DETAILED SOLUTIONS AND CONCEPTS - PERCENTS
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Please Send Questions and Comments to ingrid.stewart@csn.edu. Thank you!

YOU MUST BE ABLE TO DO THE FOLLOWING PROBLEMS WITHOUT A CALCULATOR!

Definition of a Percent

The percent (%) indicates the number of hundredths of a whole. ***1%*** equals $\frac{1}{100}$ or ***0.01***. We can also say that percent is a **ratio** of 1 to 100!

Expressing a Percent as a Decimal or Whole Number

Rule:

Drop the percent symbol and move the decimal point of the number two places to the LEFT.

NOTE: Moving the decimal point two places to the LEFT is the same as DIVIDING by 100!

Expressing a Percent as a Fraction or a Mixed Number

Rule:

- Express the percent as a decimal.
- Change the decimal to a fraction.
- Reduce to lowest terms whenever possible.

Expressing a Decimal or Whole Number as a Percent

Rule:

Move the decimal point two places to the RIGHT and add the percent symbol to the end of the number.

NOTE: Moving the decimal point two places to the RIGHT is the same as MULTIPLYING by 100!

Expressing a Fraction or Mixed Number as a Percent

Rule:

- Express the fraction as a decimal.
- Change the decimal to a percent.

Estimating a Percent of a Number

To find

1% of a number divide the number by 100

2% of a number divide the number by 100 and multiply the resulting quotient by 2.

3% of a number divide the number by 100 and multiply the resulting quotient by 3.

etc. until you get to 10

To find

10% of a number divide the number by 10.

20 % of a number divide the number by 10 and multiply the resulting quotient by 2.

30 % of a number divide the number by 10 and multiply the resulting quotient by 3.

etc.

Note you can find 5% of a number by dividing the number by 100 and multiplying the resulting quotient by 5. Or you can divide the number by 10 and then take one half of the quotient.

Simple Percent Problems

A simple percent problem has three parts:

1. a **percentage** - the number resulting from a percent being taken
2. a **rate** - the percent expressed as a decimal
3. a **base** - the number of which the rate is taken

Formulas:

Percentage = Rate $\times$ ***Base***, which can be abbreviated as ***P = R*** $\times$ ***B***

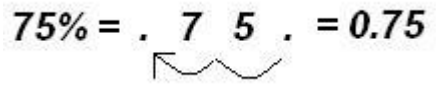
Rate = Percentage $\div$ ***Base***, which can be abbreviated as ***R = P*** $\div$ ***B***

Base = Percentage ÷ Rate, which can be abbreviated as ***B = P ÷ R***

Problem 1:

Express ***75%*** as a decimal number.

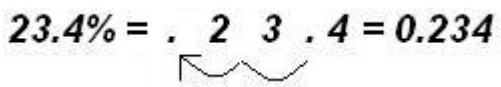
Remember the rule above says to drop the percent symbol and move the decimal point of the number two places to the LEFT.



Problem 2:

Express ***23.4%*** as a decimal number.

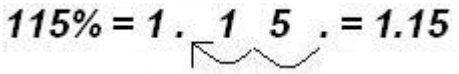
Remember the rule above says to drop the percent symbol and move the decimal point of the number two places to the LEFT.



Problem 3:

Express ***115%*** as a decimal number.

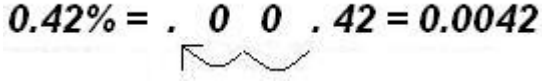
Remember the rule above says to drop the percent symbol and move the decimal point of the number two places to the LEFT.



Problem 4:

Express ***0.42%*** as a decimal number.

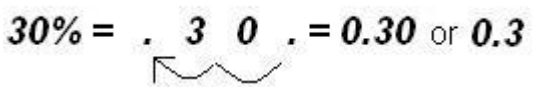
Remember the rule above says to drop the percent symbol and move the decimal point of the number two places to the LEFT.



Problem 5:

Express ***30%*** as a decimal number.

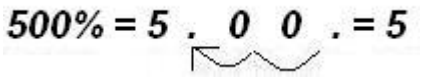
Remember the rule above says to drop the percent symbol and move the decimal point of the number two places to the LEFT.



Problem 6:

Express ***500%*** as a decimal number.

Remember the rule above says to drop the percent symbol and move the decimal point of the number two places to the LEFT.



Problem 7:

Express ***75%*** as a fraction reduced to lowest terms.

It is easiest to change the percent to a decimal number first and then to change the decimal number to a fraction!

Remember the rule above says to drop the percent symbol and move the decimal point of the number two places to the LEFT.

$$75\% = 0.75$$
$$= \frac{75}{100}$$
$$= \frac{3}{4}$$

Problem 8:

Express ***23.4%*** as a fraction reduced to lowest terms.

