Information Regarding
PHCC-GSA Entry Level Examination

Prior to acceptance into the PHCC-GSA Plumbing Apprenticeship and Training Programs, the applicant must pass a entry-level examination and oral interview. The following information has been put together to help prepare applicant for the written exam and to give insight as to the types of questions that will be on the exam.

- **Part 1: Reading and Comprehension**
  The applicant will be required to read several paragraphs and answer 13 multiple-choice questions about what was read.

- **Part 2: Math**
  The math portion of the exam consists of 40 problems, which must be solved. A calculator may be used on the math portion of the exam. Since this portion of the exam gives applicants the most problems, the PHCC-GSA Training Facility has put together sample problems similar to those one might find on the exam. These example problems, along with the answer sheet, are attached.

- **Part 3: Ruler**
  This portion of the exam will test the applicant's ability to read a ruler including fractions of inches. the applicant is given several close-up views of a ruler with a arrows identifying the specific measurements along the ruler. the applicant will be required to provide the measurement that corresponds with each of the indication arrows.

The applicant will be given one hour to complete the entire exam. A passing grade of 70% in each of the three sections is required to pass the exam.

Plumbing-Heating-Cooling Contractors
GSA Plumbers Unilateral Apprenticeship Committee

Entry Level Examination
Example Math Problems

1) 4.620
.02
+ 12.001
____

2) 2,692
+ 13,564
____

3) 33.9
- 22.65
____

4) 461.25
- 325.19
____

5) 17
x 11
______

6) 12.21
x 6.37
____

7) 12 ÷ 4 = ________

8) 324 ÷ 36 = _________

9) 4 ÷ 80 = _________

10) 12
10 3/4
+ 9 7/8
____

11) 32 1/4
- 9 7/8
____

12) 15 1/8
- 3 1/32
____

13) 6
+ 12 3/16
____

14) 32'-1 3/4" - 16'-6 1/8" = __________________________

15) 60 is what percent of 180? ______________________

16) What is 3.2% of 12.3? __________________________

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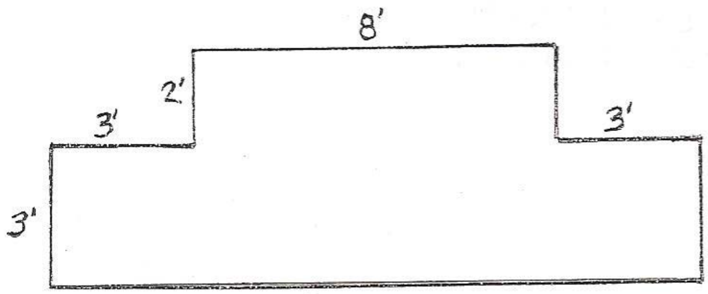
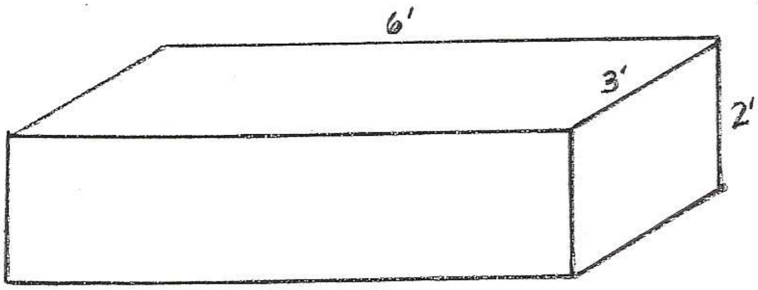
17) Compute the area of the following object:

Area = _______________



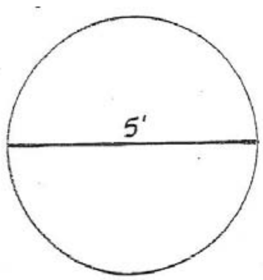
18) Compute the volume of the following object:

Volume = _____________



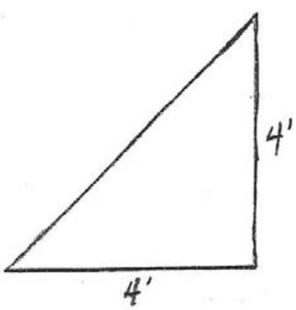
19) Compute the area of the circle:

Area = _______________



20) Compute the area of the triangle:

Area = ________________



Answers

Entry Level Examination
Example Math Problems

1)	16.641
2)	16.256
3)	11.25
4)	136.06
5)	187
6)	77.7777 or 77.78
7)	3
8)	9
9)	.05
10)	32 5/8
11)	22 3/8
12)	14 5/32
13)	18 3/16
14)	15' 7 5/8"
15)	33.33
16)	.39
17)	58 square feet
18)	36 cubic feet
19)	19.63 square feet
20)	8 square feet

ADDING FRACTIONS
SUBTRACTING FRACTIONS

In this Lesson, we will answer the following:

1. How do we add or subtract fractions?
2. How do we add fractions that do not have the same denominator?
3. What number should we choose as the common denominator?
4. How do we add mixed numbers?

