

**EVALUATING  
ACADEMIC READINESS  
FOR APPRENTICESHIP TRAINING**  
Revised for  
**ACCESS TO APPRENTICESHIP**

**MATHEMATICS SKILLS  
OPERATIONS WITH PERCENTAGES**

**AN ACADEMIC SKILLS MANUAL  
for  
The Horticulture Trades**

This trade group includes the following trades:

Arborist, and  
Horticulturist

*Workplace Support Services Branch  
Ontario Ministry of Training, Colleges and Universities*

*Revised 2011*

In preparing these Academic Skills Manuals we have used passages, diagrams and questions similar to those an apprentice might find in a text, guide or trade manual.

**This trade related material is not intended to instruct you in your trade. It is used only to demonstrate how understanding an academic skill will help you find and use the information you need.**

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# MATHEMATICS SKILLS

## OPERATIONS WITH PERCENT

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*An academic skill required for the study of the  
Horticulture Trades*

### **INTRODUCTION**

When you read the information handed out in your course, you will come across statements such as:

“Safer’s Natural Garden Fungicide contains 12% sulphur.”

“A 10-6-4 fertilizer contains 10% nitrogen, 6% phosphate and 4% potassium.”

“Commercial Grade Turfgrass Sod may contain up to 20% native grasses. Kentucky Bluegrass Sod is grown from a seed mixture containing 60 - 70% by weight of Kentucky bluegrass cultivars and 30 - 40% by weight of creeping red or hard fescue cultivars.”

“Organic matter is an important storehouse of plant nutrients such as phosphorus. Around 60% of the phosphorus in the soil is held in decaying organic matter.”

All these statements use a mathematical shorthand called percent. This skills manual looks at different ways to use percent. It covers the following topics:

- ◆ The meaning of percent
- ◆ Writing a number as a percent
  - writing whole numbers, decimals and fractions as percent,
  - rounding off
- ◆ Changing a percent to a decimal
- ◆ Problems involving percent, including
  - finding a percent of a number
  - finding what percent one number is of another
  - finding a number when a percent of it is known

### **THE MEANING OF PERCENT**

*A **percent** is an amount expressed out of a total of one hundred. It is indicated by the percent sign, %.*

**Example:** 25% means 25 parts out of a total of 100 parts.

**Example:** When your course states that you need to achieve 65% on your tests to pass, this means you need to get 65 marks out of every 100 possible marks.

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**Example:** You put a 40% antifreeze solution in your truck.

- The % tells you that the solution has been divided into a total of 100 parts.
- 40 tells us that forty of those parts consist of antifreeze,
- It also means that the other 60 of the parts ( $100 - 40 = 60$ ), or 60%, consists of other things, let's say water.

The relative amounts of antifreeze and water are easier to picture as percents than if you read that the solution is  $\frac{2}{5}$  antifreeze and  $\frac{3}{5}$  water.

Percent is often used to calculate financial amounts.

**Examples:**

A 10% increase in heating costs this year means that for every dollar you spent on heating costs last year, you now need to spend \$.10 more.

You pay 13% HST on all parts and materials which you forward on to your customers when you calculate the bill.

Your clients also pay 13% HST which you add to labour as you calculate the bill.

If you want to start your own business and you need a loan, the amount of interest on the loan is given as a percent such as 6.5%. To find out how much interest you will pay on an \$85,000 loan at 6.5% interest per year, you need to know how to do calculations with percent.

***A Percent is a Special Kind of Fraction***

A percent expresses an amount out of a total of 100 hundred equal parts. Since the 100 parts represent one whole amount, any percent less than 100 is a partial amount. A partial amount can be written as a percent, a fraction or a decimal.

**Fraction:** A fraction tells how many equal parts a whole amount is divided into; it also tells you how many of those parts you have.

**Example:** In the fraction  $\frac{19}{100}$ , the bottom number tells you how many parts, in this case 100, that the total amount is divided into. The top number tells you how many of these parts, in this case 19, you have.

- The top part of the fraction, representing the partial amount 19, is called the *numerator*.
- The bottom part of the fraction, representing the total amount 100, is called the *denominator*.
- The numerator and denominator are divided by the *fraction line*.

**Percentages are fractions too:** A percent is a kind of fraction whose denominator, like the fraction  $\frac{19}{100}$ , is 100.

