How to Get the Greatest Common Factor of Numbers

BY [CIVIL SERVICE REVIEWER](http://civilservicereview.com/author/jrbautista/) · JULY 4, 2014

The numbers that can divide an integer is called its factor or divisor. For example, the factors of 4 are 1, 2, and 4 because these are the numbers that divide 4 without having a remainder. Another example is 6 which has factors 1, 2, 3, and 6. It is clear that each number has always 1 and itself as factors. Note that in this discussion, when I say number, I mean positive integer.

If we select more than one number, we can observe that they have common factors (just like having [common multiples](http://civilservicereview.com/2013/09/least-common-multiple/)). Let’s have the following examples.

### **How to Get the Greatest Common Factor of Numbers**

**Example 1:**What are the common factors of 12 and 18?

**Factors of 12**: 1, 2, 3, 4, 6, 12

**Factors of 18:** 1, 2, 3, 6, 9, 18

If we examine the factors of 12 and 18, we see that there are 4 common factors: 1, 2, 3 and 6. Among the factors, 6 is the largest. Therefore, we say that 6 is the**greatest common factor** (GCF) or **greatest common divisor** (GCD) of 12 and 18.**Example 2 :**Find the GCF of 20, 32, 28.

**Factors of 20:** 1, 2, 3, 4, 5, 10, 20

**Factors of 32:** 1, 2, 4, 8, 16, 32

**Factors of 28:** 1, 2, 4, 7, 14, 28

As we can see, the common factors of 20, 32, and 28 are 1, 2, and 4. The GCD or GCF of the three numbers is 4.

Another way to get the greatest common factor of numbers is to write their prime factorization. Prime factorization is the process of expressing a number as product of prime numbers. A prime number is a number which is only divisible by 1 and itself (read [**Introduction to Prime Numbers**](http://mathandmultimedia.com/2010/06/14/prime-series-1/) if you don’t know what is a prime number). The first 10 prime numbers are 2, 3, 5, 7, 11, 13, 17, 19, 23, and 29.

We will use the examples above and use prime factorization in order to get their greatest common factor.

**Example 3:** Find the GCF of 12 and 18 using prime factorization.

Prime factorization of 12: 2 × 2 × 3

Prime Factorization of 18: 2 × 3 × 3

Now to get the greatest common factor, we multiply the common factors to both numbers. The common factors to both are 2 and 3, therefore, the greatest common factor of 12 and 18 is 2 × 3 = 6.

**Example 4:** Find the GCF of 12 and 18 using prime factorization.

**Prime factorization of 20:** 2 × 2 × 5

**Prime factorization of 32:** 2 × 2 × 2 × 2

**Prime factorization of 28:** 2 × 2 × 2

In this example, 2 and 2 are common to all the three numbers, so the GCD or GCD of these three numbers is 2 × 2 which is equal to 4.

The difference between the two methods is that in the first method, you list all the factors and find the largest number. In the second method, you list the prime factorization and the multiply the factors that are common to all numbers.

### **What’s the use of greatest common factor?**

Well, GCF are used a lot in mathematics, but in the Civil Service Exam, you will use it when you [reduce fractions to lowest terms](http://civilservicereview.com/2013/10/convert-fractions-to-lowest-terms/). For example, your finalanswer is

\frac{12}{18}

and \frac{12}{18} is not on the choices. Then, you know that you have to get the greatest common factor of 12 and 18 and divide both the numerator and denominator by it. So, the answer is

\displaystyle \frac{12 \div 6}{18 \div 6} = \displaystyle \frac{2}{3}

Greatest Common Factor Quiz

BY [CIVIL SERVICE REVIEWER](http://civilservicereview.com/author/jrbautista/) · JULY 6, 2014

After learning [**How to Get the Greatest Common Factor of Two Numbers**](http://civilservicereview.com/2014/07/greatest-common-factor/), let’s have a quiz! The greatest common factor is used to reduce a fraction to lowest terms, so I included such items on the quiz below.

To reduce a fraction to lowest terms, get the greatest common factor of the numerator and the denominator, and then divide

**Greatest Common Factor Quiz**

Part 1: Get the greatest common factor of the following numbers.

1.) 12 and 15

2.) 18 and 28

3.) 36 and 45

4.) 56 and 72

5.) 26 and 65

6.) 8, 12, and 64

7.) 30, 45, and 54

8.) 10 and 31

Part 2: Reduce the following fractions to lowest terms.

9.) \frac{21}{42}

10.) \frac{8}{24}

11.) \frac{13}{65}

12.) \frac{48}{56}

# How to Get the Least Common Multiple of Numbers

BY [CIVIL SERVICE REVIEWER](http://civilservicereview.com/author/jrbautista/) · SEPTEMBER 10, 2013

In mathematics, a multiple is a product of any number and an integer. The numbers 16, -48 and 72 are multiples of 8 because 8 x 2 = 16, 8 x -3 = -48 and 8 x 9 = 72. Similarly, the first five positive  multiples of 7 are the following:

**7, 14, 21, 28, 35**.

In this post, we will particularly talk about positive integers and positive multiples.  This is in preparation for the discussions on addition and subtraction of fractions.

We can always find a common multiple given two or more numbers. For example, if we list all the positive multiples of 2 and 3, we have

2, 4, **6**, 8, 10, **12**, 14, 16, **18**, 20

and

3, **6**, 9, **12**, 15, **18**, 21, 24, 27, 30.

As we can see, in the list, 6, 12 and 18 are common multiples of 2 and 3. If we continue further, there are still other multiples, and in fact, we will never run out of multiples.

Can you predict the next five multiples of 2 and 3 without listing?

The most important among the multiples is the **least common multiple**.  The least common multiple is the smallest among all the multiples. Clearly, the least common multiple of 2 and 3 is 6. Here are some examples.

***Example 1:***Find the least common multiple of 3 and 5

Multiples of 3: 3, 6, 9. 12, **15,** 18

Multiples of 5: 5, 10, **15**, 20, 25,30

As we can see, **15**appeared as the first common multiple, so 15 is the least common multiple of 3 and 5.

***Example 2:***Find the least common multiple of 3, 4, and 6.

In this example, we find the least multiple that are common to the three numbers.

Multiples of 3: 3, 6, 9, **12**, 15

Multiples of 4: 4, 8, **12**, 16, 20

Multiples of 6: 6, **12**, 18, 24, 30

So, the least common multiple of 3, 4, and 6 is **12**.

**Example 3:** Find the least common multiple of 3, 8 and 12.

Multiples of 3: 3, 6, 9, 12, 15, 18, 21, **24**

Multiples of 4: 4, 8, 12, 16, 20, **24**,

Mulitples of 12: 12, **24**, 36, 48, 60

So, the least common multiple of 3, 4 and 6 is **24**.

# How to Add Positive and Negative Integers

BY [CIVIL SERVICE REVIEWER](http://civilservicereview.com/author/jrbautista/) · AUGUST 10, 2013

One of the topics in basic mathematics  that will likely be included in the the Philippine CivilService Exam both professional and subprofessional are operations on integers. Although a few Civil Service test items may be given from this topic,  it is important that you master it because a lot of calculation in other topics will need knowledge of integers and its operations (addition, subtraction, multiplication, division). For example, solving some word problems in mathematics and solving equations will need knowledge on operations of integers.

Integers are whole numbers that are either positive or negative. Examples of integers are -5, 6, 0, and 10. If we place this on the number line, negative integers are the integers that are below 0 (left of 0), while the positive integers are the integers above 0 (right of 0).

##### Adding Integers that Are Both Positive

When you add integers that are both positive, it is just like adding whole numbers. Below are the examples.

Example 1: +2 + +4 = +6

Example 2: +9 + +41 + +9 + = +56

Example 3: +120 + +13 + +12 + = +145

Although we have created a small + before the number to indicate that it is positive, in reality, only negative numbers have signs. This means that +2 + +4 = +6 is just written as 2 + 4 = 6.

##### Adding Integers that Are Both Negative

Adding number that are both negative is just the same as adding numbers that are both positive. The only difference is that if you add two negative numbers, the result is negative.

Example 1: -5 + -8 = -13

Example 2: -10 + -18 + -32 + = -60

Example 3: -220 + -11 + -16 + = -247

##### How to Add Positive and Negative Integers

Before adding, you should always remember that +1 and -1 cancel out each other, or +1 + -1 is 0. So the strategy is to pair the positive and negative numbers and take out what’s left.

Example 1:  What is +13 + -8?

Solution:

We pair 8 positives and 8 negatives to cancel out. Then what’s left is of +13 is +5. In equation form, we have

+13 + -8 = +5 + +8 + -8 = +5 + (+8 + -8) = +5 + (0) = +5

Example 2: What is +17 + -20?

Solution:

We pair 17 negatives and 17 positives. What’s left of -20 is -3. In equation form, we have

+17 + -20 = +17 + (-17 + -3) =  (+17 + -17) + -3 = 0 + -3 = -3

Example 3: What is +16 + +37 + -20 + -3 +-9 ?

In answering questions with multiple addends, combine all the positives and the negatives then add.

That is +16 + +37 = +53 and  -20 + -3 +-9 = -32.

So, the final equation is +53  + -32. We pair 32 positives and 32 negatives leaving 21 positives.

In equation form, we have

+53  + -32 = +21  + +32 + -32 = +21  + (+32 + -32) = +21 + 0 = +21

# Practice Exercises on Addition of Integers

BY [CIVIL SERVICE REVIEWER](http://civilservicereview.com/author/jrbautista/) · AUGUST 11, 2013

In the previous post, we have learned about [adding positive and negative integers](http://civilservicereview.com/2013/08/add-positive-and-negative-integers/) particularly on how to add integers with different signs. In this post, I am going to give you 10 exercises on adding integers. I will give the answers below for you to be able to check if your answers are correct. Also, I am going to omit the + sign before the positive integers because this is not usually shown in the exam. This means that 3 will automatically mean +3 unless a – sign precedes it.