Section 2

5. How do we subtract a mixed number from a whole number?

1.	How do we add or subtract fractions?
	The units -- the denominators -- must be the same. Add or subtract only the numerators.

Example 1. $\frac{5}{8} + \frac{2}{8} = \frac{7}{8}$.

Just as

5 apples + 2 apples = 7 apples,

so

5 eighths + 2 eighths = 7 eighths.

To add anything, the units -- the *names* -- must be the same. To add apples and oranges, you have to call them "piece of fruit"!

In this problem, the unit is $\frac{1}{8}$. We are adding *eighths*. (Lesson 20.)

Example 2. $\frac{5}{8} - \frac{2}{8} = \frac{3}{8}$.

2. How do we add or subtract fractions that do not have the same denominator?

$$\frac{1}{2} + \frac{3}{8}$$

Make the denominators the same by changing to equivalent fractions. (Lesson 21.)

3. What number should we choose as the common denominator?

Choose a common multiple of the original denominators. Choose their *lowest* common multiple. (Lesson 22)

Example 3. $\frac{1}{2} + \frac{3}{8}$.

Solution. The lowest common multiple of 2 and 8, is 8 itself. We will change $\frac{1}{2}$ to a fraction whose denominator is 8.

$\frac{1}{2} = \frac{4}{8}$, because 4 is half of 8.

Therefore,

$$\frac{1}{2} + \frac{3}{8} = \frac{4}{8} + \frac{3}{8} = \frac{7}{8}.$$

In practice, it is necessary to write the common denominator only once:

$$\frac{1}{2} + \frac{3}{8} = \frac{4+3}{8} = \frac{7}{8}.$$

Example 4. $\frac{4}{5} + \frac{2}{15}$

Solution. The LCM of 5 and 15 is 15. Therefore,

$$\frac{4}{5} + \frac{2}{15} = \frac{12\ +\ 2}{15} = \frac{14}{15}.$$

$\frac{4}{5}$ has been changed to $\frac{12}{15}$ by multiplying both terms by 3.

$\frac{2}{15}$ has not been , because we are keeping the denominator changed 15.

Example 5. $\frac{2}{3} + \frac{1}{6} + \frac{7}{12}$

Solution. The LCM of 3, 6, and 12 is 12.

$$\frac{2}{3} + \frac{1}{6} + \frac{7}{12} = \frac{8 + 2 + 7}{12}$$

$$= \frac{17}{12}$$

$$= 1\ \frac{5}{12}.$$

$\frac{2}{3}$ has been changed to $\frac{8}{12}$ by multiplying both terms by 4.

$\frac{1}{6}$ has been changed to $\frac{2}{12}$ by multiplying both terms by 2.

$\frac{7}{12}$ has not been changed, because we are keeping the denominator 12.

The improper fraction $\frac{17}{12}$ has been changed to $1\frac{5}{12}$ by dividing 17 by 12.

"12 goes into 17 one (1) time with remainder 5."

Example 6. $\frac{5}{6} + \frac{7}{9}$

Solution. The LCM of 6 and 9 is 18.

$$\frac{5}{6} + \frac{7}{9} = \frac{15 + 14}{18} = \frac{29}{18} = 1\frac{11}{18}.$$

$\frac{5}{6}$ has been changed to $\frac{15}{18}$ by multiplying both terms by 3.

$\frac{7}{9}$ has been changed to $\frac{14}{18}$ by multiplying both terms by 2.

Example 7. Add mentally $\frac{1}{2} + \frac{1}{4}$.

Answer. $\frac{1}{2}$ is how many $\frac{1}{4}$'s?

$\frac{1}{2} = \frac{2}{4}$, because 2 is half of 4.

Therefore,

$\frac{1}{2} + \frac{1}{4} = \frac{3}{4}$.

The student should not have to write any problem in which one of the numbers is $\frac{1}{2}$.

