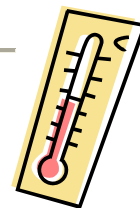


Is the Earth getting warmer?



The Earth is like a giant greenhouse. The sun's energy passes through the atmosphere and heats up the land. Some of the heat escapes back into space while some of it is reflected back towards the ground to provide added heating. Certain gases in our atmosphere like carbon dioxide (CO_2) trap more heat than would otherwise escape back into space helping to warm our planet.

Without this "greenhouse effect", the Earth would be too cold to support life. On the other hand though, too much of this greenhouse effect is not good either as the Earth could get too hot and trigger a slew of bad effects. It's a fine balance and this is what scientists are concerned about when they speak of global warming.

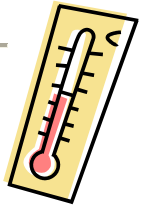
In this activity, you will look at real data that scientists have collected to see if the Earth is really getting warmer and if CO_2 is to blame. The data will be supplied to you by your teacher and shows the average temperature of the Earth and the amount of CO_2 in the atmosphere over the period 1963 - 2007

Before you begin, you should know that the average temperature of the Earth is 15°C and has been calculated by scientists who have averaged out all the temperatures readings around the world over a long period of time.

Activity

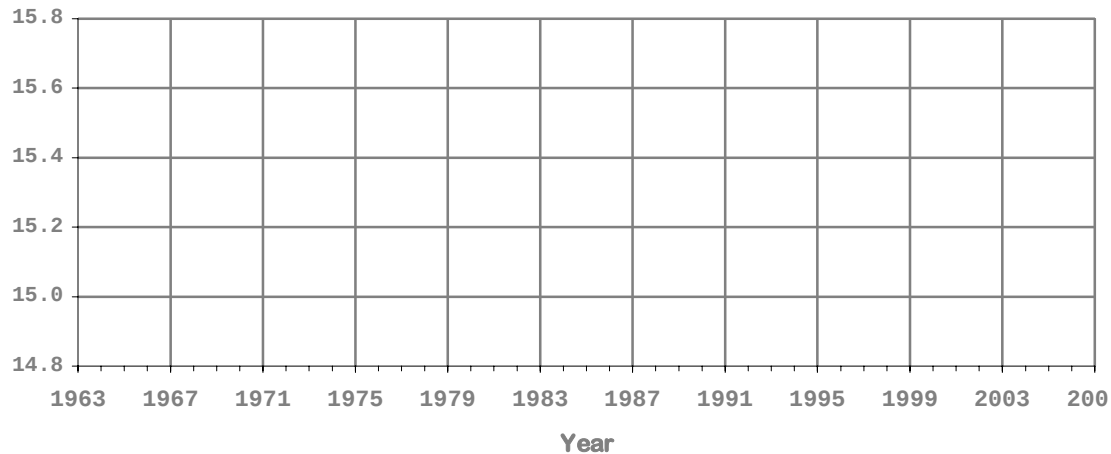
1. What is your hypothesis as to whether the Earth has gotten warmer over the past 50 years. What is your opinion based on?

Linear Relationships in the Real World Unit



2. Plot the average temperature of the Earth data that your teacher gave you using the grid below and connect the points to make a line graph.

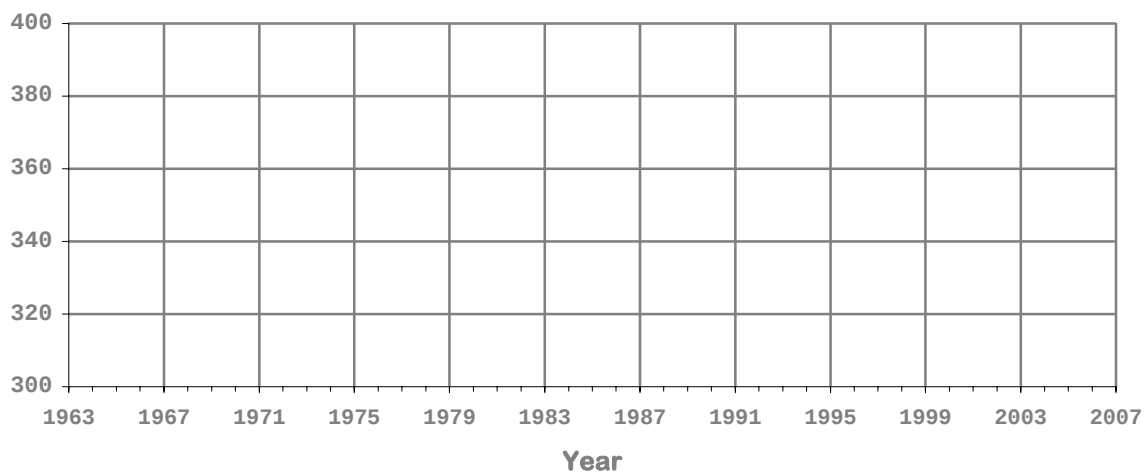
Average Temperature (C)



