Project 16 - PLAYING THE STOCK MARKET FOR GAIN OR LOSS

Introduction: We hear of people who invest in stock and make a fortune. We do not hear much about the people who buy stock and lose money, sometimes large sums of money. In this project you will simulate actual stock transactions for five stocks of your choice, and you will calculate your net gain or loss when the stocks are sold one year after purchase.

Procedure:

1. Choose your five stocks from the New York Stock Exchange or any other stock exchange. Listings of these stocks are found in most ordinary newspapers, or in the *Wall Street Journal*. These papers are available at your library.

2. For each of the five stocks, you must obtain the stock prices from one year ago. You will have to obtain a newspaper from one year ago. A library will have these newspapers. Record these prices in the table given. Also, obtain the current stock prices and record them.

NAME OF STOCK	CURRENT PRICE OF STOCK	PRICE OF STOCK ONE YEAR AGO

3. Using the stock price from one year ago, calculate the purchase price of 100 shares of each of the five stocks you have selected. For each purchase price, add a 3% commission which is paid to your stock broker. This total amount is the net purchase price. Record this information in the table on the next page.

Example: You purchase 100 shares of a stock that sells for $35 per share. The purchase price is 100 X 35 = $3,500. The commission is 3% of 3,500 = .03 X 3,500 = $105. The net purchase price is $3,500 + $105 = $3,605.

NET PURCHASE PRICE OF STOCKS PURCHASED 1 YEAR AGO			
NAME OF STOCK	**PURCHASE PRICE OF 100 SHARES**	**3 PERCENT COMMISSION**	**NET PURCHASE PRICE**

4. Using the present stock price for the five stocks you selected, calculate each selling price of the 100 shares. For each selling price, subtract a 3% commission that is paid to your stock broker. This decreased amount is the net selling price. Record this information in the table given.

Example: You sell 100 shares of a stock for $39 per share. The selling price is equal to 100 X 39 = $3,900. The commission is 3% of 3,900 = .03 X 3,900 = $117. The net selling price is $3,900 - $117 = $3,783.

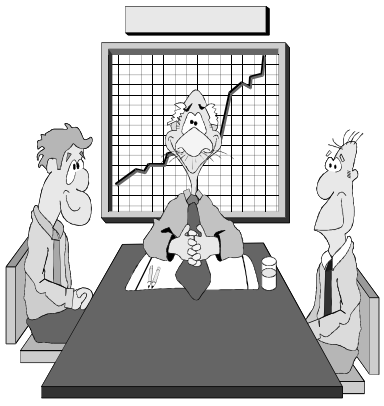
NET SELLING PRICE OF STOCKS SOLD			
NAME OF STOCK	**SELLING PRICE OF 100 SHARES**	**5 PERCENT COMMISSION**	**NET SELLING PRICE**

5. For each of the five stocks, calculate the net gain or loss by subtracting the net purchase price from the net selling price. Record this information in the table given.

NET GAIN OR LOSS			
NAME OF STOCK	**NET PURCHASE PRICE**	**NET SELLING PRICE**	**NET GAIN OR LOSS**

6. Using the five net gains or losses calculated in step 5, calculate the total net gain or loss for your five stocks by adding all the gains and subtracting all the losses.

CALCULATIONS



TOTAL NET GAIN OR LOSS $_____

7. Based on what you learned by doing this project, do you think it would be easy to make a lot of money by purchasing and selling stocks? Why or why not?

8. If you were actually going to invest in the stock market, describe how you would conduct research in order to select the best possible investments.

Project 17 - IS THE CHILL FACTOR REALLY A FACTOR?

Introduction: Chill factor is a well-known phenomena in the northern states during the winter months. Chill factor is used to describe the chilling effect on a person standing out in the cold wind, but chill factor also applies to the cooling effect of the wind on warm days. In this project you will simulate the chilling effect on a warm car left out in the wind by looking at the cooling effects of the wind on a warm container of water.

