

Performance Based Learning and Assessment Task

Exploring Equations through Life Goals

I. ASSESSMENT TASK OVERVIEW & PURPOSE:

When you grow up and get your first job, could you support yourself? How will you know if you make enough money? This activity explores the student's future career choice and expenses they would acquire over a monthly basis based on where they want to live. The students will be grouped based on career choice, and in the end they will determine if they make enough money using an equation, create a graphic representation of their salaries, and see exactly how long it would take them to have enough money for all of their expenses.

II. UNIT AUTHOR:

Savannah Montgomery, Benjamin Franklin Middle School, Franklin County

III. COURSE:

Algebra 1

IV. CONTENT STRAND:

Equations, Graphs, Proportions

V. OBJECTIVES:

The learner will be able to...

- Take the research they conducted on their future career salary and use it to write an algebraic equation
- Solve the equation (created from their research)
- Draw conclusions from the equation (created from their research)
- Calculate future salary based on raises they expect to receive in their careers
- Represent their salaries (over time) in multiple ways
- Be able to explain their reasoning

VI. REFERENCE/RESOURCE MATERIALS:

Student will need:

- An activity worksheet (see attached),
- A computer with internet access,
- A graphing calculator
- Scratch paper
- Pencils

VII. PRIMARY ASSESSMENT STRATEGIES:

- Students will be assessed by how they are working, if they are asking questions, if they are staying on task, if they are working well with others and contributing to their group (researching relevant material, keeping off task socialization to a minimum)
- Students will be assessed by the in class discussion at the end of the task (giving beneficial insight, good conclusions on what they learned from the task)
- Students will be graded according to the attached rubric

VIII. EVALUATION CRITERIA:

There is a benchmark (example of exemplary work) and grading rubric attached.

IX. INSTRUCTIONAL TIME:

I would estimate this taking two to two and a half class periods (50 minute class period)

Exploring Equations through Life Goals

Strand

Algebra

Mathematical Objective(s)

- Creating Equations
- Substitution and solving an equation
- Percent calculations
- Multiple representations of data (table, graph)
- Construct a line of best fit, find the equation of the line, and use that to solve for an unknown

Related SOL

- A.1 The student will represent verbal quantitative situations algebraically and evaluate these expressions for given replacement values of the variables.
- A.4 f) solving real-world problems involving equations
- A.11 The student will collect and analyze data, determine the equation of the curve of best fit in order to make predictions, and solve real-world problems, using mathematical models

NCTM Standards

- develop an initial conceptual understanding of different uses of variables;
- use symbolic algebra to represent and explain mathematical relationships;
- draw reasonable conclusions about a situation being modeled.
- represent, analyze, and generalize a variety of patterns with tables, graphs, words, and, when possible, symbolic rules;
- relate and compare different forms of representation for a relationship;
- model and solve contextualized problems using various representations, such as graphs, tables, and equations.

Additional Objectives for Student Learning:

EPF.11 The student will demonstrate knowledge of planning for living and leisure expenses by
e) calculating the cost of utilities, services, maintenance, and other housing expenses; and
f) evaluating discretionary spending decisions.

Materials/Resources

- Activity worksheet and grading rubric
- Class set of graphing calculators
- Class set of computers with internet access for research
- Pencils and Scratch Paper

Assumption of Prior Knowledge

Prior Mathematical Knowledge:

- Writing equations with unknown variables,
- Substituting numbers into equations to solve and make conclusions
- Creating a scatter plot and a table based off of data
- Finding the line of best fit equation
- Finding percentage values using proportions

Students will have trouble:

- Writing an equation with multiple parts instead of a normal two part equation
- Performing calculations using percentages
- Creating multiple representations of the data

DAY 1

Introduction: Setting Up the Mathematical Task (10 minutes)

- Warm up question: Sarah works for \$7.25 an hour. A mandatory cost of \$25 dollars is taken out each month. She wants to buy a new dress that is \$85 dollars. How many hours must she work to have enough money left over?
Answer: In total she needs $85+25=110$ dollars so if x represents the number of hours:
 $7.25x=110$
 $X=110/7.25$
 $X=15.2$ so she would need to work a minimum of 16 hours that month to buy the dress.
- Purpose the activity:
 - What if I wanted to see if I made enough money to live off of?
 - What could I do to figure this out? What math concepts should be used?
 - Why would this be beneficial?
 - Activity Instructions, Give out the worksheet