**Exercises on Addition of Integers**

1. 28 + 12
2. -14 + -11
3. 24 + -15
4. -16 + 31
5. 23 + 46 + -15
6. 45 + -12 + -16
7. -12 + -15 + -62
8. 22 +  -36 + 36
9. 12 + 18 + -12 + -18
10. 31 + 55 + -41 + - 32 + -10

# How to Subtract Positive and Negative Integers

BY [CIVIL SERVICE REVIEWER](http://civilservicereview.com/author/jrbautista/) · AUGUST 15, 2013

This is the continuation of the series of Civil Service review inmathematics particularly on operations of integers. In this post, we are going to discuss the most complicated operation on integers. I have taught people of all ages about this topic and it seems that for many, this is the most difficult among the four operations. In this post, we are going to learn how to subtract positive and negative integers or signed numbers. Note that in subtracting integers, there are only  four forms. If a and b are positive, the subtraction are of the following forms.

Case 1: positive minus positive (a – b)  
Case 2: negative minus positive (-a – b)  
Case 3: positive minus negative (a – -b)  
Case 4: negative minus negative (-a – -b)

##### **How to Subtract Positive and Negative Integers**

What most people don’t know that a – b is the same as a + -b,or subtracting a number is the same as adding its negative. That means that you only have to memorize the steps in [addition of integers](http://civilservicereview.com/2013/08/add-positive-and-negative-integers/). Given a subtraction sentence, you then transform it  into addition. Here are a few examples.

Case 1 Exampe 1: 5 – 8

Subtracting is the same as adding its negative, so 5 - 8 = 5 + -8. Note that 5 + -8 is already addition and 5 + -8 = -3.

Case 2 Example: -10 – 4

The expression -10 – 4 is the same as -10 + -4 = -14.

Remember also that if you see two consecutive – signs or a minus and a negative sign, you can transform it to +. That is, -(-a) = + a and -(-a) + a. In most exam, the negative signs are not usually superscript, so you will likely -(-a).

Case 3 Example: 5 – -6

The above expression might be written in 5- -6 or 5-(-6). In any case, two negative signs, a minus and a negative sign can be transformed into a plus sign so, 5 - (-6) = 5 + 6 = 11. Notice that the last equation is also an addition sentence.

Case 4 Example: -8 – -6

The expression -8 – -6 = -8 + 6 = -2.

# Civil Service Practice Test on Subtracting Integers

BY [CIVIL SERVICE REVIEWER](http://civilservicereview.com/author/jrbautista/) · AUGUST 18, 2013

Three days ago, we have learned[how to subtract positive and negative integers](http://civilservicereview.com/2013/08/subtract-positive-and-negative-integers/)or [signed numbers](http://en.wikipedia.org/wiki/Integer). In this post, I am going to give you a practice test on subtracting integers. For convenience, I have colored the negative signs blue instead of raising them to an exponent.

1. 12 – 23

2. -21 -(-4)

3. 17 – (-36)

4. -18 – 13

5. 22 – 35

6. -34 -(- 21)

7. 29 -(- 6)

8. 98 – 14

9. - 87 – 53

10. 63 – 92

# How to Subtract Positive and Negative Integers

BY [CIVIL SERVICE REVIEWER](http://civilservicereview.com/author/jrbautista/) · AUGUST 15, 2013

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Case 1: positive minus positive (a – b)  
Case 2: negative minus positive (-a – b)  
Case 3: positive minus negative (a – -b)  
Case 4: negative minus negative (-a – -b)

##### **How to Subtract Positive and Negative Integers**

What most people don’t know that a – b is the same as a + -b,or subtracting a number is the same as adding its negative. That means that you only have to memorize the steps in [addition of integers](http://civilservicereview.com/2013/08/add-positive-and-negative-integers/). Given a subtraction sentence, you then transform it  into addition. Here are a few examples.

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Subtracting is the same as adding its negative, so 5 - 8 = 5 + -8. Note that 5 + -8 is already addition and 5 + -8 = -3.

Case 2 Example: -10 – 4

The expression -10 – 4 is the same as -10 + -4 = -14.

Remember also that if you see two consecutive – signs or a minus and a negative sign, you can transform it to +. That is, -(-a) = + a and -(-a) + a. In most exam, the negative signs are not usually superscript, so you will likely -(-a).

Case 3 Example: 5 – -6

The above expression might be written in 5- -6 or 5-(-6). In any case, two negative signs, a minus and a negative sign can be transformed into a plus sign so, 5 - (-6) = 5 + 6 = 11. Notice that the last equation is also an addition sentence.

Case 4 Example: -8 – -6

The expression -8 – -6 = -8 + 6 = -2.

Observe that the four forms are already completed in the examles. From the strategy above, we only remember two strategies: (1) transform any subtraction sentence to addition sentence and (2) replace two consecutive negatives or a minus and a negative with + sign.

# Subtraction of Integers Quiz 1

BY [CIVIL SERVICE REVIEWER](http://civilservicereview.com/author/jrbautista/) · MAY 10, 2014

Welcome to the first quiz on Subtraction of Integers. If you have forgotten how to subtract integers, please read [*How to Subtract Integers*](http://civilservicereview.com/2013/08/subtract-positive-and-negative-integers/). You can alsoanswer the [Practice Exercise](http://civilservicereview.com/2013/08/practice-test-on-subtracting-integers/) first (with [full solutions](http://civilservicereview.com/2013/08/subtracting-integers-practice-test/)) before answering the quiz below. Note that in some mobile devices, theanswers maybe shown, so it is better to answer this quiz using a PC.

Instruction: Perform the subtraction. To check if your answer is correct, click the + button. You may want check your answers and share with us your score. :-)

**Subtraction of Integers Quiz 1**

1. What is 13 - 8?

2. What is 7 - 20?

3. What is -1 - 11?

4. What is 21 - (- 4)?

5. What is - 6 - 5?

6. What is 0 - (- 8)?

7. What is 15 - 12?

8. What is 9 - 18?

9. What is - 6 - (-4)?

10. What is - 10 - 12?

11. What is -7 - (- 8)?

12. What is 3 - 6?

13. What is 14 - (- 8)?

14. What is - 16 - 6?

15. What is 8 -(- 8)?

# How to Multiply Signed Numbers

BY [CIVIL SERVICE REVIEWER](http://civilservicereview.com/author/jrbautista/) · AUGUST 20, 2013

In the two previous post inMathematics, we have discussed how to [add](http://civilservicereview.com/2013/08/add-positive-and-negative-integers/)and [subtract](http://civilservicereview.com/2013/08/subtract-positive-and-negative-integers/) signed numbers. In this post, we are going to learn how to multiply signed numbers particularly integers. Signed means positive and negative.

**Positive Integer x Positive Integer**

Clearly, the product is positive. We had been multiplying positive integers since Grade school and we all know that the product is positive.

**Positive Integer x Negative Integer**

When you multiply, notice that you are actually adding repeated. When we say 2 x 3, we are actually saying twice three or 2 groups of 3 or 3 + 3. When we say, thrice 11, we are saying 11 + 11 + 11. With this in mind, 3 x – 5 = -5 + -5 + -5. Since we are adding integers which are negative, the sum is also negative or -15. This means that 3 x -5 = -15. If we generalize this, we can say that the product of a positive integer and a negative integer is negative.

**Negative Integer x Positive Integer**

If you can remember, multiplication is [commutative](http://en.wikipedia.org/wiki/Commutative_property). This means that the order of the number you multiply does not matter, their product will always be the same. For example, 4 x 3 x 5 is equal to 5 x 4 x 3 or 3 x 4 x 5 or any other arrangement using the three numbers. This means that 3 x -5 = -5 x 3. So, a negative integer multiplied by a positive integer is also negative.

**Negative Integer x Negative Integer**

For multiplication of two negative integers, we can use patterns to know their product and generalize.

-3 x 2 = -6

-3 x 1 = -3

– 3 x 0 = 0

Now, what is -3 x -1?

If we look at the pattern in the product, we are actually adding by 3 each step so the next number is 3. All other numbers from -1, -2, -3 and so on will be positive (Why?). Therefore, the product of two negative numbers is positive.

**Summary: Rules on how to Multiply Signed Numbers**

From the above discussion, we summarize the multiplication of integers.

Positive Integer x Positive Integer = Positive Integer

Positive Integer x Negative Integer = Negative Integer

Negative Integer x Positive Integer = Negative Integer

Negative Integer x Negative Integer = Positive Integer

We can also say that if we multiply two numbers with the same sign, the answeris positive. If we multiply two numbers with different signs, the answer is negative.

# Practice Test on Multiplying Integers

BY [CIVIL SERVICE REVIEWER](http://civilservicereview.com/author/jrbautista/) · AUGUST 21, 2013

In the previous post, we have learned the [rules in multiplying integers](http://civilservicereview.com/2013/08/multiply-signed-numbers/).  Below is a 10-item practice test on multiplying integers. Note that in multiplication, we can use the x and () symbols in multiplying two numbers. This means that 3 x 4 is the same as 3 (4) and (3)(4). We will use both symbols in the practice test below to familiarize yourselves with them.  Any of the two symbols can be used in the Civil Serviceexams.

##### **Practice Test on Multiplying Integers**

1. -4 x -8

2. 3 x -7

3. -12 x -7

4.  -8 x -1 x -4

5. (3 x 4)(-5)

6. 4 x -3 x -2

7. -7 x -2 x 3

8. (-8)(-3)(2)

9. (-6)(-7)(-2)

10. (2)(-3)(5)(-2)

# Dividing Positive and Negative Integers

BY [CIVIL SERVICE REVIEWER](http://civilservicereview.com/author/jrbautista/) · AUGUST 26, 2013

In the previous post on integers, we have learned the [**rules in multiplying positive integers and negative integers**](http://civilservicereview.com/2013/08/multiply-signed-numbers/). In this post, we are going to learn how to divide positive and negative integers.