- When we write a percent, we only write the numerator.
- The numerator is written with the percent (%) symbol after it.

- The % symbol represents the fraction line and indicates that the unwritten denominator is 100.

**Example:** To express the fraction  $19/100$  as a percent:

- The numerator 19 is written with the % sign after it.
- The denominator 100 is not shown.
- Nineteen percent is written as 19%.

Percent is usually used to express amounts that are less than one whole (100 parts being equal to 1 whole). Any percent less than 100% represents an amount smaller than one whole.

**Example:** Percent is used to make comparisons in manuals. A manual might compare the energy content (Btu's per liter) of different fuels compared to diesel using the following percents:

No. 2 diesel	100%
Gasoline	89%
Methanol	44%
Ethanol	58%

- You can see from this chart that diesel is the most efficient source of fuel in terms of the amount of Btu's per liter, while gasoline is next in thermal efficiency.
- Notice that since diesel is the standard used to compare the energy ratings, its rating is listed as 100%.

You also use percent when calculating financial amounts.

**Example:** The amount of income tax, and the HST you pay, are all calculated as percentages.

**Example:** A job estimate might state that 60% of the cost of a job is for labour charges and 40% is for parts; you need to know how to do these calculations.

### ***WRITING A NUMBER AS A PERCENT***

Your course description might state that you have to attend 90 hours out of a total of 100 course hours in order to pass. Or it might state that you must attend 90% of the course. 90 out of 100 is the fraction  $90/100$ . The fraction  $90/100$  and 90% both indicate the same time spent in class, but they are expressed in different ways.

**To convert any fraction, whole number or decimal number to a percent** use the following rule:

- To write a number as a percent, multiply it by 100 and add the % sign.

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**Remember:** A quick way to multiply a number by 100 is to move the **decimal point** two places to the **right**. If the decimal point isn't shown at the end of a whole number, it is assumed to be after the last digit in the number. (Digits are the symbols we use to write numbers. The digit for four is 4.)

We will look at changing a whole number, a decimal number and a fraction to a percent. There is one method each for converting whole numbers and decimals to percent and two methods for changing fractions to percent.

### **To Change a Whole Number to a Percent**

1. Multiply the number by 100.
2. Add the percent sign.

**Example:** Express 3 as a percent.

$$\begin{array}{ll} 3 \times 100 & \\ = 300 & \text{write the \% sign} \\ = 300\% & \end{array}$$

### **To Change a Decimal Number to a Percent**

1. Multiply the number by 100.
2. Move the decimal point two places to the right, using zero as a place holder if necessary.
3. Add the % sign.

**Example:** Express .725 as a percent.

$$\begin{array}{ll} .725 \times 100 & \text{move the decimal point two places to the right} \\ = 72.5 & \\ = 72.5\% & \text{write the \% sign} \end{array}$$

**Example:** Express .5 as a percent.

$$\begin{array}{ll} .5 \times 100 & \text{move the decimal point two places to the right, using one zero as a place holder} \\ = 50 & \\ = 50\% & \text{write the \% sign} \end{array}$$

### **Changing a Fraction to a Percent**

There are two methods for changing fractions to percentages.

**Method One:** (This method is handy if the denominator of the fraction divides evenly into 100.)

1. Multiply the fraction by 100.
2. Reduce the answer to its lowest terms
3. Write the percent sign with the answer.

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**Example:** Express  $\frac{2}{5}$  as a percent.

$$\begin{array}{ll} \frac{2}{5} \times \frac{100}{100} & 5 \text{ divides evenly into } 100 \\ \frac{2}{\cancel{5}_1} \times \frac{100}{\cancel{10}_2} & \text{we can cross out before multiplying} \\ = 40 & \\ = 40\% & \text{write the \% sign} \end{array}$$

**Method Two:** (This is the most common way to convert a fraction to a percent. This method is handy if the denominator of the fraction does not divide evenly into 100.)

1. Change the fraction to a decimal.
  - a. Divide the denominator of the fraction into the numerator. The answer is a decimal number.
2. Multiply the decimal by 100 and write the percent sign.

