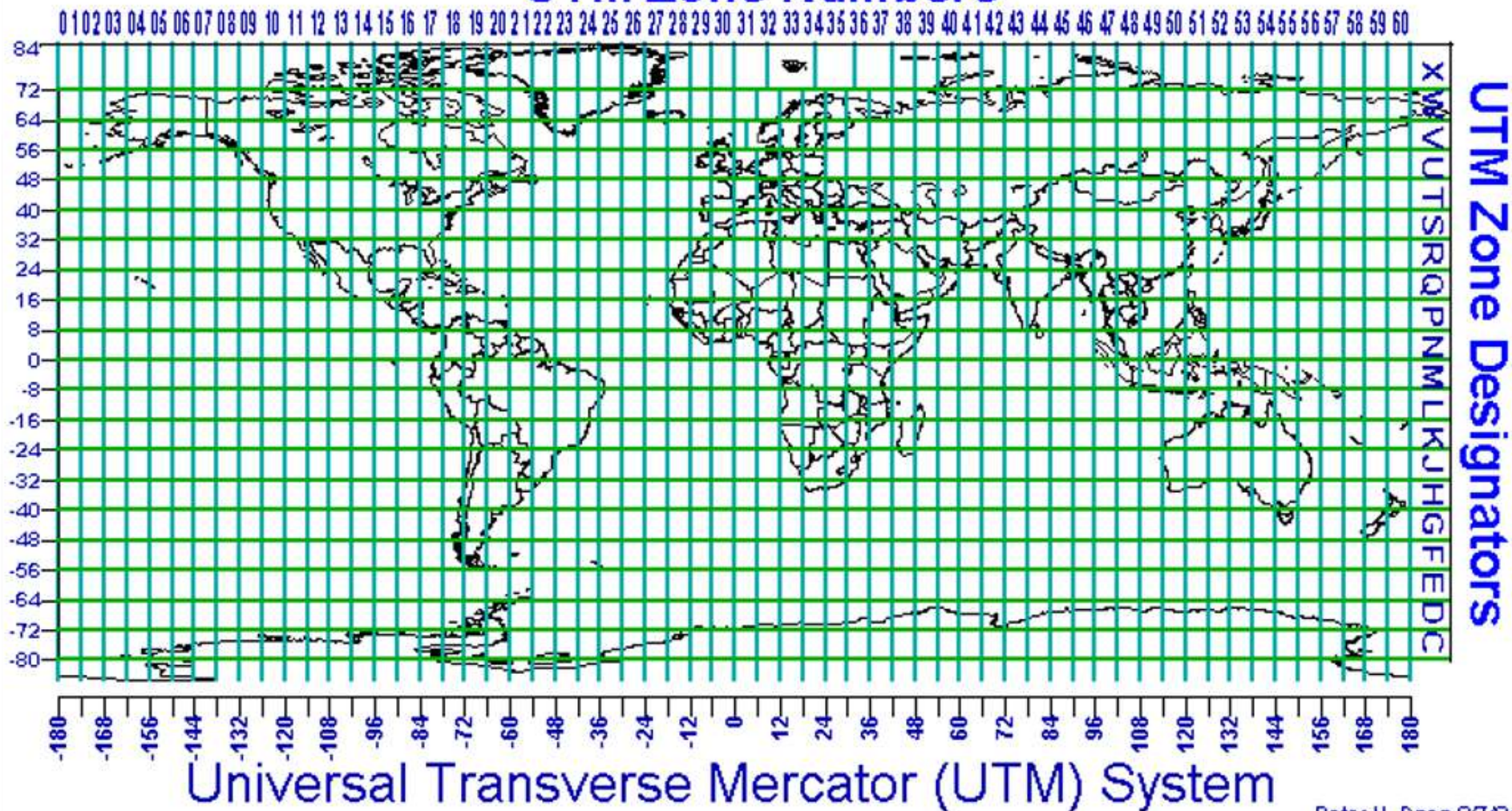
A narrow strip, 6° of longitude wide, astride the **central meridian** has very little distortion.

