The Ninety-Nines, Inc.,® International Organization of Women Pilots®

Aviation Adventure Guide
Module 5 - Maps & Charts

Southeast Section
Ninety-Nines
Women Pilots

Module 5
Maps & Charts

What is a Map or Chart? A map and chart are a graphic representations of a portion of the Earth as seen from above. A chart is a specialized form of a map. A map and chart use colors, symbols and labels to identify what is being displayed on the ground. Since a map and chart are a small paper covering a large area, it is impossible to depict all features found in the area but typically, the major features are shown in some format.

There are many types of maps and charts: road maps so people know which roads to follow when they are driving; marine charts so boaters know where the water is shallow and where underwater hazards and shipping channels are located; aviation charts showing land features, airspace, and obstructions so pilots know where they are flying. There are also topographic maps (showing ground contours), celestial maps (showing location of stars and constellations); climate maps (showing different aspects of weather); economic or resource maps (showing what natural resources might be found in an area); and the list goes on.

Regardless of the type of map or chart you are learning to read, all maps and charts have one thing in common: they all have a key or "legend". The key is a list of symbols, colors and labels with their interpretation. Once you master the art of reading and understand a map/chart key, you will have no problem at all in reading and interpreting all of the different types of maps and charts.

Sectional Charts: In aviation we use VFR (Visual Flight Rules) Sectional Charts for navigation. The sectional charts depict land elevations, obstacles, airports, airspace, land features that are easy to recognize from the air, and navigational aids.

Take a look at the segment of the sectional chart to the right. You can see many colors for the land: brown is high elevation; white is very high elevation, green is lower elevation and yellow is a large city area. You can clearly see rivers and other water bodies, lines for roads and railroads, and blue and magenta circles and lines representing airports and airspace. Other things are represented on the chart too.
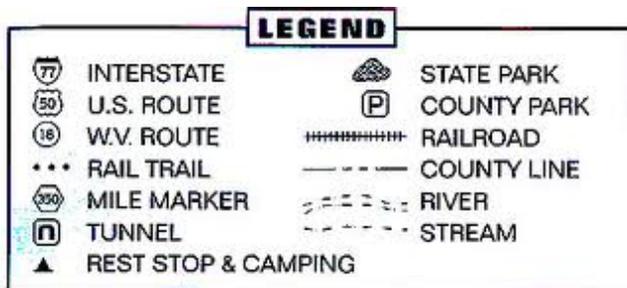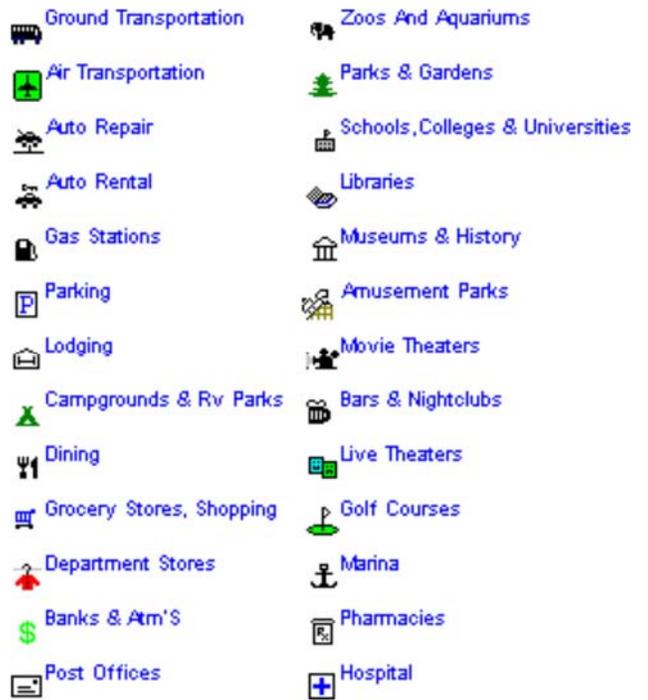

