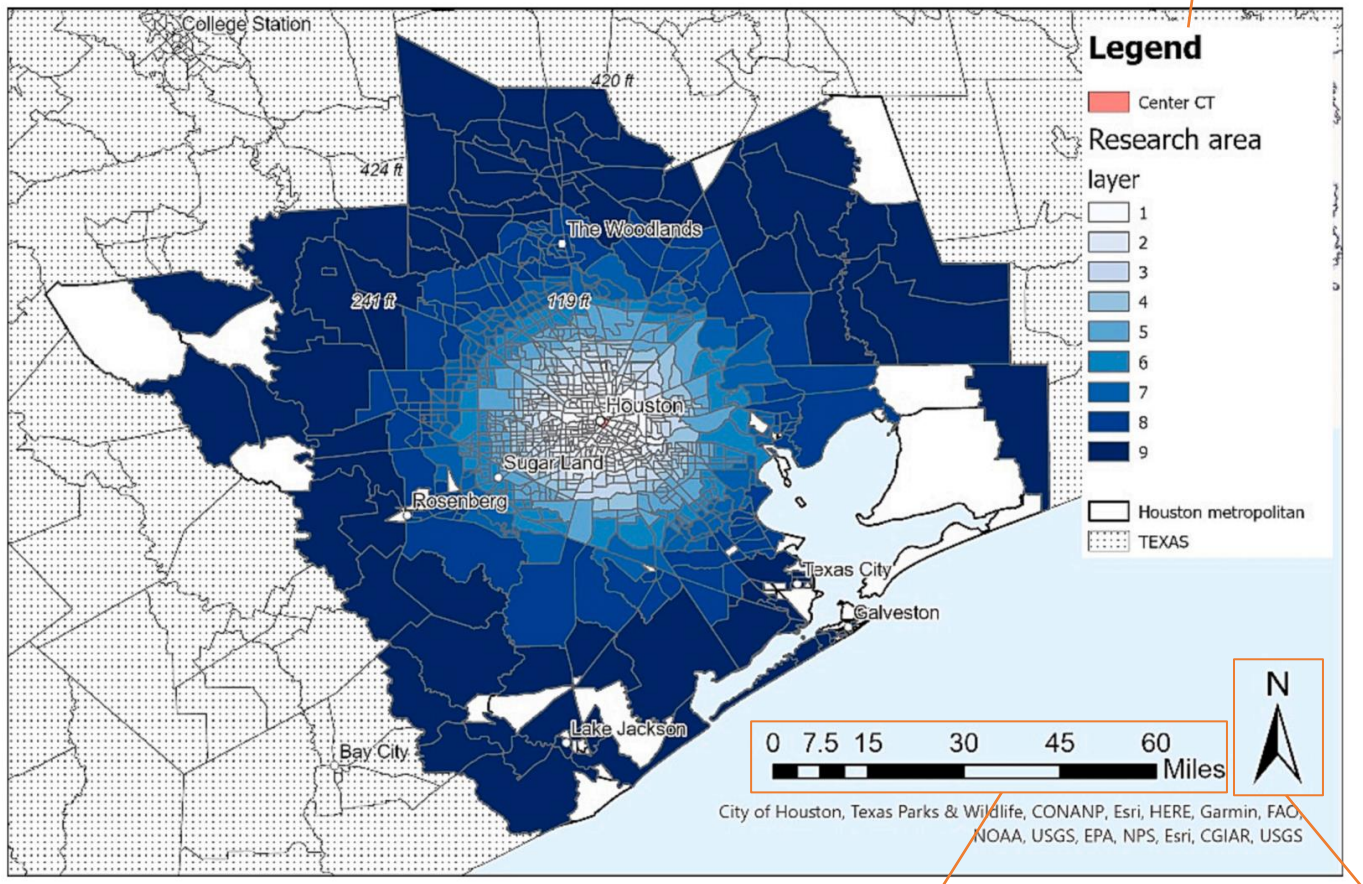
Introduction to Maps and Mapping



Maps have long served as important tools for geographers.

Transition from traditional paper maps to digital mapping technologies.

In this lab, we will learn about basic map concepts: **scales, grid systems, and topographic maps**.