3. Draw a horizontal line across 15 °C, the long-term average temperature of the Earth. Has the Earth gotten warmer since 1963? Explain.

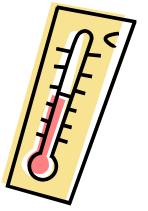
4. Now plot a line graph of the CO₂ data using the grid below.

Atmospheric CO₂ (ppm)



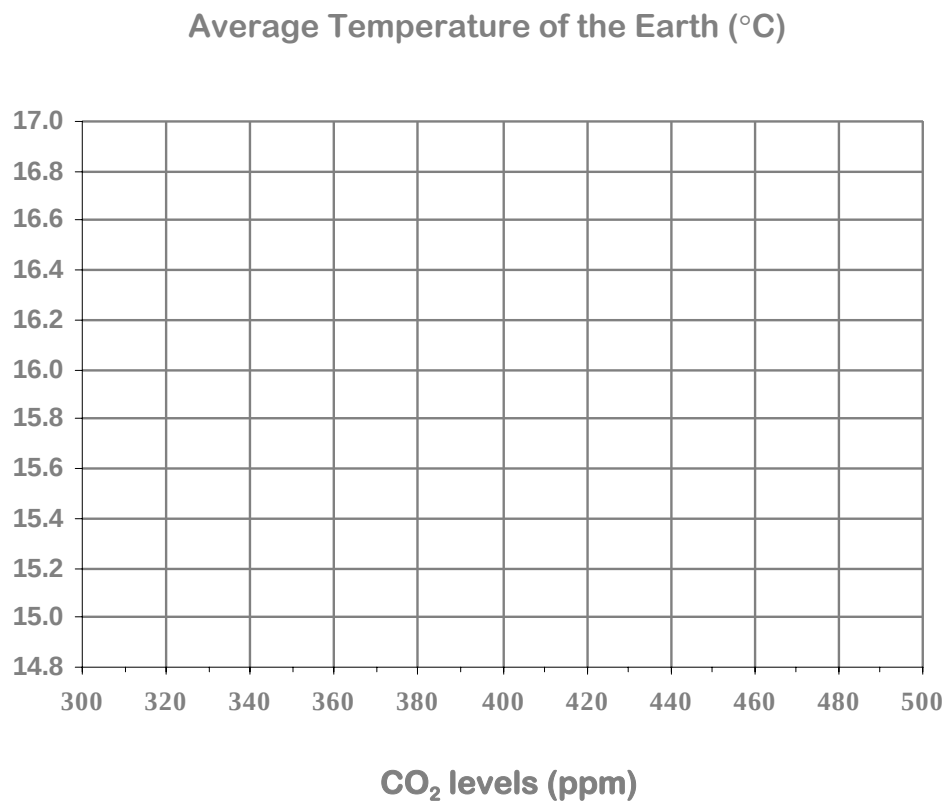
Linear Relationships in the Real World Unit

5. What has happened to the amount of CO₂ in the atmosphere? Give two (2) reasons why you believe this has happened.

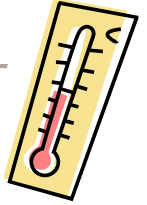


6. Do the graphs that you created support the idea that the Earth has gotten warmer and CO₂ is to blame? Explain.

7. Now use the temperature and CO₂ data to create a scatter plot.

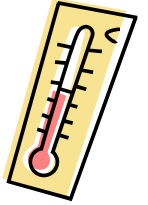


Linear Relationships in the Real World Unit



8. What does the scatter plot show in terms of the relationship between the Earth's average temperature and the amount of CO_2 in the atmosphere?
9. What advantage does the scatter plot that you created have over the individual graphs that you created in terms of detecting whether the Earth is getting warmer and if CO_2 is to blame?
10. Examine the scatter plot that you created. Has the average temperature of the Earth increased every time the CO_2 has gone up? Give an example of a year where this was not the case. Why do you think this happens?
11. Fit a trend-line through the scatter points. Be sure that your trend-line fits the data well. What advantage does this trend-line have in terms of explaining whether the Earth is getting warmer and if CO_2 is to blame?

