Meteorology 110 Name _____

Lab 1

Geography and Map Skills

1. Geography

Weather involves maps. There's no getting around it. You must know where places are so when they are mentioned in the course it won't be a mystery. This lab is not a geography test. To find places, you may use a mapping website such as Mapquest (www.mapquest.com), Googlemaps (maps.google.com), or Rand-McNally (www.randmcnally.com), etc. Read the directions carefully and do this and all labs exactly as directed.

Directions: On a blank outline map of the United States, label the places listed below. All the places have some meteorological significance. Use the white side of the outline map, not the brown side. Find everything. I will deduct points for places missed or badly placed. In congested areas like the east coast, write your place name in a blank area and draw an arrow to the exact location (do not do this with cities, though). You may abbreviate the name if your abbreviation is obvious. Find the following places:

A. Political divisions:

1. "Lower 48" states, not Alaska or Hawaii. You must use the postal abbreviations.
2. All Canadian provinces bordering the U.S. You must use the postal abbreviations.

B. Water bodies:

1. Major: Atlantic Ocean, Gulf of Mexico, Pacific Ocean, Caribbean Sea
2. Lakes: Lake Superior, Lake Huron, Lake Michigan, Lake Erie, Lake Ontario, Great Salt Lake, Lake Okeechobee
3. Rivers: St. Lawrence River, Susquehanna River, Red River, Mississippi River, Colorado River (not the one in Texas)
4. Bays: Chesapeake Bay, Georgian Bay

C. Peninsulas:

Cape Hatteras, Cape Canaveral, Baja California

D. Special: Locate and label cities. Place a dot at each location and write the city name. Get them as accurately as you can:

Seattle, WA, Denver CO, Salt Lake City, UT, Chicago IL, Detroit MI, Buffalo NY, Ottawa, ON, Washington D.C., Oklahoma City, OK, Brownsville TX, New Orleans LA

Finish finding all places before the end of the lab. You may scribble on the instructions. In fact, it's a good idea to check off the places as you find them but please try to make the map neat.

Two-letter Postal Abbreviations

United States

Alabama	AL	Nebraska	NE
Arizona	AZ	Nevada	NV
Arkansas	AR	New Hampshire	NH
California	CA	New Jersey	NJ
Colorado	CO	New Mexico	NM
Connecticut	CT	New York	NY
Delaware	DE	North Carolina	NC
Florida	FL	North Dakota	ND
Georgia	GA	Ohio	OH
Idaho	ID	Oklahoma	OK
Illinois	IL	Oregon	OR
Indiana	IN	Pennsylvania	PA
Iowa	IA	Rhode Island	RI
Kansas	KS	South Carolina	SC
Kentucky	KY	South Dakota	SD
Louisiana	LA	Tennessee	TN
Maine	ME	Texas	TX
Maryland	MD	Utah	UT
Massachusetts	MA	Vermont	VT
Michigan	MI	Virginia	VA
Minnesota	MN	Washington	WA
Mississippi	MS	West Virginia	WV
Missouri	MO	Wisconsin	WI
Montana	MT	Wyoming	WY

Canada

Alberta	AB	Ontario	ON
British Columbia	BC	Quebec	QC
Manitoba	MB	Saskatchewan	SK
New Brunswick	NB		

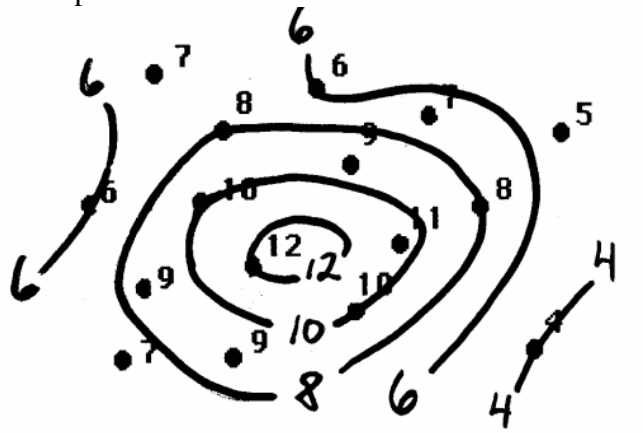
2. Isoplething

Isoplething, or contouring, is one of the most important skills you will need to understand maps in meteorology, because it's the easiest way to spot spatial patterns in those maps. In this exercise, you will make your own isopleths in order to better understand those contoured maps.

