CLEMSON ALGEBRA PROJECT
UNIT 1: EVALUATING EXPRESSIONS

PROBLEM 1: SUMMER EMPLOYMENT

This summer you will be working as a lifeguard at the city pool. Your rate of pay will be $8.26 per hour.

A. Write an algebraic expression that describes your gross pay after working *h* hours.

B. What does the coefficient of *h* represent?

C. Using the expression from part A, determine how many hours you must work in order to earn at least $300.00 per week.

D. Upon examining your paycheck stub, you notice that after working 40 hours, you paid $25.03 Social Security Tax. Write an expression to determine the percent of your gross pay that you paid for Social Security Tax. Define any variable you use.

E. What is the percentage of Social Security Tax that you pay?

MATERIALS

Casio CFX-9850Ga Plus or ALGEBRA FX2.0 Graphing Calculator

EXTENSIONS

1. Have students compare the earnings from two or more prospective jobs.
2. Have students bring in actual paycheck stubs and calculate the actual percentages for all withholdings.

ONE SOLUTION TO PROBLEM 1: SUMMER EMPLOYMENT

A. Write an algebraic expression that describes your gross pay after working *h* hours.

Simply multiply the amount you earn each hour by the number of hours you work. Notice that $\frac{dollars}{hour} * hours = dollars$. Here our answer is \$8.26 per hour times *h* hours, or 8.26*h*. Our answer will be in dollars.

B. What does the coefficient of *h* represent?

The coefficient of *h*, in this case 8.26, represents the hourly rate of pay. Here this means you earn \$8.26 every hour.

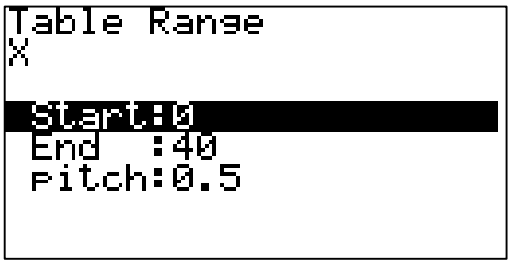
C. Using the expression from problem 1, determine how many hours you must work in order to earn at least \$300.00 per week.

One way to approach this problem is with a table of values. From the MAIN MENU on your calculator:

- Call up the "Table" menu.
- Press [SHIFT] [MENU] for SET UP. Make sure the option for "Variable" is set to "Range." Press [F1] if needed, then [EXIT] .
- We will use *x* instead of *h*. After Y1, type [8] [.] [2] [6] [X, θ, T] and [EXE] . See below left.

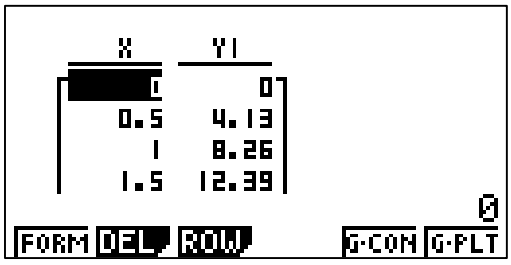
Our next step is to set the Range. Students should discuss the values for *x* which are of interest. Because the hourly rate may change after 40 hours (perhaps you receive 1.5 times your regular rate for any overtime hours), you may wish to set the upper limit at 40. To set the range:

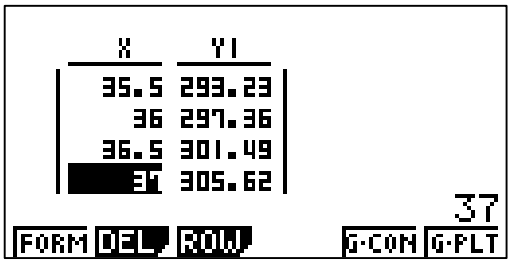
- Press [F5] to access the RANGE screen.
- Set Start and End values as appropriate. Press [EXE] after each entry.
- The pitch indicates how to increment *x*. One reasonable value is .5. See below right for one possibility.



- When all values have been input, press [EXIT] and then [F6] to see the table. See below left for the beginning of the table.

Press the down arrow until you see 36.5 in the X column. The corresponding value in the Y1 column is 301.49. Students should conclude that one must work between 36 and $36\frac{1}{2}$ hours in order to earn at least \$300.00 per week. Practically speaking, they would have to work either $36\frac{1}{2}$ or 37 hours, depending on the time periods used by the employer.

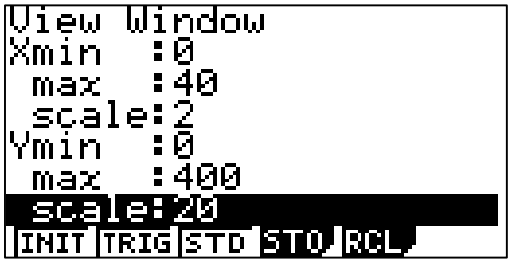


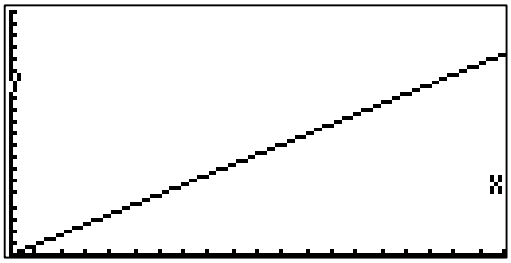


If we were not restricted to half-hour or hour increments, we may wish to get a more precise answer. One way to do so is with a graph. To do this:

From the MAIN MENU, select "Graph."

- The expression should already be entered.
- Press [SHIFT] [F3] to check the viewing window.
- Use the information from the table to set the domain and range, pressing [EXE] after each entry. See below left for a possible set of values.
- After all entries have been made, press [EXIT] and then [F6] to draw the graph. See below right.





The calculator allows us to find points very easily. With the graph shown,

- Press [F5] to access the graph solver.
- Press [F6] for more options.
- Press [F2] for "X-CAL."
- Type 300 after the Y = and press [EXE] .

The calculator moves to the requested point, which tells us that we must work 36.31961259 or approximately 36.3 hours to earn $300.00.

D. Upon examining your pay check stub, you notice that after working 40 hours, you paid $25.03 Social Security Tax. Write an expression to determine the percent this tax is of your gross pay. Define any variables you use.

Quite simply, all we need do is compute $\frac{Tax}{GrossPay} * 100$ to find this percent.

E. What is the percentage of Social Security Tax that you pay?

First, we need to determine the gross pay for 40 hours. To do this, we could scroll down through the table. Alternately, we could use the "Y-CAL" feature on the graph solver. In either case, we should determine that the gross pay is $330.40

To perform the final calculation, select "Run" from the MAIN MENU. Enter the values as shown below and press [EXE] . Our result is 7.58%.