



## 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 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.



**Entry Level Examination**  
**Example Math Problems**

$$\begin{array}{r} 1) \ 4.620 \\ \ .02 \\ + 12.001 \\ \hline \end{array}$$

$$\begin{array}{r} 2) \ 2,692 \\ + 13,564 \\ \hline \end{array}$$

$$\begin{array}{r} 3) \ 33.9 \\ - 22.65 \\ \hline \end{array}$$

$$\begin{array}{r} 4) \ 461.25 \\ - 325.19 \\ \hline \end{array}$$

$$\begin{array}{r} 5) \ 17 \\ \times 11 \\ \hline \end{array}$$

$$\begin{array}{r} 6) \ 12.21 \\ \times 6.37 \\ \hline \end{array}$$

$$7) \ 12 \div 4 = \underline{\hspace{2cm}}$$

$$8) \ 324 \div 36 = \underline{\hspace{2cm}}$$

$$9) \ 4 \div 80 = \underline{\hspace{2cm}}$$

$$\begin{array}{r} 10) \ 12 \\ \ 10 \frac{3}{4} \\ + \ 9 \frac{7}{8} \\ \hline \end{array}$$

$$\begin{array}{r} 11) \ 32 \frac{1}{4} \\ - \ 9 \frac{7}{8} \\ \hline \end{array}$$

$$\begin{array}{r} 12) \ 15 \frac{1}{8} \\ - \ 3 \frac{1}{32} \\ \hline \end{array}$$

$$\begin{array}{r} 13) \ 6 \\ + 12 \frac{3}{16} \\ \hline \end{array}$$

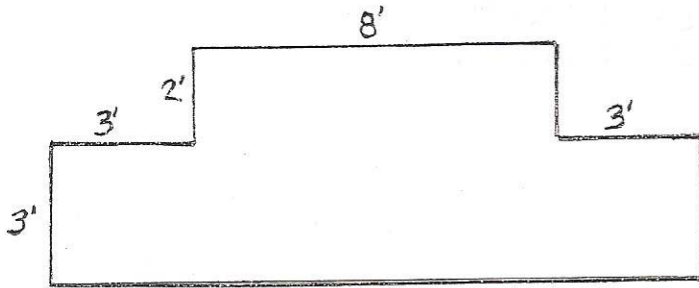
$$14) \ 32' - 1 \frac{3}{4}'' - 16' - 6 \frac{1}{8}'' = \underline{\hspace{2cm}}$$

$$15) \ 60 \text{ is what percent of } 180? \underline{\hspace{2cm}}$$

$$16) \ \text{What is } 3.2\% \text{ of } 12.3? \underline{\hspace{2cm}}$$

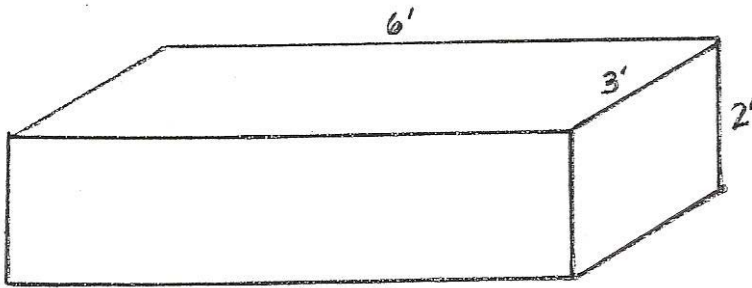


17) Compute the area of the following object:



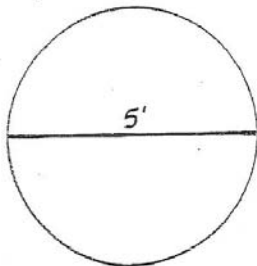
Area = \_\_\_\_\_

18) Compute the volume of the following object:



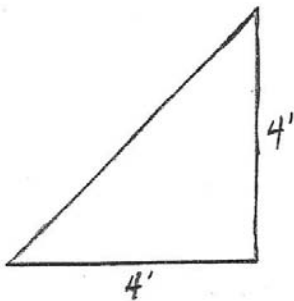
Volume = \_\_\_\_\_

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)  $32 \frac{5}{8}$
- 11)  $22 \frac{3}{8}$
- 12)  $14 \frac{5}{32}$
- 13)  $18 \frac{3}{16}$
- 14)  $15' 7 \frac{5}{8}"$
- 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

$$5 \text{ apples} + 2 \text{ apples} = 7 \text{ apples,}$$

so

$$5 \text{ eighths} + 2 \text{ eighths} = 7 \text{ eighths.}$$

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.