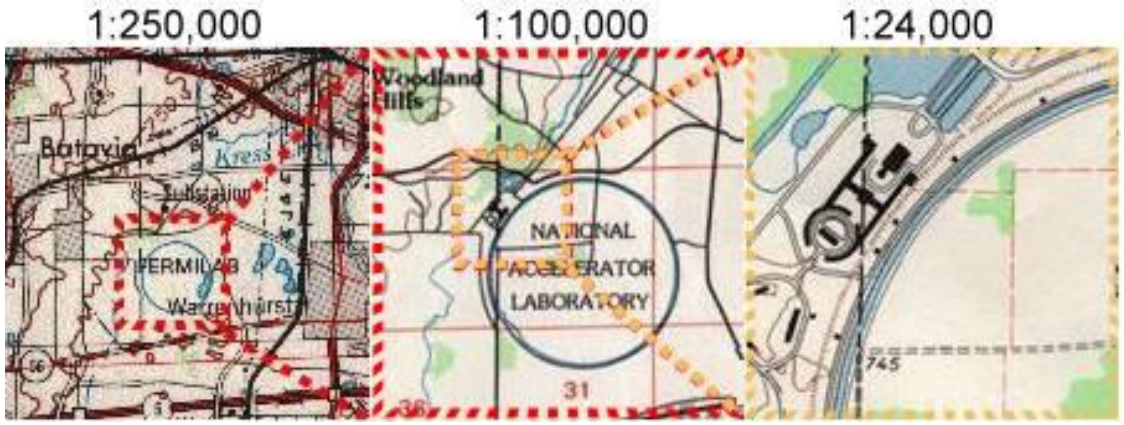
Gu, X., Chen, P., & Fan, C. (2024). Socio-demographic inequalities in the impacts of extreme temperatures on population mobility. Journal of Transport Geography, 114, 103755. https://doi.org/10.1016/j.jtrangeo.2023.103755

Three Basic Elements of a Map

Map Scales

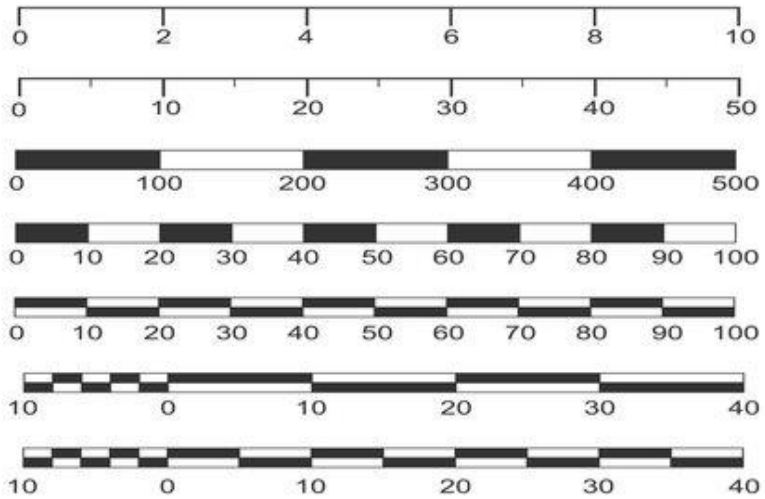
Map scales represent the relationship between the map and the real world. There are three primary types of map scales:

1. **graphical scales**
2. **verbal scales**
3. **ratio scales**



https://www.compassdude.com/map-scales.php

eg.1



eg.2

one inch to the mile

one cm equal one km

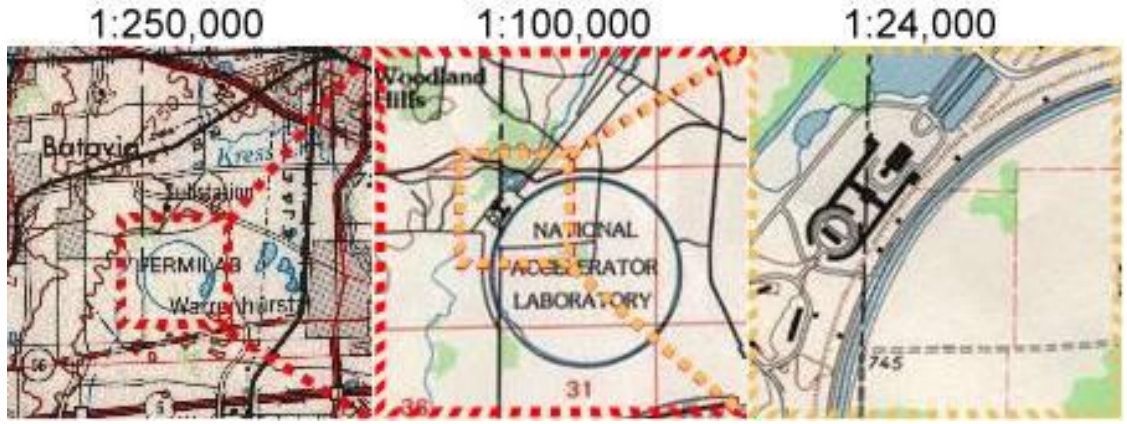
eg.3

1 : 250,000

1 : 3000

1 : 10

1 : 100000000000000



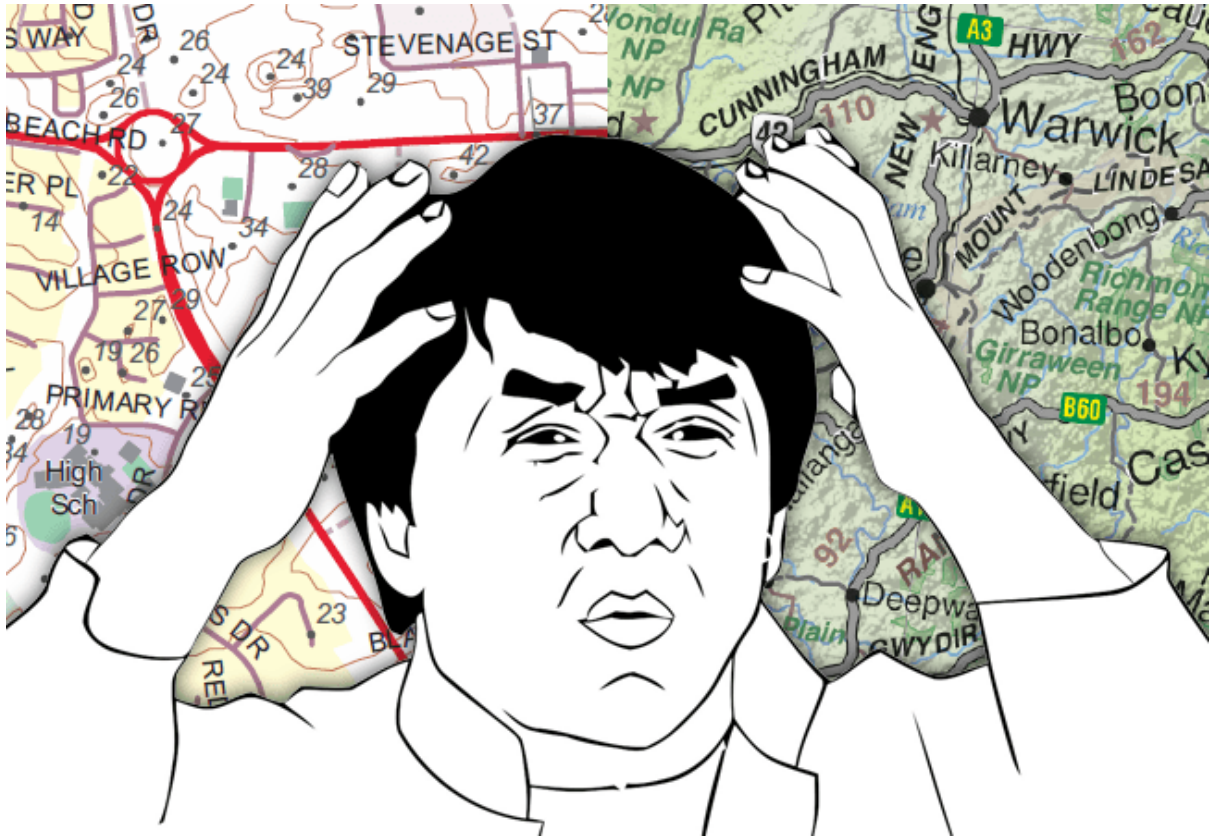
Turn to Lab Activity 2

Q8: Which map series is the <u>smaller-scale</u> map?

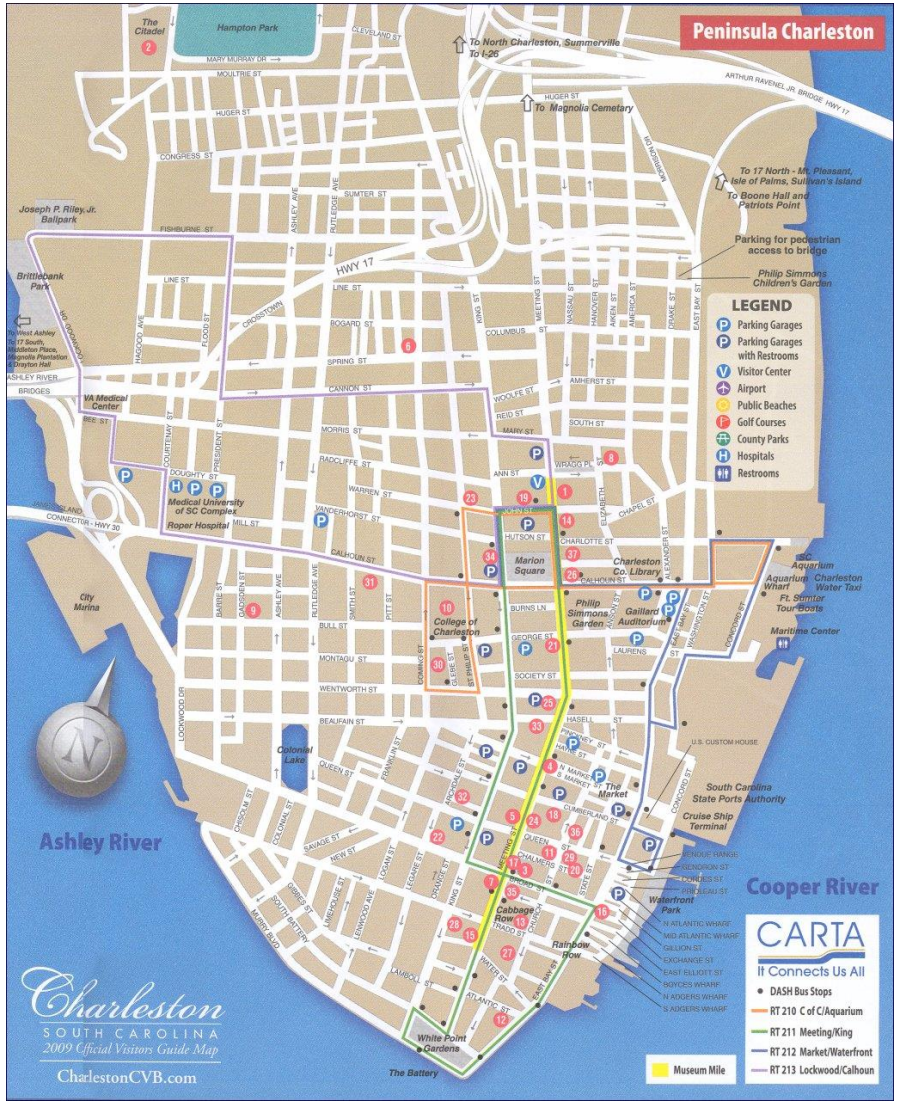
1:24,000 / 1:250,000 (circle one)