Linear Relationships in the Real World Unit



12. What is your final conclusion about whether the Earth is getting warmer and whether CO_2 is to blame?
13. Using the trend-line, predict what the average temperature will be in the year 2100 if you future generations continue to pollute the atmosphere with CO_2 at a similar rate in which we have been doing now. State any assumptions you made.
14. Now predict what the average temperature will be in the year 2100 if future generations begin to reduce the amount of CO_2 they release into the atmosphere. State your assumptions.
15. Show your predictions from Q. 13 and 14 on the scatter plot you created. Be sure to include a legend to communicate that this data is predicted and not actual data.
16. What are three (3) things that you can do everyday to help combat global warming.

Do songbirds prefer larger forests...



An ecologist is interested in whether larger patches of forest attract more song bird species than smaller forested areas in southern Ontario when choosing a place to nest and feed. After carefully studying 10 different forest patches in the province, the ecologist determined the number of bird species (not the number of birds) living in each forest patch. The results are summarized in the table below:

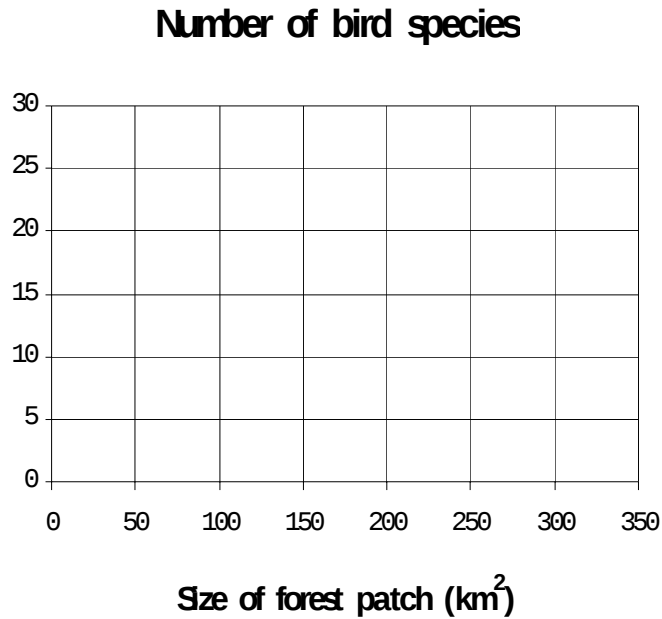
<u>Number of bird species</u>	<u>Size of forest patch (km²)</u>
2	5
6	28
15	200
5	15
8	34
28	300
17	225
9	50
14	250
18	275

1. What is the dependent variable according to what the ecologist is studying? Explain your reasoning.
2. What is your hypothesis as to the relationship between the dependent and independent variables? Explain your reasoning.

Linear Relationships in the Real World Unit



3. Create a scatter plot of the relationship between the dependent and independent variable using the grid below.



4. What does the scatter plot tell the ecologist about the relationship between the dependent and independent variables?
5. Give two (2) reasons why you see the relationship that you do in the scatter plot between the variables. Pretend you're a songbird living in a forest patch.

Linear Relationships in the Real World Unit



6. Do larger forest patches always support more songbird species than smaller ones based on the data that the ecologist collected? Give one good reason why this might happen.

7. Place a trend line through the scatter points on the scatter plot. What is the value of this line in terms of identifying the relationship between the dependent and independent variables?

8. What should the ecologists final conclusion be based on the data she collected?

9. What should the government of Ontario do based on the results of the study if they want to attract more songbird species to Ontario.

Can the Earth Sustain Itself?



There are over 6.5 billion people living on the Earth as of the year 2007, with China and India topping the list with over 1 billion people each. Experts predict that if the population continues to grow at the current rate, the world's population could double by the year 2050.

A question that many have asked is whether the Earth will be able to sustain such a large population in terms of food production? Even in the 18th century, a famous professor by the name of Thomas Malthus made a very famous prediction that population would outrun food supply eventually.

Today, there are many countries whose people are starving due to poor soil and drought conditions. In many countries, rice and wheat are the food basics of life and when these disappear, people are in trouble. The table below shows an estimate of the total population of the world and an estimate of the total annual global rice and wheat production for the respective year.