If you have observed, in the post on [**subtracting integers**](http://civilservicereview.com/2013/08/subtract-positive-and-negative-integers/), we have converted the “minus sign” to a “plus negative sign.” I think it is safe for us to say that subtraction is some sort of “disguised addition.” Similarly, we can also convert a division expression to multiplication. For example, we can turn

\displaystyle \frac{5}{3} to (5 \times \frac{1}{3}).

In general, the division

\displaystyle \frac{a}{b} to (a \times \frac{1}{b}).

From the discussion above, we can ask the following question:

Can we use the rules in multiplying integers when dividing integers?

The answer is a big YES. The rules are very much related.

positive integer ÷  positive integer = positive integer  
positive integer ÷  negative integer = negative integer  
negative integer ÷  positive integer = negative integer  
negative integer ÷  negative integer = positive integer

Notice that they are very similar to the rules in multiplying integers.

positive integer x  positive integer = positive integer  
positive integer x  negative integer = negative integer  
negative integer x  positive integer = negative integer  
negative integer x  negative integer = positive integer

Here are some examples worked examples.

1. 18 ÷ 3 = 6

2.36 ÷ -12 = – 3

3. -15 ÷ 2 = – 7.5

4.- 8 ÷ -4 = 2

From the discussion and the worked examples above, we can therefore conclude that in dividing positive and negative integers, we only need to memorize the rules in multiplying integers and apply them in dividing integers.

# Practice Test on Dividing Integers

BY [CIVIL SERVICE REVIEWER](http://civilservicereview.com/author/jrbautista/) · AUGUST 30, 2013

In the previous post we have discussed how to [divide integers](http://civilservicereview.com/2013/08/dividing-positive-and-negative-integers/).[Operations on real numbers](http://civilservicereview.com/2013/08/operations-on-real-numbers/), particularly integers, is one of the scopes of the Civil ServiceExaminations both Professional and Subprofessional.  You must master these operations because you will use them in solving equations and word problems in Algebra.

Test your skill by answering the exercises below. Recall that a divided by b is the same as a times reciprocal of b.

**Practice Test on Dividing Integers**

1.) -35 ÷ 7

2.) 38 ÷ -19

3.) 56 ÷ 8

4.) -84 ÷ -12

5.) 5. -28 ÷ -1

6.) 0 ÷ -5

7.) 47 ÷ -47

8.) -156 ÷ 12

9.) -34 ÷ -17

10.) -180 ÷ 9

# A Gentle Introduction to Fractions

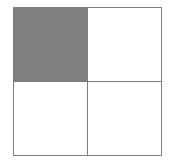
BY [CIVIL SERVICE REVIEWER](http://civilservicereview.com/author/jrbautista/) · SEPTEMBER 8, 2013

Fractions is one of themathematics topics that many people have difficulty with. However, unfortunately, it is also one of the most important topics that must be mastered. This is because examination questions inmathematics always include fractions. For example, in the Civil Service Review Numerical Reasoning tests, fractions appear in almost every test: basic arithmetic, number sequences, equations and problem solving.

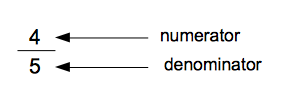
In this post, we are going to discuss the basics about fractions particularly about the terminologies used. Of course, you don’t really have to memorize them now, but you can refer to this post in the following discussions. In the future discussions, you will use the vocabulary that you have learned here.

**Introduction to Fractions**

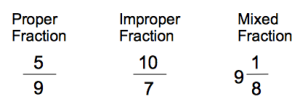
In layman’s language, a fraction is really a **part of a whole**. In the figure below, the part which is shaded is one out of four, so we say that ¼ of the square is shaded. We can also say that three out of four or ¾ of the square is not shaded. We can also say that adding ¼ and ¾ equals one whole.

[](http://i0.wp.com/civilservicereview.com/wp-content/uploads/2013/09/one-fourth.png)

Fractions can also be a **subset of a set.** If 3 out of 10 students are girls, then we say that 3/10 of the students are girls. A fraction could also mean division. For example, wen we say 7/10, we can also mean, 7 divided by 10.

[](http://i1.wp.com/civilservicereview.com/wp-content/uploads/2013/09/fractions-1.png)

A fraction is composed of a **numerator**, the number above the bar, and a**denominator**, the number below the bar. . Fractions whose numerator are less than the denominator are called **proper fractions**. Fractions whose numerator are greater than the numerator are called **improper fractions**. Improper fractions can be converted to **mixed fractions** or fractions that contain whole numbers.

[](http://i1.wp.com/civilservicereview.com/wp-content/uploads/2013/09/fractions-2.png)

Just like other numbers, we can perform operations on fractions. In the next four posts, we will be discussing the different operations on fractions. We will learn how to add, subtract, multiply, and divide fractions.

# How to Get the Least Common Multiple of Numbers

BY [CIVIL SERVICE REVIEWER](http://civilservicereview.com/author/jrbautista/) · SEPTEMBER 10, 2013

In mathematics, a multiple is a product of any number and an integer. The numbers 16, -48 and 72 are multiples of 8 because 8 x 2 = 16, 8 x -3 = -48 and 8 x 9 = 72. Similarly, the first five positive  multiples of 7 are the following:

**7, 14, 21, 28, 35**.

In this post, we will particularly talk about positive integers and positive multiples.  This is in preparation for the discussions on addition and subtraction of fractions.

We can always find a common multiple given two or more numbers. For example, if we list all the positive multiples of 2 and 3, we have

2, 4, **6**, 8, 10, **12**, 14, 16, **18**, 20

and

3, **6**, 9, **12**, 15, **18**, 21, 24, 27, 30.

As we can see, in the list, 6, 12 and 18 are common multiples of 2 and 3. If we continue further, there are still other multiples, and in fact, we will never run out of multiples.

Can you predict the next five multiples of 2 and 3 without listing?

The most important among the multiples is the **least common multiple**.  The least common multiple is the smallest among all the multiples. Clearly, the least common multiple of 2 and 3 is 6. Here are some examples.

***Example 1:***Find the least common multiple of 3 and 5

Multiples of 3: 3, 6, 9. 12, **15,** 18

Multiples of 5: 5, 10, **15**, 20, 25,30

As we can see, **15**appeared as the first common multiple, so 15 is the least common multiple of 3 and 5.

***Example 2:***Find the least common multiple of 3, 4, and 6.

In this example, we find the least multiple that are common to the three numbers.

Multiples of 3: 3, 6, 9, **12**, 15

Multiples of 4: 4, 8, **12**, 16, 20

Multiples of 6: 6, **12**, 18, 24, 30

So, the least common multiple of 3, 4, and 6 is **12**.

**Example 3:** Find the least common multiple of 3, 8 and 12.

Multiples of 3: 3, 6, 9, 12, 15, 18, 21, **24**

Multiples of 4: 4, 8, 12, 16, 20, **24**,

Mulitples of 12: 12, **24**, 36, 48, 60

So, the least common multiple of 3, 4 and 6 is **24**.

In the [next part](http://civilservicereview.com/2013/09/least-common-multiple/)of this [**series**](http://civilservicereview.com/2014/01/operations-on-fractions/), we will discuss about [How to Add Fractions](http://civilservicereview.com/2013/09/how-to-add-fractions/).

# How to Add Fractions

BY [CIVIL SERVICE REVIEWER](http://civilservicereview.com/author/jrbautista/) · SEPTEMBER 14, 2013

Fractions whose denominators are the same are called similar fractions. Fractions that are not similar are called dissimilar fractions. Hence, the fractions \frac{1}{8}, \frac{3}{8}, and \frac{5}{8} are similar fractions, while the fractions \frac{2}{3} and \frac{1}{2} are dissimilar fractions. In this post, we are going to learn how to add fractions.

**How to Add Similar Fractions**

Adding similar fractions is very easy.  In adding similar fractions, you just add the numerator and copy the denominator.  Here are a few examples.

**Example 1**

\displaystyle \frac{1}{5} + \frac{2}{5} = \frac{1 + 2}{5} = \frac{3}{5}

**Example 2**

\displaystyle \frac{1}{8} + \frac{2}{8} + \frac{4}{8} = \frac{1 + 2 + 4}{8} = \frac{7}{8}

**Example 3**

\displaystyle \frac{1}{9} + \frac{3}{9} + \frac{7}{9} = \frac{11}{9}

In most cases, improper fractions or fractions whose denominator is less than its numerator such as the third example is converted to mixed form. The mixed form of \frac{11}{9} is 1 \frac{2}{9}. We will discuss how to make such conversion in the near future.

**How to Add Dissimilar Fractions**

Addition of dissimilar fractions is a bit more complicated than adding similar fractions. In adding dissimilar fractions, you must [determine the least common multiple](http://civilservicereview.com/2013/09/least-common-multiple/) (LCM)  of their denominator which is known as the least common denominator. Next, you have to convert all the addends to equivalent fractions whose denominator is the LCM. Having the same denominator means that the fractions are already similar.  Here are a few examples.

***Example 1***

\displaystyle \frac{1}{2} + \frac{1}{3}

***Solution***

*a. Get the*[*least common multiple*](http://civilservicereview.com/2013/09/least-common-multiple/)*(LCM) of 2 and 3.*

Multiples of 2: 2, 4, **6**, 8, 10, 12

Multiples of 3: 3, **6**, 9, 12,  15

LCM of 2 and 3 is **6**.

*b. Convert the fractions into fractions whose denominator is the LCM which is****6****.*

First Addend: \displaystyle \frac{1}{2} = \frac{m}{6}

m = (6 \div 2) \times 1 = 3.

So, the equivalent of \frac{1}{2} is \frac{3}{6}.

Second Addend: \displaystyle \frac{1}{3} = \frac{n}{6}

n = (6 \div 3) \times 1 = 2

So, the equivalent fraction of \frac{1}{3} is \frac{2}{6}.

*c. Add the equivalent fractions*

\displaystyle \frac{3}{6} + \frac{2}{6} = \frac{5}{6}.

So, \displaystyle \frac{1}{2} + \frac{2}{3} = \frac{5}{6}.