NOT FOR NAVIGATION
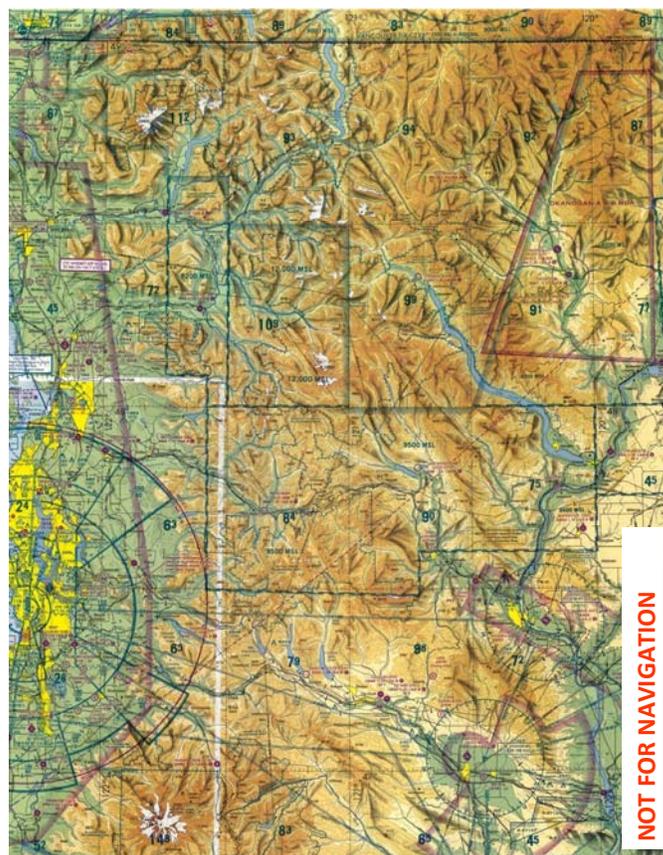
The Key is the Legend: The best way to understand a map is to understand the legend of the map. Look at each of the symbols on the map: what do they represent? Usually, they are fairly logical. Look at the samples below.

Recreational Legend

This legend on the left could have come from a recreational guide for local parks to inform visitors what services are at each park. While each symbol is defined, note that you can probably guess what many of them mean because you recognize the picture!

The legend to the right would seem to indicate City services and might be found on a visitors' guide map. People unfamiliar with the area can look on the map to readily identify points of interest, shopping, restaurants and entertainment. Again, you can guess what many of these symbols mean because you recognize the picture.

Ground Transportation
Air Transportation
Auto Repair
Auto Rental
Gas Stations
Parking
Lodging
Campgrounds & Rv Parks
Dining
Grocery Stores, Shopping
Department Stores
Banks & Atm'S
Post Offices

Zoos And Aquariums
Parks & Gardens
Schools, Colleges & Universities
Libraries
Museums & History
Amusement Parks
Movie Theaters
Bars & Nightclubs
Live Theaters
Golf Courses
Marina
Pharmacies
Hospital

LEGEND

77	INTERSTATE			STATE PARK
50	U.S. ROUTE	P	COUNTY PARK
18	W.V. ROUTE	+++++++++++	RAILROAD
•••	RAIL TRAIL	— - - —	COUNTY LINE
350	MILE MARKER		RIVER
n	TUNNEL		STREAM
▲	REST STOP & CAMPING		

This legend on the left is an example of a road map legend. It identifies types of roads, highway features and motorist services.

Ground Transportation

Air Transportation

Auto Repair

Auto Rental

Gas Stations

Parking

Lodging

Campgrounds & Rv Parks

Dining

Grocery Stores, Shopping

Department Stores

Banks & Atm'S

Post Offices

Zoos And Aquariums

Parks & Gardens

Schools,Colleges & Universities

Libraries

Museums & History

Amusement Parks

Movie Theaters

Bars & Nightclubs

Live Theaters

Golf Courses

Marina

Pharmacies

Hospital

N

1st Street

2nd Street

3rd Street

4th Street

5th Street

6th Street

Ave E

Ave F

Ave G

Ave C

Ave D

7th Street

Upper Ct.