Procedure:

1. You will need two metal containers or buckets of the same size. Large coffee cans will work. Also, two metal pails of the same size will work.

2. This experiment will have to be conducted on a day when there is at least a 20-M.P.H. wind. You will have to listen to the weather forecast in order to pick a day to conduct this experiment.

3. If possible, obtain the wind chill factor information from either the local weather service, or from a book about weather. There are tables printed up which give the wind chill index for a given temperature and wind speed.

4. On the day that you have picked for this experiment, record the temperature (without the chill factor), the wind speed, and the temperature with the chill factor.

TEMPERATURE_____

WIND SPEED_____

TEMPERATURE WITH CHILL FACTOR_____

5. Fill up both metal containers with warm water. The water must be the same temperature in both buckets, the water should be at least 90° F, and it should be at least 50° F higher than the outside temperature. Stir the water in both containers with a large spoon, and measure the temperature in both containers. Record the temperature in both buckets. If the temperature varies by more than 2 degrees, mix the water from container to container, or start over with new water.

INITIAL TEMPERATURE OF WATER_____

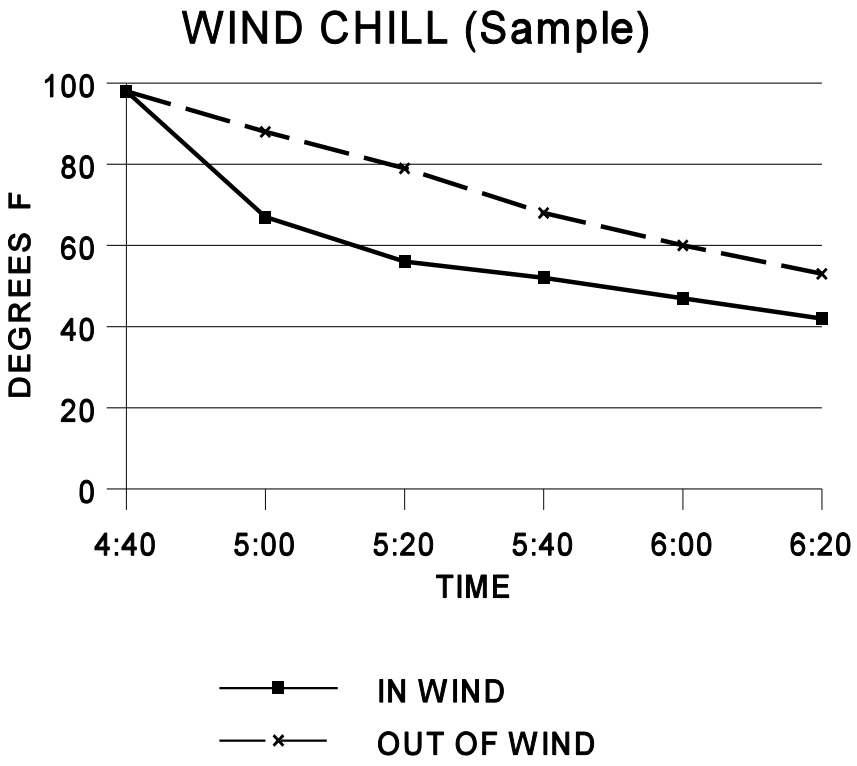
6. Place one container directly out in an open, windy area. Place the other container in an area that is out of the wind, but is still outside. Do not place the second container inside a garage, or other enclosed shelter.

7. Measure the temperature in both containers every 20 minutes. Before you measure the temperatures, stir the water in the containers with a large spoon. Record the temperatures each time you measure them. Take readings for two hours (six measurements). Fill in the table given below with your time and temperature data.