***Example 2***

\displaystyle \frac{2}{3} + \frac{1}{5}

***Solution***

*a. Get the*[*LCM*](http://civilservicereview.com/2013/09/least-common-multiple/)*of 3 and 5.*

Multiples of 3: 3, 6, 9, 12, **15**, 18

Multiples of 5: 5, 10, **15**, 20

Therefore, the LCM of 3 and 5 is **15**.

*b. Convert the given fractions into equivalent fractions whose denominator is****15****.*

First Addend: \displaystyle \frac{2}{3} = \frac{p}{15}

p = (15 \div 3) \times 2 = 10

So, the equivalent fraction of \frac{2}{3} is \frac{10}{15}.

Second Addend: \displaystyle \frac{1}{5} = \frac{q}{15}

q = 15 \div 5 \times 1 = 3

So, the equivalent fraction of \frac{1}{5} is \frac{3}{15}.

c. Add the equivalent fractions

\displaystyle \frac{10}{15} + \frac{3}{15} = \frac{13}{15}.

So, \displaystyle \frac{2}{3} + \frac{1}{5} = \frac{13}{15}

***Example 3***

\displaystyle \frac{2}{3} + \frac{1}{6} + \frac{1}{8}

***Solution***

*a. Get the*[*LCM*](http://civilservicereview.com/2013/09/least-common-multiple/)*of 3, 6 and 8.*

Multiples of 3: 3, 6, 9, 12, 15, 18, 21, **24**

Multiples of 6: 6, 12, 18, **24**, 30

Multiples of 8: 8, 16, **24**, 32, 40

LCM of 3, 6 and 8 is 24.

*b. Convert the given fractions into equivalent fractions whose denominator is****24****.*

First Addend: \displaystyle \frac{2}{3} = \frac{x}{24}

x = (24 \div 3) \times 2 = 8 \times 2 = 16.

Therefore, the equivalent fraction of \frac{2}{3} is \frac{16}{24}

Second Addend: \displaystyle \frac{1}{6} = \frac{y}{24}

y = (24 \div 6) \times 1 = 4

Therefore, the equivalent fraction of \frac{1}{6}  is \frac{4}{24}

Third Addend: \displaystyle \frac{1}{8} = \frac{z}{24}

z = (24 \div 8) \times 1 = 3

Therefore, the equivalent fraction of \frac{1}{8} is \frac{3}{24}.

*c. Add the equivalent fractions*

\displaystyle \frac{16}{24} + \frac{4}{24} + \frac{3}{24} = \frac{23}{24}

In the next post, we will have more examples and exercises regarding addition of similar and dissimilar fractions. I will also give you some tips in getting the least common multiple of two or more numbers without listing.

# Fraction Addition Practice Test 1

BY [CIVIL SERVICE REVIEWER](http://civilservicereview.com/author/jrbautista/) · SEPTEMBER 17, 2013

In the previous post, we have learned[**how to add fractions**](http://civilservicereview.com/2013/09/how-to-add-fractions/) both similar and dissimilar. We have discussed that that in adding similar fractions, we just add the numerator of the addends and copy the denominator. On the other hand, in adding dissimilar fractions, we need to [**get the least common multiple**](http://civilservicereview.com/2013/09/least-common-multiple/) of the denominator or the least common denominator to be able to convert them to similar fractions.

Below is a practice test on on adding similar and dissimilar fractions.  If you already know how, convert your answers to [**lowest terms**](http://civilservicereview.com/2013/10/convert-fractions-to-lowest-terms/) or mixed form.

**Fraction Addition Practice Test 1**

1. \displaystyle \frac{2}{7} + \frac{3}{7}

2. \displaystyle \frac{3}{5} + \frac{1}{5}

3. \displaystyle \frac{2}{3} + \frac{1}{8}

4. \displaystyle \frac{1}{4} + \frac{1}{2} + \frac{2}{5}

5. \displaystyle \frac{1}{6} + \frac{2}{3}

6. \displaystyle \frac{1}{4} + \frac{1}{8}

7. \displaystyle \frac{2}{3} + \frac{1}{2} + \frac{5}{6}

8. \displaystyle \frac{1}{11} + \frac{2}{11} + \frac{3}{11}

9. \displaystyle \frac{1}{9} + \frac{2}{9} + \frac{1}{3}

10. \displaystyle \frac{1}{8} + \frac{1}{2} + \frac{1}{3}

11. \displaystyle \frac{1}{7} + \frac{2}{21}

12. \displaystyle \frac{7}{10} + \frac{1}{2} + \frac{2}{3}

13. \displaystyle \frac{1}{5} + \frac{3}{8} + \frac{1}{2}

14. \displaystyle \frac{1}{3} + \frac{2}{9} + \frac{1}{6}

15. \displaystyle \frac{1}{4} + \frac{2}{3} + \frac{1}{6}

# Fraction Addition Practice Test 1 Solutions and Answers

BY [CIVIL SERVICE REVIEWER](http://civilservicereview.com/author/jrbautista/) · SEPTEMBER 19, 2013

The idea of [**getting the least common multiple**](http://civilservicereview.com/2013/09/least-common-multiple/)of the denominator in[**adding dissimilar fractions**](http://civilservicereview.com/2013/09/how-to-add-fractions/) is to convert them into similar fractions or fractions whose denominators are the same. Once the fractions are similar, you only need to add the numerator and  copy the denominator.

The solutions to [**Fraction Addition Practice Test 1**](http://civilservicereview.com/2013/09/fraction-addition-practice-test/) below is divided into three parts: (1) getting the least common multiple of the denominator, (2) converting the given fractions to their equivalent fractions whose denominator is the LCM and (3) adding the converted fractions. Of course, in solving this types of problem the Civil Service Exam, you don’t need to go through all the steps. You should try developing your own short cuts to make solving faster.

**Solution and Answers to the** [**Fraction Addition Practice Test 1**](http://civilservicereview.com/2013/09/fraction-addition-practice-test/)

**Solution to Number 1**

Given: \displaystyle \frac{2}{7} + \frac{3}{7}

\displaystyle \frac{2}{7} + \frac{3}{7} = \frac{2 + 3}{7} = \frac{5}{7}

Answer: \displaystyle \frac{5}{7}

**Solution to Number 2**

Given: \displaystyle \frac{3}{5} + \frac{1}{5}

\displaystyle \frac{3}{5} + \frac{1}{5} = \frac{3 + 1}{5} = \frac{4}{5}

Answer: \displaystyle \frac{4}{5}

**Solution to Number 3**

Given: \displaystyle \frac{2}{3} + \frac{1}{8}

A. Get the LCM of the denominators 8 and 3.

Multiples of 3: 3, 6, 9, 12, 15, 18, **24**

Multiples of 8: 8, 16, **24**, 32, 40

Therefore, the LCM of 8 and 3 is **24**.

B.Convert the given to equivalent fractions whose denominator is 24.

\displaystyle \frac{2}{3} = \frac{x}{24} (x = (24 \div 3) \times 2 which results to x = 16.)

\displaystyle \frac{1}{8} = \frac{y}{24} (y = (24 \div 8) \times 1 which results to y = 3.)

So, \displaystyle \frac{2}{3} = \frac{16}{24} and \displaystyle \frac{1}{8} = \frac{3}{24}

C. Add the fractions.

\displaystyle \frac{16}{24} + \frac{3}{24} = \frac{19}{24}

Answer: \displaystyle \frac{19}{24}.

**Solution to Number 4**

Given:  \displaystyle \frac{1}{4} + \frac{1}{2} + \frac{2}{5}

A. Get the LCM of 4, 2, and 5.

Multiples of 2: 2, 4, 6, 8, 10, 12, 14, 16, 18, **20**, 22

Multiples of 4: 4, 8, 12, 16, **20**, 24

Multiples of 5: 5, 10, 15, **20**, 25

B. Convert the given to equivalent fractions whose denominator is 20.

\displaystyle \frac{1}{4} = \frac{x}{20}  (x = (20 \div 4) \times 1 which results to x = 5.)

\displaystyle \frac{1}{2} = \frac{y}{20} (y = (20 \div 2) \times 1 which results to y = 10.)

\displaystyle \frac{2}{5} = \frac{z}{20} (z = (20 \div 5) \times 2 which results to z = 8.)

So, \displaystyle \frac{1}{4} = \frac{5}{20}, \displaystyle \frac{1}{2} = \frac{10}{20} and \displaystyle \frac{2}{5} = \frac{8}{20}.

C. Add the fractions.

\displaystyle \frac{5}{20} + \frac{10}{20} + \frac{8}{20} = \frac{23}{20}

Answer: \displaystyle \frac{23}{20} or \displaystyle 1 \frac{3}{20}

**Solution to Number 5**

Given: \displaystyle \frac{1}{6} + \frac{2}{3}

A. Get the LCM of the denominators 6 and 3.

Since 6 is divisible by 3, the LCM of 6 and 3 is **6**.

B. Convert the given to equivalent fractions whose denominator is 6.

Since \displaystyle \frac{1}{6} has already denominator 6, we only need to convert \displaystyle \frac{2}{3}.

\displaystyle \frac{2}{3} = \frac{x}{6} (x = (6 \div 3) \times 2 which results to x = 4).

So, \displaystyle \frac{2}{3} = \frac{4}{6}.

C. Add the equivalent fractions

\displaystyle \frac{1}{6} + \frac{4}{6} = \frac{5}{6}

Answer: \displaystyle \frac{5}{6}.

**Solution to Number 6**

Given: \displaystyle \frac{1}{4} + \frac{1}{8}

A. Get the LCM of the denominators 4 and 8.

Since 8 is divisible by 4, the LCM of 4 and 8 is **8**.

B. Convert the given to equivalent fractions whose denominator is 8.

Since \displaystyle \frac{1}{8} has already 8 as denominator, we only need to convert \displaystyle \frac{1}{4}.

\displaystyle \frac{1}{4} = \frac{x}{8}.  (x = (8 \div 4) \times 1 which results to x = 2).

So, \displaystyle \frac{1}{4} = \frac{2}{8}.