Student Exploration (40 minutes)

- Put the students into groups
 - Give the students several career categories (listed on the worksheet)
 - Have the students go to the computer and research different categories
 - Once they have had time to research and have chosen a category, group the students based off of what category they chose (Note: If they are the only one in their category they can either chose to work with another group or stay with their category and work individually)
 - After the groups have been assigned, have the groups decide on one career in their category to research
 - Page one of the activity should be complete

DAY 2

Student Exploration (45 minutes)

- Research time
 - Send them to their computers to continue on page two of the worksheet
 - Teacher walks around to assist with questions
 - Let them research the career their group chose and answer the questions on the worksheet

Class discussion/Closing (5 minutes)

- After the groups have finished the activity have a class discussion
- Have some students share what their group found
 - Was it what they thought?
 - Were they surprised?
 - What did they learn?

Student/Teacher Actions:

- Students should be conducting research and doing calculations required on the activity sheet
- Teacher should be walking around while students research keeping them on task and answering questions

Monitoring Student Responses

- Students should be able to show what their group did on their paper and make explanations when needed
- At the end a few students will share what their group found
- Teacher should be able to help students when needed on certain calculations
- To summarize the activity the last question on the worksheet is to explain what they learned from this activity

Assessment List and Benchmarks

- Students will assess themselves based on the rubric
- Students will be assessed based on the rubric
- A benchmark (example) is attached

Name:

Date:

Exploring Equations through Life Goals Day 1

When you grow up and get your first job, could you support yourself? How will you know if you make enough money? This activity explores the student's future career choice and expenses they would acquire over a monthly basis based on where they want to live. The students will be grouped based on career choice, and in the end they will determine if they make enough money using an equation, create a graphically representation of their salaries, and see exactly how long it would take them to have enough money for all of their expenses.

Below are some examples of different careers based on content area.

Accounting	Automotive	Broadcast Journalism	Business Development
Construction	Customer Service	Design	Education
Engineering	Government	Health Care	Human Resources
Legal	Manufacturing	Marketing	Real Estate
Restaurant (food)	Retail	Science	Transportation

1. Take some time to research these categories and different careers they offer. Make a decision on which category you might want to work in in the future. Write the category below.
2. Based on your category choice, you will be placed in groups. If there is no one else in your category, you may choose another category to work with another group, or you can stick with your category and do this activity individually. Get together with your group and start to discuss a career you would like to research within your category. Write the career below.
3. Lastly, talk with your group and decide on a location you want to look at. (ex. California, Colorado, New York) Salaries vary between locations, so decide where you want to "live". This will be relevant to your research. Write the location below.

Exploring Equations through Life Goals Day 2

4. Now research the career your group has chosen. What degree do you need to have this job? What is the salary (per hour) based on the location you chose?
5. Every month you must pay bills and monthly expenses. Discuss with your group what these might be. How much money would each one cost a month based on the location you chose? Write this information below. (Note: Look up how much tax is taken out of your paycheck and include this as an expense)
6. Now your group will figure out if this career would provide enough money for you to live off of. A normal work week is 40 hours a week. Work with your group to write an equation to determine if you make enough money each month to live off of. Don't forget to clarify what your variables stand for.
7. Do you make enough money?
If No- Your group will have to figure out how much money you will need to make to be able to afford your monthly expenses. Write the amount below.

If Yes-Talk with your group and decide on something you would like to save up for. (ex. a car, a trip, etc. Be creative) Then find out how much money you will need to make to pay for your monthly expenses as well as the thing you want to save up for. You decide you want to wait until you can pay for everything in one month all together. Write what you are saving up for and the total amount below. (Hint: Do not make this item to expensive)
8. Suppose every year you get a raise in your job. This raise is determined by the previous year's salary. The first two years you get a 5% raise. But then the economy dips for the next three years so you only receive a 2% raise. After those three years the economy

raises and you return to a 5% raise. Create two representations of this data. (you are welcome to use anything on the computer that may help in your display)

9. After you have created the two representations, you will find how much time (in years) it will take for you to make enough money to cover your total amount. Decide the best way to do this with your group. Show all of your work. How much time will it take?