8th

9th Street W

9th Street E

Lower Ct.

10th Street

Ave A

Ave B

Legends questions:

1.How many schools are on the map? _____ The schools are at the end of what roads?
_____ and _____ .

2. If you wanted to stay at a hotel very close to a restaurant, you would stay at the hotel on the corner of _____ and _____ .

3. The hospital is located on the corner of _____ and _____ .

4. If I wanted to go to the auto repair, I would go to the corner of _____ and _____ .

5. Most of the department stores can be found along which road? _____

6. What is at each end of Ave. D? North end: _____

South end: _____

7. What is at the corner of Ave. F and 4th Street? _____

8. There are 2 businesses along 5th Street. What are they? _____

and _____

9. How many banks are there on the map? _____

10. If I lived in Lower Ct. Subdivision and asked you for directions to the Zoo, please tell me how to get there. _____

_____

_____

_____

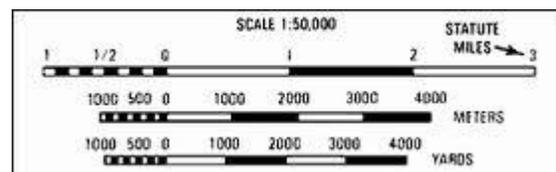11. Where are the 2 grocery stores located? _____

and _____

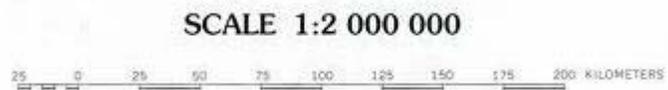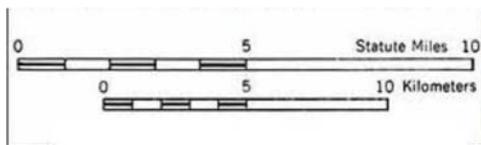12. How many hotels can be found along Ave. G? _____

Grids: One way to find a general location on a map is to use the **grid**. A grid generally looks like graph paper with lines running side-to-side and up-and-down to form little boxes. In the sample map below, the island of Maui is located at D6. Find the other islands:

1. D5 = _____

2. B1 = _____

3. C3 = _____

4. F7 = _____

5. C5 = _____
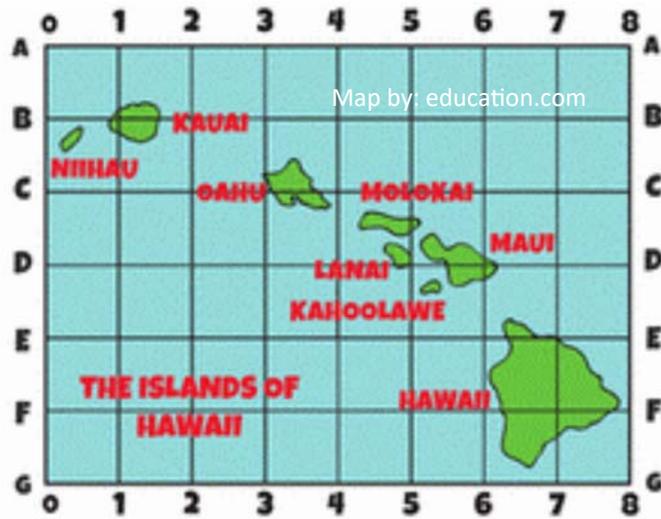
Map Scales: Since a map is a small picture of a larger area, how do we know the distance from one point to another on the map? How can we can translate that distance into real-life distance? Maps have scales that show the relationship between the distance on the map and the distance in the real world. It is often expressed like a ratio (1:500 meaning 1 unit on the map is 500 units in real life). The scale can use inches, fractions of inches or any other unit of measure that will fit on the map. The map scale is usually written on the map and can often be found somewhere near the key.

There are many examples of how a scales are written.

Activity - Using a Map Scale: Use the scale on the map to answer the distance questions below. Draw a line between each pair of cities in each question. Use a different color for each line.

