

**1. Lesson Context**

BIG PICTURE of this UNIT:	<ul style="list-style-type: none"> <li>• What is meant by the term FUNCTIONS and how do we work with them?</li> <li>• What are the most important components of “Problem Solving”?</li> <li>• From last year’s course, what are the major topics from linear relations that we have worked with, remember, and are fluent with?</li> <li>• How do we apply the concept of linear relations to (i) geometry &amp; (ii) data analysis &amp; (iii) functions</li> </ul>
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**2. Lesson Objectives**

- a. Graph scatter plots to model contextual problems
- b. Write equations of lines of best fit

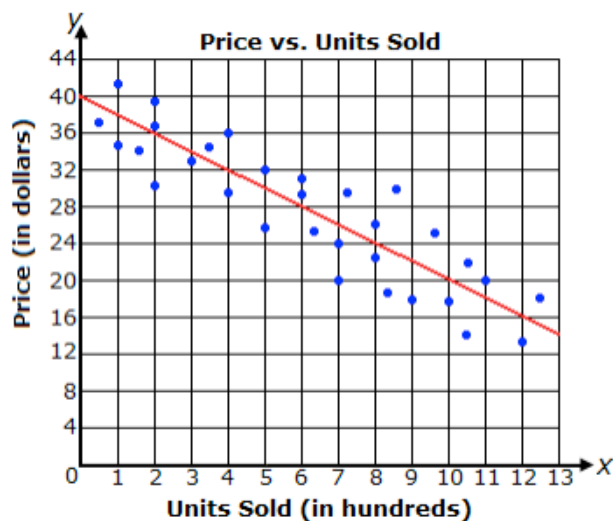
**PART 1 – Skills REVIEW**

1. Here is a set of 6 ordered pairs:  $\{(-2,3), (0,5), (3,5), (3,6), (5,8), (8,10)\}$ 
  - a. Is this set of ordered pairs an example of a “relation”? Why/why not?
  - b. Graph the six points on a graph.
  - c. Find the average x-value and the average y-value from these 6 points.
  - d. Plot this “average point” on your graph.
  - e. Draw a line of best fit for the 6 data points (7 including the average point)
  - f. Determine the equation of this line of best fit.
  
2. The table below gives the number of hours spent studying for a math exam and the final exam grade.

Hours ( $x$ )	2	5	1	0	4	2	3
grade ( $y$ )	77	92	70	63	90	75	84

- a. Use Lin Reg on your TI-84 to determine the line of best fit equation.
- b. If Farida studies 2.75 hours, what grade should she expect?
- c. How many hours should Mohamed study in order to get a grade of 97%.
- d. Do you expect this relation to be a function? Why/why not?

3. The graph below shows a line of best fit for data collected on the price of a unit in relation to the number of units sold. What is the equation of the line of best fit?



4. The table shows the number of people employed in agriculture in the United States from the year 1940 to the year 2000.

U. S. Agricultural Employment

Year	1940	1950	1960	1970	1980	1990	2000
Employment (in millions)	9.5	7.2	5.5	3.5	3.4	3.2	2.5

- Draw a scatter plot and a trend line for the data.
- Use the trend line to make a prediction for the population in the year 2010 and for 2020.
- Find the equation for a line of best fit. (Round the values for  $m$  and  $b$  to the nearest tenth.)
- Use the equation for the line of best fit to estimate the population in the year 2010 and for 2020. Round the answer to the nearest half million.

Mr. R does some further research and finds the following ADDITIONAL DATA → (2008, 2.9) and (2016, 3.3).

- Add these additional data points onto your scatter plot.
- Is your line of best fit still “valid”? Why/why not? Are your predictions for 2010 and 2020 still valid?

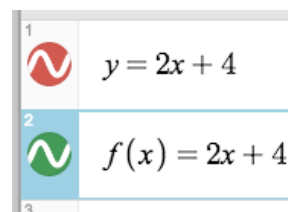
PART 2 – Skills PRACTICE

1. Ahmed works as a waiter in a restaurant. He records the cost of the meals his customers order and the tip that they leave.

Meal Cost	4.75	6.84	12.52	20.52	8.97
Tip	0.50	0.90	1.50	3.00	1.00

- a. Use Lin Reg on your TI-84 to determine the line of best fit equation.
  - b. If a dinner ordered costs \$10.50, how much tip should Ahmed expect?
2. Use DESMOS to graph the following linear relations (Type in the equations EXACTLY as they are written here – see example)

i.  $y = 2x + 4$                       ii.  $f(x) = 2x + 4$



- a. What do you notice in your graphs?
  - b. What does this tell you about meaning of the  $f(x)$  notation?
  - c. What would  $f(5)$  then equal? Show/explain your reasoning.
3. The table below shows the lengths and corresponding weights of sand sharks.
- |             |     |     |     |     |     |     |
|-------------|-----|-----|-----|-----|-----|-----|
| Length (cm) | 60  | 62  | 64  | 66  | 70  | 73  |
| Weight (kg) | 105 | 114 | 124 | 131 | 139 | 158 |
- a. Use Lin Reg on your TI-84 to determine the line of best fit equation.
  - b. Predict the weight of a sand shark whose body length is 75 cm.
  - c. Predict the body length of a shark whose weight is 150 kg
4. Given the points F(-3,-5) and G(9,12), determine:
- a. The midpoint of the line segment joining these two points.
  - b. The length of the line segment between these 2 points.
  - c. The equation of line through these two points.
  - d. Use GEOGEBRA to determine:
    - i. The angle that this line segment makes with the x-axis
    - ii. HIGHER LEVEL EXTENSION: Where would you place a third point, call it H, to make an isosceles right triangle FGH?

5. John works at a clothing store and his weekly salary is \$500 and he earns a 5% on his weekly sales. To explore the relationship between John’s weekly sales and his weekly salary, answer the following questions:

- a. Complete the data table below

Weekly sales	0	1000	2000	3000	4000	5000
Weekly salary						

- b. What will his weekly salary be if he sells \$8000 worth of clothing
- c. Will his weekly salary ever be \$1000? How?
- d. What is the slope and what does the slope mean?
- e. John gets a raise in pay and now earns a base salary of \$700, but his commission remains at 5% of total sales. Write a new equation and graph it on the grid. What is similar about the 2 graphs? What is different about the 2 graphs.
- f. John now gets a raise in pay. He stills earns a base salary of \$500, but his commission is now 7.5% Write a new equation and graph it on the grid. What is similar about the 2 graphs? What is different about the 2 graphs.
- g. John now gets promoted to Store Manager and earns a weekly salary of \$1100. and graph it on the grid. What does this graph look like?

**Higher Level Extension Work**

**8.56** The bases of two flagpoles are 12 feet apart. One flagpole is 14 feet tall and the other is 11 feet tall. A wire runs directly from the top of the tall flagpole, to the top of the small flagpole, then to the ground, without bending or curving at any point. How far from the base of the small flagpole does the wire reach the ground? **Hints:** 35

**8.57★** A line  $L$  has a slope of  $-2$  and passes through the point  $(r, -3)$ . A second line,  $K$ , is perpendicular to  $L$  at  $(a, b)$  and passes through the point  $(6, r)$ . Find  $a$  in terms of  $r$ . **Hints:** 222