C. Add the fractions.

\displaystyle \frac{2}{8} + \frac{1}{8} = \frac{3}{8}

Answer: \displaystyle \frac{3}{8}

**Solution to Number 7**

Given: \displaystyle \frac{2}{3} + \frac{1}{2} + \frac{5}{6}

A. Get the LCM of the denominators 2, 3, and 6.

Six are both divisible by 2 and 3, sLCM of 2, 3, and 6 is **6**.

B. Convert the given to equivalent fractions whose denominator is 6.

We only need to convert \displaystyle \frac{2}{3} and \displaystyle \frac{1}{2}.

\displaystyle \frac{2}{3} = \frac{x}{6}  (x = (6 \div 3) \times 2 which results to x = 4).

\displaystyle \frac{1}{2} = \frac{y}{6}  (y = (6 \div 2) \times 1 which results to x = 3).

So, \displaystyle \frac{2}{3} = \frac{4}{6} and \displaystyle \frac{1}{2} = \frac{3}{6}.

C. Add the fractions.

\displaystyle \frac{4}{6} + \frac{3}{6} + \frac{5}{6}= \frac{12}{6}

Answer: \displaystyle \frac{12}{6} or 2

**Solution to Number 8**

Given: \displaystyle \frac{1}{11} + \frac{2}{11} + \frac{3}{11}

\displaystyle \frac{1}{11} + \frac{2}{11} + \frac{3}{11} = \frac{1 + 2 + 3}{11} = \frac{6}{11}

Answer: \displaystyle \frac{6}{11}

**Solution to Number 9**

Given: \displaystyle \frac{1}{9} + \frac{2}{9} + \frac{1}{3}.

A. Get the LCM of the denominators 3 and 9.

Since 9 is divisible by 3, the LCM of 3 and 9 is **9**.

B. Convert the given to equivalent fractions whose denominator is 9.

We only need to convert \displaystyle \frac{1}{3}.

\displaystyle \frac{1}{3} = \frac{x}{9} (x = (9 \div 3) \times 1 which results to x = 3).

C. Add the fractions.

\displaystyle \frac{1}{9} + \frac{2}{9} + \frac{3}{9} = \frac{6}{9}.

Answer: \displaystyle \frac{6}{9} or \displaystyle \frac{2}{3} in lowest terms.

**Solution to Number 10**

Given: \displaystyle \frac{1}{8} + \frac{1}{2} + \frac{1}{3}

A. Get the LCM of the denominators 8, 2,  and 3.

Multiples of 2: 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, **24**, 26

Multiples of 3: 3, 6, 9, 12, 15, 18, 21, **24**, 27, 30

Multiples of 8: 8, 16, **24**, 32, 40

So, the LCM of 8, 2 and 3 is **24**.

B. Convert the given to equivalent fractions whose denominator is 8.

\displaystyle \frac{1}{8} = \frac{x}{24}  (x = (24 \div 8) \times 1 which results to x = 3.)

\displaystyle \frac{1}{2} = \frac{y}{24} (y = (24 \div 2) \times 1 which results to y = 12.)

\displaystyle \frac{1}{3} = \frac{z}{24} (z = (24 \div 3) \times 1 which results to z = 8.)

So, \displaystyle \frac{1}{8} = \frac{3}{24}, \displaystyle \frac{1}{2} = \frac{12}{24} and \displaystyle \frac{1}{3} = \frac{8}{24}.

C. Add the fractions.

\displaystyle \frac{3}{24} + \frac{12}{24} + \frac{8}{24} = \frac{3 + 12 + 8}{24} = \frac{23}{24}.

Answer: \displaystyle \frac{23}{24}

**Solution to Number 11**

Given: \displaystyle \frac{1}{7} + \frac{7}{21}

A. Get the LCM of the denominators 7 and 21.

Since 21 is divisible by 7, the least common multiple of 7 and 21 is **21**.

B. Convert the given to equivalent fractions whose denominator is 21.

We only need to convert \displaystyle \frac{1}{7}.

\displaystyle \frac{1}{7} = \frac{x}{21}: (x = (21 \div 7) \times 1 which gives x = 3.)

So, \displaystyle \frac{1}{7} = \frac{3}{21}.

C. Add the fractions.

\displaystyle \frac{3}{21} + \frac{2}{21} = \frac{5}{21}

Answer: \displaystyle \frac{5}{21}

**Solution to Number 12**

Given: \displaystyle \frac{7}{10} + \frac{1}{2} + \frac{2}{3}

A. Get the LCM of the denominators 2, 3, and 10.

Multiples of 2: 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, **30**, 32

Multiples of 3: 3, 6, 9, 12, 15, 18, 21, 24, 27, **30**, 33

Multiples of 10: 10, 20, **30**, 40, 50

The LCM of 2, 3, and 10 is **30**.

B. Convert the given to equivalent fractions whose denominator is 30.

\displaystyle \frac{7}{10} = \frac{x}{30} (x = (30 \div 10) \times 7 which results to x = 21.)

\displaystyle \frac{1}{2} = \frac{y}{30} (y = (30 \div 2) \times 1 which results to y = 15.)

\displaystyle \frac{2}{3} = \frac{z}{30} (z = (30 \div 3) \times 2 which results to z = 20.)

So, \displaystyle \frac{7}{10} = \frac{21}{30}, \displaystyle \frac{1}{2} = \frac{15}{30} and \displaystyle \frac{2}{3} = \frac{20}{30}.

C. Add the fractions.

\displaystyle \frac{21}{30} + \frac{15}{30} + \frac{20}{30} = \frac{56}{30}

Answer:  \displaystyle \frac{56}{30} or 1 \displaystyle \frac{26}{30} or 1 \displaystyle \frac{13}{15} in lowest terms.

**Solution to Number 13**

Given: \displaystyle \frac{1}{5} + \frac{3}{8} + \frac{1}{2}

A. Get the LCM of the denominators 8, 5,  and 2.

Multiples of 2: 2, 4, 6, 8, 10, …, 36, 38, **40**, 42

Multiples of 5: 5, 10, 15, 20, 25, 30, 35, **40**, 45, 50

Multiples of 8: 8, 16, 24, 32, **40**, 48, 56

So, the LCM of 8, 5, and 2 is **40**.

B. Convert the given to equivalent fractions whose denominator is 40.

\displaystyle \frac{1}{5} = \frac{x}{40} (x = (40 \div 5) \times 1 which results to x = 8.)

\displaystyle \frac{3}{8} = \frac{y}{40} (y = (40 \div 8) \times 3 which results to y = 15.)

\displaystyle \frac{1}{2} = \frac{z}{40} (z = (40 \div 2) \times 1 which results to z = 20.)

So, \displaystyle \frac{1}{5} = \frac{8}{40}, \displaystyle \frac{3}{8} = \frac{15}{40} and \displaystyle \frac{1}{2} = \frac{20}{40}.

C. Add the fractions.

\displaystyle \frac{8}{40} + \frac{15}{40} + \frac{20}{40} = \frac{43}{40}

Answer: \displaystyle \frac{43}{40} or 1 \displaystyle \frac{3}{40}

**Solution to Number 14**

Given: \displaystyle \frac{1}{3} + \frac{2}{9} + \frac{1}{6}

A. Get the LCM of the denominators 3, 9, and 6.

Multiples of 3: 3, 6, 9, 12, **18**, 21

Multiples of 6: 6, 12, **18**, 24, 30

Multiples of 9: 9, **18**, 27, 36, 45

So, the LCM of 3, 9 and 6 is **18**.

B. Convert the given to equivalent fractions whose denominator is 18.

\displaystyle \frac{1}{3} = \frac{x}{18} (x = (18 \div 3) \times 1 which results to x = 6.)

\displaystyle \frac{2}{9} = \frac{y}{18} (y = (18 \div 9) \times 2 which results to y = 4.)

\displaystyle \frac{1}{6} = \frac{z}{18} (z = (18 \div 6) \times 1 which results to z = 3.)

So, \displaystyle \frac{1}{3} = \frac{6}{18}, \displaystyle \frac{2}{9} = \frac{4}{18} and \displaystyle \frac{1}{6} = \frac{3}{18}.

C. Add the fractions.

14. \displaystyle \frac{6}{18} + \frac{4}{18} + \frac{3}{18} = \frac{13}{18}

Answer: \displaystyle \frac{13}{18}

**Solution to Number 15**

Given: \displaystyle \frac{3}{12} + \frac{8}{12} + \frac{2}{12} = \frac{13}{12}

A. Get the LCM of the denominators 4, 3 and 6.

Multiples of 4: 4, 8, **12**, 16, 20

Multiples of 3: 3, 6, 9, **12**, 15

Multiples of 6:  6, **12**, 18, 24, 30

So, the LCM of 4, 3, and 6 is **12**.

B. Convert the given to equivalent fractions whose denominator is 8.

\displaystyle \frac{1}{4} = \frac{x}{12} (x = (12 \div 3) \times 1 which results to x = 4.)

\displaystyle \frac{2}{3} = \frac{y}{12} (y = (12 \div 3) \times 2 which results to y = 8.)

\displaystyle \frac{1}{6} = \frac{z}{12} (y = (12 \div 6) \times 1 which results to z = 2.)

So, \displaystyle \frac{1}{4} = \frac{3}{12}, \displaystyle \frac{2}{3} = \frac{8}{12} and \displaystyle \frac{1}{6} = \frac{2}{12}.

C. Add the fractions.

Answer: \displaystyle \frac{13}{12} or \displaystyle 1 \frac{1}{12}

# How to Multiply Fractions

BY [CIVIL SERVICE REVIEWER](http://civilservicereview.com/author/jrbautista/) · OCTOBER 22, 2013

Among the four fundamental operations on fractions, multiplication is the easiest. It is just simple. Multiply the numerator and then the denominator. Of course, if the given fractions can be [**converted to lowest terms**](http://civilservicereview.com/2013/10/convert-fractions-to-lowest-terms/), the easier the multiplication will be.

In this post, we are going to learn how to multiply fractions. You must master this operation, as well as other fundamental operations on fractions because you will use them in higher mathematics and solving word problems. Below are some examples.