Isopleths are lines of constant value of any parameter, such as temperature (isotherms), pressure (isobars), or wind speed (isotachs). The technique of isoplething forms the basis for the analysis of most meteorological parameters. By drawing isopleths one generalizes, over an area, data which is observed at a finite number of places within the area. Any continuous field of numbers can be isoplethed. All one needs to do is to connect all the points having the same numerical value. To do this, one must sometimes interpolate values between the observation places.

The first and most important rule is:

1. Draw lines which keep higher values on one side and lower values on the other. It should look like the following example:



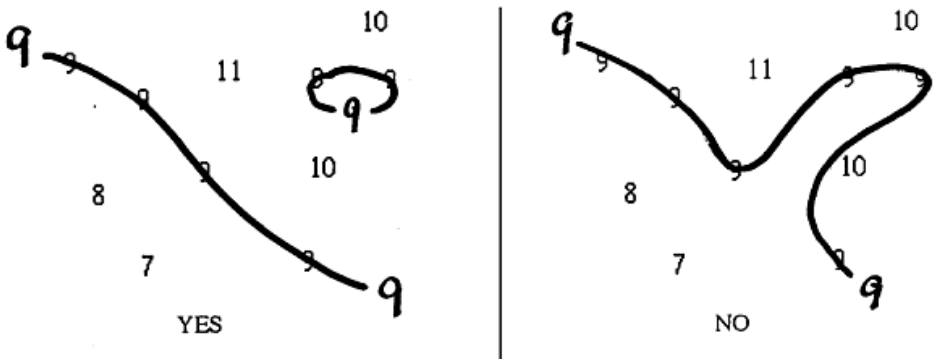
Example of isoplething. Observations which are <u>exactly</u> the same as the isopleths must lie exactly on it.

Other rules are as follows:

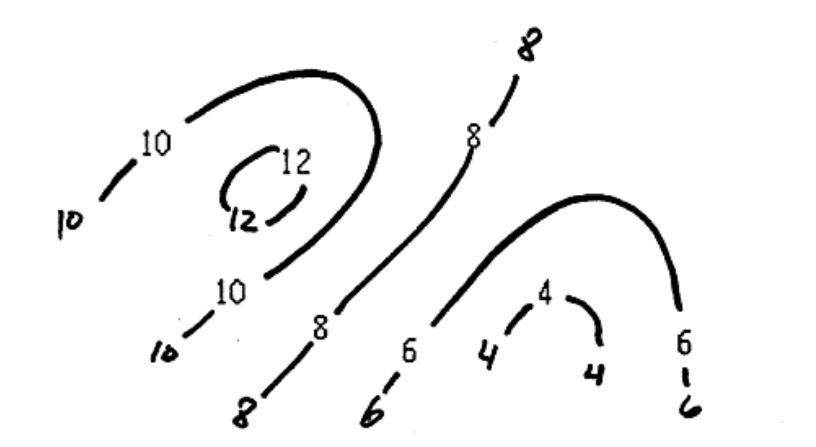
2. Interpolate, i.e., a "10" line should be midway between observations of 9 and 11 and 1/3 of the way from 9 to 12.

3. Isopleths NEVER branch, fork, or intersect. Leave no loose ends in the middle of a map. You may stop a line just in from the edge of the map or where the data ends. Label all ends (see #5).

4. Avoid narrow necks. In general, do not pass an isopleth of value N between two observations of value N+1 or N-1. The isopleth below is a line of value 9:



5. Label all isopleths with their value:



6. Draw isopleths lightly in pencil so you can erase and redraw easily if mistakes are made. Ink or draw over in colored pencil only after you are sure of your analysis. (OK, that's not a "rule". It's just a suggestion.)

In the following diagrams, your task is to follow the rules of isoplething to completely contour the following fields of data. Remember to label your contours properly.