Q9: Which map series would be more helpful for finding a neighborhood park after arriving in New Orleans?

1:24,000 / 1:250,000 (circle one)



- Large-scale maps show smaller areas with more detail.
- Small-scale maps show larger areas with less detail.




NEW YORK
POPULATED PLACES
1,000,000 and over
New York
100,000 – 499,999
Syracuse
25,000 – 99,999
Binghamton
24,999 and less
Saranac Lake
State capital
Albany
Urban areas
TRANSPORTATION
Interstate; limited access highway
Other principal highway
Railroad
Ferry
Airport
PHYSICAL FEATURES
Streams
Lakes
Highest elevation in state (feet) 5344
Other elevations (feet) 4180
CANADA
QUÉBEC
ONTARIO
VERMONT
NEW HAMPSHIRE
MASSACHUSETTS
CONNECTICUT
PENNSYLVANIA
NEW JERSEY
Lake Ontario
Lake Erie
Lake Champlain
Lake George
Finger Lakes
Seneca Lake
Cayuga Lake
Oneida Lake
Black R
Hudson River
Delaware River
Susquehanna River
ADIRONDACK MTS
Catskill Mts
Slide Mtn 1,270 m 4,180 ft
Mt Marcy 1,629 m 5344 ft
Long Island Sound
Long Island
ATLANTIC OCEAN
Massena
Malone
Plattsburgh
Ogdensburg
Potsdam
Saranac Lake
Lake Placid
Tupper Lake
Long Lake
Watertown
Oswego
Fulton
Rome
Utica
Oneida
Ilion
Gloversville
Johnstown
Amsterdam
Saratoga Springs
Glens Falls
Schenectady
Troy
Albany
Lockport
Niagara Falls
N Tonawanda
Rochester
Newark
Seneca Falls
Auburn
Syracuse
Geneva
Geneseo
Cheektowaga
Buffalo
Dunkirk
Fredonia
Jamestown
Olean
Wellsville
Bath
Hornell
Bansville
Corning
Elmira
Endicott
Ithaca
Cortland
Norwich
Oneonta
Sidney
Binghamton
Catskill
Hudson
Poughkeepsie
Monticello
Newburgh
Middletown
Peekskill
White Plains
Yonkers
New York
LGA
Queens
Brooklyn
JFK
Montauk
0 20 40 60 80 100 120 km
0 20 40 60 80 mi
Albers equal area projection
© Nations Online Project


Major streets
Other streets
Railroads
Subways and stations
Ferries
State boundaries
County boundaries
City limits
Points of interest
Parks
© Encyclopædia Britannica, Inc.
1 American Craft Museum
2 Art Students League
3 Avery Fisher Hall
4 Carnegie Hall
5 City Hall
6 Columbus Circle
7 Cooper Union for the Advancement of Science and Art
8 David H. Koch Theater
9 Federal Hall National Memorial
10 Federal Reserve Bank
11 Fraunces Tavern Museum
12 GE Building
13 Grand Army Plaza
14 International Building
15 Juilliard School
16 Library and Museum of the Performing Arts
17 Metropolitan Opera House
18 Museum of Modern Art
19 National Academy of Design
20 New York City Center
21 New York Stock Exchange
22 Radio City Music Hall
23 St. Bartholomew's Church
24 St. Patrick's Cathedral
25 Theodore Roosevelt Birthplace National Historic Site
26 Trinity Church
27 U.S. Customs House
28 Woolworth Building
29 Yivo Institute for Jewish Research

1 : 250,000	1 / 250,000
1 : 3000	1 / 3000
1 : 10 →	1 / 10
1 : 100000000000000	1 / 100000000000000

In ratio scale, You can use the colon as a division sign.