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

$$\begin{array}{ll} \frac{3}{8} & \\ = 3 \div 8 & \text{change the fraction to a decimal} \\ = .375 & \\ \\ .375 \times 100 & \text{multiply by } 100 \\ = 37.5 & \\ = 37.5\% & \text{write the percent sign} \end{array}$$

**Methods One and Two** result in the same answer. You can use either method with any fraction to convert it to a percent.

**Examples:**

- a) Express .25 as a percent.  
 $.25 \times 100 = 25\%$
- b) Express 1 as a percent.  
 $1 \times 100 = 100\%$
- c) Express  $\frac{1}{4}$  as a percent.  
 $\frac{1}{4} \times 100 = 25\%$
- d) Express 65 out of 100 as a percent.  
 $\frac{65}{100} \times 100 = 65\%$
- e) Express  $\frac{5}{8}$  as a percent.  
 $5 \div 8 = .625$   
 $.625 \times 100 = 62.5\%$

f) Express  $\frac{1}{3}$  as a percent.

$$\begin{aligned}\frac{1}{3} &= 1 \div 3 \\ &= .33... \\ &= .33... \times 100 \\ &= 33.33... \%\end{aligned}$$

**To round off an answer:**

1. Look at the digit one place to the right of the place you are rounding off to.
2. If that digit is five or more, change the digit you are rounding off to one more than it is.
3. If the digit to the right is less than five, leave the digit you are rounding off the same.
4. Discard any digits after the one you have rounded off.
5. If the number you are rounding off to is 9 and the digit one past it is five or greater, the 9 becomes 10 and the place value where the 9 was becomes 0. The one from the 10 is added to the digit to the left of the 9, which becomes one larger in value.

**Example:** Round .6769 to two decimal places.

We look at the digit one past the 7, the second decimal place, which is a 6. Since it is five or larger, the 7 becomes 8 and the other digits are dropped.

6769 rounded to two decimal places is .68

**Example:** Express  $\frac{1}{3}$  as a percent with the percent rounded to two decimal places.

$$\begin{array}{ll}\frac{1}{3} = 33.3333... \% & \text{expressed as a percent} \\ = 33.33 \% & \text{rounded to two places}\end{array}$$

**Example:** Express  $\frac{2}{3}$  as a percent.

$$\begin{array}{ll}\frac{2}{3} = 66.666.. \% & \text{expressed as percent} \\ = 66.67 \% & \text{rounded off}\end{array}$$

*Sometimes you are told how many places to round off to in the question and sometimes you are not. If you are not told, answers are generally rounded off to two places, although there are often exceptions. One eighth ( $\frac{1}{8}$ ) is 12.5% as a percent and .125 as a decimal number. When a decimal number ends evenly in three or four places, we don't round it off.*

**CHANGING A PERCENT TO A DECIMAL**

Imagine you have been told that insulating the walls of your greenhouse will result in an energy savings of 10% on your heating bill. Before you decide whether to insulate, you might want to calculate the actual monthly savings. You convert 10% to a decimal and then multiply the decimal number by your average monthly heating bill. To do this calculation, you first need to know how to change a percent to a decimal.

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### **Decimals Are Also a Type of Fraction**

Like percent, decimals are a kind of fraction. A *decimal is the numerator of a fraction which has a denominator that is a power of ten.* (A power of ten is a number that starts with 1 followed by any number of zeros such as 10, 100, 1000.) However, decimals show no denominator. A decimal point placed in front of the numerator replaces the denominator and the fraction line.

You have already learned how to convert a decimal number to a percent: multiply by 100 and add the % sign. To change a percent to a decimal, reverse the process.

#### **To change a percent to a decimal:**

1. Remove the percent sign and divide by 100.

**Remember:** *To divide by 100 quickly, move the decimal point two places to the left. When dividing by 100, the decimal point moves in the opposite direction than when multiplying by 100. If there are empty spaces between the decimal point and the digits of the number after you have moved the decimal point to the left, fill the spaces with zeros.*

**Example:** Divide 3.67 by 100 the quick way.

Move the decimal point two places to the left and fill the empty space with a zero. The answer is .0367

**Example:** Change 5% to a decimal.

5% = .05            move the decimal 2 places to the left, use zero as a place holder and remove the % sign

**Example:** Change 33.3% to a decimal.

33.3% = .333        move the decimal 2 places to the left and remove the % sign

**Example:** Express 10% as a decimal.

10% = .10 or .1     move the decimal point two places to the left and remove the % sign

**Example:** If you can save 10% in energy costs if you insulate your greenhouse how much money you would save if you insulated the greenhouse.