10. What if you got a part time job? You get paid minimum wage and year 1 you can work 4 hours a month. Every year after that the amount (in hours) you can work at your part time job doubles each year. How long would it take you to meet your monthly goal now? Show two representations of the data and find the exact time (in years) it will take. (Note: Remember to deduct taxes from this wage)

11. What did you (personally) learn from this exercise? Will knowing this information help you in the future? Note: This is an individual reflection not a group reflection

Grading Rubric

Make sure you have everything listed to get full credit. Use this as an assessment tool as you work with your group through this activity.

Question numbers	3 points	2 Point	1 Points	0 points
Numbers 1-3	Student identifies career category, career their group chose, and location their group chose	Student identifies two of the three	Student identifies one of the three	Student does not identify any of the three
Number 4	Student identifies what degree is needed for the groups chosen career and provides an accurate hourly wage	Student identifies the degree and provides a somewhat accurate hourly wage	Student does not identify the degree and provides a somewhat accurate hourly wage	Student does not provide the degree or an accurate hourly wage
Number 5	Student determines at least 5 expenses and a reasonable cost for each	Student determines at least 5 expenses and a somewhat reasonable cost for each	Student does not determine at least 5 expenses and a reasonable cost for each	Student does not determine any expenses or a reasonable cost for each
Number 6	Student writes an accurate equation to determine if their salary will support their cost of living, and identifies what the variables stand for	Student writes an accurate equation to determine if their salary will support their cost of living, completes the correct calculations, but does not identify what the variables stand for	Student writes a somewhat accurate equation to determine if their salary will support their cost of living, attempts the calculations, and does not identify what the variables stand for	Students does not write an equation to determine if their salary will support their cost of living, does not attempt the calculations, does not identify what the variables stand for
Number 7	Student identifies whether or not they make	Student identifies whether or not they make	Student identifies whether or not they make	Student does not identify whether or not they make enough money,

	enough money, performs the correct calculations, and writes the amount needed	enough money, performs the correct calculations, but does not write the amount needed	enough money, attempts to perform the correct calculations, and does not write the amount needed	does not perform calculations or write the amount needed
Number 8	Student performs the correct percent calculations and provides two accurate representations of the data	Student performs the correct percent calculations, and provides two representations of the data with some error	Student performs the percent calculations with some error and provides two representations of the data with some error	Student does not perform the percent calculations or provide two representations of the data
Number 9	Student identifies an accurate way to find the exact time, performs the correct calculations, and provides the correct answer	Student identifies the accurate way to find the exact time, performs the calculations and provides an answer with some error	Student does not identify the accurate way to find the exact time, performs calculations and provides an answer	Student does not identify the accurate way to find the exact time, perform calculations or provide an answer
Number 10	Student identifies the correct minimum wage for the area, performs the correct calculations, provides two accurate representations of the data, and provides the correct answer	Student identifies the correct minimum wage for the area, performs the correct calculations, provides two representations of the data with some error, and provides an answer with some error	Student identifies the correct minimum wage for the area, but does not perform the correct calculations, provides two accurate representations of the data, or the correct answer	Student does not identify the correct minimum wage for the area, perform the correct calculations, provide two accurate representations of the data, or the correct answer
Number 11	Student provides a	Student provides a relevant,	Student provides a	Student does not provide a

	relevant, detailed, grammatically correct reflection	detailed reflection with some grammatical errors	short reflection without relevant information with grammatical errors	reflection
Extra Credit	Student turns in the activity worksheet on time, works well with their group (provides input into discussions and work), and provides input to the class discussion	Student turns in the activity worksheet on time, works well with their group (provides input into discussions and work), but does not contribute to the class discussion	Student turns in the activity worksheet on time, tried to work well with their group (provides some input into discussions and work), but does not contribute to the class discussion	Student does not turn in the activity worksheet on time, does not work well with their group and does not contribute to the class discussion
				Grade: /33

Comments:

Name: **BENCHMARK EXAMPLE**

Date:

Exploring Equations through Life Goals Day 1

When you grow up and get your first job, could you support yourself? How will you know if you make enough money? This activity explores the student's future career choice and expenses they would acquire over a monthly basis based on where they want to live. The students will be grouped based on career choice, and in the end they will determine if they make enough money using an equation, create a graphically representation of their salaries, and see exactly how long it would take them to have enough money for all of their expenses.

