

Lesson 5 – Modelling With Scatter Plots & Linear Functions

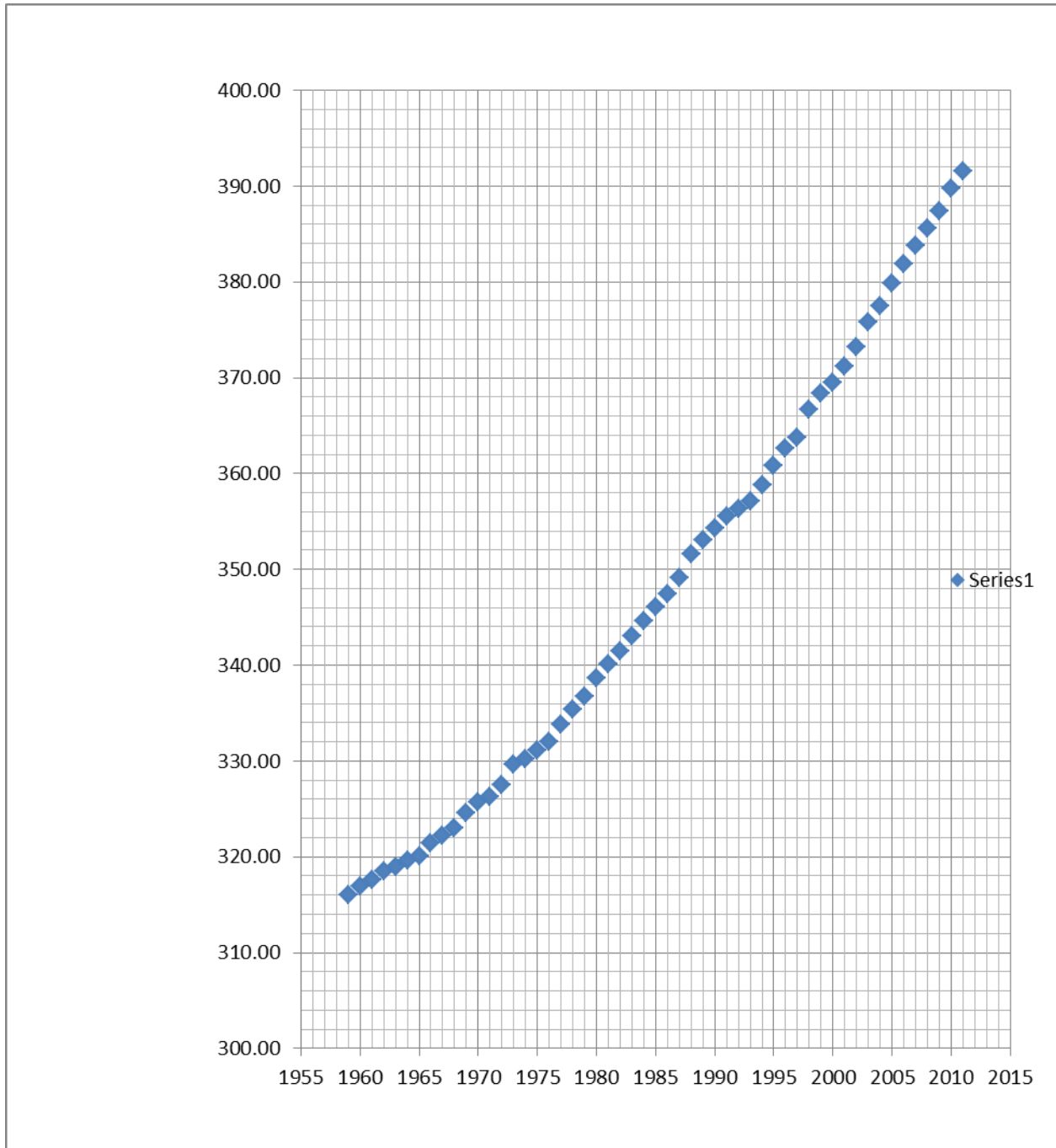
Date: _____

(A) Lesson Objectives:

- a. Write equations of median-median best fit lines
- b. Use the TI-84 to generate the equation of the line of best fit
- c. Apply Scatter Plots to Real World Applications

(B) Atmospheric CO2 Levels – from Mauna Loa

- a. → <http://co2now.org/Current-CO2/CO2-Now/noaa-mauna-loa-co2-data.html>
- b. Graph → Draw the line of best fit



