


Solving Percent Problems Review

 <http://www.augustatech.edu/math/molik/solvingpercentprobs.pdf>

Solving Percent Problems

There are three types of percent problems that you are going to have to solve: finding the part, whole, and percent. There are two ways to do this, so pick the one you understand the best.

Way #1: The Proportion Method.

In this method, we write a proportion like so: $\frac{\%}{100} = \frac{\text{part}}{\text{whole}}$. The percent is always over 100 because that's what percent means. The "part over whole" is the definition of a fraction. In this case, the number following "of" is the whole.

The advantage to the proportion method is that we never have to worry about moving decimal points in our percents. The division by 100 takes care of that for us.

Way #2: The Percent Equation Method.

This method is a word-for-word translation method. In this case, "of" means "multiply" and "is" means "equals". The advantage is that it's sometimes easier; the disadvantage is that there's decimal moving involved with the percents.

A) Finding the part. Find 15% of 80.

Way #1: The number following "of" is 80, so that's the whole. The percent is 15, so we're trying to find the part: $\frac{15}{100} = \frac{x}{80}$. Now cross multiply and find "x".


$$\begin{array}{r} \frac{15}{100} = \frac{x}{80} \\ 1200 = 100x \\ \frac{1200}{100} = \frac{100x}{100} \\ 12 = x \end{array}$$

Way #2: We're looking for 15% of 80, so the translation is like so:

$$\begin{array}{ccc} \downarrow & \downarrow & \downarrow \\ 0.15 & \bullet & 80 = x \\ 12 = x \end{array}$$

Example: Find 52% of 95.

$$\begin{array}{r} \cancel{\frac{52}{100} = \frac{x}{95}} \\ 100x = 4940 \\ \hline 100 \quad 100 \\ x = 49.4 \end{array}$$


$$\begin{array}{l} .52 \cdot 95 = x \\ 49.4 = x \end{array}$$

B) Finding the whole: ^P 25 is 40% of what number?

Way #1: There is no number following "of"; that's what we're trying to find, so that will be our variable this time. That means 25 is the part, and, of course, 40 is the

percent: $\frac{40}{100} = \frac{25}{x}$. Cross multiply and find "x".

$$\frac{40x}{40} = \frac{2500}{40}$$

$$x = 62.5$$

Way #2: "25 is 40% of what number" translates as such:

$$\begin{array}{ccccccc} \downarrow & \downarrow & \downarrow & \downarrow & \downarrow \\ 25 & = & 0.40 & \bullet & x \end{array}$$

Again, we have to move the decimal point.

Like with proportions, we divide by 0.40 on both sides to solve for "x".

$$\frac{25}{.4} = \frac{.4x}{.4}$$

$$x = 62.5$$

Example: ^p30 is 75% of what number?

$$\frac{75}{100} = \frac{30}{x}$$

or

$$\frac{30}{.75} = \frac{.75x}{.75}$$

$$\frac{75x}{75} = \frac{3000}{75}$$

$$x = 40$$

$$x = 40$$

C) Finding the percent: ^P9 is what percent of ^W15?

Way #1: The whole is 15, we're trying to find the percent, and so the part is 9.

$$\frac{x}{100} = \frac{9}{15}$$

$$\frac{15x}{15} = \frac{900}{15}$$

$$x = 60$$

Remember, we don't have to move the decimal point!

Way #2: "9 is what percent of 15" translates like so:

$$\begin{array}{ccc} \downarrow \downarrow & \downarrow & \downarrow \downarrow \\ 9 = & x & \bullet 15 \\ \hline 15 & 15 & \\ \hline .6 & = x & \\ \hookrightarrow & 60\% & \end{array}$$

Again, divide by 15.
This time we must move the decimal point in the answer because it's the decimal equivalent of a percent.

Example: ^P14 is what percent of ^W35?

$$\frac{x}{100} = \frac{14}{35}$$
$$\frac{35x}{35} = \frac{1400}{35}$$
$$x = \textcircled{40\%}$$

or

$$\frac{14}{35} = \frac{x \cdot 35}{35}$$
$$x = .4$$
$$\textcircled{40\%}$$

1) Find 7% of \$25.99

$$.07(25.99) = X$$

or

$$\frac{7}{100} = \frac{X}{25.99}$$

$$\text{\$1.82}$$

2) 3 is 20% of what number?

$$3 = .20(X)$$

or

$$\frac{20}{100} = \frac{3}{X}$$

$$X = 15$$

3) What percent of 60 is 28?

$$x(60) = 28$$

or

$$\frac{x}{100} = \frac{28}{60}$$

$$\boxed{46.7\%}$$

4) 0.8% of 3500 is what number?

$$.008(3500) = x$$

or

$$\frac{.8}{100} = \frac{x}{3500}$$

$$\boxed{28}$$

Name _____ *Statistics: Chapter 2 Percent Practice Part I*

Using Mental Math to Estimate and Verify Percent Calculations: Part I

Calculators are great tools to get accurate answers quickly and easily and we will use them throughout this course. However as the saying goes, “Garbage in, garbage out.” In this case, that means when someone keys wrong information into a calculator then the calculator will provide useless answers. Another common mistake with calculators is copying the display incorrectly. In either case, it is your built-in calculator (your brain) that can best detect these kinds of mistakes. Percents are common in Statistics and a little mental math goes a long way to trap errors that can lead you to incorrect conclusions.

Here are a few common mental math tips for using “benchmark” percents to estimate percentages. You probably already know most of them:

- 100% of a value is equal to that value
- 50% of a value is half that value
- 25% of a value is a quarter of that value (half of a half)
- 33% of a value is about a third of that value.
- 75% of a value is three quarters ($3 \times 25\%$ or the whole value minus a quarter of that value)
- 10% of a value is a tenth of that value--shift the digits one place smaller (to the right)
- 5% of a value is half of a tenth of that value
- 1% of a value is one hundredth of that value (shift the digits two places smaller)

So, for example, let's say I use my calculator to calculate 37% of 45 and the calculator gives me 32 for the answer. I should immediately catch that this answer is incorrect because 37% is less than half and half of 45 is around 22 or 23. (In fact, I can estimate 40% pretty quickly by taking a tenth of 45 (4.5) and mentally multiplying by 4: $4 \times 4.5 = 18$)

1. Mentally estimate the following percent calculations then use a calculator to find an exact answer.

	Mental estimate (do first!)	Using a calculator
Σ a) 18% of 93	20% ~ $10\% = 9.3 \rightarrow 20\% = 18.6$	$.18(93) = 16.74$
b) 65% of 57	50% ~ 28 + 10% = 6 ~ 34	$.65(57) = 37.05$
c) 3% of 4,160		
d) 90% of 594		
e) 78% of 4,200,000		
f) 0.25% of 5,034		

Finish (c-f) for homework

2. For the problems below, use only your “built-in calculator” (your brain!) to estimate which answer is closest. Write down your thinking so you can share it with the class.

- a) _____ is 2% of 1,326 ^{1% = 13} _{2% = 26} I) 13 II) 26 III) 130 IV) 260
- b) ^P 412 is 28% of _____ ^{400 x 4} ₁₀₀ I) 87 II) 116 III) 1471 IV) 2353
- c) 28% of 412 is _____ I) 87 II) 116 III) 1471 IV) 2353
- d) 15 is _____ % of 95 I) 16 II) 26 III) 54 IV) 93
- e) _____ % of 54,123 is 119 I) 0.2 II) 2 III) 22 IV) 50

Finish (c-e) for homework.