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Transverse Cylindrical Projection Surface

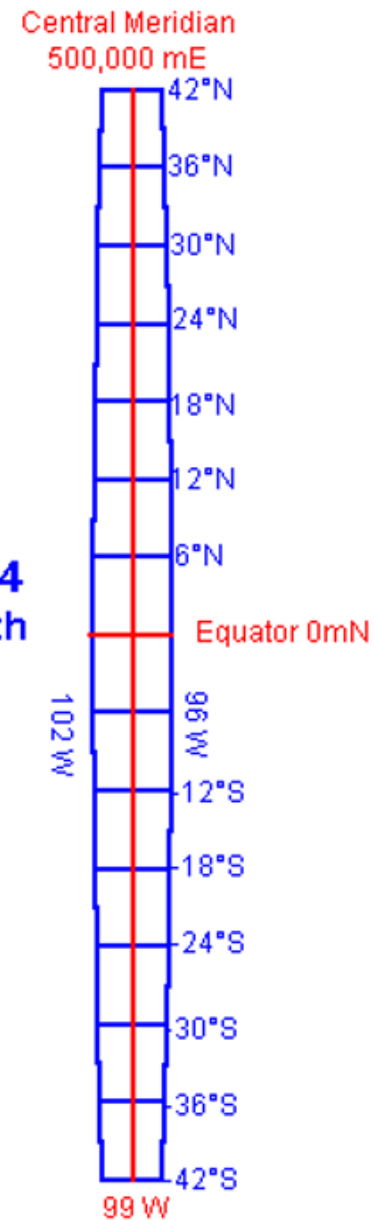
UTM Zone Numbers



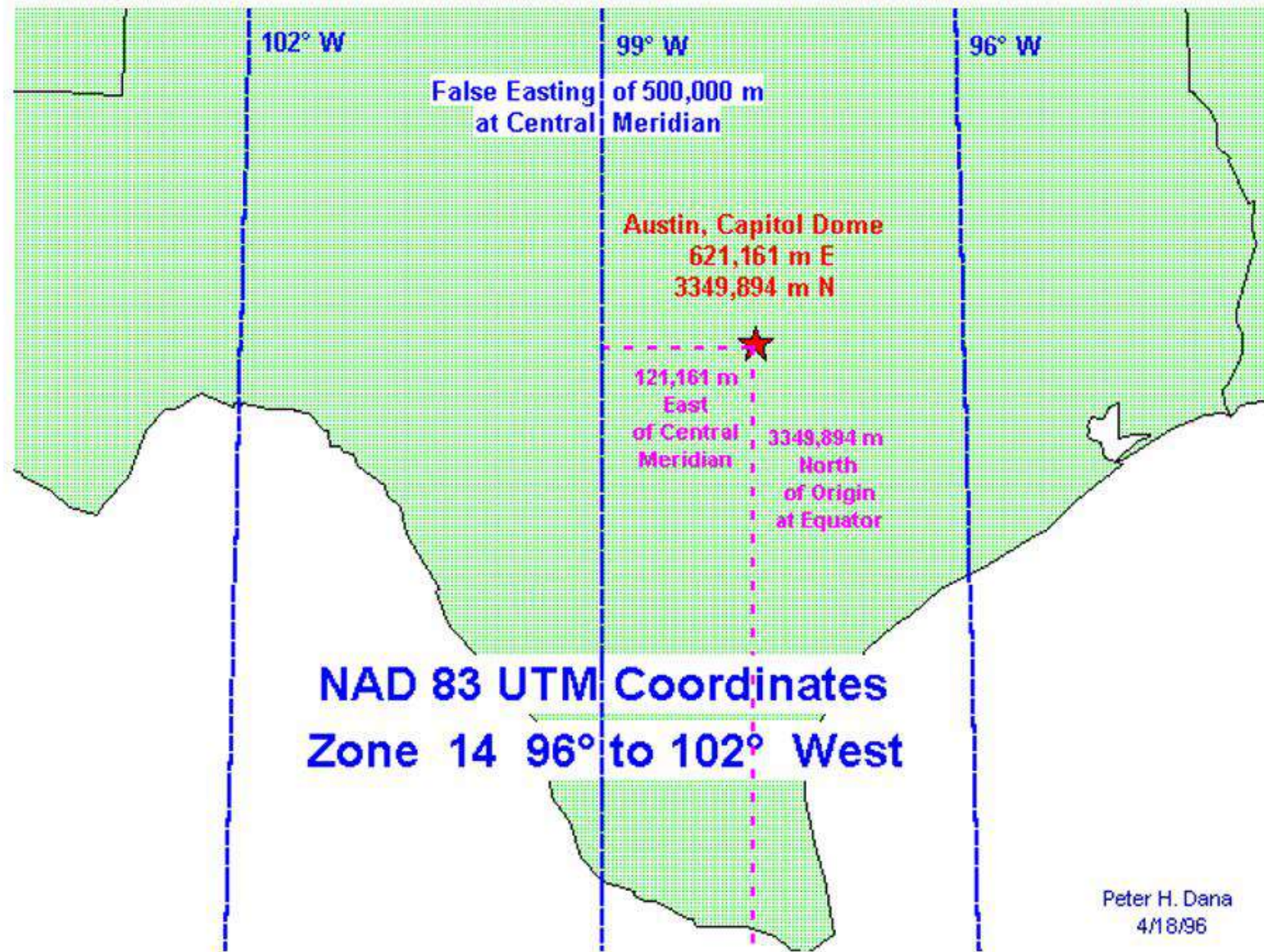
By moving the cylinder around the globe, 60 strips can be created: these are UTM grid zones, numbered 1-60.