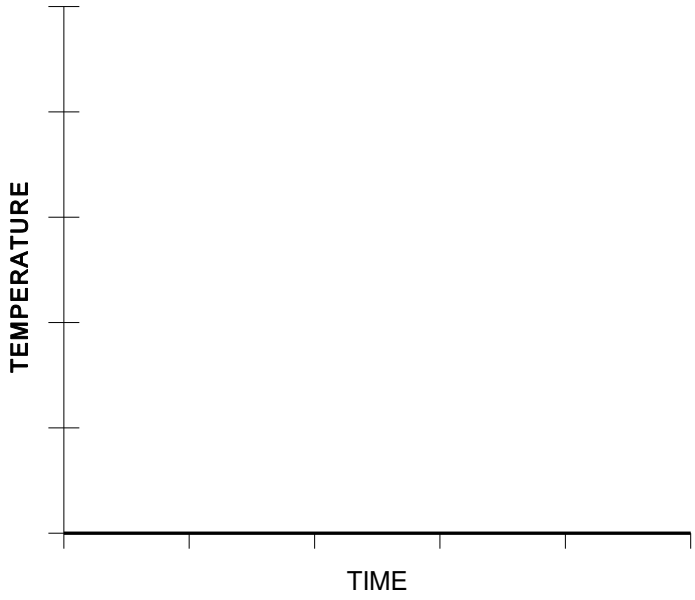
TEMPERATURE DATA		
TIME OF MEASUREMENT	**TEMPERATURE OF WATER LEFT IN WIND**	**TEMPERATURE OF WATER PLACED OUT OF WIND**

8. Graph your data using a graph similar to the sample graph on the following page.

SAMPLE DATA		
TIME OF MEASUREMENT	**TEMPERATURE OF WATER LEFT IN WIND**	**TEMPERATURE OF WATER PLACED OUT OF WIND**
4:40 P.M.	98 DEGREES	98 DEGREES
5:00 P.M.	67 DEGREES	88 DEGREES
5:20 P.M.	56 DEGREES	79 DEGREES
5:40 P.M.	52 DEGREES	68 DEGREES
6:00 P.M.	47 DEGREES	60 DEGREES
6:20 P.M.	42 DEGREES	53 DEGREES


WIND CHILL (Sample)
100
80
60
40
20
0
DEGREES F
4:40
5:00
5:20
5:40
6:00
6:20
TIME
IN WIND
OUT OF WIND

GRAPH


TEMPERATURE
TIME

9. Based on your results, what conclusions did you reach about the wind chill factor?

Project 18 - PLAYING A BETTER GAME OF BATTLESHIP BY USING MATHEMATICS

Introduction: Many who have played the game of *Battleship* will say it is a game of luck. Different players have different strategies for placing their ships, but targets are usually chosen at random. In this project, you will learn a technique in the game of *Battleship* that will give you an edge over your opponent.

Procedure:

1. You must obtain the game of *Battleship*. If you do not already own this game, perhaps you could borrow it from someone who does own it. If you are not familiar with the rules of *Battleship*, read over the rules given with the game.

2. Find another person who can participate in this experiment with you. They must not know the "mathematical" method that you will use. Note: If you have a computer version of the game, you can play against the computer.

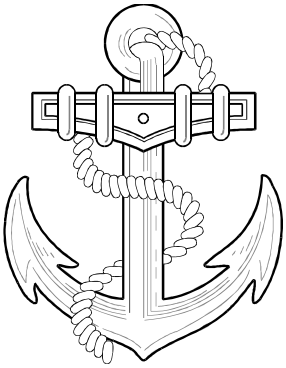
3. You will use the "mathematical" method which is described here. Shown below is a representation of the game board used in the game, *Battleship*, where all positions are labeled with O or X symbols. To use this method, only choose targets which lie on positions labeled with X. Also, If you get a "hit", first choose targets which are two units away because these targets will be locations which correspond to positions labeled with the X symbol. Only choose targets which do not lie on positions labeled X to sink a ship that has been located.