Below are some examples of different careers based on content area.

Accounting	Automotive	Broadcast Journalism	Business Development
Construction	Customer Service	Design	Education
Engineering	Government	Health Care	Human Resources
Legal	Manufacturing	Marketing	Real Estate
Restaurant (food)	Retail	Science	Transportation

1. Take some time to research these categories and different careers they offer. Make a decision on which category you might want to work in in the future. Write the category below.

Education

2. Based on your category choice, you will be placed in groups. If there is no one else in your category, you may choose another category to work with another group, or you can stick with your category and do this activity individually. Get together with your group and start to discuss a career you would like to research within your category. Write the career below.

Middle School Math Teacher

3. Lastly, talk with your group and decide on a location you want to look at. (ex. California, Colorado, New York) Salaries vary between locations, so decide where you want to "live". This will be relevant to your research. Write the location below.

Franklin County Public Schools, Virginia

Exploring Equations through Life Goals Day 2

4. Now research the career your group has chosen. What degree do you need to have this job? What is the salary (per hour) based on the location you chose?

Yearly Salary: \$36,967

$\$36,967/12 \text{ months} = \3080.58 a month

$\$3080.58/4 \text{ weeks} = \770.15 a week

$\$770.15/40 \text{ hours a week} = \19.25 an hour

5. Every month you must pay bills and monthly expenses. Discuss with your group what these might be. How much money would each one cost a month based on the location you chose? Write this information below. (Note: Look up how much tax is taken out of your paycheck and include this as an expense)

Taxes are 20% of my monthly wages so: $\frac{20\%}{100\%} = \frac{x}{\$3,080.58}$ $x = \$616.12$

Taxes: \$616.12

Master's Degree: \$1,000

Student Loans: \$362

Gas Money: \$100

Groceries: \$175

Rent: \$262.50

Electric: \$80

Internet/TV/Phone: \$144

Car Payment: \$225

6. Now your group will figure out if this career would provide enough money for you to live off of. A normal work week is 40 hours a week. Work with your group to write an equation to determine if you make enough money each month to live off of. Don't forget to clarify what your variables stand for.

Let x be my hourly wage

$$4(40x) = 616.12 + 1,000 + 362 + 100 + 175 + 262.5 + 80 + 144 + 225$$

$$4(40(19.25)) = 616.12 + 1,000 + 362 + 100 + 175 + 262.5 + 80 + 144 + 225$$

$$4(770.15) = 2,964.62$$

$$3,080.58 = 2,964.62$$

\$3,080.58: Salary per month

\$2,964.62: Expenses per month

7. Do you make enough money?

If No- Your group will have to figure out how much money you will need to make to be able to afford your monthly expenses. Write the amount below.

If Yes- Talk with your group and decide on something you would like to save up for. (ex. a car, a trip, etc. Be creative) Then find out how much money you will need to make to

pay for your monthly expenses as well as the thing you want to save up for. You decide you want to wait until you can pay for everything in one month all together. Write what you are saving up for and the total amount below. (Hint: Do not make this item too expensive)

I am going to save up for a motorcycle that costs \$1,899.99. So I would have to make \$2,181 dollars a month for my monthly expenses, plus \$1,899.99 to pay for my motorcycle. So I would need a total of $\$2,181 + \$1,899.99 = \$4,080.99$ that month.