10% = .1

If the average monthly heating bill is \$250, 10% saving would be  $.1 \times \$250 = \$25$ . The savings would be \$25 a month. You can now decide if it is worthwhile insulating.

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**TO WRITE A NUMBER AS A PERCENT**

1. Multiply the number by 100 using one of the methods shown. Use zeros as place holders when needed. If the decimal point is not shown in a whole number, it is assumed to be after the last digit.
2. Write the % sign.

Express the following as a percent. **Answers are at the end of this skills manual.**

1. a) 10 out of 100                      b)  $1/5$                                       c) 100 out of 100  
d)  $2/1$                                       e) .85                                      f) 2.75  
g) .05                                      h)  $1/3$                                       i) 1

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**TO CHANGE A PERCENT TO A DECIMAL**

1. Remove the percent sign.
2. Divide the number by 100 by moving the decimal point **two** places to the **left**. Use zeros as place holders when needed.
3. If the decimal point is not shown, it is assumed to be after the last digit in the number.

Change the following percents to decimal numbers.

2. a) 28%                                      b) 56.7%                                      c) 7%  
d) 100%                                      e) 8.5%                                      f) 250%  
g) 15%                                      h) .2%                                      i) 62.5 %

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## **PROBLEMS INVOLVING PERCENT**

Sometimes you have to solve problems which involve percent. You may be given information expressed as a percent and asked to find an unknown amount by using the given information. For example, you use percent to find the amount of sales tax owed or to find the interest on a loan.

***Note:** When doing percent problems, a calculator can do the calculations accurately, but you first have to decide what steps to use and in what order. Once you have figured out what you are asked to find and what method to use, you can use your calculator.*

We will look at three main types of percent problems so you will know what method to choose for different situations. The three types of problems are:

- Finding the percent of a number.
- Finding what percent one number is of another.
- Finding a number when you know a percent of it.

### **Problem Type #1: To Find a Percent of a Number**

The most common kind of percent problem involves finding a percentage of a number.

**Example:** In Ontario, you pay 13% HST for many goods and services you buy. If you want to know the total price of an object or service before buying it, you need to calculate the amount of tax (13%) and add that to the cost. If the price of a truck is \$22 000, you have to add 13% harmonized sales tax to find the total cost.

#### **To find the percent of a number:**

1. Change the percent to a decimal.
2. Then multiply the number by the decimal.

*We looked at how to change a percent to a decimal in the last section. Drop the percent sign and move the decimal point two places to the left.*

**Example:** Find 5% of 20. .

$$5\% = .05$$

1. Change 5% to a decimal.

When you move the decimal point two places to the left, you will need to use a zero as a place holder

$$\begin{array}{r} 20 \\ \times .05 \\ \hline 100 \\ \underline{\phantom{00}} \\ 1.00 \end{array}$$

Now multiply .05 x 20.

$$5\% \text{ of } 20 = 1$$

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**Example:** Find 25% of \$150.

$$\begin{array}{r} \$150 \\ \times .25 \\ \hline 7500 \\ 3000 \\ \hline \$37.50 \end{array}$$

Change 25% to the decimal .25 and multiply.

$$25\% \text{ of } \$150 = \$37.50$$

Most problems that ask you to find a percentage of a number deal with money and are worded something like this:

- If a pruning saw costs \$49.99 and the taxes are 13%, what is the total amount you will have to pay?
- Find the amount of interest you must pay in a year on a loan of \$3000 if the interest rate is 12% per annum (per year).
- Find the total amount you pay for a truck that sells for \$22 00 if you pay 13% tax.

In each case, you must first find a percentage of the given number. In the first problem, you find 13% of \$49.99, in the second, 12% of \$3000 and in the third problem, 13% of \$22,000.

