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3.2: Unit Analysis and Linear Equations

1. A person earns a starting salary of \$32 thousand dollars at a company. Each year they receive a \$2 thousand dollar raise. Let s be the person's salary, in thousands of dollars, after they have worked for the company for t years.

(a) Calculate the values of s for the given values of t and fill out the table below:

t	s
0	
1	
2	
3	
4	

(b) What is the value of s when t is 8?

(c) What does your answer from 1b mean in this situation?

(d) What is the s -intercept? What does it mean in this situation?

(e) When will the salary be \$42 thousand dollars per year?

(f) Find a linear equation of the form $s = mt + b$ that models this data.

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2. Rewrite the equation that you found in problem 1f: _____. In this equation the variable s is given in thousands of dollars, and t is given in years. These are called the **units** of the variable. In any equation the units on the left side must be equal to the units on the right side.

(a) In the equation you found in problem 1f, what is b , and what does it mean in this situation? What are the units of b .

(b) What is m , and what does it mean in this situation? What are the units of m ?

(c) Why are the units of m different from the units of b .

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3. Between the years of 2009 and 2013 the minimum wage remained constant at \$7.25 per hour. Let w be the minimum wage, in dollars, at t years after 2009.

(a) Use the above information to fill out the table:

t	w
0	
1	
2	
3	
4	

(b) What are the units of w ? What are the units of t ?

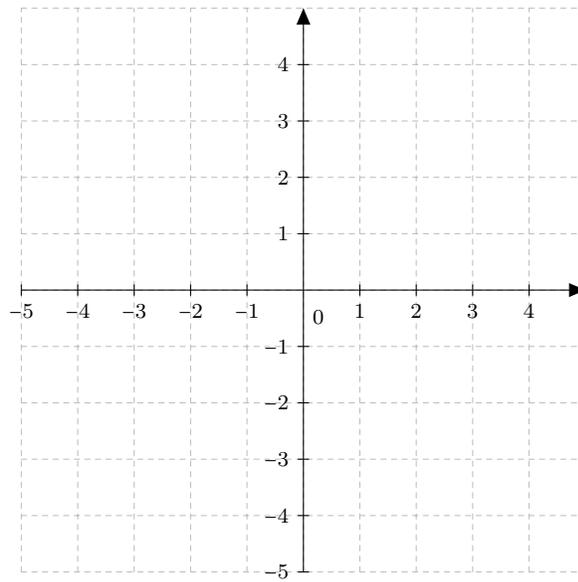
(c) Find a linear equation of the form $w = mt + b$ that models this data.

(d) What is b , and what does it mean in this case? What units does b have?

(e) What is m , and what does it mean in this case? What units does m have?

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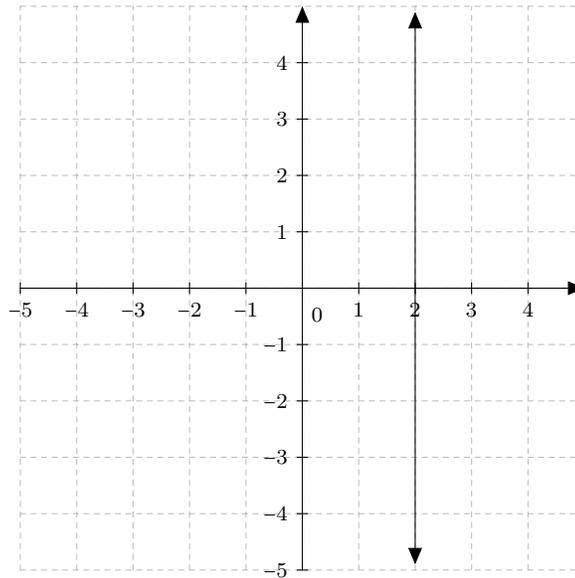
- (f) Rewrite the equation that you found in problem 3c: _____. Graph this equation.



- (g) For a linear equation $y = mx + b$, the number m represents the rate of change of the quantity y . In our current situation we find that $m = 0$. What is the slope of the graph you made above?

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4. In question 3 we found that the data was modeled by a horizontal line. This meant that the rate of change of the variable w was zero, and therefore it was constant. Consider the following graph:



- (a) List four points that are on this graph:
- (b) The slope is thought of as change in y divided by change in x . Choose two of the points that are on this graph. What is the change in y ? What is the change in x ? Can you calculate the slope of this line? Why or Why not?
- (c) What is an equation of this line?
- (d) Can this be written in the form of $y = mx + b$. Why or Why not? What does this mean? Use the back of this page if you need more room to write.