1. What is the approximate distance from Phoenix, AZ to Santa Fe, NM? _____ nm

2. What is the approximate distance from Oklahoma City, OK to Austin, TX? _____ nm

3. What is the approximate distance from Lincoln, NE to Atlanta, GA? _____ nm

4. What is the approximate distance from Baton Rouge, LA to Montgomery, AL? _____ nm

5. What is the approximate distance from Denver, CO to Jefferson City, MO? _____ nm

6. What is the approximate distance from St Paul, , MN to Tallahassee, FL? _____ nm

What is a "Nautical Mile"? A **nautical mile** is a measure of distance. It is based on the circumference of the earth at the equator. If you were to cut the earth in half at the equator you would have a circle. This circle is divided into 360°. Each degree is divided into 60 minutes. Each minute of arc on this circle is equal to 1 nautical mile. If you were to travel around the earth at the equator, the total distance traveled would be 21,600 nautical miles (360° x 60). Nautical miles are the standard distance measure for travel by air and sea.

When we travel by car in the United States we use **statute miles.** One nautical mile is approximately 1.15 statute miles. One statute mile is approximately 0.87 nautical miles.

Activity - Map Reading: Using the Map Legend (the key) on the right and the map on the following page, answer the following questions:

1. The name of the town on I-25, at exit 78 (E 8 on the grid) is:

    _____ .

2. The name of the capital city (grid F 8) is:
    _____ .

3. Are there facilities at Edness K. Wilkins SP (grid D 6)? Circle YES or NO

4. If you lived in Buffalo along I-90, where is the closest place to ski? _____

5. What kind of road would I be driving on heading southwest on State Road 91 as I approach highway 487 (grid D 7)?

    _____

6. On what Interstate highway would I drive from Cheyenne to Rawlins? _____

7. On this section of map, I-90 passes through 3 states. What states are they? _____, _____ and _____ .

8. Name 2 points of interest noted on this map: _____ and _____ .

9. Gillette can be found at what grid coordinates? _____ and _____

10. Name 2 rivers found on the map:

    _____ and _____

Map Legend

Roads and related symbols

Free limited-access highway
Toll limited-access highway
New road (under construction as of press time)
Other multilane highway
Principal highway
Other through highway
Other road (conditions vary — local inquiry suggested)
Unpaved road (conditions vary — local inquiry suggested)
One way route; toll ferry (unless labeled otherwise)
Interstate highway; Interstate highway business route
U.S. highway; U.S. highway business route
Trans-Canada highway; Autoroute
Mexican highway or Central American highway
State or provincial highway; secondary state or provincial, or county highway
Great River Road; Great Circle Route
Lewis & Clark Highway; Lincoln Highway; Route 66
Toll booth or fee booth
Tunnel; mountain pass
Interchanges and exit numbers
For most states, the mileage between interchanges may be determined by subtracting one number from the other.
Highway distances (segments of one mile or less not shown):
Cumulative miles (red): the distance between arrows
Cumulative kilometers (blue): the distance between arrows

Comparative distance: 1 mile = 1.609 kilometers   1 kilometer = 0.621 mile

Cities & towns size of type on map indicates relative population

National capital; state or provincial capital
County seat or independent city
City, town, or recognized place—incorporated, unincorporated
Urbanized area
Separate cities within metropolitan area

Parks, recreation areas, & points of interest

National park
National forest, national grassland, or city park
National preserve or national wildlife refuge
State or provincial park system site, or other national park system site
Park with camping facilities; park without camping facilities
Point of interest, historic site or monument
Airport
Campsite; golf course or country club
Hospital or medical center
Native American tribal lands
Military or governmental installation; military airport
Ski area; tourist information

