

I. Determining independent and dependant variables

1. Determine which one is the dependent variable and which one is the independent variable in the following series of coupled graph variables.

Duration of night and latitude

Air temperature and time

Time and angle of sun's rays

Specific humidity and temperature

Volume of a gas and time

Latitude and angle of sun's rays

Specific humidity and latitude

Atmospheric pressure and latitude

Temperature and volume of a gas

Altitude and atmospheric pressure

II. Scaling the axis

1. Using graph paper, fill out the following tables to review the procedure for setting up graphs of the data in Tables I and II.

TABLE I
Angle of noon sun (in °) above the horizon on the 22nd day of each month

	J	F	M	A	M	J	J	A	S	O	N	D
Equator	70	80	90	78	70	66.5	70	78	90	79	70	66.5
45°N	25	35	45	57	65	68.5	65	57	45	34	25	21.5
90°N	-20	-10	0	12	20	23.5	20	12	0	-11	-20	-23.5

Negative angle indicate the sun is below the horizon at noon

Equator		
Name of variables		
Independent and dependent variable		
Axis used to plot: x-axis or y-axis		
Range of data		
Value of one square (round this off to a nice number)		
45°N		
Name of variable		
Independent and dependent variable		
Axis used to plot: x-axis or y-axis		
Range of data		
Value of one square (round off)		
90°N		
Name of variable		
Independent and dependent variable		
Axis used to plot: x-axis or y-axis		
Range of data		
Value of one square (round off)		

TABLE II
Average daily insolation on the 22nd day of each month in W/m²

	J	F	M	A	M	J	J	A	S	O	N	D
Equator	420	430	440	420	405	395	410	425	440	430	420	410
45°N	150	230	305	405	460	475	455	400	300	200	140	120
90°N	0	0	0	300	480	520	450	250	0	0	0	0

Ignoring the effects of the atmosphere

Equator		
Name of variable		
Independent and dependent variable		
Axis used to plot: x-axis or y-axis		
Range of data		
Value of one square (round off)		
45°N		
Name of variable		
Independent and dependent variable		
Axis used to plot: x-axis or y-axis		
Range of data		
Value of one square (round off)		
90°N		
Name of variable		
Independent and dependent variable		
Axis used to plot: x-axis or y-axis		
Range of data		
Value of one square (round off)		

III. Plotting graphs

- Plot the data in Table III on a piece of graph paper.

TABLE III
Approximate percentage of solar radiation reaching the surface through the atmosphere

Sun's angle of incidence (°)	Percentage of radiation reaching surface
90	75
70	74
50	69
30	56
20	43
10	20
5	5
0	0

Answer the following questions in relation to the graph you just plotted.

- Which variable is the independent variable?
- Which variable is the dependent variable?

c) What is the value of one square on the X-axis?

d) What is the value of one square on the Y-axis?

e) Can you connect the data points? Why?

f) What type of graph did you use and why?

2. Plot a graph of the data in Table IV.

TABLE IV
Approximate specific humidity (g/kg) at various temperatures

Temperature (°C)	Specific humidity (g/kg)	Temperature (°C)	Specific humidity (g/kg)	Temperature (°C)	Specific humidity (g/kg)
-9.4	1.9	7.2	6.2	23.9	18.8
-6.7	2.2	10.0	7.6	26.7	22.3
-3.9	2.8	12.8	9.3	29.4	26.2
-1.1	3.5	15.6	11.1	32.2	30.7
1.7	4.3	18.3	13.2	35.0	36.5
4.4	5.2	21.1	15.6	37.8	43.0

Answer the following questions in relation to the graph you just plotted.

a) Which variable is the independent variable?

b) Which variable is the dependent variable?

c) What is the value of one square on the X-axis?

d) What is the value of one square on the Y-axis?

e) Can you connect the data points? Why?

f) What type of graph did you use and why?

3. Plot a graph of the data in Table V.

TABLE V
Environmental lapse rate for two locations

Elevation (ft)	Temperature (°F)	
	Location A	Location B
0	80	55
2,000	72	46
3,000	67	51
5,000	59	41
7,000	47	34
10,000	33	30

Answer the following questions in relation to the graph you just plotted.

- a) Which variable is the independent variable?
- b) Which variable is the dependent variable?
- c) What is the value of one square on the X-axis?
- d) What is the value of one square on the Y-axis?
- e) Can you connect the data points? Why?
- f) What type of graph did you use and why?