	1	2	3	4	5	6	7	8	9	10
A	X	O	X	O	X	O	X	O	X	O
B	O	X	O	X	O	X	O	X	O	X
C	X	O	X	O	X	O	X	O	X	O
D	O	X	O	X	O	X	O	X	O	X
E	X	O	X	O	X	O	X	O	X	O
F	O	X	O	X	O	X	O	X	O	X
G	X	O	X	O	X	O	X	O	X	O
H	O	X	O	X	O	X	O	X	O	X
I	X	O	X	O	X	O	X	O	X	O
J	O	X	O	X	O	X	O	X	O	X

Example: You select C3 and it is a hit. Your next selection is C1 and it is not a hit. Your next selection is A3 and it is a hit. At this point you know that there is probably a ship which covers the targets A3, B3, and C3 so you then select the target B3 for the purpose of sinking the ship.

	1	2	3	4	5	6	7	8	9	10
A	X	O	X	O	X	O	X	O	X	O
B	O	X	O	X	O	X	O	X	O	X
C	X	O	X	O	X	O	X	O	X	O
D	O	X	O	X	O	X	O	X	O	X
E	X	O	X	O	X	O	X	O	X	O
F	O	X	O	X	O	X	O	X	O	X
G	X	O	X	O	X	O	X	O	X	O
H	O	X	O	X	O	X	O	X	O	X
I	X	O	X	O	X	O	X	O	X	O
J	O	X	O	X	O	X	O	X	O	X

4. When you set your ships up, randomly scatter your ships. Do not clump them together. Your opponent can set up, and play in any manner they wish, but do not describe your method to your opponent. You should play eight games with your opponent, and record how many times you have won.



NUMBER OF WINS_____

NUMBER OF LOSSES_____

5. Describe why using the "mathematical" method gives you an edge over your opponent?

6. What is the maximum number of “shots” you would have to take to locate every one of your opponents ships? Explain why your opponent cannot locate all of your ships with that same number of “shots”.

7. In this experiment, you spaced your ships apart. Write down a method of ship spacing which would allow your opponent to win easily. Describe why this method would allow your opponent to more easily defeat you.

8. Is there a method of placing your ships that would work better than spacing them apart? If so, describe it.

9. If you were playing a game of *Battleship* where only the two largest ships were used, devise an "improved method" for this game, and explain why it would give you an advantage over your opponent.

Project 19 - HOW'S THE WEATHER? A LOOK AT THE GREENHOUSE EFFECT

Introduction: In the last 10 years we have heard a lot about the possibility of a "greenhouse effect" causing a global temperature increase. The greenhouse effect is the result of increased levels of carbon dioxide (CO_2) in the atmosphere which could possibly be causing increased global temperatures. In this project, you will analyze temperature data for your local region and an outside region, and look for a possible trend.

Procedure:

1. Go to your local library and ask for a weather almanac. Find weather data for a major city nearest to where you live. Also, obtain weather data for a major city that is at least 500 miles away.

2. Find the data listed as annual temperature. Record the annual temperatures and the year in which the temperature was calculated for each of the two cities that you selected. Obtain 30 years worth of data. Record this data.

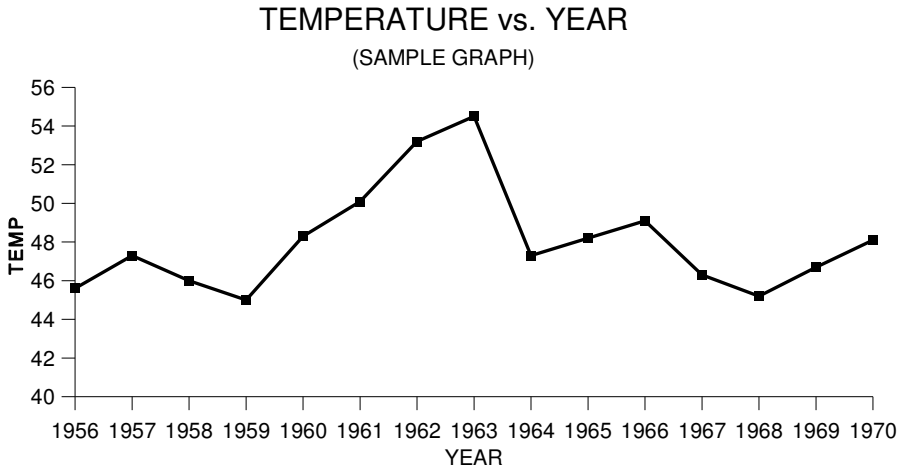
TEMPERATURE vs. YEAR - FIRST CITY															
YEAR															
TEMP															
YEAR															
TEMP															