Lesson 5 – Modelling With Scatter Plots & Linear Functions Date: _____

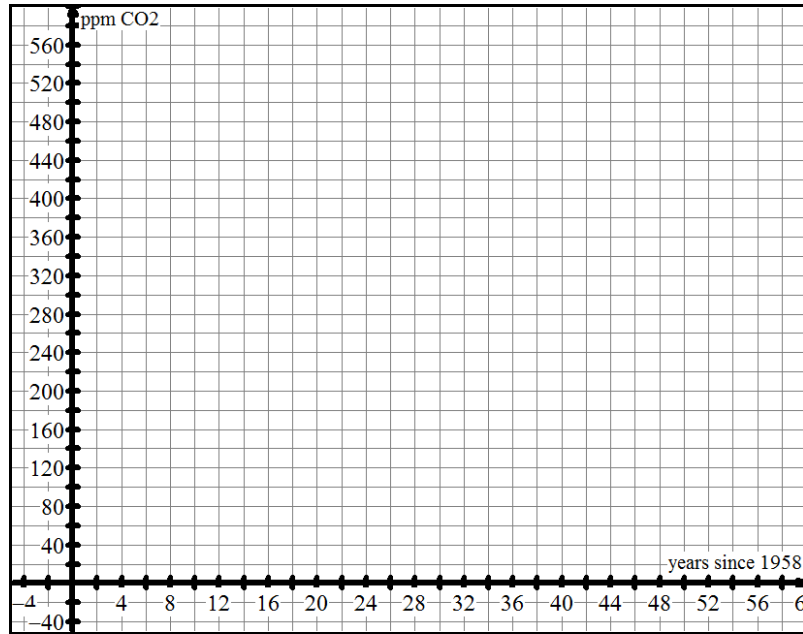
Verbal Description:

The amount of CO₂ (in ppm) in the air at the Mauna Loa Astronomical Observatory has been measured regularly since 1959. In 1972, the amount of CO₂ recorded was 327.45 ppm while in 2012, the amount was 389.78 ppm.

Data Table:

Years since 1959		
ppm of CO ₂		

Graph:



Equation:

Slope:

Meaning of Slope:

Y-intercept:

Meaning of y-intercept :

Questions:

- (a) When will the CO₂ levels be at 600 ppm?
- (b) What was the amount of CO₂ in the air in June of this year?
- (c) If I give you an additional data point, (in the year 2005, the measured amount was 379.78), will your equation change? Why? How?
- (d) Interpret the statement $C(46) = 413$
- (e) What would be the domain and range of this linear function? Explain.

Lesson 5 – Modelling With Scatter Plots & Linear Functions Date: _____

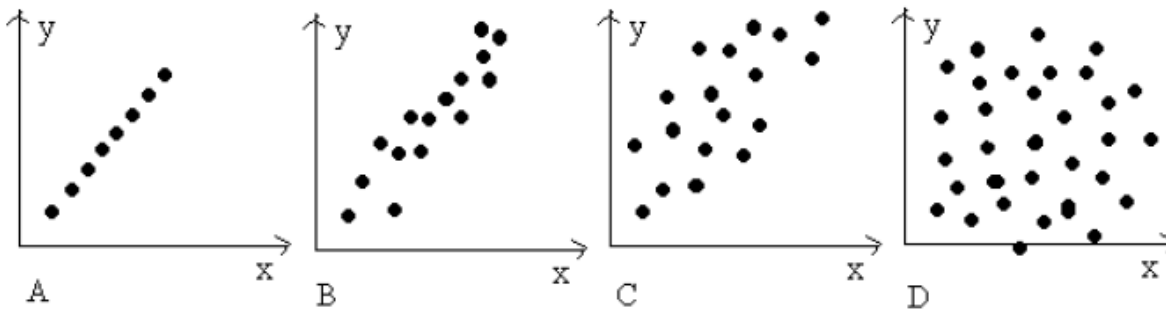
(C) Fast Five

- a. Find the mean and median of 5,7,2,10,5
- b. Graph the line $y = 6$
- c. Graph the line $x = -2$
- d. Determine the equation of the line through the point $(-2,4)$ that is perpendicular to the line $2x - 4y = 8$

(D) Skills Practice:

- a. Terminology → The strength of the relationship gives us an indication how closely the points in the scatter diagram fit a straight line or a relevant curve. The measure of the strength of a linear relationship is called the **correlation coefficient** and denoted by r .