**Example 1:** If a pruning saw costs \$49.99 and the sales tax is 13%, what is the total amount you have to pay?

First find the amount of tax paid. Change 13% to the decimal .13 and multiply.

$$\begin{array}{r} .13 \times \$49.99 \\ = \$6.4987 \text{ rounded to } \$6.50 \end{array}$$

Add the amount of tax paid to the cost of the drill.

$$\begin{array}{r} \$49.99 + \$6.50 \\ = \$56.49 \end{array}$$

The total amount paid is \$57.49.

**Example 2:** Find the amount of interest you must pay in a year on a loan of \$3000 if the interest rate is 12% per annum.

Change 12% to the decimal .12 and multiply.

$$\begin{array}{r} .12 \times \$3000 \\ = \$360 \end{array}$$

The yearly interest paid is \$360.

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**Example 3:** Find the total cost of a truck that sells for \$22,000 after you pay 13% HST.

Change 13% to .13 and multiply by \$22,000 to find the amount of tax you have to pay.

$$\$22,000 \times .13 = \$2860$$

Add \$2860 to the cost of the truck.

$$\$22000 + \$2860 = \$24\ 860$$

The total cost for the truck is \$24 860.

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### TO FIND A PERCENT OF A NUMBER

1. Change the number with the percent to a decimal by dropping the percent sign and moving the decimal **two** places to the **left**.
  2. Multiply the two numbers together.
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**Solve the following questions.** Round off money values to two decimal places. **Answers are at the end of this skills manual.**

3. a) Find 50% of 200.                      b) Find 33.3% of 150.                      c) Find 4.25% of 30.  
  
d) Find 12% of \$48.50.                      e) Find 15% of \$1.99.                      f) Find .25% of 12.  
  
g) What is 100% of 75?                      h) What is 150% of 68?                      i) What is 9% of \$10.75?
4. If the sales tax is 15%, what is the tax on a set of climbing ropes that costs \$145.98? What is the total cost?
5. How much active ingredient is there in 4.8 kilograms of a formulated pesticide product that contains 80% active ingredient?
6. How much interest will you pay in a year on a loan of \$6,000 if the interest rate is 6% per year?
7. A 30-10-10 fertilizer contains 30% nitrogen. How much nitrogen is there in a 10 kilograms bag of 30-10-10 fertilizer?

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### **Problem Type #2: Find What Percent One Number Is of Another**

This type of problem allows us to use percent to compare things in a way we can easily understand.

**Example:** The three main ingredients in a chemical fertilizer are nitrogen, phosphorus and potassium, listed in that order on the label. The product label lists the amount of each nutrient out of a total of 100 parts. Say you are to apply a 20 kilogram bag of 40-20-10 fertilizer. You want to know what percent of each ingredient is in this fertilizer. You know that 40 parts out of a total of 100 parts are composed of nitrogen, 20 parts are phosphorus and 10 parts are potassium. The other 70 parts are filler.

If you have to find what percent of the bag is nitrogen (40 parts), you have to know how to write one number as a percent of another.

Questions that require you to do this can be worded in two ways:

“36 is what percent of 400?” or “What percent of 400 is 36?”

**To find what percentage one number is of another, follow these three steps:**

**First step:** Make a fraction. When one number is expressed out of another, it can be written as a fraction.

**Example:** 150 out of 500 is the fraction  $150/500$ .

You have to know which number is the numerator and which number is the denominator to make the fraction.:

- ◆ The number representing the total, or *the number following “of”*, is the **denominator**. It forms the bottom part of the fraction.
- ◆ The other number is the **numerator**. It forms the top part of the fraction.

**Remember:** To make a fraction, write “is” over “of”, or is/of.

**Second step:** Make the fraction into a decimal number. *The numerator is divided by the denominator.*

**Note:** You make the fraction in order to see what part is the numerator and what part is the denominator. This lets you correctly divide the numerator by the denominator. You can divide without making a fraction if you know to divide the number associated with “is”, the numerator, by the number following “of”, the denominator.

**Third step:** Change the decimal answer to a percent:

- ◆ Multiply it by 100.
- ◆ Add the percent sign.

**Remember:** To multiply by 100 move the decimal point two places to the right.

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**Example:** 150 is what percent of 500?

$$\frac{150}{500}$$

Write the fraction. Remember *is* over *of*

$$150 \div 500 = .3$$
$$.3 \times 100 = 30\%$$

Change the fraction to a decimal.  
Change the decimal to a percent.