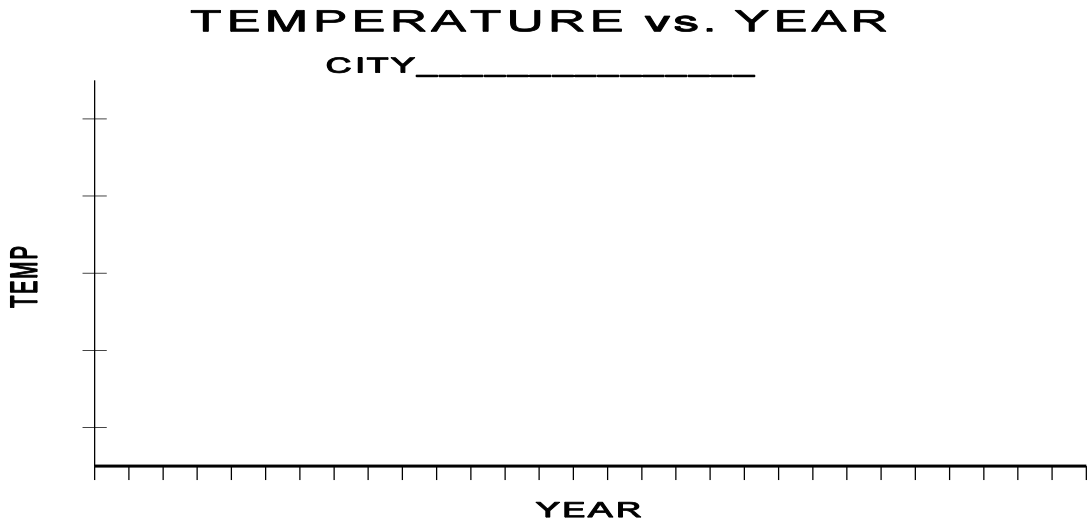
TEMPERATURE vs. YEAR - SECOND CITY															
YEAR															
TEMP															
YEAR															
TEMP															

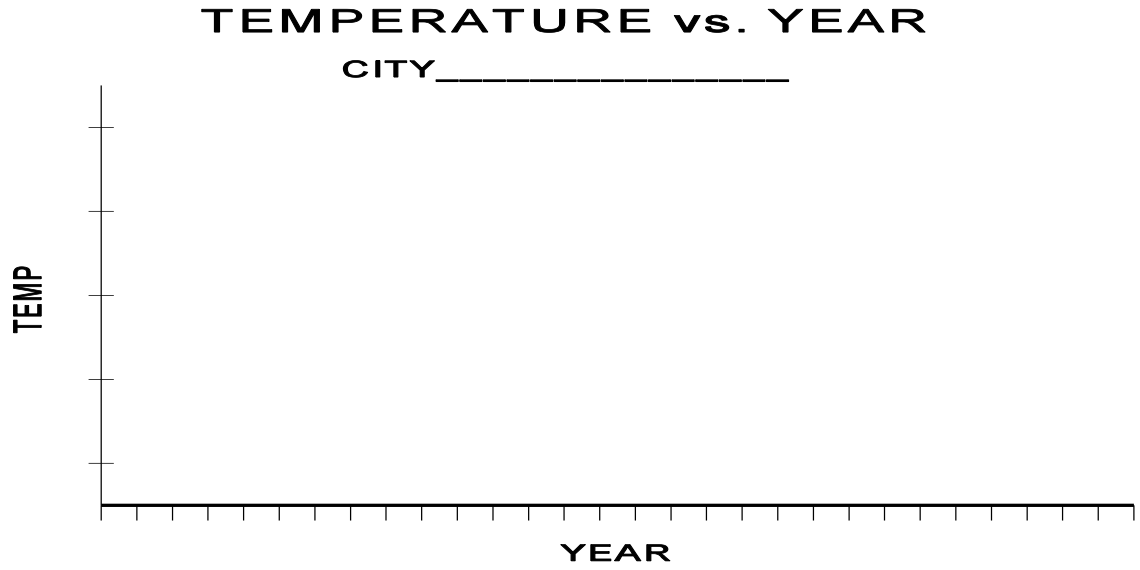
3. For each of the two cities, construct a line graph which compares the annual temperature and the year for the 30 years worth of data that you have

