

# How to Figure Percents

## The Easy Way



c. 2020 Carolyn VanGorkom

Math textbooks can be self-defeating. You can spend pages and pages learning about something, but fail the test. That's because each page taught you how to do one individual type of problem, but the test has the problems all mixed up. Which type of solution do you use on which problem? It's so confusing!

That's where this single, all-inclusive method for figuring out percent problems comes in handy. Not only is it easy, but it works on all the different types of percent problems. Then, when it's time to take a test, you'll work out all the problems the same way. That increases your odds of acing the test. It also improves your chances of using this in real life – at the grocery store, for example.

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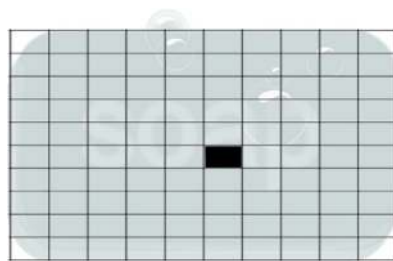
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## Preface: Laying the foundation

We're going to have to get the boring stuff out of the way first. Every book you pick up will start with practice sets on place value, fractions and decimals. I'm going to assume you've already gone through those, so let's just cut to the essentials.

### 1. Definitions

A percent means how many out of a hundred. You've heard it in advertising: ABC soap is 99 percent pure. That means if you could divide the bar up into a hundred equal parts, 99 parts would be soap and 1 part would be something else. Of course, soap is all mixed up so it doesn't work that way, but you get the picture.



Another way to look at it is to focus on the word "cent." How many cents in a dollar? That's right, a hundred. So if I pay a sales tax to my state of 8 percent, that means I pay them 8 cents for every dollar I spend.



## 2. Writing percents % as numbers #

Let's continue our sales tax example. How do you write 8 cents with a dollar sign? That would be \$0.08. Do you see how the decimal moved? It was 8. Now it's \$0.08. Some people would tell you that the decimal moved two places to the *left*. To be fair to those of us with dyslexia, let's change that a bit. The decimal moved two places **SMALLER**.

Why two places? Well, how many zeros are in the number 100? Two. When you write a percent sign (like this: %), how many zeros are on it? Two. So when you're changing back and forth between percents and numbers, you're going to move the decimal two places.

That leads us to our first big idea: the percent % is always going to be two places **BIGGER** than the number #. The number # is going to be two places **SMALLER** than the percent %.

**The % is two places bigger than the #.**  
**The # is two places smaller than the %.**

### Practice problem: 8% = ?

Step one: Written with a decimal, the number 8 is "8." The rule is, if there's no decimal printed, it's hiding at the end of the "ones" place. Fill in the decimal below.

8   
↑

Step two: Move the decimal two places smaller.

. 8 .  
└───┬───┘

Step three: fill in any missing places between the number and the new decimal with a ZERO.

. 0 8 answer  
└───┬───┘

**Final answer: 8% equals .08 (the #)**

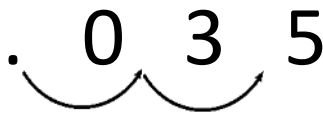
### 3. Writing numbers # as percents %

One last step, which is really just doing the above in reverse. What if I had the number .035, but I needed to know what percent that was? Answer: Just move the decimal two places BIGGER and tack on a % sign.

Step one: Write your number # with the decimal.

. 0 3 5

Step two: Move the decimal two places bigger.

. 0 3 5  


Step three: Fill in the new decimal and write % at the end of the number.

3 . 5 % answer

### 4. Bringing it all together

Percent problems can usually be boiled down to this format: This number is a percent of another number.

It could be written like this: “What number is 30% of 60?”

Or maybe: “125 is what percent of 500?”

Or even: “45 is 20% of what number?”

Or, to be really tricky, you’ll see a word problem like this: “Jana went to the store. Apples cost 75% of what oranges cost. Oranges cost \$1.20 per pound. How much did apples cost?”

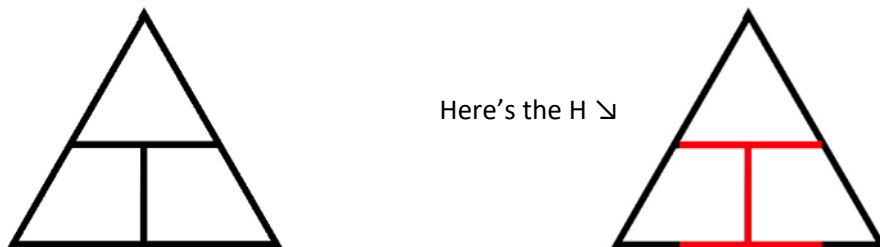
We’ll get to those, too, but for now let’s look at the big picture. If you’re really observant, you can see in all of these problems that there is a number attached to the word ‘IS’, another number attached to the word ‘OF’, and a third number attached to the % sign.

