

Willow is now making \$9 an hour working part time for her uncle's lawn mowing service. She used to make \$8 last year.

- (1) By what percent has her hourly rate increased?
- (2) If she works 3 days a week for 4 hours at a time, how much more will she make in 8 weeks this year than she did last year?
- (3) Willow can work a few more hours a week (rather than going out with her friends) can you come up with an equation to represent how she can figure out how much she'd earn in 8 weeks this year?
- (4) Willow really wants to be able to pay for car insurance this year, how many hours would Willow have to work this year to earn \$1200?

MATH STANDARDS ALIGNMENT

CCSS.MATH.CONTENT.8.EE.C.7

Solve linear equations in one variable.

CCSS.MATH.CONTENT.8.EE.B.5

Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways.

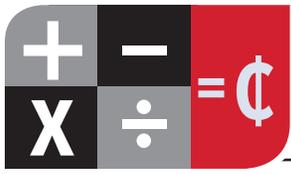
Personal Finance Big Ideas:

What is Money, Delayed Gratification, Scarcity, Time Value of Money

METHOD 1: NOTICE, I WONDER™

After reading the problem, I noticed:

- Willow now makes \$9/hour
- Willow made \$8/hour last year
- Her hourly rate has increased by \$1
- She works 3 days a week for 4 hours each time
- I want to know how much more she'd make in 8 weeks this year than she did in 8 weeks last year.



I then wondered:

- How many lawns does Willow mow?
- Does she ever do anything for his lawn mowing service?
- Does she ever work for more or less than 4 hours at a time?
- How many percent did her hourly rate go up?
- Did she ask for a raise or did she just get one?
- How much does she make a week?
- How much does she make for 2 weeks?

(1) Looking at the problem, I think I want to start with the percent increase in her hourly rate. I know she was making \$8 and is not making \$9, so the overall increase is \$1 per hour. So, I need to figure out what percent of \$8 is \$1. I can do that by setting up and solving a proportion:

Let x = the percent increase

$$\frac{1}{8} = \frac{x}{100}$$

$$100 = 8x$$

$$\frac{100}{8} = x$$

$$12.5 = x$$

So I can see that it was a \$1 is 12.5% of \$8, so the raise was a 12.5% raise.

(2) Now I want to figure how much more she'd make in 8 weeks this year than she did last year.

I'll start by figuring out how much she'd make in 8 weeks last year. I know she works 12 hours a week and would be paid \$8/hour. So she'd make $12 \times 8 = \$96$ a week. For 8 weeks, she'd make $96 \times 8 = \$768$.

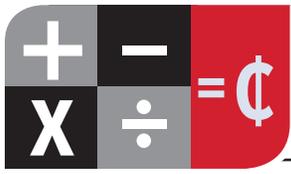
Now, this year she'd work 12 hours a week and make \$9/hour, so she'd make $12 \times 9 = \$108$ per week. For 8 weeks she'd earn $108 \times 8 = \$864$.

So this year, she'd make more money and we can figure out how much more by using subtraction: $\$864 - \$768 = \$96$. So she'd make \$96 more this year working for 8 weeks than she did last year.

(3) To come up with an equation, I know her hourly rate is \$9 this year. I don't know how many hours a week she will work, so I'll call that x (let x = # of hours a week Willow will work) and I know she can only work for 8 weeks (the lawn mowing season). So, to calculate her earnings:

Earnings = \$9 per hour * x hours per week * 8 weeks

Earnings = $72x$



(4) I can use my equation from (3) to figure out how much Willow would have to work to earn \$1200:

$$1200 = 72x$$

$$16 \frac{2}{3} = x$$

So Willow would have to work 16 hours and $\frac{2}{3}$ of an hour or 16 hours and 40 mins a week for 8 weeks to earn \$1200.

METHOD 2: LOGICAL REASONING

(1) First we wanted to figure out Willow's percent increase. Her hourly rate increased by \$1, so I need to figure out what \$1 represents as a percent of \$8. I think I can keep breaking \$8 in half to get to \$1, and if I keep breaking the percentages in half, I can figure this out:

I know \$4 is half of \$8 is 50% of \$8.

I know \$2 is half of \$4 so \$2 is 25% of \$8.

I know \$1 is half of \$2 so it's 12.5% of \$8.

(2) Now, I want to figure out how much more she made this year than last year. She works 4 hours at a time, so for each of those hours she gets \$1 more than she did last year, or \$4 more every time she works. She works three times a week, so each week she gets \$12 more this year than last year. And we want to know how much more she gets in 8 weeks. So to find that I multiply \$12 by 8 weeks and I can see that she makes \$96 more this year than last year.

(3) To come up with an equation, I know her hourly rate is \$9 this year. I don't know how many hours a week she will work, so I'll call that x

let x = # of hours a week Willow will work

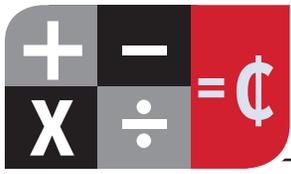
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So, to calculate her earnings:

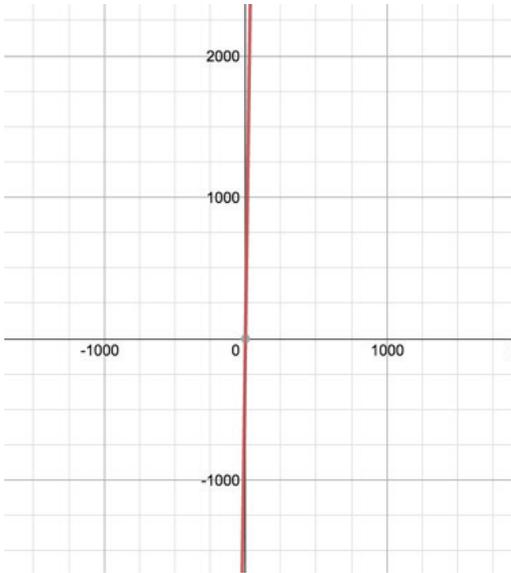
Earnings = \$9 per hour * x hours per week * 8 weeks

Earnings = 72x





I also graphed this:



You can see that the line goes through (0,0), which makes sense because if Willow doesn't work any hours ($x = 0$), she won't earn any money ($y = 0$).

- (4) To figure out how many hours Willow would have to work each week, I can start by looking at the graph. I used [desmos.com](https://www.desmos.com) to graph this, so I can drag my cursor along the graph and see that (16, 1152) is a point on the line and I can see that (17, 1224) is also a point on the line. This tells me that if she works 16 hours a week, she will earn just less than \$1200 in 8 weeks, she'll earn \$1152. If she works 17 hours a week, she'll earn \$1224, slightly more than \$1200 for the 8 weeks. So, I know my answer must be between 16 and 17 hours a week. I can set my equation equal to \$1200 and solve it:

$$1200 = 72x$$

$$16 \frac{2}{3} = x$$

It looks like if Willow works $16 \frac{2}{3}$ hours, or 16 hours and 40 minutes, she'll make \$1200. That certainly agrees with the information I got from the graph, so it seems like a reasonable answer to me!