For example, grid zone 14 is centered on 99° west and runs through Texas. This zone covers 96° to 102° west. A 1-km grid is superimposed onto this map. The grid lines are numbered by their distance north from the equator and east from an imaginary base line which is arbitrarily located 500 km west of the central meridian (so the central meridian becomes the 500,000 m east grid line). Any point within the grid zone can be fixed by these two distances (a northing and an easting).

UTM Zone 14
(from 42°South
to 42°North)



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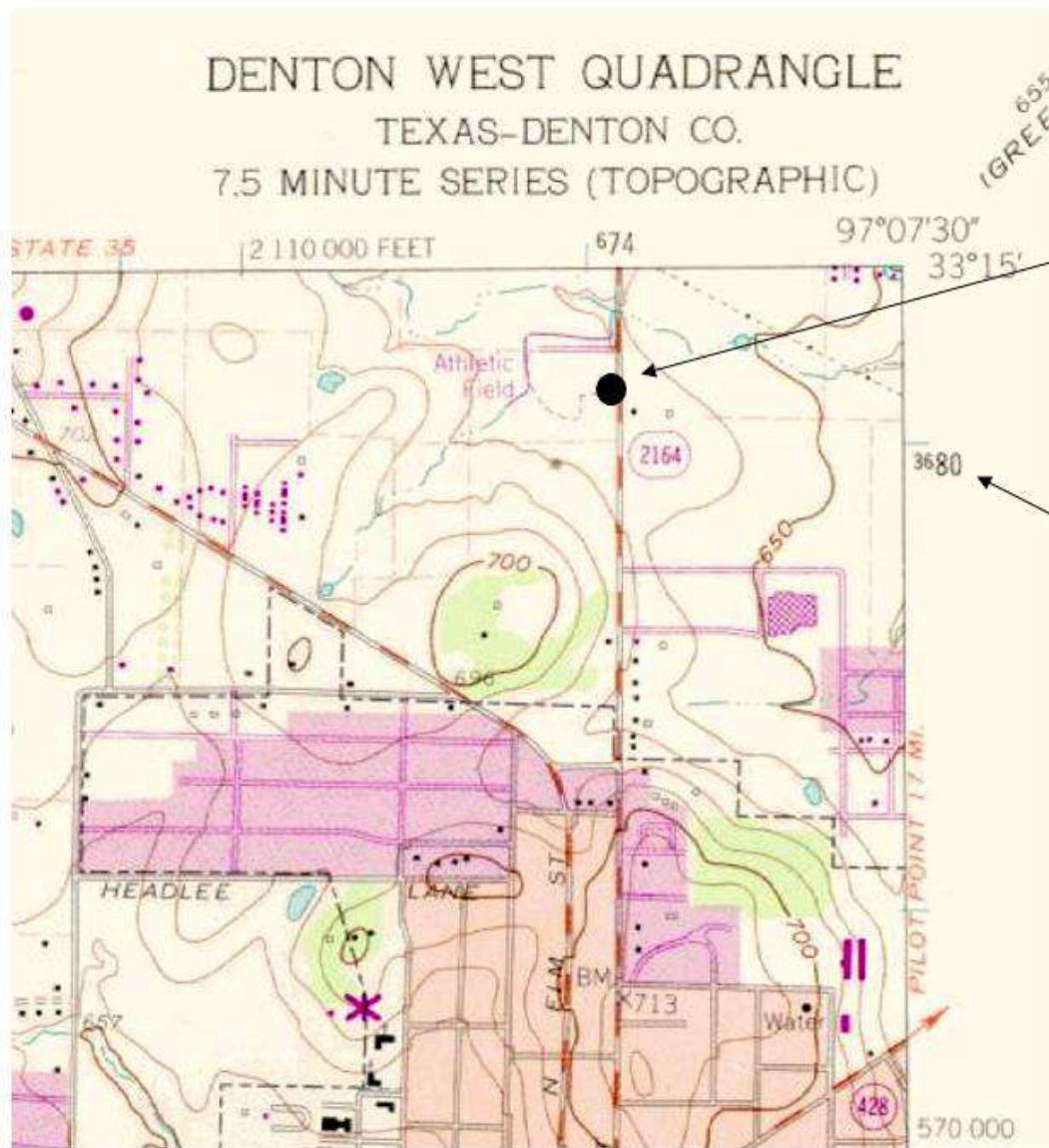
The UTM reference:

Zone 14: 621161 m E, 3349894 m N

is a unique location within grid zone 14, accurate to the nearest meter. The grid zone number must be specified because this same reference occurs in all grid zones.

When working on a map of a small area in the U.S. such as Denton, UTM grid references are usually given to the nearest hundred meters (i.e. the nearest 1/10 of a grid square; so 621161 m E would become 621200 m E). Also by convention, the zone number, the first digit in the easting, the first two digits in the northing and the two zeros (10's and 1's of meters) can be dropped. The example above would then become:

212499 This is a 6-digit UTM grid reference.

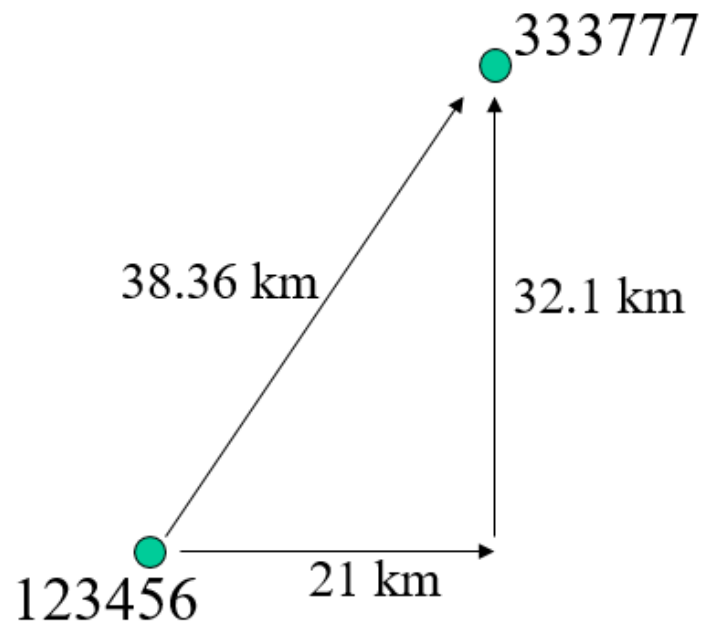


For example, this point is 674100 m east and 3680300 m north in grid zone 14. It's 6 digit UTM reference is: 741803

UTM grid tick

Note: to find the original UTM reference, you can put the "missing" numbers back, so 741803 becomes 674100 m east and 3680300 m north

Plane-coordinate grid references like UTM references can be used to calculate distances between points because they are based on measured distances. For example, the UTM references 123456 and 333777 would have an easting separation of $33300 - 12300 \text{ m} = 21000 \text{ m} = 21 \text{ km}$; and a northing separation of $77700 - 45600 \text{ m} = 32100 \text{ m} = 32.1 \text{ km}$. By Pythagoras theorem, the straight line distance between these points would be: $\text{sqrt } 21^2 + 32.1^2 = \text{sqrt } 1471.41 = 38.36 \text{ km}$.



THANK YOU