Example:

SAMPLE DATA															
YEAR	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970
TEMP	45.6	47.3	46.0	45.0	48.3	50.1	53.2	54.5	47.3	48.2	49.1	46.3	45.2	46.7	48.1



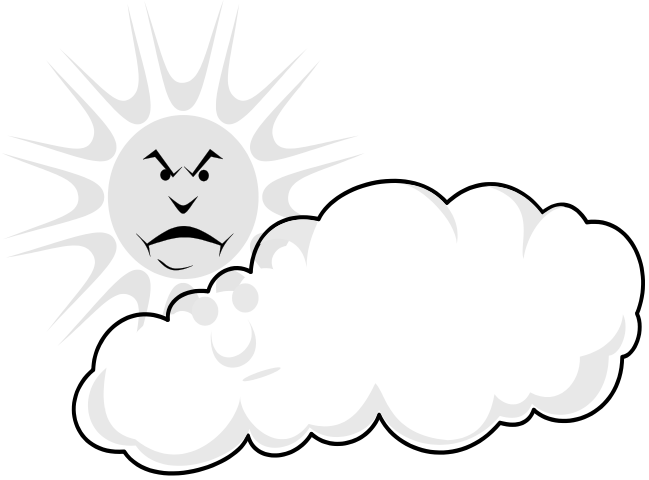




4. Starting with your earliest year, obtain five-year averages of temperature. Calculate these five year averages for both cities. Record your results in the tables given on the following page.

Example: If you have data for the years 1955 through 1985, find the average temperature for the years 1955 through 1959. Then, find the average temperature for the years 1960 through 1964, and so on.

CALCULATIONS



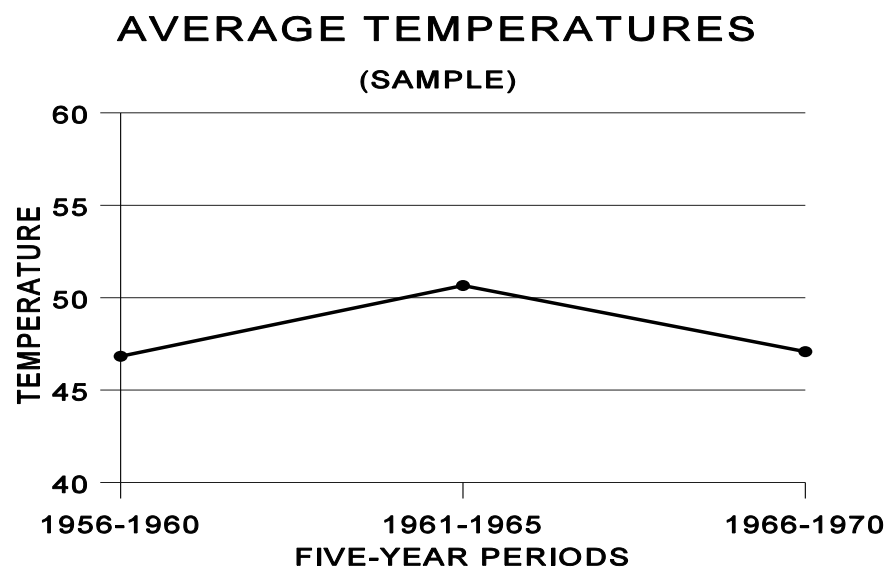
NAME OF CITY_____	
YEARS	AVERAGE TEMPERATURE