Physical features
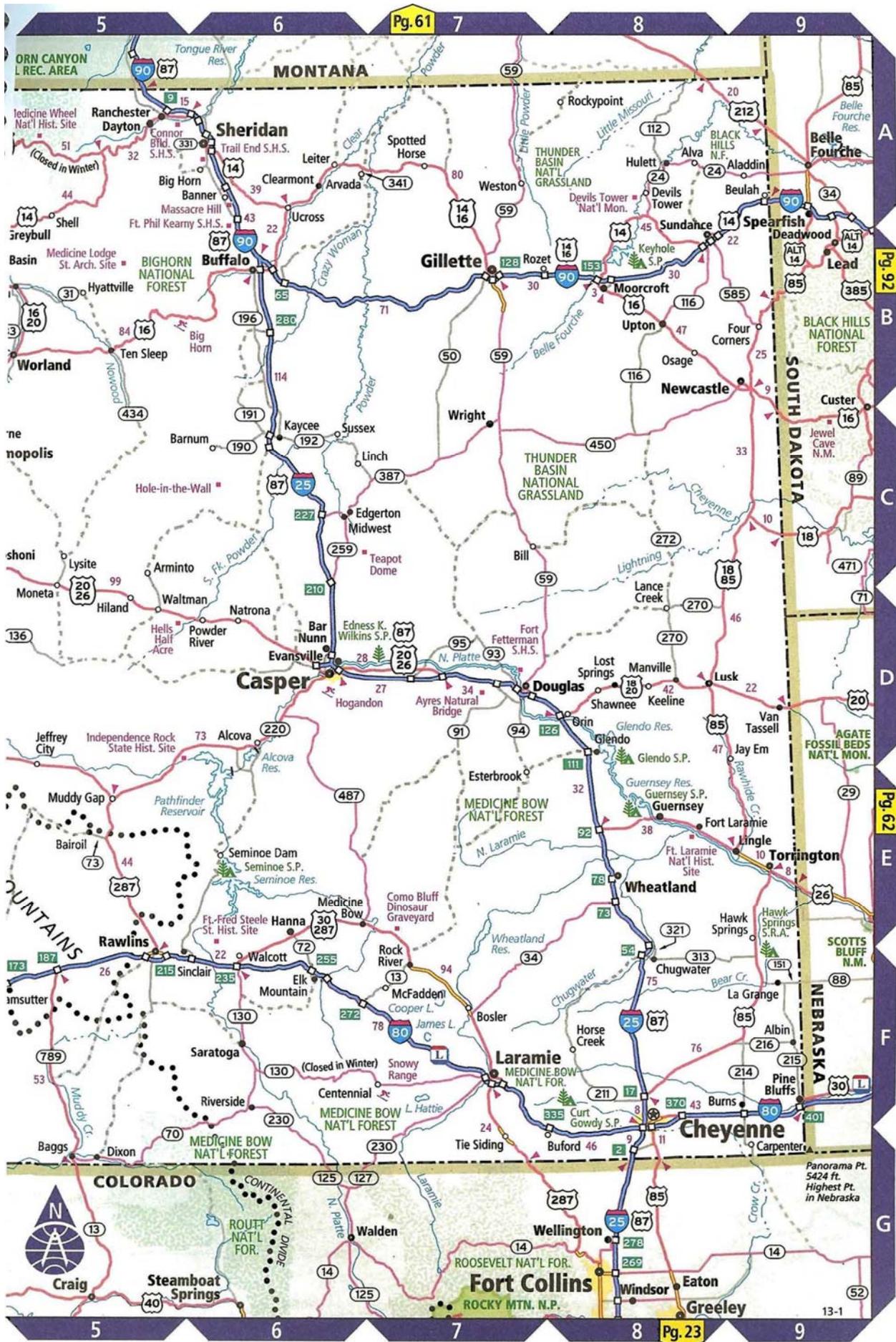
Dam
Mountain peak; highest point in state/province
Lake; dry lake
River; intermittent river
Desert; glacier
Swamp or mangrove swamp
Continental divide

Other symbols

Area shown in greater detail on inset map
Inset map page indicator
Map continuation indicator
Intracoastal waterway
County or parish boundary and name
State or provincial boundary
National boundary
Time zone boundary

MONTANA

Rand McNally 2013 Road Atlas - NOT TO BE USED FOR NAVIGATION

Pg. 92

Pg. 62

BIGHORN CANYON NAT'L REC. AREA

Tongue River Res.