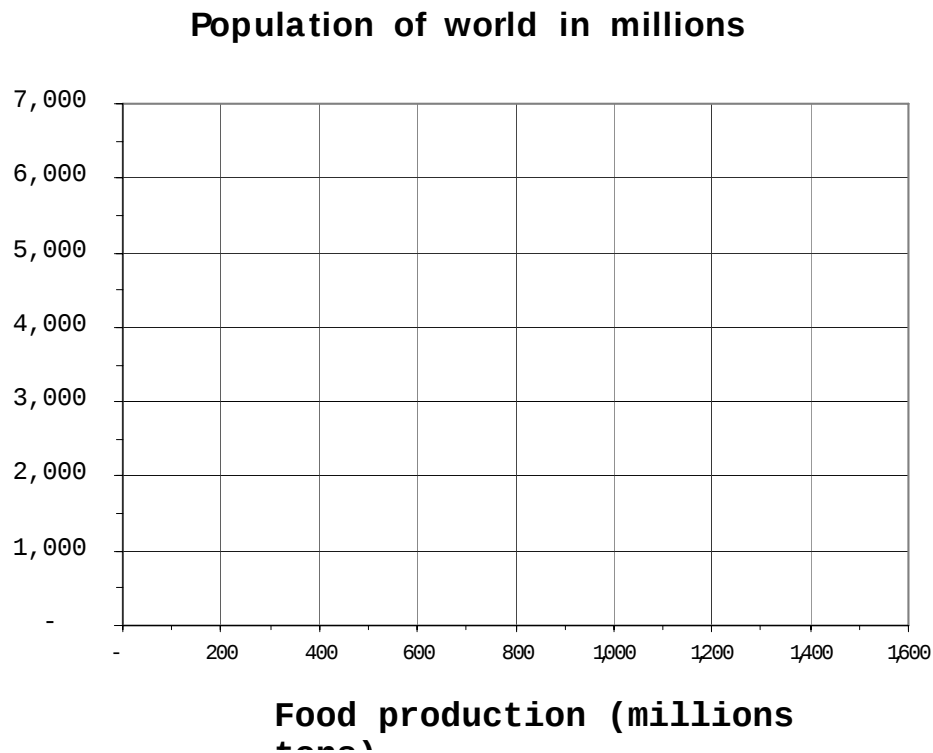
<u>Year</u>	<u>Population (millions)</u>	<u>Food (millions tons)</u>
1950	2,519	650
1955	2,757	780
1960	3,023	820
1965	3,337	1,000
1970	3,696	1,096
1975	4,073	1,128
1980	4,442	1,159
1985	4,843	1,327
1990	5,279	1,417
1995	5,692	1,337
2000	6,085	1,443
2005	6,464	1,588

Linear Relationships in the Real World Unit

Activity



1. What is your hypothesis as to the relationship between food production and the world's population? Explain your reasoning.
2. Plot the data on the scatter plot below as accurately as you can using the scale provided.