8. Suppose every year you get a raise in your job. This raise is determined by the previous year's salary. The first year you do not get a raise. The next two years you get a 5% raise. But then the economy dips for the next three years so you only receive a 2% raise. After those three years the economy rises and you return to a 5% raise. Create two representations of this data. (you are welcome to use anything on the computer that may help in your display)

Year 1: \$36,967

So $\$36,967 / 12 \text{ months} = \$3,080.58$ a month

Year 2: $\frac{5\%}{100\%} = \frac{x}{\$36,967}$ $x = \$1,848.35$ raise

So I make $\$36,967 + \$1,848.35 = \$38,815.35$ this year

So $\$38,815.35 / 12 \text{ months} = \$3,234.61$ a month

Year 3: $\frac{5\%}{100\%} = \frac{x}{\$38,815.35}$ $x = \$1,940.77$ raise

So I make $\$38,815.35 + \$1,940.77 = \$40,756.12$ this year

So $\$40,756.12 / 12 \text{ months} = \$3,396.34$ a month

Year 4: $\frac{2\%}{100\%} = \frac{x}{\$40,756.12}$ $x = \$815.12$ raise

So I make $\$40,756.12 + \$815.12 = \$41,571.24$ this year

So $\$41,571.24 / 12 \text{ months} = \$3,464.27$ a month

Year 5: $\frac{2\%}{100\%} = \frac{x}{\$41,571.24}$ $x = \$831.42$ raise

So I make $\$41,571.24 + \$831.42 = \$42,402.66$ this year

So $\$42,402.66 / 12 \text{ months} = \$3,533.56$ a month

Year 6: $\frac{2\%}{100\%} = \frac{x}{\$42,402.66}$ $x = \$848.05$ raise

So I make $\$42,402.66 + \$848.05 = \$43,250.71$ this year

So $\$43,250.71 / 12 \text{ months} = \$3,604.22$ a month

Year 7: $\frac{5\%}{100\%} = \frac{x}{\$43,250.71}$ $x = \$2,162.54$

So I make $\$43,250.71 + \$2,162.54 = \$45,413.25$ this year

So $\$45,413.25 / 12 \text{ months} = \$3,784.44$ a month

Year 8: $\frac{5\%}{100\%} = \frac{x}{\$45,413.25}$ $x = \$2,270.67$ raise

So I make $\$45,413.25 + \$2,270.67 = \$47,683.91$ this year

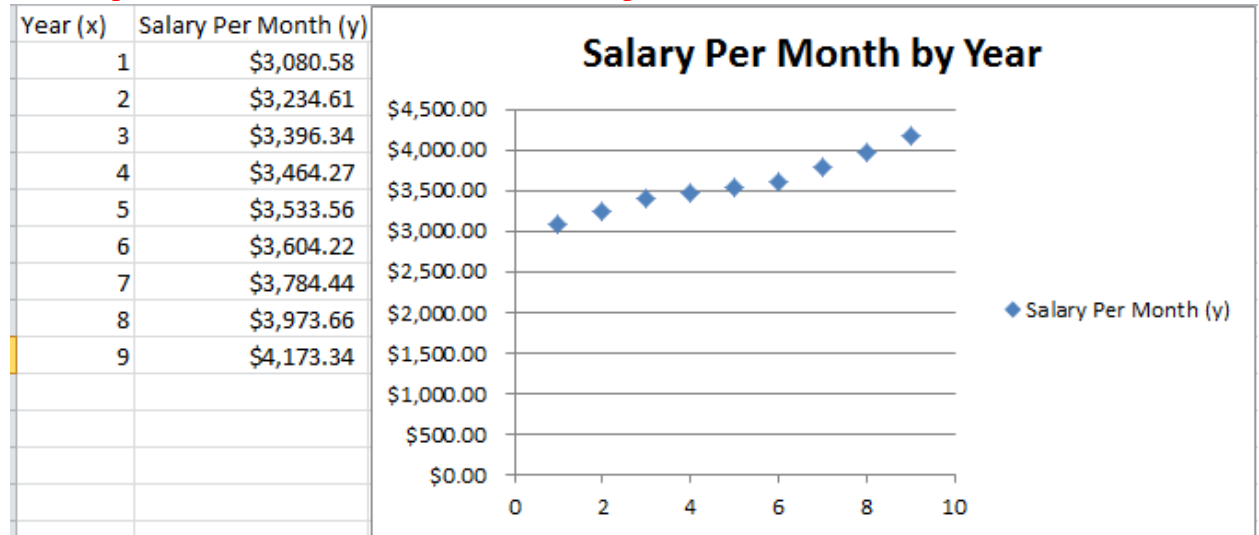
So $\$47,683.91 / 12 \text{ months} = \$3,973.66$ a month