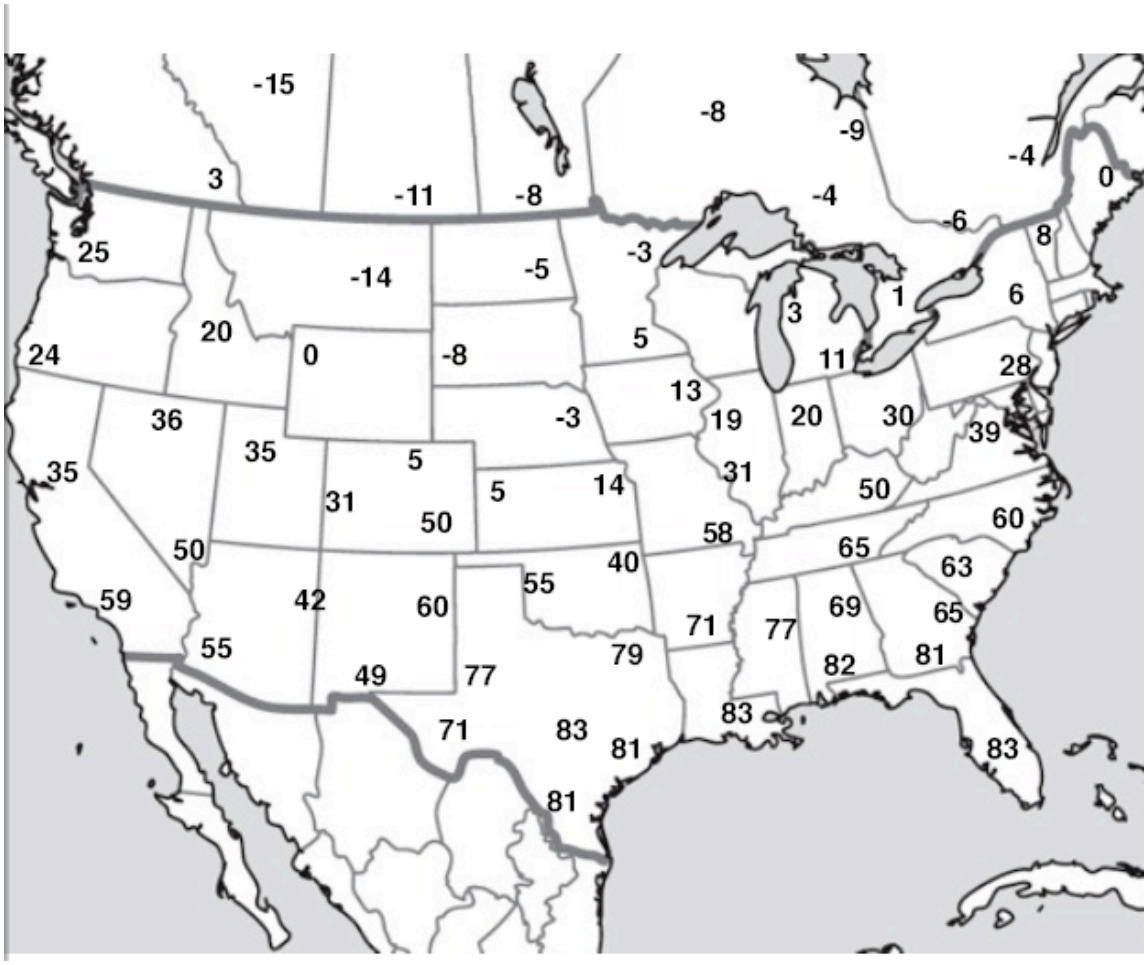
1) Contour the following in intervals of 10 (i.e. 30, 40, 50, ...)

38	33	30	28	26	25	22
42	39	38	36	34	32	31
47	46	46	44	42	40	38
60	58	56	54	53	48	46
68	66	66	65	62	59	54

2) Contour the following in intervals of 10. Remember, it is possible for contours to make complete loops and close on themselves rather than ending at an edge!

45	42	38	34	29	25	18	16	18	21	26
46	42	36	30	25	19	10	7	8	13	21
43	38	33	28	24	20	15	13	12	17	24
41	34	30	28	26	24	22	21	21	23	27
37	33	31	28	25	27	26	27	29	32	35
39	37	35	34	36	34	34	35	37	41	43

3) On the following map of temperatures from a February day, draw isotherms (isopleths of temperature) for 0°F and all other isotherms at intervals of 20°F. Don't forget units on your labels. Label <u>all</u> ends. Leave no ends dangling without a label.



Extra credit: For 3% more, identify the area with the strongest temperature gradient (largest change over the smallest distance). Draw an arrow pointing at this area and label that arrow.