Now, Back to Q8 & Q9. Try to solve them.

Grid System-Geographic Coordinates

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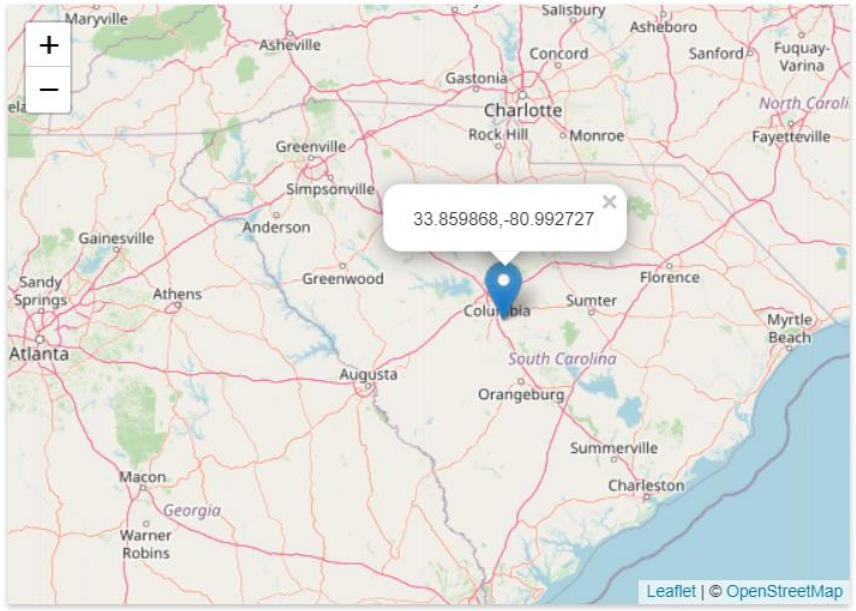
Geographic coordinates are based on latitude and longitude.

- Latitude measures the north-south position
- longitude measures the east-west position.

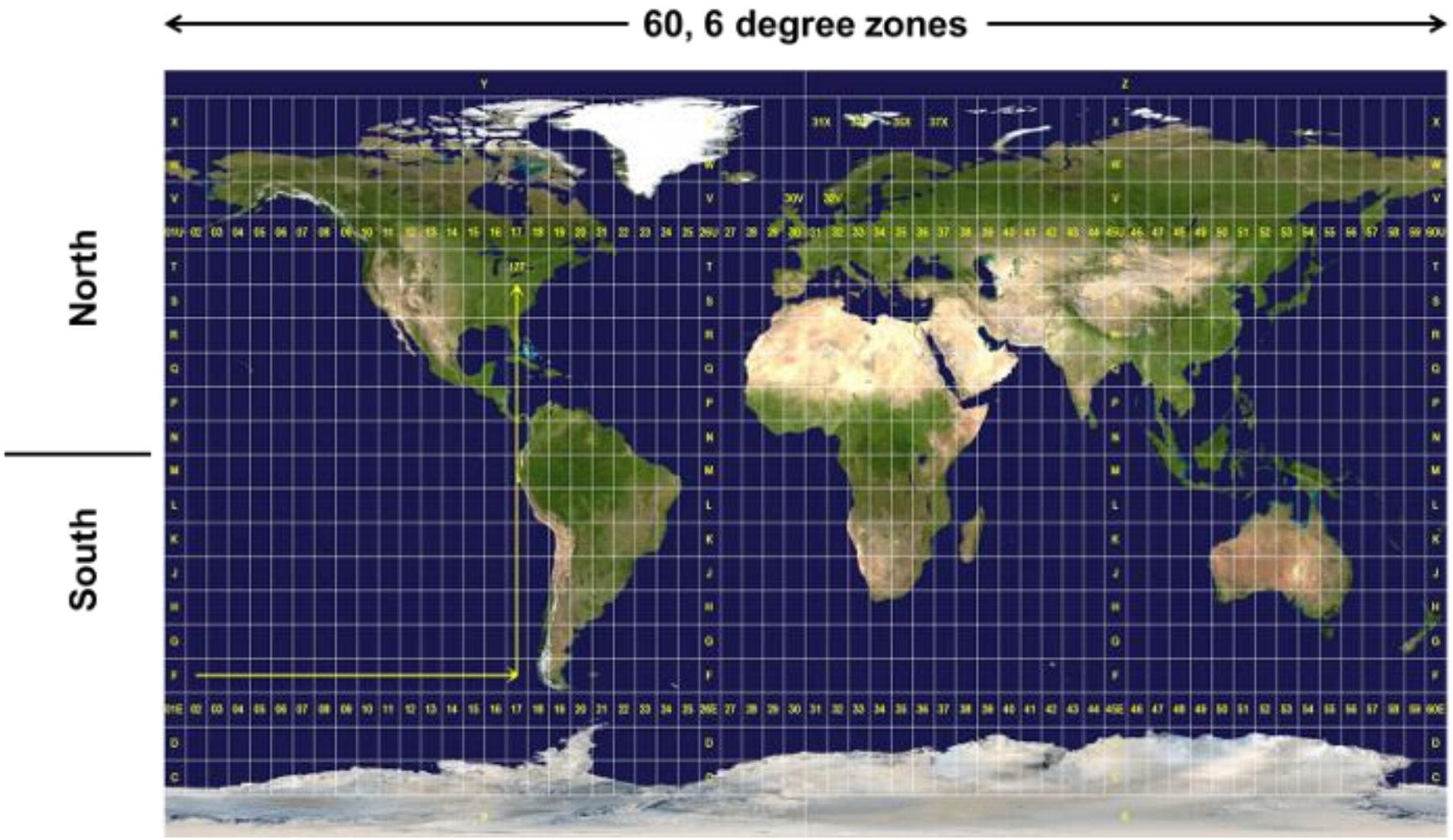
https://www.arcgis.com/home/webscene/viewer.html?layers=70b02790add94ce990ead498d974e3c9