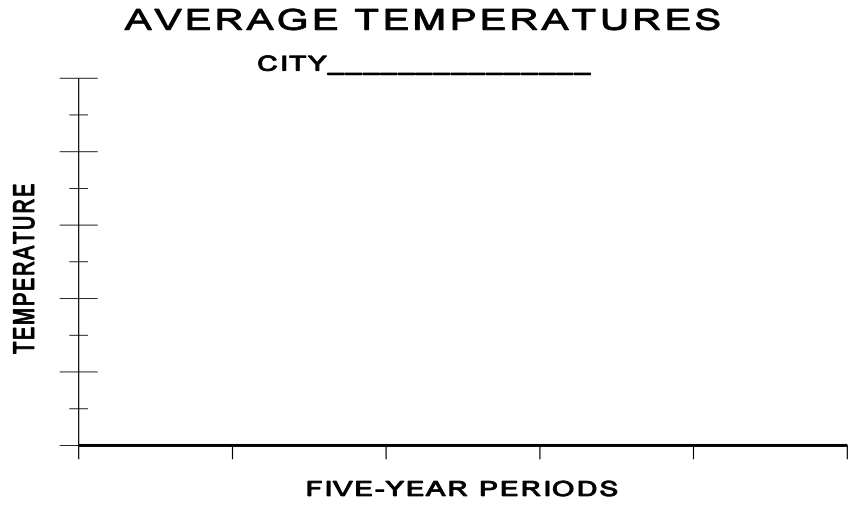
NAME OF CITY_____	
YEAR	AVERAGE TEMPERATURE

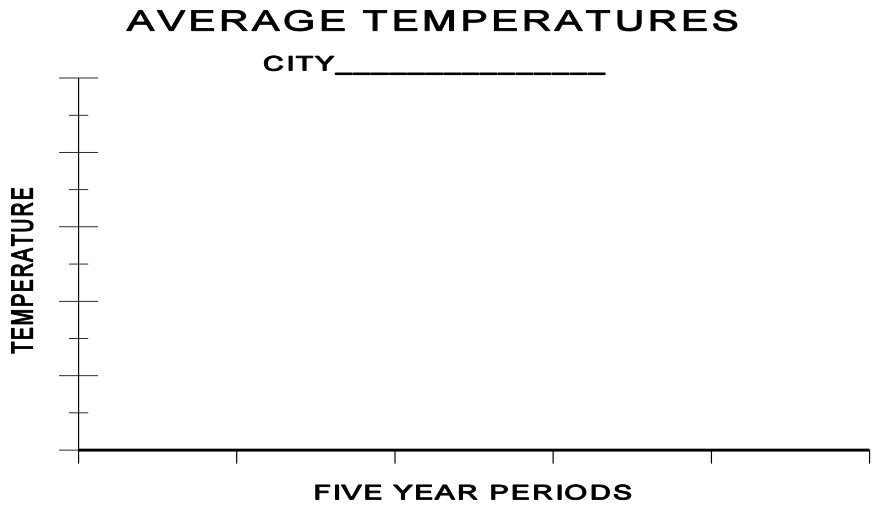
5. Construct a line graph similar to the graph of step 2, except use five year averages instead of yearly averages. Do this for both cities.

Example: The following three averages were obtained from the sample data given previously.