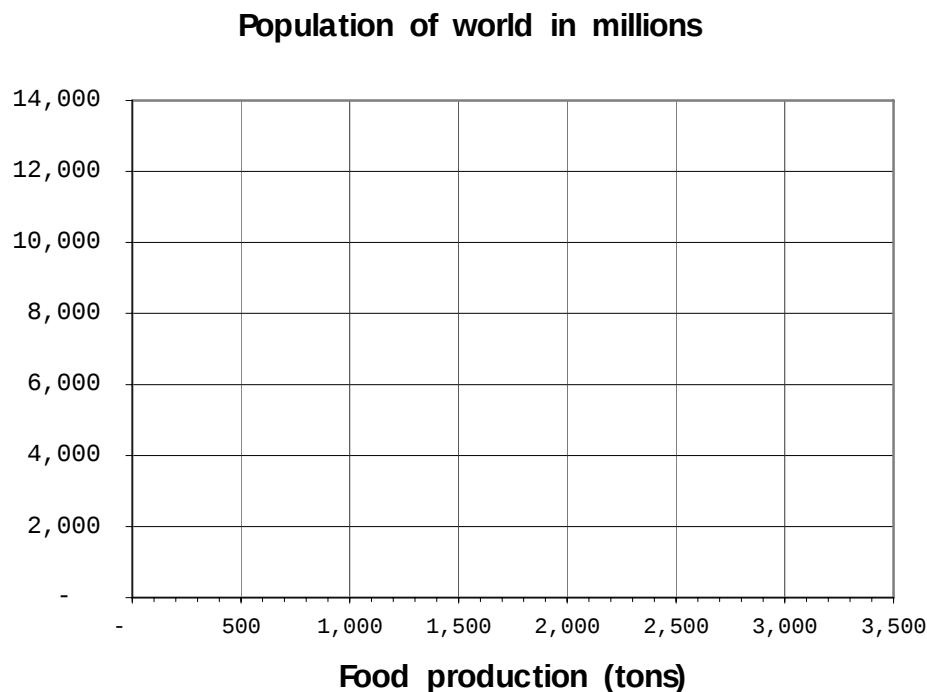


3. What does the scatter plot you created tell you about the relationship between food production and population of the world?

Linear Relationships in the Real World Unit



4. Why do you think the relationship you described in Q3 exists?
5. Sketch a trend-line through the data points and explain the value of this line when examining the relationship between the dependent and independent variables.
6. Plot your trend-line on the graph below and use it to make your own prediction about how much food will have to be produced to sustain the world's population in the year 2050. Do you think the Earth can sustain such a population? State your assumptions.



Linear Relationships in the Real World Unit



7. Create a table to show the amount of food that was produced per person since 1950. Was Malthus' famous prediction correct? Explain why it was or wasn't.

<u>Year</u>	<u>Food per person</u>
1950	_____
1960	_____
1970	_____
1980	_____
1990	_____
2000	_____
2005	_____

8. List three (3) factors other than food production that affect the world's population.

-
-
-

9. Some would argue that food production has kept up with population growth on a "global" basis but not on a "local" basis. What do you think is meant by this? Explain.

10. Why do you think this is an important social issue for everyday people in Canada? How can we help to sustain the world's population? Explain.

Choose your own social issue...



Now that you have become an expert on examining relationships in the real world, it is time to take charge and choose your own relationship to analyze.

The challenge

Choose a current issue from the real world that you are interested in or would like to learn more about. A simple working definition of a social issue for this project is any issue that has an effect on a person, city, country, the world, wildlife, the environment, etc. Here are some ideas to get you thinking about a specific topic.

- Is there a relationship between a country's wealth (GDP) and the amount of money that donate to developing countries?
- Is there a relationship between a city's unemployment rate and the number of food shelters in the city?
- Is there a relationship between the population of a city and the number of people that own hybrid automobiles?
- Is there a relationship between the number of students that would use public transportation and price of a bus ticket?

Once you have an idea about a social issue that interests you, the difficult part will be posing a question in a way that allows you to find data to quantify the relationship. Try to pose a question that doesn't have an obvious answer as this will make your topic interesting.

Linear Relationships in the Real World Unit



The Deliverables

You must submit a report that includes the following as part of your final project:

- A short introduction providing background information on your topic and sparking the audiences' interest.
- A question posed about the relationship between a dependent and independent variable for your topic
- Your hypothesis and brief explanation as to your gut feeling about your topic's relationship
- A data table organizing the data that you collected for your dependent and independent variables
- A properly labeled scatter plot showing the relationship between your variables that you collected data for
- A trend-line showing the overall relationship between the data on the scatter plot
- A discussion of the answer to your question concerning the relationship including reasons for the results you have found
- Going beyond the data to make a meaningful prediction about your social issue using your trend line and scatter plot
- Discussion of any other factors that affect the confidence of your answer to the question you posed about your social issue
- Your final conclusion as the answer to the question you posed concerning your social issue.

Social Issue Evaluation



Topic _____

Name _____

Introduction (15%)

Level 1

Level 2

Level 3

Level 4

Captures the readers attention and interest.....

Sufficient background information provided.....

Meaningful question posed about a social issue

Hypothesis clearly stated and justified

Data (25%)

Quality of primary data collected.....

Quality of secondary data collected.....

Data well organized in a properly labeled table.....

Source of data clearly indicated.....

Results (35%)

Accuracy of scatter plot

Accuracy of trend-line

Correct interpretation of results

Meaningful prediction made

Conclusion (10%)

Reasons for your results explained and justified.....

Discussion of other factors involved

Clear, well organized, and simple conclusion.....

Comment on whether hypothesis was correct

Report organization (15%)

Spelling and grammar.....

Report organization

Tables and figures neat and properly labeled

Professional appearance