### In Brief

**To find what percent one number is of another number:**

1. Make a fraction by writing the number with the word *is* over the number with the word *of*.
2. Convert the fraction to a decimal by dividing the numerator by the denominator.
3. Change the decimal to a percent by multiplying by 100 and adding the % sign.

If you are dividing with a calculator, always key in the numbers so that the dividend (the number being divided into) is keyed in first, then the division sign and then the divisor (the number you divide by). To divide 75 by 25 using a calculator, key in the dividend 75 first and then the divisor 25.

**Example:** 620 is what percent of 1000?

$$\frac{620}{1000}$$

Write the fraction. (*is* over *of*)

$$620 \div 1000$$
$$= .62$$

Change the fraction to a decimal by dividing.

$$.62 \times 100$$
$$= 62\%$$

Change the decimal to a percent by multiplying and adding the % sign.

$$620 \text{ is } 62\% \text{ of } 1000$$

**Example:** What percent of 50 is 25?

$$25/50$$
$$= 25 \div 50$$
$$= .5$$
$$.5 \times 100 = 50\%$$

**Rounding off:** If the division answer doesn't come out evenly or is a repeating decimal, round off the answer. If the answer will be in percent, round off to four places so you have two decimal places in your percent.

**Example:** 1 is what percent of 3?

$$1 \div 3$$
$$= .3333\dots$$

round off to four places

$$.3333 \times 100$$
$$= 33.33\%$$

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**Example:** 200 is what percent of 300?

$$\begin{array}{l} 200 \div 300 \\ = .6666\dots \end{array} \quad \text{rounded to four places is } .6667$$

$$.6667 \times 100 = 66.67\%$$

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**TO FIND WHAT PERCENT ONE NUMBER IS OF ANOTHER**

1. Make a fraction. Use the number representing the total or the number following “of” as the denominator. Make the other number the numerator.
  2. Change the fraction to a decimal number by dividing the numerator by the denominator.
  3. Multiply this division answer by 100 and add the percent sign.
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Answer the following questions. **Answers are at the end of this skills manual.**

8. a) 3 is what percent of 12?      b) 28 is what % of 32?      c) What percent of 36 is 9?
- d) What % of 40 is 15?      e) What % of 1 is 1?      f) 250 is what % of 200?
- g) 25 is what % of 75?      h) What % of \$3.99 is \$1.10?
9. You are asked to plant a total of 25 shrubs and trees on a property. If you plant 15 shrubs and 10 trees, what percentage of each do you plant?
10. Tall bean plants were crossed with short bean plants. All the first generation ( $F_1$ ) offspring were tall. These plants were then crossed with each other. In the second generation ( $F_2$ ) of plants, approximately 750 were tall and 250 were short. What percentage of second generation plants were tall and what percentage were short? (First find the total number of  $F_2$  plants.)
11. If the normal price of a low pressure spray gun is \$500 and you pay \$440 for one that is on sale, what % savings do you get? (Your savings are the amount you don't pay. The discount is \$60. What % is 60 of 500?)

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12. An electrolyte solution in a battery consists of 1.28 kilograms of water and 7.2 kilograms of acid. What percent of the solution is water and what percent is acid. (First you need to add the two weights to get the total weight of the solution.)
13. An estimate for a landscaping job is given as \$1250. The final bill is \$1400. Your final bill should not be more than 10% greater than the estimate. Is the bill within the 10% guideline?

**Problem Type #3: Find a Number When a Percent of It Is Known**

**To find a number when a percent of it is known follow these steps:**

1. Change the percent to a decimal number by dropping the percent sign and moving the decimal point two places to the left.
2. Divide the given number by the decimal number. The division answer is the unknown number.

**Example:** In a typical bill for a landscaping job, 60% of the cost is for labour and the rest is for plants and materials. If the labour charge on a bill comes to \$900, how much is the total bill?

Change 60% to a decimal.

$$60\% = .6$$

Divide the cost for labour by the decimal number. The division answer is the cost of the total bill.

$$\$900 \div .6 = \$1500$$

The total bill is \$1500.

This type of question can be worded in two different ways, but each is solved in the same way.

**Example:** 45% of what number is 90?

$$\begin{aligned} \text{Change 45\% to .45} \\ 90 \div .45 = 200 \end{aligned}$$

The unknown number is 200.