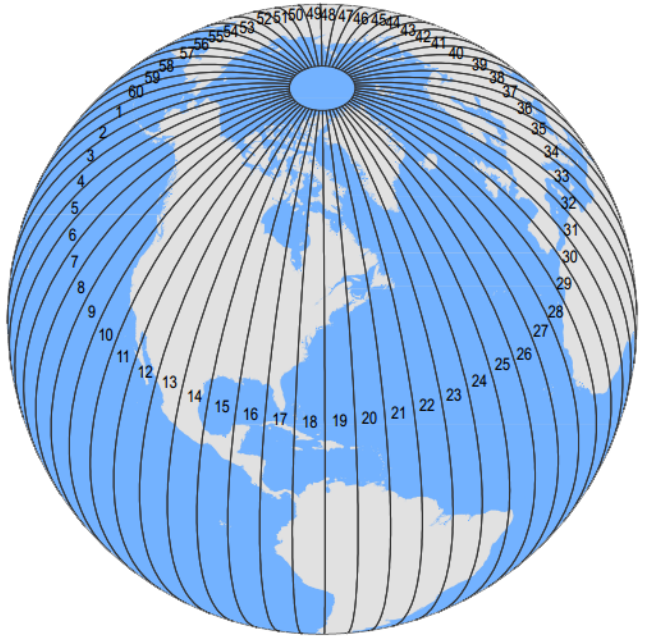
https://www.latlong.net/



Lat Long	GPS Coordinates
(33.859868, -80.992727)	33° 51' 35.5248" N 80° 59' 33.8172" W

