

CHAPTER 9: PERCENTAGES

There aren't too many problems on the math competency exam that deal with percentages. You can count on one for sure. We won't spend too much time dealing with percentages. However, the problem(s) they do present you with shouldn't be too bad. If you can solve an equation, you can deal with the percentage problems presented on the math competency exam.

The word **percent** is derived from the Latin "per centum" which translates to "by the 100". When we talk about percent, we can think about them as a fraction out of 100.

45% means $\frac{45}{100}$ which can then be turned into a decimal, 0.45.

6% means $\frac{6}{100}$ which can then be turned into a decimal, 0.06.

There are three types of percent problems. We will take a look at each individually.

1. Finding the percent of a number
2. Finding what percent one number is of another
3. Finding a number when a percent of it is known

When we translate English statements into math expressions, we learned that

- "of" refers to "multiplication"
- "is" refers to the equal sign

Finding the Percent of a Number

To find the percent of a number, we should write and solve an equation. We do this by changing the English statement into math expressions.

EXAMPLE 1

What number is 60% of 45?

SOLUTION TO EXAMPLE 1

1.	<p>"What number" is the unknown number we are trying to find. We replace this phrase by a variable.</p> <p>"is" refers to the equal sign.</p> <p>Change the percentage to its fraction. So 60% is $\frac{60}{100}$</p> <p>"of" refers to multiplication.</p>	$x = \frac{60}{100} \times 45$
2.	Solve the equation.	$= \frac{60}{100} \times \frac{45}{1} = \frac{2700}{100} = 27$

MATHEMATICS COMPETENCY EXAM STUDY GUIDE – PART A

Let's take a look at one of the problems on the math competency exam practice test.

EXAMPLE 2

Marcy wants to buy a car for \$3600. A down payment of 35% is required. How much is the down payment?

SOLUTION 1 TO EXAMPLE 2

When we read the problem, it says we have to put a down payment which is a percentage of the cost of the car. So it is really asking "How much is 35% of \$3600?"

1.	"How much" is the unknown number we are trying to find. We replace this phrase by a variable. "is" refers to the equal sign. Change the percentage to its fraction. So 35% is $\frac{35}{100}$ "of" refers to multiplication.	$x = \frac{35}{100} \times 3600$
2.	Solve the equation.	$= \frac{35}{100} \times \frac{3600}{1} = \frac{126000}{100} = \1260

SOLUTION 2 TO EXAMPLE 2

This solution works best when the percent ends with a "0" or "5", in this case "35%". What I know already is that 10% of \$3600 is \$360. I had to move the decimal one space to the left. 5% would be half of 10%. So 5% of \$3600 is \$180.

1.	What I know already is that 10% of \$3600 is \$360. I had to move the decimal one space to the left. 5% would be half of 10%. So 5% of \$3600 is \$180.	What number is 10% of \$3600? What number is 5% of \$3600?
2.	To get 35%, we need to find 10% + 10% + 10% + 5%.	$\$360 + \$360 + \$360 + \$180 = \$1260$

Finding What Percent One Number is of Another

We still use the same translations that we did for "Finding the Percent of a Number". But our equation is going to be a little different.

Let's jump right into our examples and I'll point out the differences.

EXAMPLE 3

What percent of 65 is 13?

SOLUTION TO EXAMPLE 3

1.	“what percent” is the unknown number we are trying to find. We replace this phrase by a variable. “of” refers to multiplication. “is” refers to the equal sign.	$p \times 65 = 13$
2.	Solve the equation.	$p \times 65 \div 65 = 13 \div 65$ $p = \frac{13}{65} = \frac{1}{5} = 0.20$
3.	Change the decimal to a percent.	$0.20 = 20\%$

\therefore So 20% of 65 is 13.

Here is an example from the math competency exam.

EXAMPLE 4

28 is what percent of 70?

SOLUTION TO EXAMPLE 4

1.	“is” refers to the equal sign. “what percent” is the unknown number we are trying to find. We replace this phrase by a variable. “of” refers to multiplication.	$28 = p \times 70$
2.	Solve the equation.	$28 \div 70 = p \times 70 \div 70$ $p = \frac{28}{70} = \frac{2}{5} = 0.40$
3.	Change the decimal to a percent.	$0.40 = 40\%$

\therefore So 28 is 40% of 70.

Notice that the two problems were written a little differently, but each problem asks for the same thing, “what percent”.

Finding a number when a percent of it is known

We still use the same translations that we did for “Finding the Percent of a Number”. There isn’t much difference except for the equations that we write. You would need to read the question careful and decide which part we are trying to find.

Let’s jump right into our examples.

EXAMPLE 5

4.2% of what number is 2.31?

SOLUTION TO EXAMPLE 5

1.	Change percent to a fraction. “of” refers to multiplication. “what percent” is the unknown number we are trying to find. We replace this phrase by a variable. “is” refers to the equal sign.	$\frac{4.2}{100} \times n = 2.31$
2.	Solve the equation. Remember we are getting rid of a fraction, we multiply by its reciprocal	$\begin{aligned} \frac{100}{4.2} \times \frac{4.2}{100} \times n &= \frac{100}{4.2} \times 2.31 \\ n &= \frac{100}{4.2} \times \frac{2.31}{1} = \frac{231}{4.2} \end{aligned}$
3.	Simplify	$\frac{231}{4.2} = 55$

∴ So 4.2% of 55 is 2.31.

EXAMPLE 6

Joanna took Len to a restaurant for lunch. She left a tip of \$5.25, 15% of the bill. How much was the bill for lunch?

SOLUTION TO EXAMPLE 6

When reading over the problem, it is simply asking “\$5.25 is 15% of what number?”.

1.	“is” refers to the equal sign. Change percent to a fraction. “of” refers to multiplication. “what percent” is the unknown number we are trying to find. We replace this phrase by a variable.	$5.25 = \frac{15}{100} \times n$
2.	Solve the equation. Remember we are getting rid of a fraction, we multiply by its reciprocal	$\begin{aligned} \frac{100}{15} \times 5.25 &= \frac{100}{15} \times \frac{15}{100} \times n \\ \frac{100}{15} \times \frac{5.25}{1} &= n \end{aligned}$
3.	Simplify	$\frac{525}{15} = 35$

∴ So \$5.25 is 15% of \$35.

TRY THESE – Percentages

1. 20% of 80 is what number?
2. 12 is 60% of what number?
3. What percent of 20 is 15?
4. 10 is 60% of what number?
5. What percent of 40 is 8?
6. 70% of the seats at Adams Field were filled with fans. If there were 4200 people who attended the football game, what is the seating capacity of the stadium?