***Example 1***

\displaystyle \frac{4}{5} \times \frac{1}{3}

***Solution***

\displaystyle \frac{4}{5} \times \frac{1}{3} = \frac{4 \times 1}{ 5 \times 3} = \frac{4}{15}.

Answer: \displaystyle \frac{4}{15}.

***Example 2***

\displaystyle \frac{2}{3} \times \frac{5}{6}

***Solution***

\displaystyle \frac{2}{3} \times \frac{5}{6} = \frac{10}{18}

We reduce the fraction to lowest term by dividing both the numerator and the denominator by 2. This results to $latex \frac{5}{9} which is the final answer.

Answer: \displaystyle \frac{5}{9}

***Example 3***

\displaystyle \frac{12}{15} \times \frac{2}{3}

***Solution***

First, we reduce \frac{12}{15} by dividing both the numerator and the denominator by 3. This results to \frac{4}{5}. We now multiply:

\displaystyle \frac{4}{5} \times \frac{2}{3} = \frac{8}{15}.

Answer: \displaystyle \frac{8}{45}.

***Example 4***

\displaystyle 3 \frac{1}{2} \times \frac{1}{4}

***Solution***

In this example, we need to convert the mixed fraction into improper fraction. To do this, we multiply the denominator of the mixed fraction to the whole number and the product to the denominator. That is

\displaystyle \frac{2 \times 3 + 1}{2} = \frac{7}{2}.

Now, let us multiply the two fractions.

\displaystyle \frac{7}{2} \times \frac{1}{4} = \frac{7}{8}

Answer: \displaystyle \frac{7}{8}

# Practice Test on Multiplying Fractions

BY [CIVIL SERVICE REVIEWER](http://civilservicereview.com/author/jrbautista/) · OCTOBER 23, 2013

In the previous post, we have learned [**how to multiply fractions**](http://civilservicereview.com/2013/10/how-to-multiply-fractions/). We have learned that it is the easiest operation on fractions. To multiply fraction, we just have to multiply the numerators and then the denominators. That is a fraction \frac{a}{b} multiplied by \frac{c}{d} is equal to \frac{a \times c}{b \times d}.

**Practice Test on Multiplying Fractions**

Below are the exercises on multiplying fractions.  Multiply the fractions and reduce your answers to the lowest terms. If the answer is an improper fraction,[convert the improper fraction to mixed fraction](http://civilservicereview.com/2013/10/improper-fractions-to-mixed-forms/" \o "How to Convert Improper Fractions to Mixed Forms" \t "_blank).

1. \displaystyle \frac{2}{3} \times \frac{4}{5}

2. \displaystyle \frac{3}{4} \times \frac{5}{6}

3. \displaystyle \frac{3}{5} \times \frac{5}{7}

4. \displaystyle \frac{8}{16} \times \frac{2}{3}

5. \displaystyle \frac{6}{15} \times \frac{1}{4}

6. \displaystyle \frac{11}{12} \times \frac{5}{22}

7. \displaystyle \frac{8}{15} \times 9

8. \displaystyle \frac{2}{3} \times \frac{6}{5}

9. \displaystyle \frac{15}{4} \times \frac{3}{18}

10. \displaystyle \frac{1}{8} \times 1 \frac{2}{9}

11. \displaystyle 1\frac{5}{9} \times 3 \frac{2}{7}

# Answers to the Multiplying Fractions Practice Test

BY [CIVIL SERVICE REVIEWER](http://civilservicereview.com/author/jrbautista/) · NOVEMBER 3, 2013

In the previous post, we have learned [**how to multiply fractions**](http://civilservicereview.com/2013/10/how-to-multiply-fractions/). We have learned that it is Below are the solutions and answers to the [Practice Test on Multiplying Fractions](http://civilservicereview.com/2013/10/practice-test-on-multiplying-fractions/).  If you have forgotten the methods of calculation, you can read [How to Multiply Fractions](http://civilservicereview.com/2013/10/how-to-multiply-fractions/).

The methods shown in some of the solutions below is only one among the many. I have mentioned some tips, but I don’t want to fill the solution with short cuts because there are times that when you forget the shortcut, you are not able to solve the problem. My advice if you want to pass the Civil ServiceExamination for Numerical Literacy is to master the basics, practice a lot, and develop your own shortcuts.

1. \displaystyle \frac{2}{3} \times \frac{4}{5}

**Solution**

\displaystyle \frac{2}{3} \times \frac{4}{5} = \frac{2 \times 4}{3 \times 5}= \frac{8}{15}

2. \displaystyle \frac{3}{4} \times \frac{5}{6}

***Solution***

\displaystyle \frac{3}{4} \times \frac{5}{6} = \frac{3 \times 5}{4 \times 6} = \frac{15}{24}

Now, [reducing to lowest term](http://civilservicereview.com/2013/10/convert-fractions-to-lowest-terms/) we have

\displaystyle \frac{15 \div 3}{24 \div 3} = \frac{5}{8}.

3. \displaystyle \frac{3}{5} \times \frac{5}{7}

***Solution***

\displaystyle \frac{3}{5} \times \frac{5}{7} = \frac{3 \times 5}{5 \times 7} = \frac{15}{35}

Reducing to lowest terms, we have

\displaystyle \frac{15 \div 5}{35 \div 5} = \frac{3}{7}.

Note: Notice that the numerator and the denominator of both fractions have 5’s. Since we are multiplying them, we can actually cancel 5 from the start of the calculation making the answer \frac{3}{7}.

4. \displaystyle \frac{8}{16} \times \frac{2}{3}

***Solution***

In computations, if some fractions can be reduced to the lowest term before starting the calculation, the better. In this case, \frac{8}{16} can be reduced to \frac{1}{2}, so we just multiply \frac{1}{2} and \frac{2}{3}.

\displaystyle \frac{1}{2} \times \frac{2}{3} = \frac{1 \times 2}{2 \times 3} = \frac{2}{6}.

Dividing both the numerator and the denominator by two reduces \frac{2}{6} to \frac{1}{3} which is the final answer.

5. \displaystyle \frac{6}{15} \times \frac{1}{4}

***Solution***

First, we reduce first \frac{6}{15} to \frac{2}{5} by dividing both the numerator and denominator by 3.  We then multiply the two fractions.

\displaystyle \frac{2}{5} \times \frac{1}{4} = \frac{2}{20}.

We reduce to lowest terms by dividing both the numerator and the denominator by 2 which results to \frac{1}{10}.

6. \displaystyle \frac{11}{12} \times \frac{5}{22}

***Solution***

In this example, 11 and 22 are both multiples of 11.  Eleven is a numerator and 22 is a other one is in the denominator. This way, you can cancel them by dividing both sides by 11. This makes the first fraction \frac{1}{12} and the second fraction \frac{5}{2}. That is,

.

This gives the final product \displaystyle \frac{5}{24}.

7. \displaystyle \frac{8}{15} \times 9

***Solution***

When multiplying  whole numbers with fractions, just put 1 as the denominator of the whole numbers.

\displaystyle \frac{8}{15} \times \frac{9}{1} = \frac{72}{15}

Dividing both the numerator and denominator by 3, we have \frac{24}{5} or 4 \frac{4}{5} in mixed fraction form.

8. \displaystyle \frac{2}{3} \times \frac{6}{5}

***Solution***

\displaystyle \frac{2}{3} \times \frac{6}{5} = \frac{12}{15}

Dividing the numerator and the denominator by 3, we have \frac{4}{5}.

9. \displaystyle \frac{15}{4} \times \frac{3}{18}

***Solution***

\displaystyle \frac{15}{4} \times \frac{3}{18} = \frac{45}{72}

Dividing both the numerator and the denominator by 9 gives \frac{5}{8} as the finalanswer.

10. \displaystyle \frac{1}{8} \times 1 \frac{2}{9}

***Solution***

First we convert 1 \frac{2}{9} to improper fraction. That is,

1 \displaystyle \frac{2}{9} = \frac{(9 \times 1) + 2}{9} = \frac{11}{9}.

Then we multiply:

\displaystyle \frac{1 \times 11}{8 \times 9} = \frac{11}{72}.

The correct answer is \frac{11}{72}.

11. \displaystyle 1\frac{5}{9} \times 3 \frac{2}{7}

***Solution***

In this example, we convert 3 \frac{2}{7} first to [improper fraction](http://mathworld.wolfram.com/ImproperFraction.html). To convert, multiply the denominator by the whole number and then add the numerator to the product. This will be the numerator of the mixed fraction as shown in the following computation.

\displaystyle 3 \frac{2}{7} = \frac{7 \times 3 + 2}{7} = \frac{23}{7}.

Now, converting 1 \frac{5}{9} to mixed fraction gives us \frac{14}{9}$.

Multiplying the fractions, we have

\displaystyle \frac{14}{9} \times \frac{23}{7}.

We can reduce the fraction to \frac{2}{9} \times 23 by dividing 14 and 7 by 7. Therefore, the finalanswer is \frac{46}{9} or

5 \displaystyle \frac{1}{9}

# How to Divide Fractions

BY [CIVIL SERVICE REVIEWER](http://civilservicereview.com/author/jrbautista/) · NOVEMBER 9, 2013

We have already discussed[**addition**](http://civilservicereview.com/2013/09/how-to-add-fractions/) and [**multiplication of fractions**](http://civilservicereview.com/2013/10/how-to-multiply-fractions/) and what we have left are subtraction and division. In this post, we learn how to divide fractions.

To divide fractions, we must get the reciprocal of the divisor. This is just the same as swapping the numerator and the denominator. For example, the reciprocal of \frac{2}{3} is \frac{3}{2}. After getting the reciprocal, just multiply the fractions.

***Example 1***

\displaystyle \frac{3}{5} \div \frac{2}{3}

***Solution***

First, we get the reciprocal of \frac{2}{3}, the divisor. This is \frac{3}{2}. Then, we multiply the fractions.