(And for clarity, the word ‘is’ represents all of the “to be” verbs: are, was, were, etc. It can also be replaced with ‘equals.’ They mean the same thing in this context.)

Most textbooks like to teach you these three different types of problems separately. You'd get a whole page of practice with the 'IS' number missing; a whole page with the 'OF' number missing; and a whole page with the '%' number missing. And you'd learn a different way to find the missing number for each type. Not here. **How to Figure Percents the Easy Way** boils it all down into a single concept.

## The IHOP Grid

IHOP is the mnemonic that we'll use to remember where all the pieces of the puzzle go in our grid. The I stands for the number connected to the IS part of the problem. The O stands for the number connected to the OF part of the problem – or the original total, if you're working with a word problem. And the P stands for the percent, with one important caveat – you have to move the decimal two places smaller before you put it into our grid. Where does the H come in? It's an integral part of our grid, of course. It's turned on its side at the bottom.



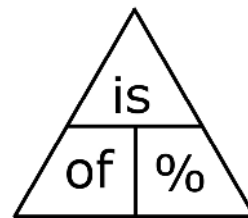
Practice on your own drawing this grid on a piece of paper. Make a triangle big enough to write in – about an inch and a half tall and wide. Divide it in half across the middle, then divide the bottom into two pieces. It should look like you wrote a letter H sideways along the bottom.

Now here's how we're going to put our numbers into the grid.

The IS goes on top.

The OF goes on the bottom.

The PERCENT % goes on the other side of the bottom, AFTER you move the decimal two places smaller to form a number #.



Once you put the numbers in position, follow these rules:

If you have one number on the top, and one number on the bottom, divide on your calculator.

If you have two numbers on the bottom, multiply on your calculator.

$\text{TOP} \div \text{BOTTOM}$
---------------------------------

$\text{BOTTOM} \times \text{BOTTOM}$
--------------------------------------

## Example 1: What number is 30% of 60?

Step one: Circle the percent, because it's usually the easiest to identify.

What number is 30% of 60?

Step two: Circle the IS and the OF, with the number if there is one.

What number is 30% of 60?

Step three: Change the Percent to a decimal number #. Put the OF and Percent on the grid.



Step four: The OF and the Percent are beside each other, so multiply to find the IS.

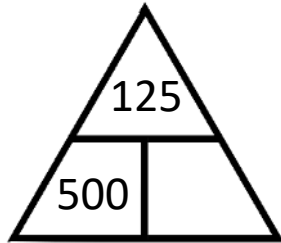
$$60 \times .30 = 18, \text{ answer}$$

## Example 2: 125 is what percent of 500?

Step one: Circle the IS, the OF, and the % like steps one and two above.

125 is what percent of 500?

Step two: Put the IS and the OF onto the Grid like step three above.



Step three: The IS is on top, and the OF is on the bottom, so divide: IS  $\div$  OF.

$$125 \div 500 = 0.25$$

Step four: Change the number into a percent by moving the decimal two places BIGGER.

$$.25 = 25\%, \text{ answer}$$

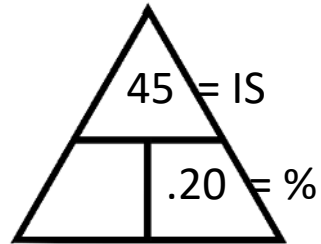
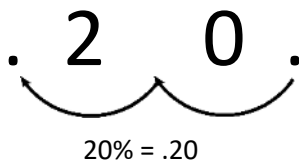


## Example 3: 45 is 20% of what number?

Step one: Circle the IS, the OF, and the %.

45 is 20% of what number?

Step two: Change 20 % into a # by moving the decimal two places smaller. Fill in the grid.



Step three: The IS is on top, and the % is on the bottom, so divide: IS  $\div$  %.

$$45 \div .20 = 225, \text{ answer.}$$

Did you notice that as we practiced, it took fewer steps for each problem? That's because as you get used to the concept, you can combine steps. Soon, it becomes a habit. In fact, the goal of this method is to get you used to identifying the IS, the OF, and the PERCENT. Then, when you see any of these at the grocery store or on your tax forms, you will know what to do with the numbers without even reaching for a pencil and paper.

If you have the %, you will always move the decimal two places smaller before you multiply or divide it.

If you have the IS, you will always divide it by one of the other numbers.

If you don't have the IS, you will multiply the OF and the %.

If the problem doesn't use IS, look for words that mean the same, like was or equals.

If the problem doesn't have the OF, look for the total amount.

And that's it. Let's see how this works itself out in a word problem, shall we?

## Example 4: A word problem

Jana went to the store. Apples cost 75% of what oranges cost. Oranges cost \$1.20 per pound. How much did apples cost?