Medicine Wheel Nat'l Hist. Site
Ranchester
Dayton
Connor Bfld. S.H.S.
Trail End S.H.S.
Sheridan
(Closed in Winter)
Big Horn
Banner
Massacre Hill
Ft. Phil Kearny S.H.S.
Greybull
Shell
Basin
Medicine Lodge St. Arch. Site
Buffalo
Hyattville
Ten Sleep
Big Horn
Worland
BIGHORN NATIONAL FOREST
Leiter
Clearmont
Arvada
Ucross
Spotted Horse
Weston
Rockypoint
THUNDER BASIN NAT'L GRASSLAND
Hulett
Alva
Aladdin
Devils Tower Nat'l Mon.
Devils Tower
Beulah
Belle Fourche
Belle Fourche Res.
BLACK HILLS N.F.
Spearfish
Deadwood
Lead
Sundance
Gillette
Rozet
Moorcroft
Keyhole S.P.
Upton
Four Corners
Osage
Newcastle
Custer
Jewel Cave N.M.
BLACK HILLS NATIONAL FOREST
SOUTH DAKOTA
Crazy Woman
Kaycee
Sussex
Linch
Barnum
Hole-in-the-Wall
Edgerton
Midwest
Teapot Dome
Wright
Bill
THUNDER BASIN NATIONAL GRASSLAND
Lightning
Lance Creek
Powder River
nopolis
shoni
Lysite
Arminto
Moneta
Hiland
Waltman
Natrona
Bar Nunn
Evansville
Casper
Edness K. Wilkins S.P.
Fort Fetterman S.H.S.
Hogadon
Ayres Natural Bridge
Douglas
Lost Springs
Manville
Shawnee
Keeline
Lusk
Van Tassell
AGATE FOSSIL BEDS NAT'L MON.
Hells Half Acre
Powder River
Orin
Glendo Res.
Glendo
Glendo S.P.
Jay Em
Jeffrey City
Independence Rock State Hist. Site
Alcova
Alcova Res.
Esterbrook
MEDICINE BOW NAT'L FOREST
Guernsey Res.
Guernsey S.P.
Guernsey
Fort Laramie
Lingle
Torrington
Muddy Gap
Pathfinder Reservoir
N. Laramie
Rawhide Cr.
Ft. Laramie Nat'l Hist. Site
Bairoil
Seminoe Dam
Seminoe S.P.
Seminoe Res.
Medicine Bow
Como Bluff Dinosaur Graveyard
Wheatland
Hawk Springs
Hawk Springs S.R.A.
SCOTTS BLUFF N.M.
MOUNTAINS
Ft. Fred Steele St. Hist. Site
Hanna
Rawlins
Walcott
Elk Mountain
Rock River
McFadden
Cooper L.
Bosler
Chugwater
La Grange
NEBRASKA
amsutter
Sinclair
James L. C.
Horse Creek
Albin
Saratoga
Snowy Range
Laramie
MEDICINE BOW NAT'L FOR.
Burns
Pine Bluffs
Riverside
Centennial
L. Hattie
Curt Gowdy S.P.
Cheyenne
Carpenter
Baggs
Dixon
MEDICINE BOW NAT'L FOREST
MEDICINE BOW NAT'L FOREST
Tie Siding
Buford
Panorama Pt. 5424 ft. Highest Pt. in Nebraska
COLORADO
CONTINENTAL DIVIDE
N. Platte
Laramie
ROUTT NAT'L FOR.
Walden
Wellington
ROOSEVELT NAT'L FOR.
Craig
Steamboat Springs
Fort Collins
Windsor
Eaton
ROCKY MTN. N.P.
Greeley

13-1

Latitude and Longitude: No discussion of maps would be complete without a lesson on latitude and longitude. With a latitude (LAT) and longitude (LON) coordinate, you can pinpoint *any* spot on earth.

Lines of latitude are called parallels, because they run roughly parallel to one another and to the equator and run laterally around the Earth. You can remember latitude and lateral. Lines of latitude are numbered with 0° at the equator, 90° N at the north pole and 90° S at the south pole.