Year 9: $\frac{5\%}{100\%} = \frac{x}{\$47,683.91}$ $x = \$2,384.20$ raise

So I make $\$47,683.91 + \$2,384.20 = \$50,068.12$ this year

So $\$50,068.12 / 12 \text{ months} = \$4,172.34$ a month

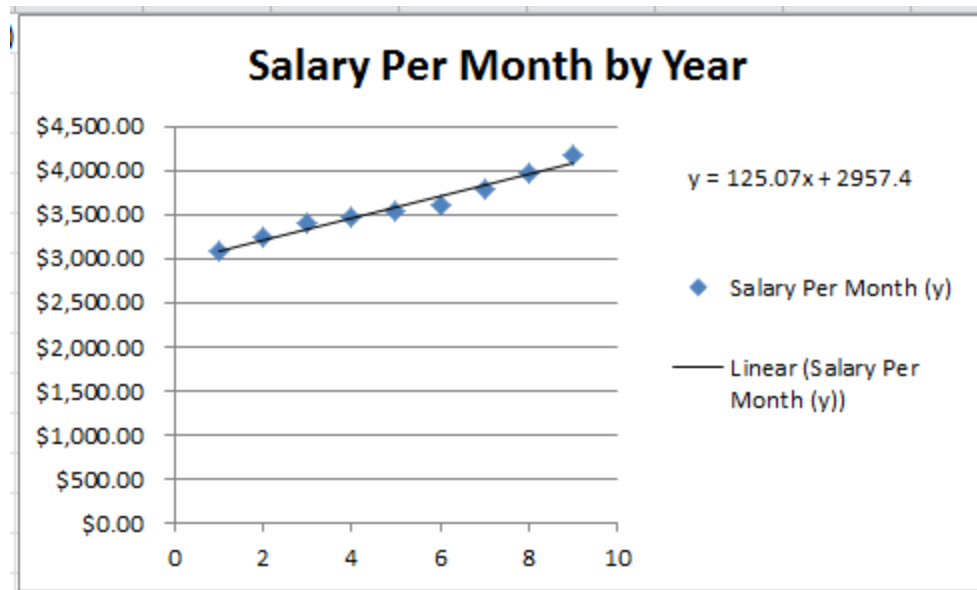
Two Representations of the data: Table and Graph



I used excel to enter in my table of data, then I made a scatter plot of that data

- After you have created the two representations, you will find the exact time (in years) it will take for you to make enough money to cover your total amount. Decide the best way to do this with your group. Show all of your work. How much time will it take?

I decided to take the scatter plot I made and create a trend line. I will use excel to find the equation of the trend line. I will then use that equation to find out how much time it will take.



The equation of the trend line is $y=125.07x+2957.4$, and since y is the salary per month and x is the time (in years), I know that I want \$4,080.99 to pay for my expenses and my motorcycle. So I will plug that in for y and solve for x :

$$4,080.99=125.07x+2,957.4$$

$$1,123.59=125.07x$$

$$8.98=x$$

I know that that is 8 years but I need to know how much 0.98 is in days

$$\frac{98}{100} = \frac{x}{365} \quad x=357.7 \text{ days}$$

So I know it would take 8 years and 358 days till I make \$4,080.99 a month to pay for my expenses and my motorcycle.

10. What if you got a part time job? You get paid minimum wage and year 1 you can work 4 hours a month. Every year after that the amount (in hours) you can work at your part time job doubles each year. How long would it take you to meet your monthly goal now? Show two representations of the data and find the exact time (in years) it will take. (Note: Remember to deduct taxes from this wage)

First I found out the minimum wage in VA is \$7.25 an hour.