For example,

$\frac{1}{2} + \frac{2}{10} = \frac{7}{10}$

because $\frac{1}{2} = \frac{5}{10}$.

Example 8. In a recent exam, one eighth of the students got A, two fifths got B, and the rest got C. What fraction got C?

Solution. Let the whole number of students be represented by 1. Then the question is:

$$\frac{1}{8} + \frac{2}{5} + ? = 1.$$

Now,

$$\frac{1}{8} + \frac{2}{5} = \frac{5+16}{40} = \frac{21}{40}.$$

The rest, the fraction that got C, is the complement of $\frac{21}{40}$.

It is $\frac{19}{40}$.

4. How do we add mixed numbers?

$$4\tfrac{3}{8} + 2\tfrac{2}{8}$$

Add the whole numbers and add the fractions.

Example 9. $4\frac{3}{8} + 2\frac{2}{8} = 6\frac{5}{8}$.

Example 10. $3\frac{2}{5} + 1\frac{4}{5} = 4\frac{6}{5}$.

But $\frac{6}{5}$ is improper, we must change it to a mixed number:

$\frac{6}{5} = 1\frac{1}{5}$.

Therefore,

$4\frac{6}{5} = 4 + 1\frac{1}{5} = 5\frac{1}{5}$.

Example 11.

$$\begin{array}{r} 6\tfrac{3}{4} \\ +\ 3\tfrac{5}{8} \\ \hline \end{array}$$

Solution. When the denominators are different, we may arrange the work vertically.

To add the fractions, the denominators must be the same. The LCM of 4 and 8 is 8. We will change $\frac{3}{4}$ to $\frac{6}{8}$ -- we will multiply both terms by 2:

$$\begin{array}{rl} 6\tfrac{3}{4} = 6\tfrac{6}{8} & \\ +\ 3\tfrac{5}{8} = 3\tfrac{5}{8} & \\ \hline 9\tfrac{11}{8} & = 9 + 1\tfrac{3}{8} \\ & = 10\tfrac{3}{8}. \end{array}$$

We added $6 + 3 = 9$. $\frac{6}{8} + \frac{5}{8} = \frac{11}{8} = 1\frac{3}{8}$.

$9 + 1\frac{3}{8} = 10\frac{3}{8}$.

At this point, please "turn" the page and do some Problems.

or

Continue on to the next Section.

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The center mark between numbers is 1/2. The red lines on these rulers are marked at 1/2, and 1.	 
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When marking down a distance from a ruler, mark the whole inch, followed by a space, then the fraction of an inch.

For example, 1 1/2, or 2 3/8.

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The next smallest mark, if there are any, are 1/16ths. The red marks on this ruler are at 1/16, 1/8, 3/16, 1/4, 5/16, 3/8, 7/16, 1/2, 9/16, 5/8, 11/16, 3/4, 13/16, 7/8, 15/16, and 1.	

When marking down a distance from a ruler, mark the whole inch, followed by a space, then the fraction of an inch.

For example, 1 1/2, or 2 3/8.

How to calculate percentages

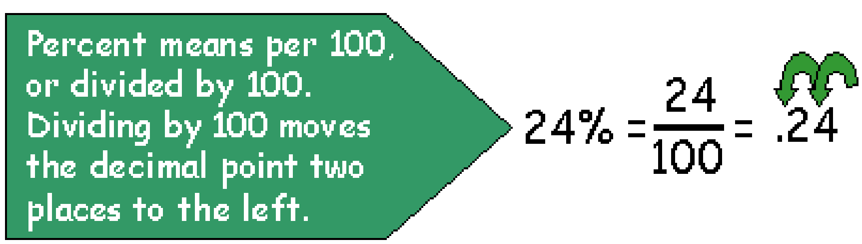
The guidance below will help you work through percentage calculation problems including those found on the percentage worksheets page.

As you guide your child you should also take the opportunity to explain the importance and relevance of percentage calculations: pay rises, allowance rises, interest rates, discounts on sale items etc. Learning is always improved when the relevance of what is being learned is appreciated.