Lines of longitude, also called meridians, start at the north pole and run down to the south pole. Unlike lines of latitude, they are NOT parallel to one another; but they are closer together at the poles and widest apart at the equator where the earth is at is fattest. They are also numbered with 0° at Greenwich, England (also the spot from where Universal Coordinated Time (UTC) or Zulu time is taken) and they run up to 180° E and 180° W, ending at the International Date Line.

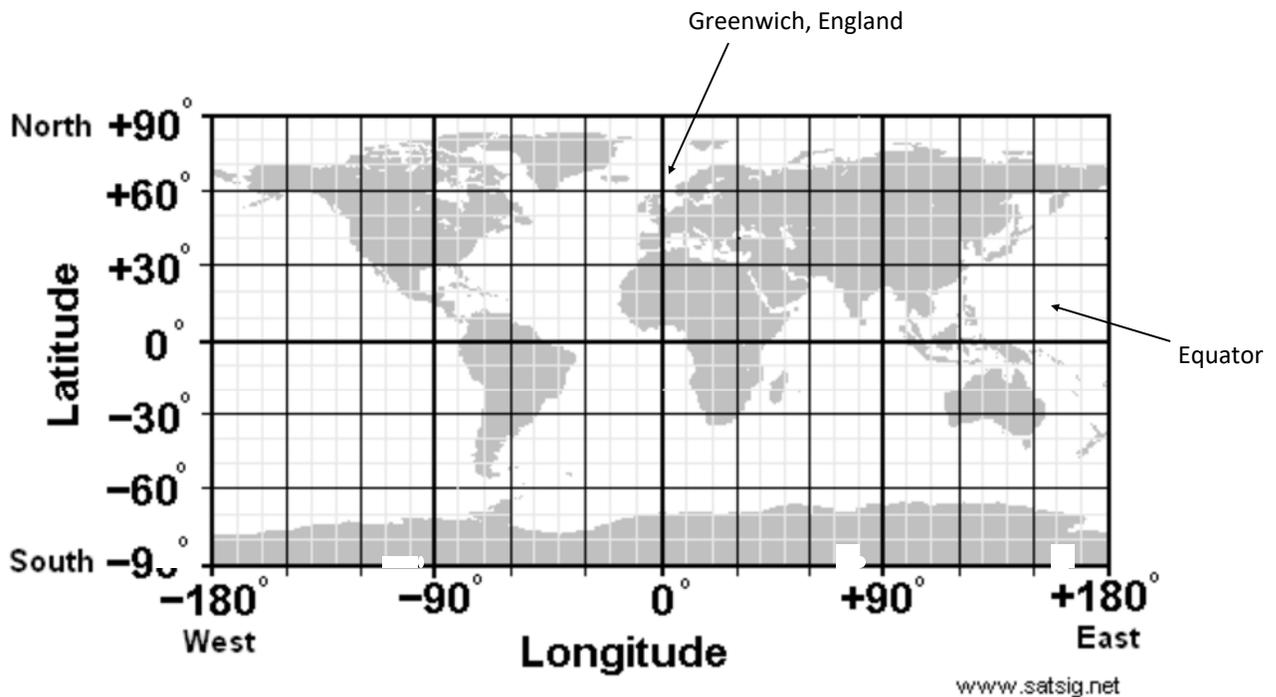Lines of Latitude and longitude are numbered using symbols:

° for degrees

' for minutes

" for seconds

in order to give you a precise location.