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

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.

$$\begin{aligned}\frac{2}{3} + \frac{1}{6} + \frac{7}{12} &= \frac{8+2+7}{12} \\ &= \frac{17}{12} \\ &= 1 \frac{5}{12}.\end{aligned}$$

$\frac{2}{3}$  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?

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

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.**

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

**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:

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

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

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

**At this point, please "turn" the page and do some [Problems](#).**

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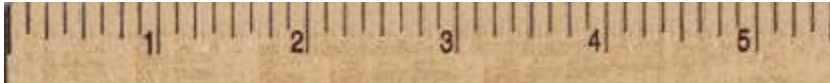
E-mail: [themathpage@nyc.rr.com](mailto:themathpage@nyc.rr.com)

# How do I read a ruler?

## English Rulers

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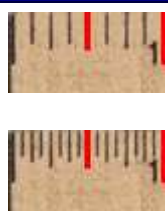

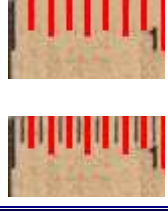

Take a look at the following English Rulers.



A ruler marked in 8ths. Every mark is 1/8th of an inch.



A ruler marked in 16ths. Every mark is 1/16th of an inch.

<p>The center mark between numbers is 1/2.</p> <p>The red lines on these rulers are marked at 1/2, and 1.</p>	 Two small images of a ruler. The top image shows a red vertical line at the center mark between 0 and 1. The bottom image shows red vertical lines at the 1/2 and 1 marks.
<p>The next smallest marks on a ruler are 1/4ths.</p> <p>The red marks on these rulers are at 1/4, 1/2, 3/4, and 1. (1/2 is the same as 2/4)</p>	 Two small images of a ruler. The top image shows red vertical lines at the 1/4, 1/2, and 3/4 marks. The bottom image shows red vertical lines at the 1/4, 1/2, 3/4, and 1 marks.
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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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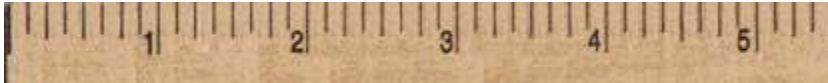
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When marking down a distance from a ruler, mark the whole inch, followed by a space, then the fraction of an inch.

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



## 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:

Percent means per 100, or divided by 100. Dividing by 100 moves the decimal point two places to the left.

$$24\% = \frac{24}{100} = .24$$


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

Changing a number to its percentage value requires the opposite operation - multiply by 100 (or move the decimal point two places to the right.)

$$.32 \times 100 = 32\%$$


### 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:

Multiply the fraction by 100 to give the result as a percentage value.

$$\frac{1}{5} \times 100 = 5 \overline{)20}$$

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

Divide the percentage value by 100 and simplify the fraction if necessary.

$$60\% = \frac{60}{100} = \frac{3}{5}$$

## 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?

Multiply by 100. Dividing the top and bottom by 25 (cancelling) leaves  $12 \times 4$ .

$$\frac{12}{25} \times \frac{100}{4} = 48\%$$

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

Multiply the price by 20% (20/100). Add the result to the original price. ( $\$1.50 + .30 = \$1.80$ )

$$\$1.50 \times \frac{20}{100} = \$0.30$$

$$\$1.50 + \$0.30 = \$1.80$$

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

The price,  $p$ , times 15% ( $15/100$ ) equals 6. Solve the equation by multiplying both sides by 100 and then dividing both sides by 15. The price without tax ( $P$ ) is 40.

$$P \times \frac{15}{100} = 6$$

$$P \times \frac{15}{100} \times 100 = 6 \times 100$$

$$P \times \frac{15}{\cancel{15}} = \frac{600}{15} = 40$$

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)

$$31 \div 100 = .31$$

We now know what 1% is. We just need to multiply it by 6 to find 6%

$$.31 \times 6 = 1.86$$

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.

**Common error when finding percentages**

Dividing instead of multiplying after converting percent to a decimal. e.g. Find 35% of 80

Doing this	Instead of this
$80 \div 0.35$ $= 228.571$	$0.35 \times 80$ $= 28$

I am finding part of something  
but in this case I do 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.