Universal Transverse Mercator (UTM) Grid

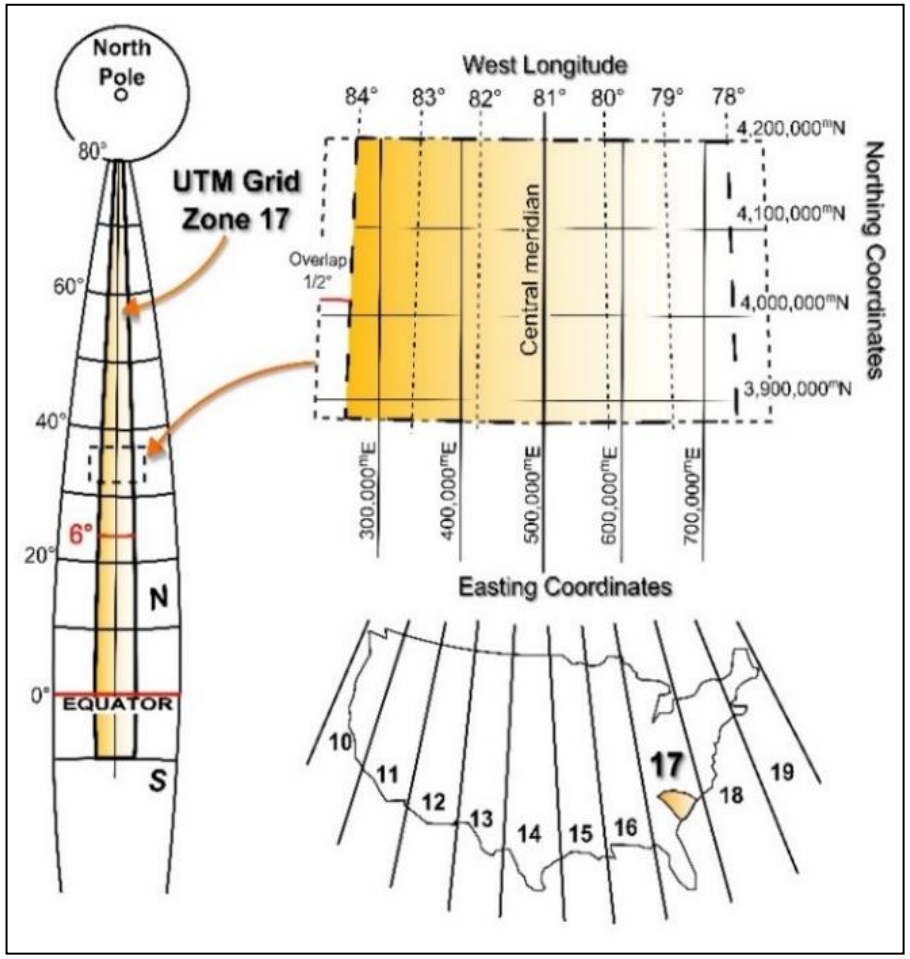




1. UTM Zone Width:
•Each UTM zone covers 6 degrees of longitude.
•At the equator, this width is about 667 km (667,000 meters), but it decreases as you move toward the poles due to the Earth's curvature.

2. Easting Values:
•Easting values in the UTM system range from 0 to 1,000,000 meters.
•The central meridian of each zone is given a **false easting** of 500,000 meters to prevent negative values.

3. Understanding Easting Changes:
•On the central meridian, the easting is 500,000 meters.
•Moving east increases the easting (e.g., 600,000 meters = 100,000 meters east of the central meridian).
•Moving west decreases the easting (e.g., 400,000 meters = 100,000 meters west of the central meridian).



Q3: How far is a UTM northing of 4,000,000m from the equator?

(*note: 1 km = 1000 m*)

Q4: In the UTM system, if a location has an easting of 600,000m, is it <u>EAST</u> or <u>WEST</u> of the central meridian?

Topographic Maps and Contour Lines

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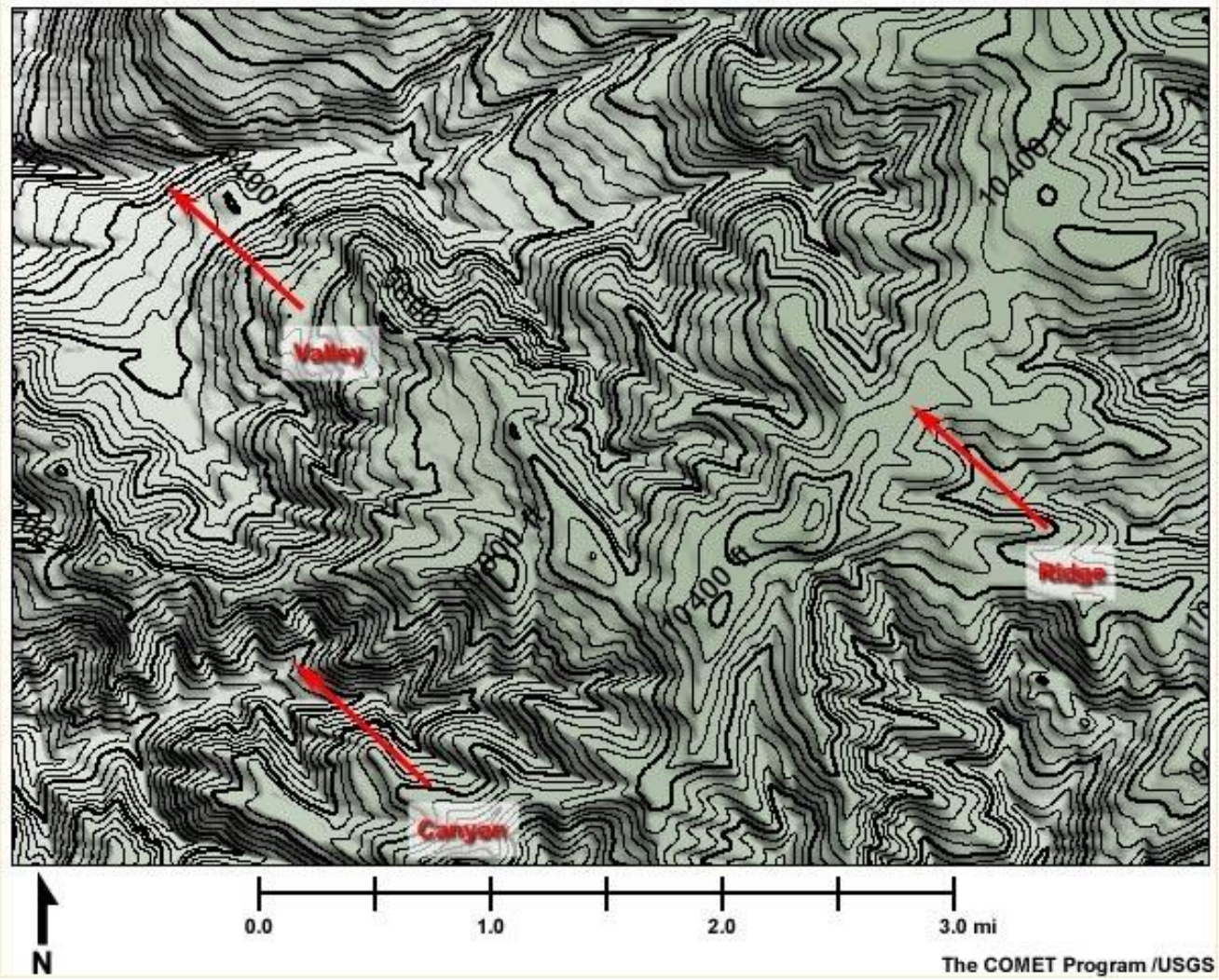

