

Title: Latitude and Longitude

What you will learn:

- Prepare a formal laboratory report using the template provided
- Cartesian coordinate system
- Latitude and Longitude
- Conversion from latitude/longitude to Cartesian Coordinates system

Resources: Read and study the following resources before doing the exercise.

- Definition of latitude and longitude from whatis.com
<http://whatis.techtarget.com/definition/latitude-and-longitude>
- Conversion from latitude/longitude to Cartesian coordinate system
https://cdn.citl.illinois.edu/courses/TSM352/TSM352_Labs/Module1_Lab01/M1_Lab01_Presentation01/index.htm

Laboratory Exercise

Map coordinates are often given in terms of latitude and longitude. However, these are angular measures and have to be converted to linear measures in order to calculate distances and areas.

Determine the area of the field shown below in both acres and hectares given the latitude and longitude of the corners.



Figure 1. Aerial view of the field

Table 1. Coordinates of field boundaries

Corner	Longitude	Latitude
1	-88.2236640	40.0868791
2	-88.2215168	40.0868791
3	-88.2215168	40.0864410
4	-88.2204432	40.0864410
5	-88.2204432	40.0856196
6	-88.2191549	40.0856196
7	-88.2191550	40.0837085
8	-88.2236640	40.0837030
9	-88.2236640	40.0856196
Local Origin	-88.2236640	40.0837030

Procedure:

1. Open the Lat_Long_Converter.xlsx file and copy the local origin into the worksheet cells for the origin of Latitude and Longitude.

	A	B	C	D	E	F	G
1							
2				Longitude at origin	Latitude at origin		
3				-88.223664	40.083703		
4							
5							
6							
7							
8		X	Y	E	Longitude	Latitude	X
9	Formulas	753.514	-112.988	-88.22096747	40.08339364	753.514	-112.988
10							
11							
12							
13							
14							
15							
16							
17							
18							

2. Copy the latitude and longitude coordinates of the field boundary into the appropriate columns below the formula row.

Lat_Long_Converter01.xlsx [Compatibility Mode]

	A	B	C	D	E	F	G
1							
2				Longitude	Latitude		
3				at origin	at origin		
4				-88.223664	40.083703		
5							
6							
7							
8		X	Y	Longitude	Latitude	X	Y
9	Formulas	753.514	-112.988	-88.22096747	40.08339364	753.514	-112.988
10				-88.223664	40.0868791		
11				-88.22151678	40.0868791		
12				-88.22151679	40.08644101		
13				-88.22044318	40.08644101		
14				-88.2204432	40.08561961		
15				-88.21915488	40.08561961		
16				-88.21915495	40.08370848		
17				-88.223664	40.083703		
18				-88.223664	40.08561961		
19							
20							
21							

- Copy the formulas from the right X-Y columns into the rows with the boundary coordinates. The coordinates will be in feet, relative to the local origin. Watch the lab2 video for this step of the procedure at: https://mediaspace.illinois.edu/media/t/1_xbrm1rcx
- Plot the XY boundary points to be sure that lines do not cross. Do NOT include the coordinates in the Formula row. Watch the lab2 video for this step of the procedure at: https://mediaspace.illinois.edu/media/t/1_xbrm1rcx
- Enter the X-Y coordinates for the boundary into the x and y columns at <http://www.mathopenref.com/coordpolygonareacalc.html> and calculate the area (sq. feet).
- Convert the result to acres and to hectares.

Deliverables:

Write your laboratory report following the lab_report_template. The report should include the following:

- Table of coordinates (from Excel)
- Plot of field (XY boundary from Excel)
- Area in ft² and acres