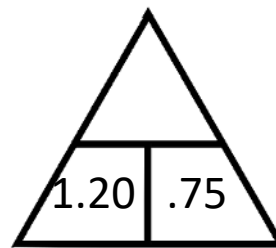
Step one: Find the IS, the OF and the %

The % is easy: 75%. But there is no obvious "IS." There are no words that mean the same, like equals or were. So let's look for something that could be a total, because that would be our "OF." Here, apples are 75% OF WHAT? Of the price of oranges, and we know what the oranges cost. That's our clue. The oranges are the OF, because that's the **total amount** we're comparing the apples to. (Who says you can't compare apples and oranges?) OF = \$1.20 per pound.

Step two: Change the % to a #. Fill in the Grid.

$$\begin{array}{c} .75 \\ \text{---} \end{array}$$

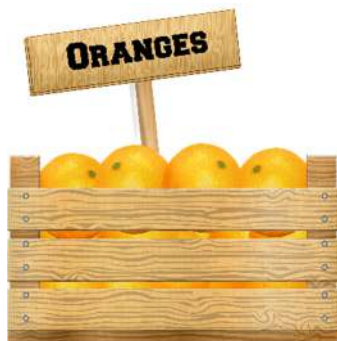
75% = .75



Step three: The numbers are both on the bottom, so multiply them. Write your answer with a \$ sign.

$$\$1.20 \times .75 = \$0.90, \text{ answer.}$$

Final answer: Apples cost \$0.90 per pound.

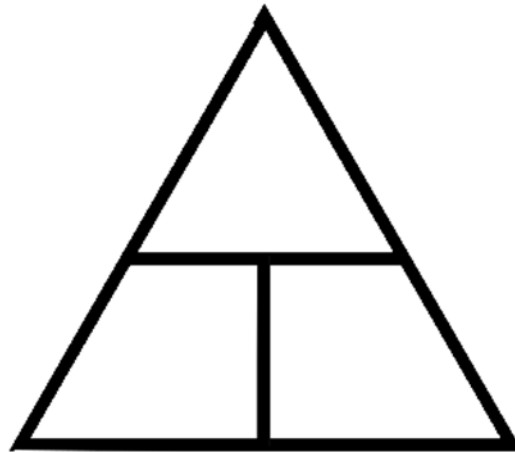


## Practice Problems:

In each of these problems, circle the IS, the OF, and the %. On another sheet of paper: make a grid, fill it in, and find the answer.

Remember, always move the % decimal two places smaller to form a # before putting it into the grid, and move it two places bigger when you write it as a %. Also, remember that if you have a number on the top, you have to divide. If both numbers are on the bottom, you have to multiply.

1. Find 18% of 150.
2. What percent of 52 is 13?
3. 90% of what number is 27?
4. Find a number so that 75% of it is 9.
5. 49 is what percent of 70?
6. What number is 84% of 125?
7. Find 40% of \$5.00.
8. What percent of 75 is 63?
9. 92% of what number is 115?
10. What is 80% of 145?



Word Problems: (Hint – most of these require an extra step to solve.)

11. A quality used car costs \$12,000. This is only 60% of the new price of the same model. How much would a new model cost, and how much would you save by buying the used car?
12. A local store is holding a clearance sale. Everything is 40% off. What would be the sale price for a shirt that originally cost \$30.00? (Not including sales tax.)
13. There were 20 questions on the Algebra test. What percent grade would you earn if you missed 3 problems?
14. If you receive a \$1,000 a week in self-employment income, you have to pay 15.3% in employment taxes to the government. Without any other withholdings, how much would you keep?
15. A miner found a rich vein of silver ore. He took a sample to the assayer, who found it contained 0.5% silver. To be clear, that's only half a percent of silver in the rock, which is five times the usual. How many pounds of ore would it take to produce 1 pound of silver at that concentration?

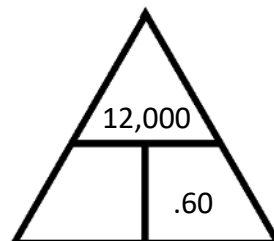
## Solutions:

- 27.** 18% of 150 is 27.
- 25%.** 13 is 25% of 52.
- 30.** 90% of 30 is 27.
- 12.** 75% of 12 is 9.
- 70%.** 49 is 70% of 70.
- 105.** 84% of 125 is 105.
- \$2.** 40% of \$5.00 is \$2.00.
- 84%.** 63 is 84% of 75.
- 125.** 92% of 125 is 115.
- 115.** 80% of 145 is 116.