A contour line is a line drawn on a topographic map to indicate ground elevation or depression.
A contour interval is the vertical distance or difference in elevation between contour lines. Index contours are bold or thicker lines that appear at every fifth contour line.

Practice: What is the contour interval?

Practice: Which direction (N, S, E, W) does this slope face?

Practice: What is the elevation of the contour line immediately 'below' B?

Practice: What is the elevation of the contour line immediately above B?

Practice: Using linear interpolation, what is the approximate elevation of point B?

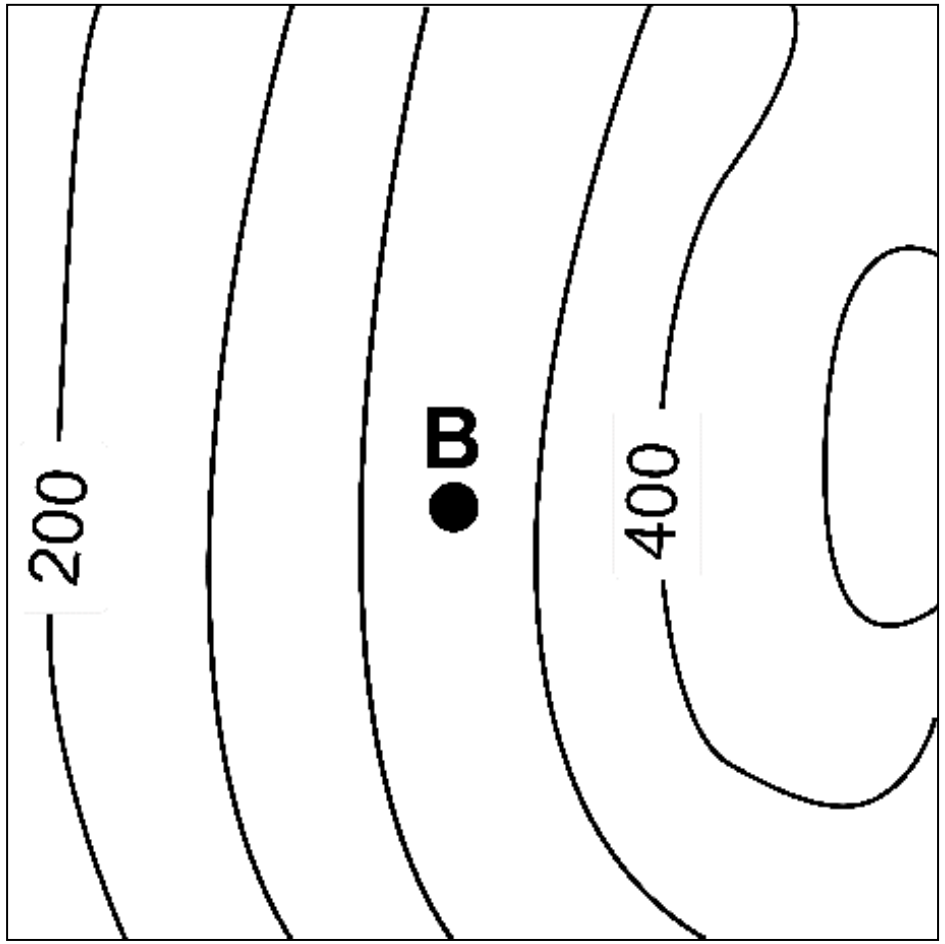

Figure 7. Topographic map with unstated contour interval. Calculate elevation of point B by linear interpolation.

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You can check the slides on:

https://pengyu-gis.github.io/Teaching.html

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