**Example:** 12 is 24% of what number?

$$\begin{aligned} \text{Change 24\% to .24} \\ 12 \div .24 = 50 \end{aligned}$$

The unknown number is 50.



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**To answer the following problems, you will have to decide what method to use.**

17. An apprentice earning \$16.50 an hour receives a 4% increase in pay. What is the new hourly rate? (Find the increase and add it to what the apprentice is making now.)
  
18. A dwarf crab apple tree is rated as growing 45% the size of a standard crab apple. If the standard crab apple is expected to grow 6 meters high, how high should the dwarf tree grow?
  
19. An order of shrubs contains 420 plants. 260 of the plants are spreading junipers and the rest are deciduous shrubs. What percent of the order consists of deciduous shrubs?
  
20. A new truck costs \$23,000. You put \$4000 down and borrow the rest at 6% interest. What is the total amount that you pay for the truck?
  
21. Rhododendrons cost \$21.85 each. The volume discount for buying 200 at a time is 25%. What would be the cost of buying 200 rhododendrons? (Find 75% of the regular cost.)

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**ANSWER PAGE**

**WRITING PERCENT**

- 1 a) 10%    b) 20%    c) 100%    d) 200%    e) 85%    f) 275%  
g) 5 %    h) 33.33%    i) 100%

**CHANGING PERCENT TO A DECIMAL**

2. a) .28    b) .567    c) .07    d) 1    e) .085    f) 2.5  
g) .15    h) .002    i) .625

**FINDING A PERCENT OF A NUMBER**

3. a) 100    b) 49.95    c) 1.275    d) \$5.82    e) \$.30    f) .03  
g) 75    h) 102    i) \$.97

4. Sales tax is  $.15 \times 145.98 = \$21.90$  The total cost is  $\$145.98 + 21.90 = \$167.88$ .

5.  $.8 \times 4.8 = 3.84$  kilograms

6.  $.06 \times 6,000 = \$360$ . You will pay \$360 interest.

7.  $.3 \times 10 = 3$  kg

**FINDING WHAT PERCENT ONE NUMBER IS OF ANOTHER**

8. a) 25%    b) 87.5%    c) 25%    d) 37.5%    e) 100%    f) 125%  
g) 33.33%    h) 27.57

9.  $15 \div 25 = .6$   
 $.6 \times 100 = 60\%$   
 $10 \div 25 = .4$   
 $.4 \times 100 = 40\%$   
There are 60% shrubs and 40% trees in the planting.

10. total number of F<sub>2</sub> plants  $750 + 250 = 1000$   
 $750 \div 1000 = .75$   
 $.75 \times 100 = 75\%$   
 $250 \div 1000 = .25$   
 $.25 \times 100 = 25\%$   
There are 75% tall plants and 25% short plants.

11.  $60 \div 500 = .12$

$.12 \times 100 = 12\%$

The saving is 12%.

12.  $1.28 + 7.2 = 8.48$  kg

$1.28 \div 8.48 = .15$

$.15 \times 100 = 15\%$  water

$100\% - 15\% = 85\%$  acid

13.  $\$1250 \div \$1400 = .8928$

$.8928 \times 100 = 89.28\%$

$100\% - 89.28 = 10.82\%$

It is just over the 10% allowed.

### FINDING A NUMBER WHEN A PERCENT OF IT IS KNOWN

14. a) 500      b) 50              c) 80              d) 24              e) 70              f) 31.5

15.  $\$250 \div .75 = \$333.33$

The total bill will be \$333.33.

16.  $1.2 \div .6 = 2$

You need to apply 2 kg.

17.  $.04 \times \$16.50 = \$.66$

$\$16.50 + \$.66 = \$17.16$

18.  $.45 \times 6 = 2.7$  m

19.  $420 - 260 = 160$

$160 \div 460 = .348$  (rounded off)

$.348 \times 100 = 34.8\%$

34.8% of the order consists of deciduous shrubs.

20.  $\$23,000 - \$4,000 = \$19,000$

6% interest on \$19,000 is \$1,140

Total cost is  $\$23,000 + \$1,140 = \$24,140$

21.  $\$21.85 \times 200 = \$4370.$

$\$4370 \times .75 = \$3277.50$