SAMPLE DATA	
YEARS	AVERAGE TEMPERATURE
1956 - 1960	46.83
1961 - 1965	50.66
1966 - 1970	47.08


AVERAGE TEMPERATURES
(SAMPLE)
60
55
50
45
40
TEMPERATURE
1956-1960
1961-1965
1966-1970
FIVE-YEAR PERIODS


AVERAGE TEMPERATURES
CITY_____
TEMPERATURE
FIVE-YEAR PERIODS


AVERAGE TEMPERATURES
CITY_____
TEMPERATURE
FIVE YEAR PERIODS

6. Based on your data and graphs obtained, what type of temperature trend did you see in each of the cities that you studied? Does your data suggest a possible greenhouse effect? Why or why not?

7. Describe two ways in which you would conduct a more in-depth study on the greenhouse effect and global warming.

Project 20 - HOW MUCH DOES IT COST TO PAINT YOUR LIVING ROOM?

Introduction: When we hire someone to paint our house, the cost can range from $500 to several thousand dollars. The paint is inexpensive, but the labor required is costly. In this project you will play the role of a painting contractor, and prepare a price estimate of the cost to paint your own living room. In order to prepare this price estimate, you will need to measure the surface area, estimate the amount of paint required, and estimate the number of hours required to paint your living room.

Procedure:

1. First, you will need to calculate the total number of square feet that you will be painting. Measure each rectangular region that is to be painted and obtain the length and width in feet. Multiply the length (ft) times the width (ft) to obtain the square feet of each rectangular region. Do not include areas that are not painted such as doorways or windows. Remember to take all measurements in feet.

Example: Starting from the front door you measure 10 ½ feet to the corner. You measure the height of your walls to be 8 feet. The square feet in this region are 8 ft X 10 ½ ft = 84 square feet. Then, proceed to measure all of the rectangular regions of your living room walls.

CALCULATIONS

2. Add all of the square feet calculated in step 1. Record this figure.

TOTAL SQUARE FEET_____

3. Select a brand of paint that you would use if you were to actually paint your living room. Note what the price per gallon is, and how many square feet each gallon covers. You will use these two figures in calculating your estimate.

PRICE PER GALLON $_____

SQUARE FEET COVERED PER GALLON_____

4. Using your total square feet calculated and the number of square feet each gallon covers, calculate how many gallons would be required to paint your living room. Then, calculate how many gallons would be required to apply two coats.

Example: If each gallon covers 500 square feet, and you are painting 900 total square feet, the number of gallons required would be 900 ÷ 500 = 1.8 gallons. To apply two coats, 3.6 gallons would be required. Since you cannot purchase partial gallons, 3.6 gallons would be rounded up to 4 gallons.

CALCULATIONS

GALLONS REQUIRED FOR TWO COATS_____

5. Calculate the cost of the paint you would use to apply two coats.

COST OF PAINT $_____

6. Estimate the approximate total time that it would take you to paint your living room. Then, think of an hourly rate you would charge if you were the painting contractor. Using this rate, calculate the cost of labor.

Example: If you estimated that it would take you 10 total hours to paint your living room, and your hourly rate is $20 per hour, then the cost of labor would be 10 x $20 = $200.

ESTIMATED TOTAL HOURS OF LABOR_____

HOURLY LABOR RATE $_____

COST OF LABOR $_____

7. Prepare an estimate for this painting job by listing the total square feet, the total paint required, the type of paint, the total cost of paint, the hours of labor, the total cost of labor, and the total cost.

ESTIMATE

_____***TOTAL SQUARE FEET***

_____***TOTAL PAINT REQUIRED***

_____***TYPE OF PAINT***

$_____***TOTAL COST OF PAINT***

$_____***TOTAL COST OF LABOR***

$_____***TOTAL COST***

8. What are at least three additional costs to you, the contractor, besides the cost of the paint? Describe them.