

BLC150–Algebra Workshop

Name: _____

Homework 4: I suggest you do the homework on scrap paper and then transfer your process and answers to this homework sheet. In other words, do a rough draft and then a final draft on this paper. I'm going to start grading for presentation. Treat these as short papers. I recommend pencil over pen, for obvious reasons.

Epimetheus [Afterthought]: Problem problems I saw after grading HW-2.

- a) What three consecutive odd numbers add up to 339. c) $\frac{x^2-1}{2} = 12$
- b) $\frac{\sqrt{x+4}}{5} + 12 = 13$ d) Solve to satisfy both: $x + y = 5$ and $3x - 2y = 5$

PERCENTAGES

Percent quite literally means *per-centum*, which means per-100.

A percentage is actually a fraction. 50% should be written $\frac{50}{100}$, fifty per one hundred.

The symbol, %, sort of implies this. Perhaps the symbol should really be $\frac{1}{100}$, instead of %. That way 25% would be written $25(\frac{1}{100}) = \frac{25}{100}$. That way you would never need to convert percentage to decimal. It would be obvious. You've got 25 hundredths.

50% is the same as $\frac{50}{100} = \frac{1}{2} = 0.5 = 0.50 = \frac{5}{10} \dots etc.$

Most of the time 0.5 or 1/2 is how you actually use 50% in any mathematical equation.

We may think in percents, but we do math in *per-100s*.

1. Convert the following to a fraction, then to a decimal, then solve. (Use a calculator when needed.)

	E.g. 50% of 30.	a. 50% of 70.	b. 25% of 200.
Fraction version	$\frac{50}{100} \cdot 30 = \frac{150}{100} = 15$ or $\frac{1}{2} \cdot 30 = \frac{30}{2} = 15$		
Decimal version	$= 0.5 \cdot 30 = 15$		

	c. 15% of 120.	d. 5% of 1000.	e. 8% of 200.
Fraction version	$\frac{15}{100} \cdot \frac{120}{1} = \frac{15 \cdot 12}{10} = 18$		
Decimal version		$0.05 \cdot 1000 = 50$	

Useful tricks: 10% of 134 is 13.4. 20% of 134 is just 13.4 times 2 which is 26.8.

1% of 122 is 1.22. 2% is 2.44. 4% is double again: 4.88.

Just move the decimal point...and double it or triple or quadruple it.

2. You are at a nice restaurant and you are paying the bill. The service was good but not out of the ordinary so you want to tip 20%. The bill is \$132. What should you leave as a tip? [Hint: What is 10%? Just double it.]
3. You are at a nice restaurant, but the service is pretty bad. You never got water and the silverware was a bit gross. You want to leave a 15% tip. The bill was \$160. What's the tip? [Hint: What is 10%? Now what is 5%?... It's just half of 10%. Add them together and you'll get 15%.]
4. Amazing service. Amazing meal. Free desert. What is 30% of \$220. [Hint: It's just 10% of \$220 times 3.]

5. Guess the answers to the following. Don't use a calculator. Just circle the answer.

a. 2% of 100.	a. 4	b. 2	Note: What's 1%. Now double it.
	c. 0	d. 80	
b. 10% of 100.	a. 5	b. 10	What's one tenth of 100?
	c. 15	d. 20	
c. 12% of 100.	a. 120	b. 12	What's 10% of 100 plus 2% of 100?
	c. 1.2	d. 8	
d. 12% of 200	a. 240	b. 120	Now double the last one since the amount doubled.
	c. 12	d. 24	
e. 12% of 500	a. 60	b. 36	Now multiply the answer from c. by 5.
	c. 78	d. 250	
f. 25% of 400.	a. 50	b. 100	What's 1/4 of 100, multiplied by 4.
	c. 200	d. 88	
g. 15% of 300.	a. 40	b. 45	What's 10% of 300. What's half of that. Add them together to get 15%.
	c. 65	d. 100	
h. 30% of 300.	a. 30	b. 60	What's 30% of 100. Multiply that by 3 for 30% of 300.
	c. 90	d. 120	
i. 0.5% of 200	a. 0	b. 1	What's 1% of 200. Halve it.
	c. 2	d. 4	
j. 2.5% of 500	a. 5	b. 12.5	What's 1% of 500. Multiply that by 2.5 (or 2 + 1/2)
	c. 25	d. 50	

6. Set up an equation and then solve it.

E.g. If a shirt is 20% off and it originally cost \$40. What does it now cost?

$$\$40 - (0.20)(\$40) = \$40 - \$8 = \$32.$$

a. A car costs \$22,500. The dealer says he'll give you 12% (0.12) off. How much is the car now?

b. There was a 10% increase in homicide in Metropolis from 2016 to 2017. There were 120 homicides in 2016. How many were there in 2017.

c. You need to buy 3 shirts for work. It's a "Buy 2, Get 1 Free" sale at Barney's. You could buy 2 shirts and get a third for free and pay \$20. The store next door is having a $33\frac{1}{3}\%$ off sale. Their shirts before the discount cost \$10. Which sale is better?

d. Your friend is a hopeless slacker. He complains that his supplier of Dorito's Cool Ranch™ just increased prices by 15%. He used to pay \$40 per carton. What does he have to pay now?

e. The population of Annandale was 15,230 in 2016. In 2017 the population was 14,250. How much did the population decrease (in percent) from 2016 to 2017.

$$15,230 - 15,230x = 14,250. \text{ Solve for } x \text{ and convert to percentage.}$$

f. Your friend complains that his favorite study aid, NoDoz™, used to contain 200mg of caffeine. Now it contains only 165mg. How much did it decrease in terms of percentage?

g. Your friend tells you that his IQ is 16% higher than the average Mauritanian. You are weirdly surprised how good your friend is at math considering his continuous use of NoDoz™ and you are also surprised by his knowledge of strange trivia. What is his IQ? Are you impressed? Do you trust IQ statistics? [You'll have to look up the average IQ of a Mauritanian.]

7. And now for a bunch of fractions. Solve for the variable and show your work.

<p>a. $\frac{x}{3} + \frac{x}{2} = \frac{5}{6}$</p>	<p>b. $\frac{x}{4} + \frac{x}{3} = \frac{7}{6} \rightarrow \frac{4x}{12} + \frac{3x}{12} = \frac{7}{6} \rightarrow \frac{7x}{12} = \frac{7}{6}$ $\rightarrow \frac{12(7x)}{12} = \frac{12(7)}{6} \rightarrow 7x = 14 \rightarrow x = 2$</p>
<p>b. $\frac{1}{x} + \frac{8}{3} = 3$</p>	<p>c. $\frac{x}{4} + \frac{3x}{12} = 2$</p>
<p>d. $\frac{1}{3x} + \frac{3}{x} = \frac{2}{3}$ [Hint: you'll eventually want to cross-multiply.]</p>	<p>e. $\frac{36}{2x-3} = \frac{4}{1}$ [Hint: Start out by cross-multiplying.]</p>
<p>f. $\frac{22}{2x-3} = 2$</p>	<p>g. $\frac{8}{x^2} + \frac{2}{x} = \frac{3}{x}$</p>
<p>h. $(x - 9)^2 = 0$ [Hint: Just think about it. Don't do any "algebra".]</p>	<p>i. $x - 11 = -1$ [Hint: Just think about it. Don't do any "algebra".]</p>