\displaystyle \frac{3}{5} \times \frac{3}{2} = \frac{9}{10}

Answer: \frac{9}{10}

***Example 2***

\displaystyle \frac{5}{6} \div \frac{10}{7}

***Solution***

First, we get the reciprocal of \frac{10}{7} which is \frac{7}{10}. Multiplying the fractions, we have

\displaystyle \frac{5}{6} \times \frac{7}{10} = \frac{35}{60}

We [**reduce the answer to lowest terms**](http://civilservicereview.com/2013/10/convert-fractions-to-lowest-terms/)by dividing both the numerator and denominator by 5 resulting to \frac{7}{12}.

Answer: \frac{9}{10}

***Example 3***

\displaystyle 5 \frac{3}{4} \div \frac{4}{5}

***Solution***

In dividing fractions, the dividend and the divisor must not be mixed fractions. Therefore, we need to convert the [**mixed fraction to improper fraction**](http://civilservicereview.com/2013/11/mixed-fractions-to-improper-fractions/). To do this, we multiply 4 by 5 and then add 3. The result becomes the numerator of the mixed fraction. So, the the equivalent of 5 \frac{3}{4} is \frac{23}{4}.

Multiplying the fractions, we have

\displaystyle \frac{23}{4} \times \frac{5}{4} = \frac{115}{16} (Hint: Which number can you cancel?).

We can convert the[**improper fraction to mixed**](http://civilservicereview.com/2013/10/improper-fractions-to-mixed-forms/)**f**orm which is equal to

\displaystyle 7\frac{3}{16}

Answer: \frac{9}{10}

***Example 4***

\frac{7}{8} \div 4.

***Solution***

If the divisor is a whole number, the reciprocal will be 1 “over” that number. In the given, the reciprocal of 4 is \frac{1}{4}. After getting the reciprocal of the divisor, we multiply the two fractions:

\displaystyle \frac{7}{8} \times \frac{1}{4} = \frac{7}{32}.

Answer: \frac{7}{32}

# Practice Test on Dividing Fractions

BY [CIVIL SERVICE REVIEWER](http://civilservicereview.com/author/jrbautista/) · NOVEMBER 29, 2013

Divide the following fractions and reduce your answers to lowest terms. Convert all answers that are improper fractions to mixed fractions.

1.) \frac{4}{5} \div \frac{2}{3}.

2.) \frac{2}{7} \div \frac{5}{21}

3.) 8 \div \frac{4}{5}

4.) \frac{3}{5} \div 12

5.) 15 \frac{2}{3}

6.) 3 \frac{2}{5} \div \frac{3}{4}

7.) \frac{3}{4} \div 2 \frac{1}{9}.

8.)7\frac{2}{3} \div 7\frac{1}{2}

9.) \displaystyle \frac{2\frac{3}{5}}{4}

10.) \displaystyle \frac{2 \frac{1}{2}}{\frac{8}{3}}

# How to Subtract Fractions

BY [CIVIL SERVICE REVIEWER](http://civilservicereview.com/author/jrbautista/) · NOVEMBER 16, 2013

We have already learned the three operations on fractions namely [**addition**](http://civilservicereview.com/2013/09/how-to-add-fractions/), [**multiplication**](http://civilservicereview.com/2013/10/how-to-multiply-fractions/), and [**division**](http://civilservicereview.com/2013/11/how-to-divide-fractions/). In this post, we are going to learn the last elementaryoperation: subtraction. If you have mastered [**addition of fractions**](http://civilservicereview.com/2013/09/how-to-add-fractions/), this will not be a problem for you because the process is just the same. Let’s subtract fractions!

***Example 1:*** \displaystyle \frac{8}{15} - \frac{3}{15}.

***Solution***

The given is a similar fraction (fraction whose denominators are the same), so just like in addition, we just perform the operation on the numerators. Therefore, we just have to subtract the numerator and copy the denominator. That is,

\displaystyle \frac{8}{15} - \frac{3}{15} = \frac{5}{15}.

We [**reduce to lowest term**](http://civilservicereview.com/2013/10/convert-fractions-to-lowest-terms/) by dividing both the numerator and denominator of \frac{5}{15}by 5. This results to \frac{1}{3} which is the final answer.

***Example 2:*** \displaystyle \displaystyle \frac{3}{5} - \frac{1}{2}.

***Solution***

The two fractions are dissimilar, so we must find their least common denominator. To do this, we  **[find the least common multiple](http://civilservicereview.com/2013/09/least-common-multiple/" \o "How to Get the Least Common Multiple of Numbers" \t "_blank)**of 2 and 5. The  common multiples of 2 are

2, 4, 6, 8, 10, 12 and so on

and the common multiples of 5 are

5, 10, 15, 20, 25 and so on.

As we can see from the lists above, 10 is the least common multiple of 2 and 5.

We now change the denominator of both fractions to 10.

First, we find the equivalent fraction of \frac{3}{5}. That is,

\displaystyle \frac{3}{5} = \frac{x}{10}.

To find the value of x,  divide 10 by 5 and then multiply to 3. The result is 6 which becomes the numerator of the equivalent fraction. So, the equivalent fraction of \frac{3}{5} is \frac{6}{10}.  If you are confused with this process, please read [**How to Add Fractions**](http://civilservicereview.com/2013/09/how-to-add-fractions/).

Now, we get the equivalent fraction of \frac{1}{2} or we find the value of y in \frac{1}{2} = \frac{y}{10}. We divide 10 by 2 and then multiply it by 1, which gives us 5. So, the equivalent fraction of \frac{1}{2} is \frac{5}{10}.

We now subtract the fractions.

\displaystyle \frac{6}{10} - \frac{5}{10} = \frac{1}{10}.

The final answer is \frac{1}{10}.

***Example 3:*** 6 \frac{3}{4} - \frac{1}{5}

***Solution***

First, we convert 6 \frac{3}{4} to improper fraction. That is,

\displaystyle \frac{4 \times 6 + 3}{4} = \frac{27}{4}.

to get

\displaystyle \frac{27}{4} - \frac{1}{5}.

The least common multiple of 5 and 4 is 20 (try listing as in example 2).

Now, to get the equivalent fraction, we have \frac{27}{4} = \frac{a}{20}. Now, (20 \div 4) \times 27 = 135. This means, the equivalent fraction

\displaystyle \frac{27}{4} = \frac{135}{20}.

We also convert \frac{1}{5} to \frac{b}{20} which is equal to \frac{4}{20}.

Now, we subtract the fractions.

\displaystyle \frac{135}{20} - \frac{4}{20} = \frac{131}{20}.

 Converting the answer which is an [**improper fraction to mixed number**](http://civilservicereview.com/2013/10/improper-fractions-to-mixed-forms/), we have

\frac{131}{20} = 6 \displaystyle \frac{11}{20}.

# Practice Test on Subtraction of Fractions

BY [CIVIL SERVICE REVIEWER](http://civilservicereview.com/author/jrbautista/) · DECEMBER 16, 2013

A month ago, I have discussed the first part of the [**subtraction of fraction**](http://civilservicereview.com/2013/11/how-to-subtract-fractions/) tutorials and I apologize for the delay of the exercises.  Sharpen what you have learned from the practice test below.

Practice Test on Subtraction of Fractions

1.  \frac{13}{17} - \frac{2}{17}.

2.  \frac{8}{15} - \frac{4}{15}.

3. \frac{5}{8} - \frac{1}{2}

4. \frac{4}{5} - \frac{1}{3}

5. 2 \frac{3}{5} - \frac{1}{4}

6. 4 \frac{5}{6} - 2 \frac{1}{6}

7. 4 \frac{3}{4} - 2 \frac{1}{3}

8. \frac{6}{13} - \frac{3}{10}

9. 4 \frac{8}{15} - 2 \frac{3}{5}

10. 8 \frac{1}{3} - 4

# Solutions and Answers to Subtraction of Fractions Practice Test

BY [CIVIL SERVICE REVIEWER](http://civilservicereview.com/author/jrbautista/) · DECEMBER 17, 2013

Below are the complete solutions and answers to the [**Practice Test on Subtraction of Fractions**](http://civilservicereview.com/2013/12/practice-test-on-subtraction-of-fractions/). If you do not know how to do it or you have forgotten the methods, please read  **[How to Subtract Fractions](http://civilservicereview.com/2013/11/how-to-subtract-fractions/" \o "How to Subtract Fractions" \t "_blank).**

Practice Test on Subtraction of Fractions

1.  \frac{13}{17} - \frac{2}{17}.

Solution

The given fractions are similar, so we just subtract the numerators and copy the denominator.

\displaystyle \frac{13}{17} - \frac{2}{17} = \frac{11}{17}.

Answer: \frac{11}{17}.

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2.  \frac{8}{15} - \frac{4}{15}.

This is similar to number 1. They are similar fractions.

\displaystyle \frac{8}{15} - \frac{4}{15} = \frac{4}{15}.

Answer: \frac{4}{15}

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3. \frac{5}{8} - \frac{1}{2}

As we have mentioned in [**How to Add Fractions**](http://civilservicereview.com/2013/09/how-to-add-fractions/) and [**How to Subtract Fractions**](http://civilservicereview.com/2013/11/how-to-subtract-fractions/), we need to make the dissimilar fractions similar in order to perform addition and subtraction. In this case, we need to make their denominators the same. We need to make \frac{1}{2} as \frac{n}{8}, and clearly n = 4. So,

\displaystyle \frac{5}{8} - \frac{4}{8} = \frac{1}{8}

Answer: \frac{1}{8}

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4. \frac{4}{5} - \frac{1}{3}

First, we find the Least Common Multiple (LCM) of 3 and 5 by listing:

Common Multiples of 3: 3, 6, 9, 12, **15**, 18, …

Common Multiples of 5: 5, 10, **15**, 20, 25

So, the LCM of 3 and 5 is 15.

Next, we convert the given to fractions whose denominator is 15.

\frac{4}{5} = \frac{x}{15} which means that x = (15 \div 5) \times 4 = 12.