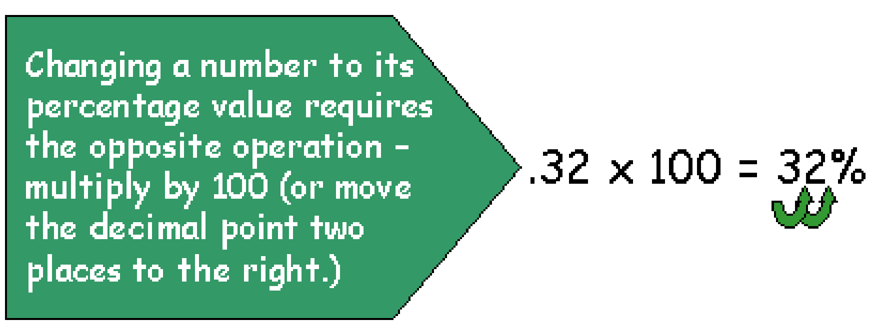
What is a percentage?

Percent means “for every 100” or "out of 100." The (%) symbol as a quick way to write a fraction with a denominator of 100. As an example, instead of saying "it rained 14 days out of every 100," we say "it rained 14% of the time."

Percentages can be written as decimals by moving the decimal point two places to the left:



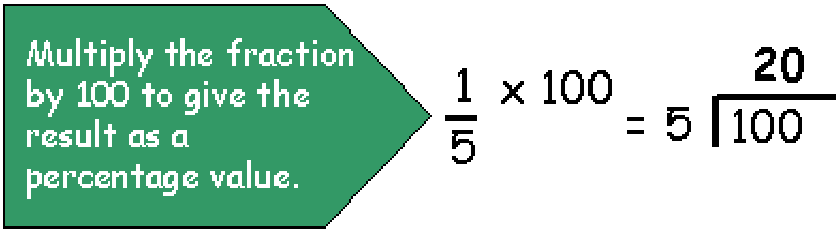
Decimals can be written as a percentages by moving the decimal point two places to the right:



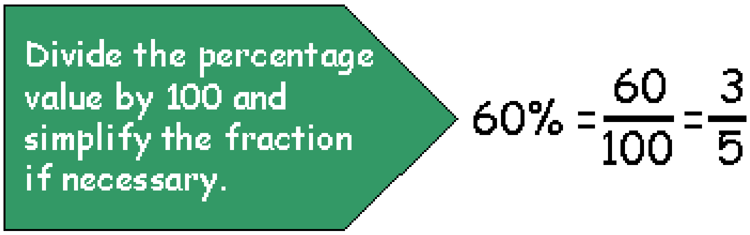
Formula for calculating percentages

The formula for calculating percentages or for converting from percentages are relatively simple.

To convert a fraction or decimal to a percentage, multiply by 100:



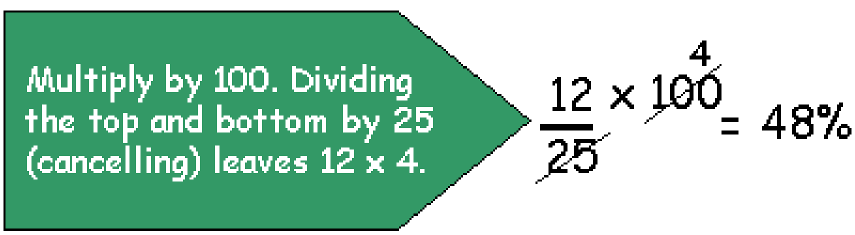
To convert a percentage to a fraction, divide by 100 and reduce the fraction (if possible):



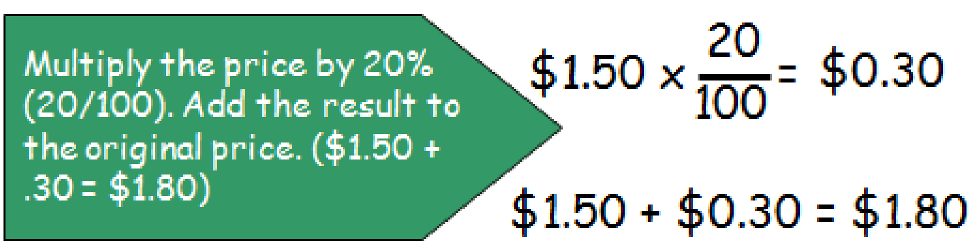
Examples of percentage calculations

The following two examples show how to calculate percentages.