- b. Visual Examples →



2. Match these labels to the above diagrams:

“no association”,

“strong positive association”,

“weak positive association”

“perfect positive association.”

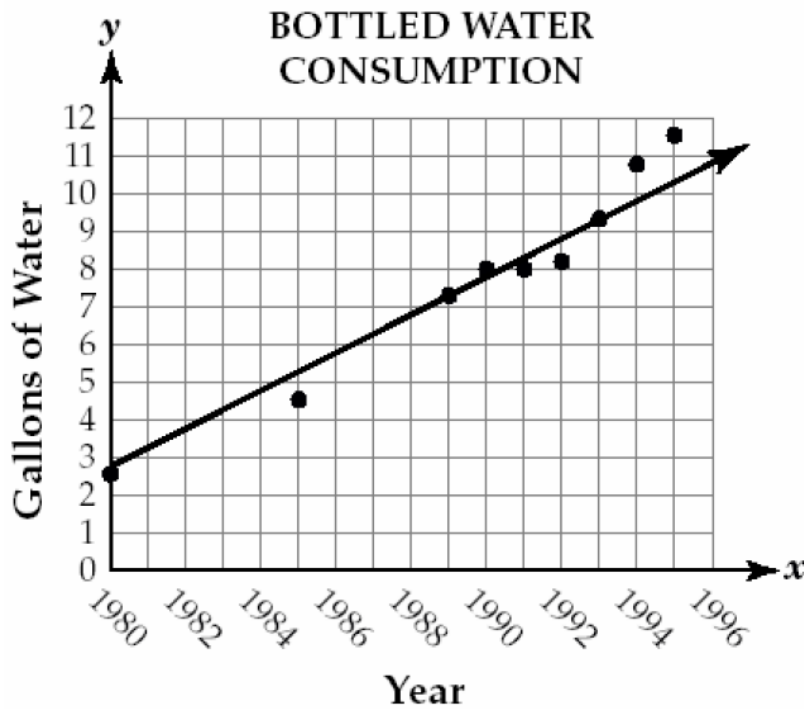
3. Explain the reasoning of your answers above.

1. **SKETCH** the scatter diagrams for the following (use at least 8 data points):

<p>Perfect negative linear association between x and y</p>	<p>Very strong negative linear association between x and y</p>	<p>Weak negative linear association between x and y</p>
--	--	---

(E) Skills Practice → Lines of Best Fit and Scatter Plots

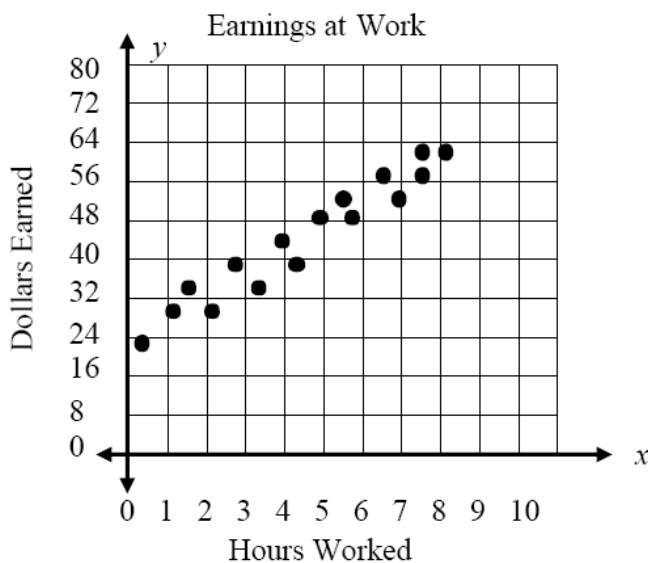
4. Take a look at the graph with a line of fit below. Answer the questions at the right.



Questions about the Line of Fit

- Is the slope of the line positive or negative?
- According to the line of fit, about how many gallons of water will be consumed in 1996?
- According to the line of fit, when the year increases by 5 years, how many gallons of water increase?
- What is the y-intercept of the line of fit?

3. The graph below shows the earnings that Jim makes on his newspaper route. Because he gets paid by commission, he doesn't always earn the same amount. In the graph below, sketch a line of fit as best you can and then answer the questions...

