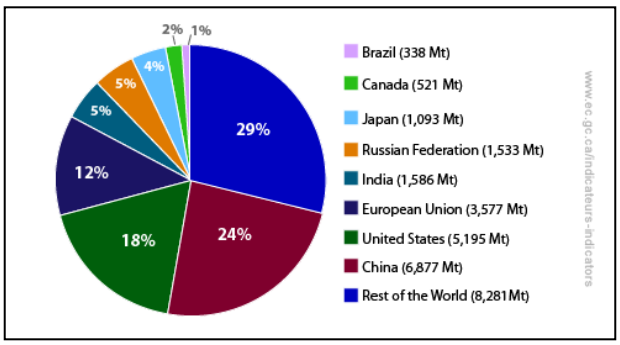

This graph shows the percentage of carbon dioxide produced world-wide by the major contributors. The units in parenthesis give the number of millions of tons of carbon dioxide generated in 2009. The US produced 5,195 million tons (5.2 gigatons) of carbon dioxide.

Since the late 1800s, the amount of carbon dioxide in the atmosphere has been steadily increasing every year. Until careful studies of the global average temperature began in the 1900s, it wasn't very clear what effect this would have on our environment. During this time, the sheer number of human beings on Earth has steadily increased from one billion to over 7 billion today.

The needs of so many people for transportation, heat, light, and the production of food and other essentials of comfortable living has fueled a rapid consumption of fossil fuels. This generates the carbon dioxide that leads to global warming.

Problem 1 – Between 1970 and 2010, the average global temperature has increased by +1.1° Fahrenheit (+0.6° Celsius), or a rate of +0.028° F/year. In 1970, the average global temperature was 57.2° F (+14.0° C). Write a linear equation in the point-slope form that models the Fahrenheit temperature change from 1970 to 2012. What do you predict the temperature will be in 2020?

Problem 2 – Between 1970 and 2010, the world population changed from 3.7 billion to 6.9 billion at a rate of 80 million people per year. Write a linear equation for the population, P, during a given year, Y, in point-slope form. What will be the population in the year 2020?

Problem 3 – The United States produced 1.2 billion tons of carbon in 1985 at a growth rate of +0.02 billion tons per year. China produced 0.9 billion tons of carbon in 2003 at a growth rate of +0.15 billion tons per year. In what year will China and the US be producing the same amount of carbon from fossil fuel consumption?

Temperature data from http://www.currentresults.com/Environment-Facts/changes-in-earth-temperature.php and http://www.climatewatch.noaa.gov/article/2009/carbon-dioxide-earths-hottest-topic

Problem 1 - Between 1970 and 2010, the average global temperature has increased by +1.1^o Fahrenheit (+0.6^o Celsius) over 40 years, or a rate of +0.028^o F/year. In 1970, the average global temperature was 57.2^o F (+14.0^o C). Write a linear equation in the point-slope form, that models the temperature change from 1970 to 2012. What do you predict the Fahrenheit temperature will be in 2020?

Answer: Point-slope: Coordinates of the point are (1970, +57.2F) the slope m = +0.028
So **F-57.2 = +0.028(Y-1970)**. In 2020, the predicted temperature will be
F-57.2 = +0.028(2020-1970), so **F = +58.6^o Fahrenheit**.

Problem 2 – Between 1970 and 2010, the world population changed from 3.7 billion to 6.9 billion at a rate of 80 million people per year. Write a linear equation for the population, P, during a given year, Y, in point-slope form. What will be the population in the year 2020?

Answer: The point is (1970, 3.7 billion) the slope is 0.080 billion/year, so the formula is
P – 3.7 billion = +0.080(Y-1970). In 2020, P-3.7 billion = +0.080(2020-1970), so
P = 7.7 billion people. (Note: Actual forecasts suggest 7.6 billion.)

Problem 3 – The United States produced 1.2 billion tons of carbon in 1985 at a growth rate of +0.02 billion tons per year. China produced 0.9 billion tons of carbon in 2003 at a growth rate of +0.15 billion tons per year. In what year will China and the US be producing the same amount of carbon from fossil fuel consumption?

Answer: First write the two equations: China: y-0.9 = +0.15(x-2003) and US: y – 1.2 = +0.02(x-1985). Then simplify them: China: y = +0.15x -299.55 and US: y = +0.02x -38.5. Now solve these two equations for the intersection point (X,Y).

y = +0.15x – 299.55
y = +0.02x – 38.5. use substitution: x = (y+38.5)/0.02 so x = 50y + 1925

Y = +0.15 (50y + 1925) - 299.55 so y = 7.5y -10.8 and so **y = 1.66** and x = 50(1.66) + 1925 , **x= 2008**.
The intersection point is (2008, 1.66). In the year, 2008 China and the US will each be producing 1.66 billion tons of carbon. After 2008, China will be producing more carbon that the US.

See graph below from the Earth Policy Institute: http://www.earth-policy.org/indicators/C52