

Name_____

Controls of Temperature

Axis Tilt and Subsequent Beam Depletion

1. Review of solar elevation angles. Complete the table.

Location	Latitude (°)	Date	Solar Elevation (°)	Season at this location/date
A) Aberdeen, Scotland	57 N	Dec 21		
B) Baltimore, MD	39 N	June 21		
C) Myrtle Beach, SC	34 N	Sept 21		
D) Honolulu, HI	21 N	June 21		
E) Johannesburg, South Africa	26 S	Sept 21		
F) Puerto Toro, Chile	55 S	Mar 21		

2. Of the 6 cities above on the respective day given, which will be receiving solar radiation values close to the solar constant* of 1376 J/m²? *Hint: Think beam spreading! _____

3. Below are measured solar radiation values (in W/m²) taken at the Lake Wheeler Field Lab (Raleigh, NC) on sunny days on two different days of the year.

Time	7am	8am	9am	10am	11am	Noon	1pm	2pm	3pm	4pm	5pm	6pm	7pm
Day A	0	26	178	349	465	560	597	588	497	361	192	31	0
Day B	85	130	235	452	601	783	984	999	977	774	523	234	78

a) On which day was the solar elevation angle the highest?

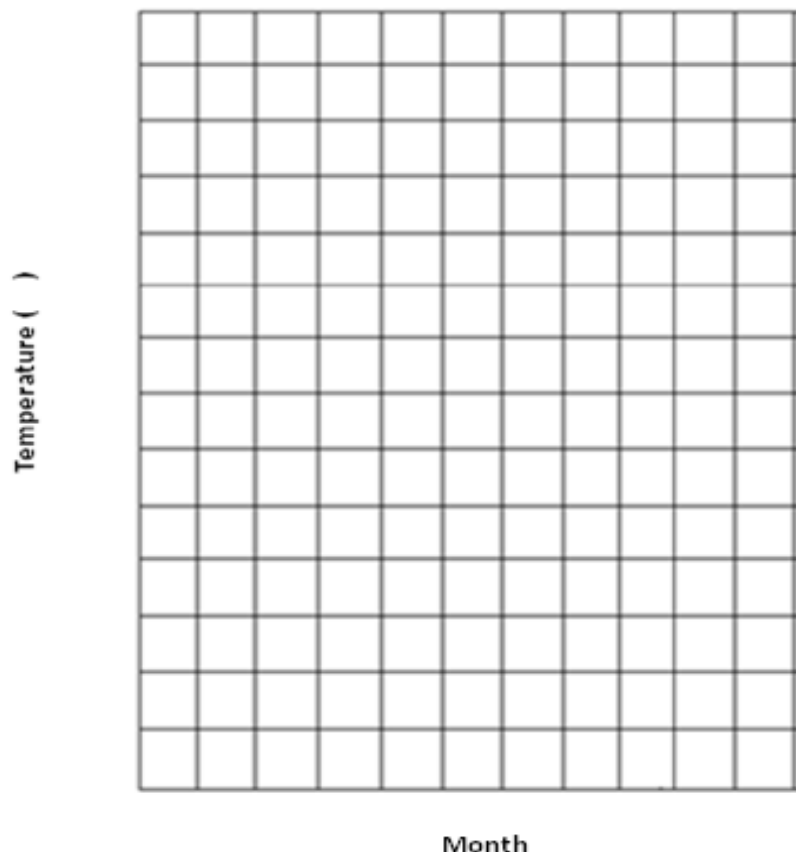
b) How do you know?

Land/Water Distribution

Month	Boston, MA	Des Moines, IA
January	29	18
February	30	25
March	39	37
April	47	51
May	57	62
June	68	72
July	74	76
August	72	74
September	65	65
October	55	54
November	45	39
December	34	23

4. The chart above lists monthly average high temperatures (in °F) for Boston, Massachusetts and Des Moines, Iowa.

Plot the data and then answer question 5.



5. Boston, MA and Des Moines, IA are both located at approximately 40° N latitude so they receive similar noontime solar radiation amounts throughout the year. Summarize the temperature data you plotted and explain the temperature differences given their geographic location in the United States.

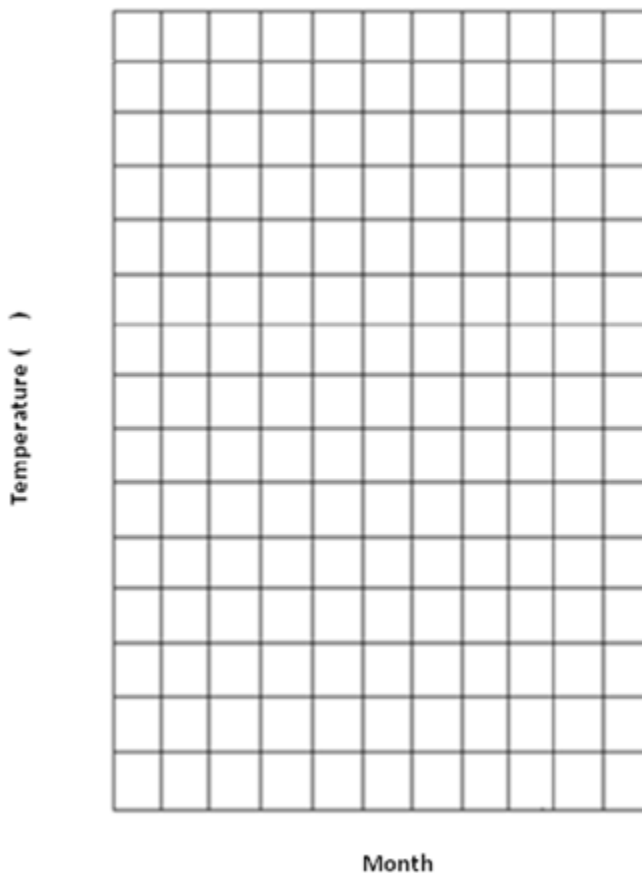
Elevation/Altitude

City	Altitude	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Richmond, VA	170 ft	45	49	58	69	76	84	88	86	80	69	60	50
Blacksburg, VA	2132 ft	41.1	44.8	53.3	62.9	71.5	78.6	82.5	81.3	75.3	65.3	55.0	44.9

Altitude is in feet above sea level.

Temperatures are average maximum high each month (in °F).

Plot the data.



6. Richmond and Blacksburg are at the same approximate latitude (37 °N) and neither is located close enough to the Atlantic Ocean for it to strongly influence temperatures. Summarize the data that you plotted and explain how, all else being equal, elevation affects temperatures.