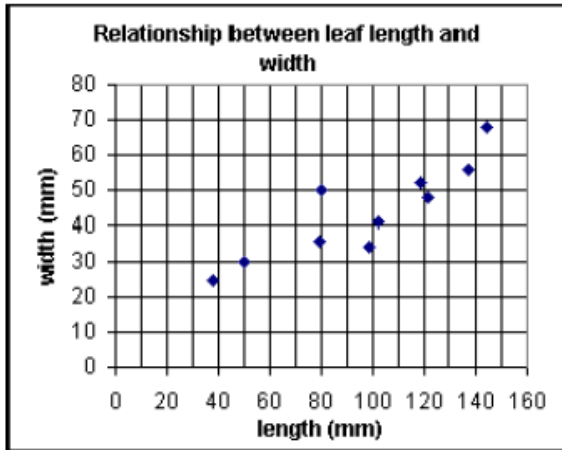


Questions about the Line of Fit

- How many dollars did Jim earn for working 5 hours?
- Using your line of fit, predict how many dollars Jim will earn for working 10 hours.
- Is the slope of your line of fit positive or negative?
- What is the y-intercept of your line of fit?

(F) Skill Application

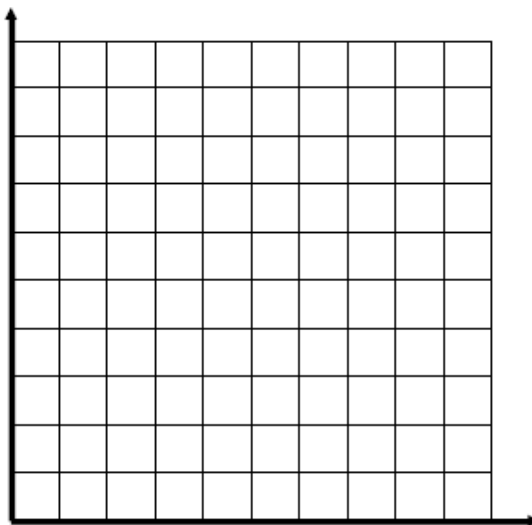
2. The length and width of 10 leaves are shown on the scatter diagram (side).



- Plot the point M(97,44) which represents the mean length and the mean width on the diagram.
- Draw a suitable line of best fit.
- Write a sentence describing the relationship between leaf length and leaf width for this sample.

Every year since 1990, the number of runners in the U.S. has grown. Below is a chart of the number of runners in the hundreds of thousands.

Year	Year since 1990	Runners
1994		5.5
1995		5
1996		6
1997		7
1998		6.7
1999		7
2000		7.1
2001		7.5



- What is the equation of the line of best fit?
- Predict the number of runners in 1985? Is this a reasonable answer? Why or why not?
- Predict the number of runners in 2050? Is this a reasonable answer? Why or why not?

Lesson 5 – Modelling With Scatter Plots & Linear Functions Date: _____

(G) Further Skill Application

2. Active Dentists in the U.S.

Year (x)	0	5	10	15	20	25	30
Number of Dentists (y)	154	152	149	147	144	136	121

- Is there any constant rate of change with this data?
- Pick any two points and calculate the slope.
- What does the slope mean in the context of this situation?
- Calculate the line of best fit. Use mathematics to explain how you determined your answer. Use words, symbols, or both in your explanation.
- Identify the y – intercept.
- What does the y – intercept mean in the context of this situation?

(H) For each of the following, write the prediction equation and then solve the problem.

1. A student who waits on tables at a restaurant recorded the cost of meals and the tip left by single diners.

Meal Cost	\$4.75	\$6.84	\$12.52	\$20.42	\$8.97
Tip	\$0.50	\$0.90	\$1.50	\$3.00	\$1.00

If the next diner orders a meal costing \$10.50, how much tip should the waiter expect to receive?

Equation _____ Tip expected _____

2. The table below gives the number of hours spent studying for a science exam (x) and the final exam grade (y).

X	2	5	1	0	4	2	3
Y	77	92	70	63	90	75	84

Predict the exam grade of a student who studied for 6 hours.

Equation _____ Grade expected _____

3. The table below shows the lengths and corresponding ideal weights of sand sharks.

Length	60	62	64	66	68	70	72
Weight	105	114	124	131	139	149	158

Predict the weight of a sand shark whose length is 75 inches.

Equation _____ Weight expected _____

(I) HOMEWORK → For Further Practice:

- <http://arapahoe.littletonpublicschools.net/Portals/7/Math/Lhotta/Line%20of%20Best%20Fit%20Worksheet.pdf>
<http://www.gradeamathhelp.com/support-files/lines-of-fit-d.pdf>