It is easiest to change the percent to a decimal number first and then to change the decimal number to a fraction!

Remember the rule above says to drop the percent symbol and move the decimal point of the number two places to the LEFT.

$$23.4\% = 0.234$$
$$= \frac{234}{1000}$$
$$= \frac{117}{500}$$

Problem 9:

Express ***115%*** as a fraction reduced to lowest terms.

It is easiest to change the percent to a decimal number first and then to change the decimal number to a fraction!

Remember the rule above says to drop the percent symbol and move the decimal point of the number two places to the LEFT.

$$115\% = 1.15$$
$$= 1\frac{15}{100}$$
$$= 1\frac{3}{20}$$

Problem 10:

Express ***0.42%*** as a fraction reduced to lowest terms.

It is easiest to change the percent to a decimal number first and then to change the decimal number to a fraction!

Remember the rule above says to drop the percent symbol and move the decimal point of the number two places to the LEFT.

$$0.42\% = 0.0042$$
$$= \frac{42}{10000}$$
$$= \frac{21}{5000}$$

Problem 11:

Express ***30%*** as a fraction reduced to lowest terms.

It is easiest to change the percent to a decimal number first and then to change the decimal number to a fraction!

Remember the rule above says to drop the percent symbol and move the decimal point of the number two places to the LEFT.

$$30\% = 0.3$$
$$= \frac{3}{10}$$

Problem 12:

Express ***0.0263*** as a percent.

Remember the rule above says to move the decimal point two places to the RIGHT and add the percent symbol to the end of the number.

$$0.0263 = 0.\ 0\ 2\ .\ 6\ 3 = 2.63\%$$

Problem 13:

Express ***3.987*** as a percent.

Remember the rule above says to move the decimal point two places to the RIGHT and add the percent symbol to the end of the number.

$$3.987 = 3.\ 9\ 8\ .\ 7 = 398.7\%$$

Problem 14:

Express ***0.4*** as a percent.

Remember the rule above says to move the decimal point two places to the RIGHT and add the percent symbol to the end of the number.

$$0.4 = 0.\ 4\ 0\ . = 40\%$$

Problem 15:

Express ***3*** as a percent.

Remember the rule above says to move the decimal point two places to the RIGHT and add the percent symbol to the end of the number.

$$3 = 3\ .\ 0\ 0\ . = 300\%$$

Problem 16:

Express $\frac{3}{8}$ as a percent.

It is easiest to change the fraction to a decimal number first and then to change the decimal number to a percent!

Remember the rule above says to move the decimal point two places to the RIGHT and add the percent symbol to the end of the number.

$$\frac{3}{8} = 0.375$$
$$= 37.5\%$$

Problem 17:

Express $\frac{7}{10}$ as a percent.

Remember the rule above says to move the decimal point two places to the RIGHT and add the percent symbol to the end of the number.

$$\frac{7}{10} = 0.7$$
$$= 70\%$$

Problem 18:

Express $1\frac{2}{3}$ as a percent. Round to one decimal place.

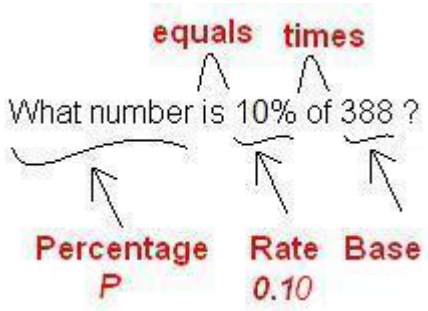
Remember the rule above says to move the decimal point two places to the RIGHT and add the percent symbol to the end of the number.

$$1\frac{2}{3} = 1.66666\ldots \text{(repeating 6)}$$
$$\approx 166.7\%$$

Problem 19:

What number is 10% of 388?

Let's change the English sentence to a Math sentence! You must memorize this!



Remember, when we need to find ***P*** we use the formula ***P = R ×B***. See lecture notes above!

P = 0.10 ×388

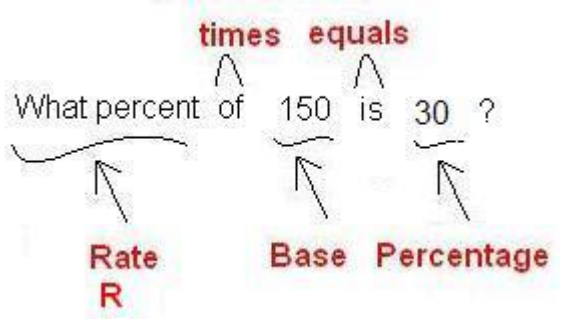
P = 38.8

The percentage equals 38.8.