Where am I? Each degree of latitude and longitude is divided in 60 minutes; each minute is divided into 60 seconds and each second is divided in hundredths

Greenwich, England

Equator

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Activity - Latitude and Longitude: Write the name of the city and state at the given latitude and longitude coordinates.
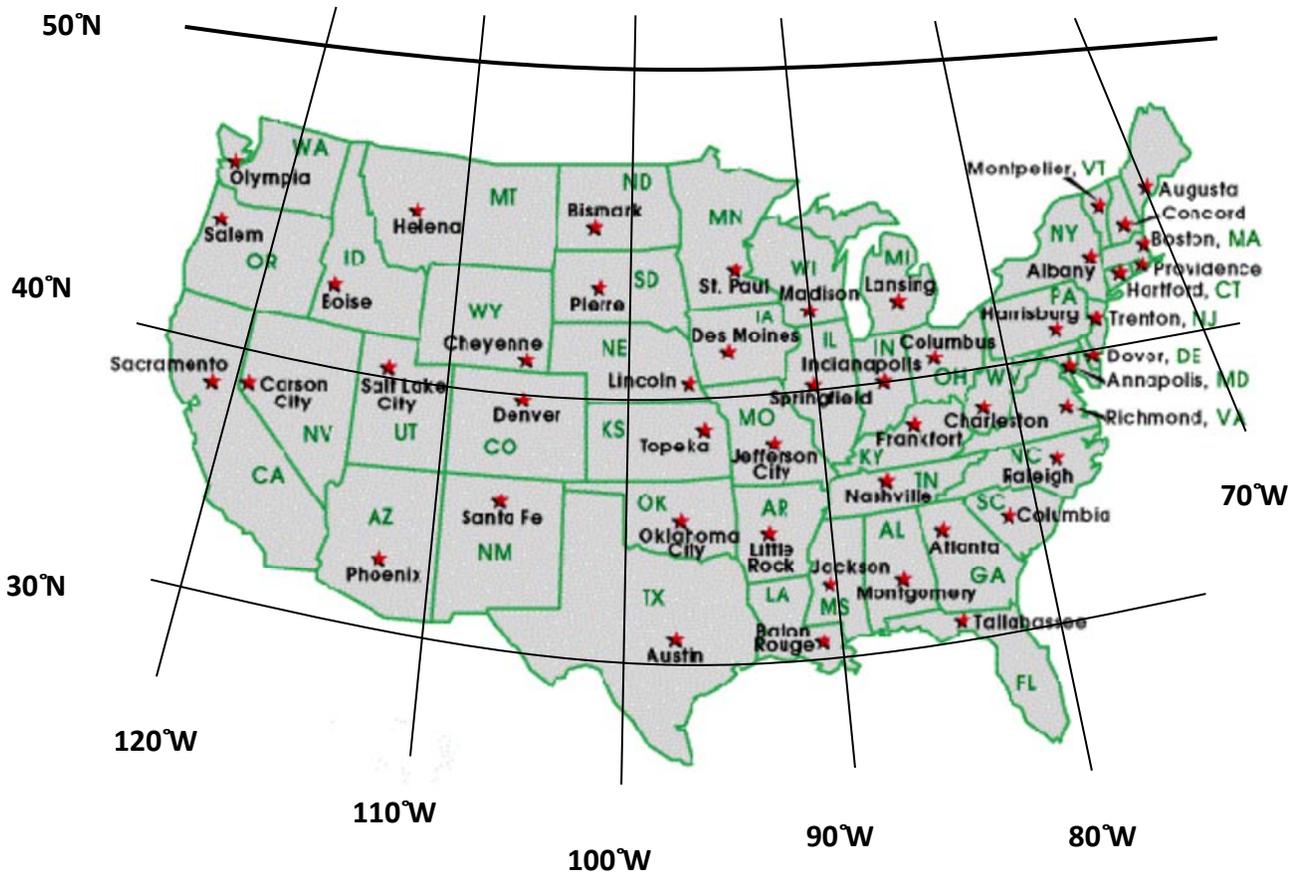
1. 44° N latitude, 100° W longitude = _____

2. 46° N latitude, 112° W longitude = _____

3. 44° N latitude, 123° W longitude = _____

4. 37° N latitude, 77° W longitude = _____

5. 34° N latitude, 92° W longitude = _____

6. 44° N latitude, 69° W longitude = _____

7. 39° N latitude, 119° W longitude = _____

8. 33° N latitude, 112° W longitude = _____

Activity - My Map: Draw a map of your classroom, yard, community, school, town or some other place familiar to you. Be sure to make you own symbols to add into the key.

Map of _____

KEY