11. Full solution: \$12,000 is 60% of the new car.

$$12,000 \div .60 = \$20,000 \text{ new model.}$$

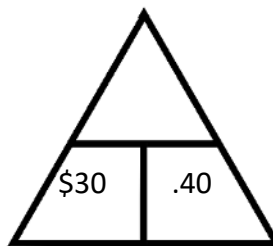
$$\text{Savings} = \$20,000 - \$12,000 = \$8,000 \text{ saved.}$$



12. Full solution: What is 40% off of \$30?

$$\$30 \times .40 = \$12 \text{ off.}$$

$$\$30 - \$12 = \$18 \text{ sale price.}$$

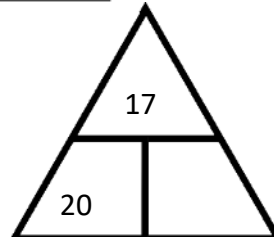


13. Full solution: There are 20 questions. You missed 3.

$$\text{Step 1: } 20 - 3 = 17, \text{ the number you got right.}$$

- Step 2: What percent is 17 of 20?

$$17 \div 20 = 0.85 = 85\%$$

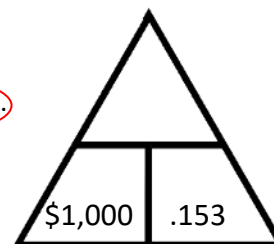


14. Full solution: Employment taxes are 15.3% of the total, \$1,000.

$$\text{Move the decimal two places smaller: } 15.3\% = .153$$

$$\$1,000 \times .153 = \$153$$

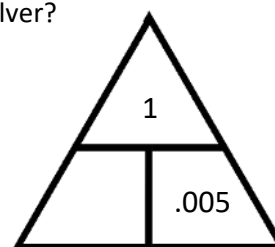
$$\text{Take home pay} = \$1,000 - \$153 = \$847 \text{ (not including state and federal income taxes).}$$



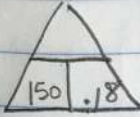
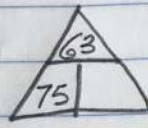
15. Full solution: How many pounds of ore at 0.5% will equal 1 pound silver?


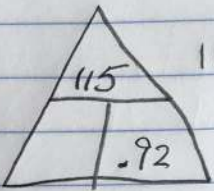
$$\text{Move the decimal two places smaller: } 0.5\% = .005$$


$$1 \div .005 = 200 \text{ pounds of ore to produce 1 pound of silver.}$$

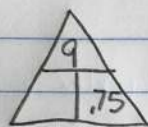
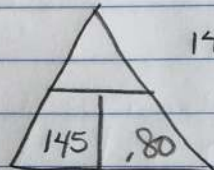



PS: I thought you'd like to see how I checked my work... I still use paper and pencil!

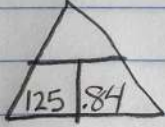
1.   $150 \times .18 = 27$       8.   $63 \div 75 = .84$   
 $84\%$

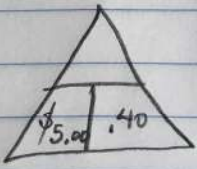
2.   $13 \div 52 = .25$   
 $= 25\%$       9.   $115 \div .92 = 125$

3.   $27 \div .90 = 30$

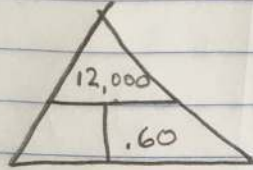
4.   $9 \div .75 = 12$       10.   $145 \times .80 =$

5.   $49 \div 70 = .7$   
 $= 70\%$        $.70$   
Remember to move the decimal 2 places bigger  
and fill in the blank space with a zero.

6.   $125 \times .84 = 105$

7.   $\$5.00 \times .40 = \$2.00$

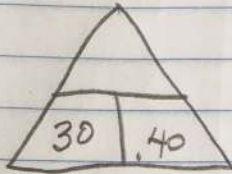
11.



$$\text{new} = 12,000 \div .60 = 20,000$$

$$\text{savings} = 8,000$$

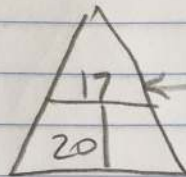
12.



$$\$30 \times .40 = \$12 \text{ off}$$

$$\$30 - \$12 = \$18 \text{ sale price}$$

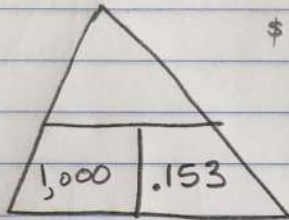
13.



$$20 - 3 = 17$$

$$17 \div 20 = .85 = 85\%$$

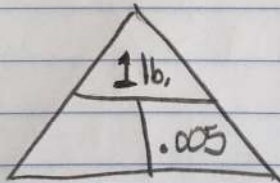
14.



$$\$1000 \times .153 = \$153 \text{ taxes}$$

$$\$1000 - \$153 = \$847 \text{ Keep}$$

15.



$$0.5\% = .005$$

$$1 \div .005 = 200 \text{ pounds}$$