IV. Conversion factors

- 1. Convert the temperatures in the first column of table IV to °Fahrenheit and to °Kelvin (write your answers in the table directly).
- 2. Convert 23.9 feet to meters: _____ to inches: _____
- 3. Convert 80°F to °C: _____ to °K: _____
- 4. Convert 790 ft to m: _____ to mi: _____
- 5. Convert 88.50 cm to in: _____ to m: _____ to km: _____

6. Convert 75 mph or to ms^{-1} :

to km/h:

7. Convert a sea-level pressure of 1013.25 mb to inches of mercury:

to pascals:

V. Scientific notation

1. Write the following numbers in scientific notation:

Original number	Scientific notation
1,500,000	
0.002	
0.085	
0.0000092	
180	
3,600,000,000	
0.000000000000036	
85,000	
0.01	

VI. Topographic profiles and vertical exaggeration

1. Using one piece of graph paper, plot topographic profiles for **maps A** and **B** (distributed in class). The vertical exaggeration for the topographic profile from **map A** should be 10x. The vertical exaggeration for the topographic profile from **map B** should be 15x.

2. Plot a topographic profile for **map C** (distributed in class). Use a vertical exaggeration of your choice.

3. What is the vertical exaggeration of the profile displayed below **map C** (distributed in class)?

VII. Gradients

1. Calculate the gradients of atmospheric pressure change with altitude using the following data:
 - a) From 0 to 5000 m of elevation, the pressure changes from 1013 mb to 550 mb.
 - b) From 5000 m to 10,000 m of elevation, the pressure changes from 550 mb to 250 mb.
2. What is the atmospheric pressure gradient from A to A' on **map D** (distributed in class)?
3. What is the atmospheric pressure gradient from B to B' on **map E** (distributed in class)?
4. What is the atmospheric pressure gradient from C to C' on **map F** (distributed in class)?
5. What is the average gradient from D to D' on the topographic map of **Mt. Tom, CA** (distributed in class)?
6. What is the average gradient from the summit (highest point along your cross section) to the base of the Western side of the topographic profiles A, B and C that you plotted in questions 1 and 2 of **section VI**?

VIII. Total relief

1. What is the total relief on the topographic map of **Mt. Tom, CA** (distributed in class)?
2. What is the total relief of **map C** (distributed in class)?
3. What is the total relief on the topographic map of the **Mauna Loa volcano in Hawaii** (distributed in class)?

IX. Isolines

1. Using the map of **Air temperature in 15 cities** (distributed in class), draw isotherms at 10° intervals.
2. If you are told that the previous data have been collected during the summer in the western United States, what temperature scale are you dealing with: Fahrenheit, Kelvin, or Celsius?
3. Using the map of **Air temperature in 41 cities** (distributed in class), draw isotherms at 5°F intervals.
4. Draw isobars at 4 mb intervals on the map of **atmospheric pressure** (distributed in class). There is one high pressure center and one low pressure center on the map – label each appropriately (“H” or “L”).

X. Representative fraction and graphic scale

1. Calculate the RF for each of the graphic scales on the page distributed in class.
2. If a map with one of these graphic scales was to be enlarged (such as with a photocopy machine):
 - a) Would the RF of the map change? Why?
 - b) Would the graphic scale still be usable? Why?
3. If you have a baseline of 400 feet long in reality and it is represented by 4 inches on your paper, what is the RF of your map?
4. If a measured distance of 10 cm on a map represents an actual distance of 5 km, what is the RF of the map?
5. On a map with a scale of 1:24,000, a measured distance of one inch represents an actual distance in feet of:
6. On a map with a scale of 1:62,500, a measured distance of 4.5 inches represents an actual distance in miles of:

7. On a map with a scale of 1:250,000, a measured distance of 4.5 inches represents an actual distance in miles of:

8. On a map with a scale of 1:50,000, a measured distance of 7.5 cm represents an actual distance in kilometers of:

9. On the map of the Mauna Loa volcano in Hawaii (distributed in class), determine the distance in miles and in kilometers from the “**Patrol Cabin**” (at the summit of Mauna Loa) to the “**Rest House**” (northeast of the summit or Mauna Loa). The scale of the map is 1:250,000.

XI. Points of compass and azimuths

1. What are the azimuths of the following wind directions?

a) SW

b) NE

c) S

d) NNE

2. Translate the following azimuths into compass directions.

a) 0°

b) 45°

c) 90°

d) 270°

e) 180°