Problem 20:

What percent of 150 is 30?

Again, let's change the English sentence to a Math sentence! You must also memorize this!



Remember, when we need to find ***R*** we use the formula ***R = P ÷B***. See lecture notes above.

R = 30 ÷150

R = 0.2

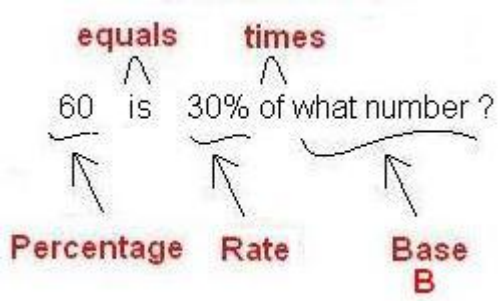
Since we are asked to find a percent, we need to change the decimal to percent form by moving the decimal point two places to the right.

The rate equals 20%.

Problem 21:

60 is 30% of what number?

Again, let's change the English sentence to a Math sentence! You must also memorize this!



Remember, when we need to find ***B*** we use the formula ***B = P ÷ R***. See lecture notes above

B = 60 ÷ 0.3

Note that ***R*** has to be expressed as a decimal, that is ***30%*** = ***0.3*** .

B = 200

The base equals 200.

Problem 22:

A certain automobile cooling system has a capacity of 6 gallons of fluid. To give protection to -10º F, 40% of the cooling system capacity must be antifreeze. How many gallons of antifreeze should be used?

HINT: When you are asked to solve word problems involving percents it is BEST to immediately ask yourself "What am I asked to find? Is it a percentage, the rate, or the base?"

In this case, we are looking for the percentage ***P***. Remember, when we need to find ***P*** we use the formula ***P = R ×B***. See lecture notes above!

P = 0.4 ×6

P = 2.4

2.4 gallons of antifreeze should be used.

Problem 23:

The first baseman of a baseball team caught 33 out of 55 balls. What percent is this?

We are asked to find a percent. That is, we need to find the rate ***R***. Remember, when we need to find ***R*** we use the formula ***R = P ÷ B***. See lecture notes above.

R = 33 ÷ 55

R = 0.6

Since we are asked to find a percent, we need to change the decimal to percent form by moving the decimal point two places to the right.

Therefore, the first baseman caught 60% of the balls.

Problem 24:

A client's medication was increased by 32.5 mg or 10% per day. How many mg did the client get on the day before the increase?

We are asked to find the base ***B***. Remember, when we need to find ***B*** we use the formula ***B = P ÷ R***. See lecture notes above.

B = 32.5 ÷ 0.1

B = 325

The client received 325 mg on the day before the increase.

Problem 25:

Assume that your restaurant bill is $12.60. You want to leave a 15% tip, but you are too embarrassed to pull out a calculator. Therefore, you decide to estimate the tip by rounding to the nearest ones (dollar). What is it?

You can find 10% of the bill by dividing 12.60 by 10. That's the same as moving the decimal point one place to the left!

You get $1.26.

Now, you can find 5% of the bill by finding one-half of 1.26.

You get $0.63.

Now, if you wanted to leave exactly 15% you would have to count out 1.26 + 0.63 or $1.89. However, we need to estimate the tip to the nearest dollar.

Therefore, instead of calculating 1.26 + 0.63 we find 1.00 + 1.00 or $2.

Problem 26:

As you stroll through the Gap, you are excited to find a great sale on jeans. They are normally $95, but the store has reduced the price by 30%. You forgot your calculator and you are too embarrassed to ask the sales person how much less you have to pay for the jeans. Therefore, you decide to estimate the discount by rounding to the nearest dollar. What is it?

You can find 10% of the price by dividing 95 by 10. That's the same as moving the decimal point one place to the left!

You get $9.50.

Now, you can find 30% of the bill by multiplying 9.50 by 3, which is $28.50. However, we need to estimate the discount to the nearest dollar.

Therefore, instead of calculating 9.50 $\times$3 we find 10 $\times$3 or $30.

Problem 27:

Student fees collected by a college this year was 3 times more than last year. What is the percent increase?

The formula for percent change is as follows:

$$\frac{amount\ of\ change}{original\ amount} \times 100 = percent\ change$$

Let's say that last year we collected $1 \times F$ number of fees. This year we collected 3 times as much or $3 \times F$ number of fees. Now we will place these "numbers" into our formula.

$$\frac{3 \times F - 1 \times F}{F} \times 100 = \frac{2 \times F}{F} \times 100 = 2 \times 100 = 200$$

Therefore, the percent increase is 200%.