If 20% is taken out for taxes then realistically I make $\frac{20\%}{100\%} = \frac{x}{\$7.25} \quad x=\$1.45$

So I make $\$7.25-\$1.45=\$5.80$ an hour

Year 1: \$3,080.58 a month

So this year I work 4 hours a month $4(\$5.80) = \23.20 more a month

So I make $\$3,080.58+\$23.20 = \$3,103.78$ a month

Year 2: \$3,234.61 a month

So this year I work $2(4)=8$ hours a month $8(\$5.80)=\46.40 more a month

So I make $\$3,234.61+\$46.40=\$3,281.01$ a month

Year 3: \$3,396.34 a month

So this year I work $2(8)=16$ hours a month $16(\$5.80)=\92.80

So I make $\$3,396.34+\$92.80=\$3,489.14$ a month

Year 4: \$3,464.27 a month

So this year I work $2(16)=32$ hours a month $32(\$5.80)=\185.60

So I make $\$3,464.27+\$185.60=\$3,649.87$ a month

Year 5: \$3,533.56 a month

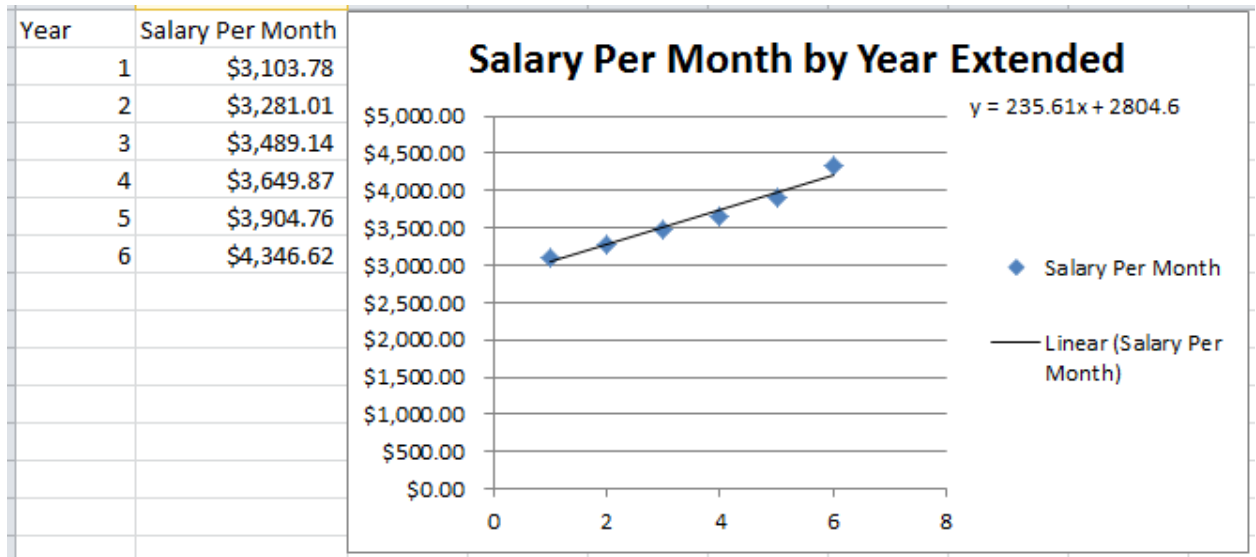
So this year I work $2(32)=64$ hours a month $64(\$5.80)=\371.20

So I make $\$3,533.56+\$371.20=\$3,904.76$ a month

Year 6: \$3,604.22 a month

So this year I work $2(64)=128$ hours a month $128(\$5.80)=\742.40

So I make $\$3,604.22+\$742.40=\$4,346.62$ a month



The equation of the new trend line is $y=235.61x+2804.6$, and since y is the salary per month and x is the time (in years), I know that I want \$4,080.99 to pay for my expenses and my motorcycle. So I will plug that in for y and solve for x :

$$4,080.99=235.61x+2804.6$$

$$1,276.39=235.61x$$

$$5.42=x$$

I know this is 5 years but I need to know how much 0.42 is in days

$$\frac{42}{100} = \frac{x}{365} \quad x=153.3 \text{ days}$$

So with the part time job it would only take 5 years and 154 days to make \$4,080.99 to pay for my expenses and my motorcycle.

11. What did you (personally) learn from this exercise? Will knowing this information help you in the future? Note: This is an individual reflection not a group reflection
- I learned a lot from this project. It gave me insight into different careers. It also helped me to see what I want in the future and whether that job can support me on a monthly basis. I learned how to calculate how much I spend a month and whether I can afford it based off of my hourly wage. I also learned how to budget for something I want. I increased my knowledge of making tables, graphing, finding equations to a line, and using that information to make conclusions. This helped me see a real world application of what I am learning in Algebra.