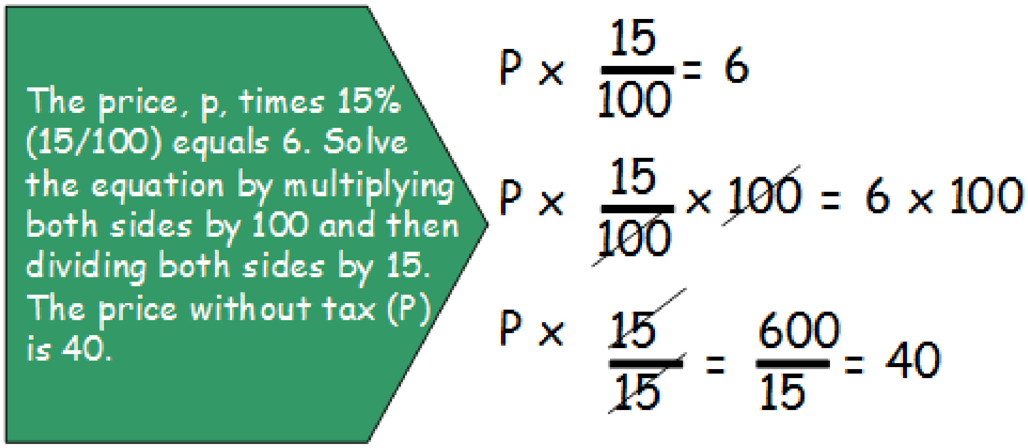
1) 12 people out of a total of 25 were female. What percentage were female?



2) The price of a $1.50 candy bar was to be increased by 20%. What was the new price?



3) The tax on an item is $6.00. The tax rate is 15%. What is the price without tax?



Similar types of problems to those in the examples above are solved in a series of three mini-lessons on *Calculating with Percent*. These are listed below.

Percentage Chart

This Percentage Chart shows what 15% of $1 through $100 is although it is customizable so you can set the percentage and the numbers to whatever you want.

Find 1% - The Unitary Method

Handy Tip: A good way of finding percentages is to start by finding what 1% is.

Example: What is 6% of 31?

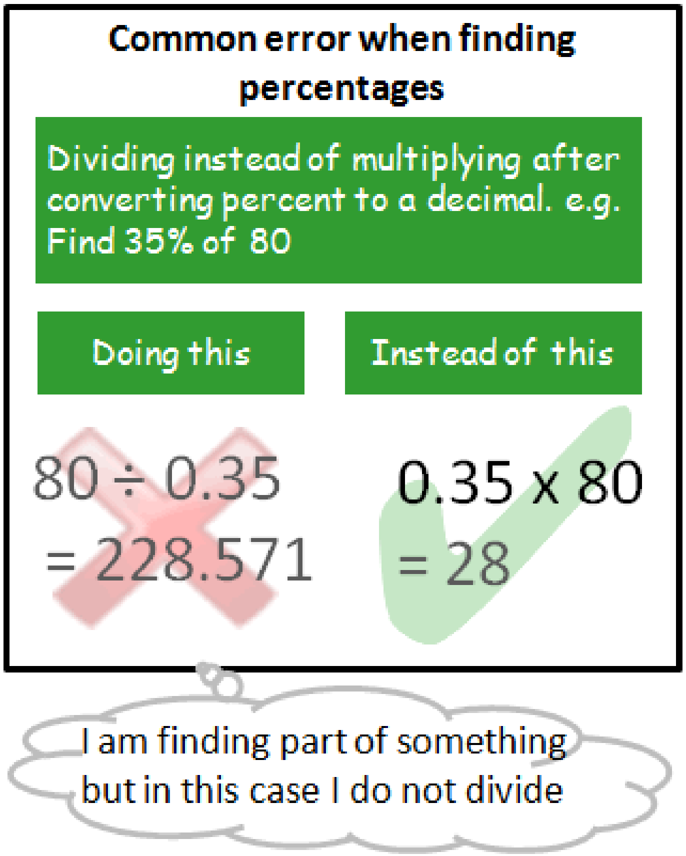
Find 1%. Divide by 100 (or move the decimal point two places to the left)	31 ÷ 100 = .31
We now know what 1% is. We just need to multiply it by 6 to find 6%	.31 x 6 = 1.86

6% of 31 is 1.86

You can practice calculating percentages by first finding 1% (and/ or finding 10%) and then multiplying to get your final answer using this Calculating Percentages in Two Steps Worksheet. There are also more percentage worksheets here too.

Common error when finding a percentage

Since percentages are often thought of as parts of a larger whole thing, there can a tendency to divide instead of multiply when faced with a problem such as "find 35% of 80." As the example below shows, after converting the percent to a decimal, the next step is to multiply, not divide.



An understanding of percent allows students to estimate to check whether their answer is reasonable. In this example, knowing that 35% is between one-quarter and one-half would mean the answer should be somewhere between 20 and 40.