\frac{1}{3} = \frac{y}{15} which means that y = (15 \div 3) \times 1 = 5.

So, \frac{4}{5} = \frac{12}{15} and \frac{1}{3} = \frac{5}{15}.

Performing the subtraction, we have

\displaystyle \frac{12}{15} - \frac{5}{15} = \frac{7}{15}.

Answer: \frac{7}{15}

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5. 2 \frac{3}{5} - \frac{1}{4}

First, we get the LCM of 4 and 5 which is 20 (try listing as shown in the previous question.

Second, we we convert the mixed fraction to improper fraction. That is,

2 \frac{3}{5} = \frac{5 \times 2 + 3}{5} = \frac{13}{5}.

Third, we get the equivalent fractions of \frac{13}{5} and \frac{1}{4} whose denominator is 20. Clearly, \frac{1}{4} = \frac{5}{20}, so we are only left with \frac{13}{5}.

\frac{13}{5} = \frac{n}{20}

We solve for n: (20 \div 5) \times 13 = 52. This means that

\frac{13}{5} = \frac{52}{20}.

Performing the subtraction, we have

\displaystyle \frac{52}{20} - \frac{5}{20} = \frac{47}{20}.

Converting this [**improper fraction to mixed form**](http://civilservicereview.com/2013/10/improper-fractions-to-mixed-forms/), we have

2 \frac{7}{20} as the answer.

Answer: 2 \frac{7}{20}.

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6. 4 \frac{5}{6} - 2 \frac{1}{6}

This is one of the cases where you can separate the whole number and the fraction in subtraction. I will discuss about this later.  Here, we just subtract the whole numbers 4 - 2 = 2 and then subtract the fraction \frac{5}{6} - \frac{1}{6} = \frac{4}{6}. So, theanswer is 2 \frac{4}{6} or 2 \frac{2}{3} when [reduced to lowest terms](http://civilservicereview.com/2013/10/convert-fractions-to-lowest-terms/).

Answer: 2 \frac{2}{3}.

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7. 4 \frac{3}{4} - 2 \frac{1}{3}

First, we get the LCM of 4 and 3, which is clearly 12 (try listing as shown in No. 4).

Second, we convert the mixed fractions into improper fractions.

4 \frac{3}{4} = \frac{4 \times 4 + 3}{4} = \frac{19}{4}

2 \frac{1}{3} = \frac{3 \times 2 + 1}{3} = \frac{7}{3}

Now, we convert the given fractions to fractions whose denominator is 12.

\frac{19}{4} = \frac{m}{12}, m = (12 \div 4) \times 19 = 57.

\frac{7}{3} = \frac{n}{12}, n = (12 \div 3) \times 7 = 28.

This means that \frac{19}{4} = \frac{57}{12} and \frac{7}{3} = \frac{28}{12}.

Now, subtracting the two fractions, we have

\displaystyle \frac{57}{12} - \frac{28}{12} = \frac{29}{12}.

Converting the improper fraction to mixed form, we have  2\frac{5}{12}.

Answer: 2 \frac{5}{12}.

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8. \frac{6}{13} - \frac{3}{10}

The Least Common Multiple of 10 and 13 is 130. Converting both fractions and and subtracting, we have

\displaystyle \frac{60}{130} - \frac{39}{130} = \frac{21}{130}.

Answer: \frac{21}{130}.

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9. 4 \frac{8}{15} - 2 \frac{3}{5}

The Least Common Multiple of 15 and 5 is 15.

Now, converting the mixed fractions to improper fractions gives us \frac{68}{15} and \frac{13}{5}.

We only need to convert \frac{13}{5} to \frac{n}{15} since the denominator of the other fraction is already 15. Now,

\frac{13}{5} = \frac{39}{15}. Subtracting the two fractions, we have

\displaystyle \frac{68}{15} - \frac{39}{15} = \frac{29}{15}.

Converting the improper fraction to mixed number, we have

\frac{29}{15} = 1 \frac{14}{15}.

Answer: 1 \frac{14}{15}.

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10. 8 \frac{1}{3} - 4

In this case, we just subtract the whole numbers which leaves an answer of 4 \frac{1}{3}.

Answer: 4 \frac{1}{3}

# Exercises on Converting Fractions to Lowest Terms

BY [CIVIL SERVICE REVIEWER](http://civilservicereview.com/author/jrbautista/) · OCTOBER 12, 2013

In the previous post, we learned how to convert fractions to lowest terms. In this post, I have created 15 exercises for you to practice.

Convert the following fractions to lowest terms. In case the fraction is improper, convert it to mixed form. Be sure that the fraction part is in lowest terms.

1. \displaystyle \frac{12}{15}

2. \displaystyle \frac{18}{24}

3. \displaystyle \frac{21}{49}

4. \displaystyle \frac{56}{72}

5. \displaystyle \frac{26}{65}

6. \displaystyle \frac{18}{32}

7. \displaystyle \frac{38}{95}

8. \displaystyle \frac{32}{12}

9. \displaystyle \frac{16}{84}

10. \displaystyle \frac{39}{24}

11. \displaystyle \frac{15}{45}

12. \displaystyle \frac{51}{85}

13. \displaystyle \frac{18}{54}

14. \displaystyle \frac{35}{49}

15. \displaystyle \frac{74}{24}

How to Convert Improper Fractions to Mixed Forms

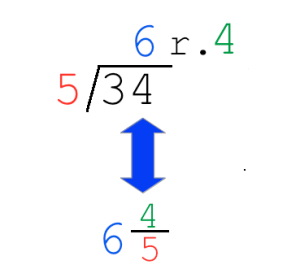
BY [CIVIL SERVICE REVIEWER](http://civilservicereview.com/author/jrbautista/) · OCTOBER 13, 2013

In [**Introduction to Functions**](http://civilservicereview.com/2013/09/an-introduction-to-fractions/)**,** we have learned about proper and improper fractions. A fraction whose numerator (the number above the fraction bar) is less than its denominator (the number below the fraction bar) is called a**proper fraction**. Therefore, \frac{1}{3}, \frac{2}{5} and\frac{11}{20} are proper fractions.

On the other hand,  a fraction whose numerator is greater than its denominator is called an **improper fraction**. Therefore the fractions \frac{21}{7}, \frac{8}{3} and \frac{67}{5} are improper fractions.

In the Civil Service Examinations, some fractions need to be converted from one form to another. For example, in answering a number series test, you might need to convert an improper fraction to mixed form in order to compare it to other fractions in mixed form. In this post, we learn this method: how to convert an improper fraction to mixed form.

In converting improper fractions to mixed form you will just have to divide the fraction, find its quotient and its remainder. Remember that the fraction \frac{34}{5} also means 34 divided by 5.

[](http://i2.wp.com/civilservicereview.com/wp-content/uploads/2013/10/improper-fraction-to-mixed-form.png)When we divide 34 by 5, we call 5 the divisor.  The quotient to this division  is 6with a remainder of 4. From the method, we can observe the following:

* The quotient 6 is the whole number on the mixed fraction.
* The divisor 5 is the denominator of the mixed fraction.
* The remainder 4 goes to the numerator of the mixed fraction.

Now, for the second example, let us convert \frac{28}{3} into mixed fraction. If we divide 28 by 3, the divisor is 3, the quotient is 9 and the remainder is 1. Therefore, the equivalent of the improper fraction \frac{28}{3} is

9 \displaystyle\frac{1}{3}.

# Practice Test on Converting Improper Fractions to Mixed Number

BY [CIVIL SERVICE REVIEWER](http://civilservicereview.com/author/jrbautista/) · OCTOBER 16, 2013

In the previous post, we have learned how to [**convert improper fractions to mixed number**](http://civilservicereview.com/2013/10/improper-fractions-to-mixed-forms/). Now, try the following exercises. All theanswers must also be reduced to lowest terms. Good luck.

1.) 22/7

2.) 81/6

3.) 55/10

4.) 76/32

5.) 34/16

6.) 89/35

7.) 114/6

8.) 81/33

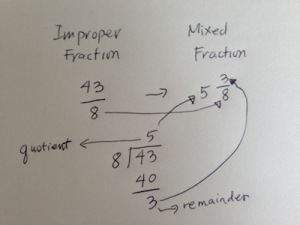
9).) 76/15

10.) 19/3

# Answers to Practice Test on Converting Improper Fraction to Mixed Number

BY [CIVIL SERVICE REVIEWER](http://civilservicereview.com/author/jrbautista/) · OCTOBER 19, 2013

This is the complete solutions andanswers to the [**Practice Test on Converting Improper Fraction to Mixed Number**](http://civilservicereview.com/2013/10/converting-improper-fractions-to-mixed-number/). As illustrated in the image below, the quotient in the division becomes the whole number in the mixed fraction, the remainder in the division becomes the numerator of the fraction part of mixed fraction, and the denominator from the improper fraction becomes  the denominator of the fractional part of the mixed fraction.

[](http://i0.wp.com/civilservicereview.com/wp-content/uploads/2013/10/improper-fraction-to-mixed-fraction.jpg)

In the solutions below, all answers were also [**reduced to lowest terms**](http://civilservicereview.com/2013/10/convert-fractions-to-lowest-terms/).

**Solutions and Answers**

1.) 22/7

**Solution:**

Quotient: 3  
Remainder: 1  
Denominator: 7

Answer: 3 \frac{1}{7}

2.) 81/6

**Solution:**

Quotient: 13  
Remainder: 3  
Denominator: 6

Answer: 13 \frac{3}{6}  
Answer in lowest terms: 13 \frac{1}{2}

3.) 55/10

**Solution:**

Quotient: 5  
Remainder: 5  
Denominator: 10

Answer: 5 \frac{5}{10}  
Answer in lowest terms: 5 \frac{1}{2}

4.) 76/32

**Solution:**

Quotient: 2  
Remainder: 12  
Denominator: 32

Answer: 2 \frac{12}{32}  
Answer in lowest terms: 2 \frac{3}{8}

5.) 34/16

**Solution:**

Quotient: 2  
Remainder: 2  
Denominator: 16

Answer: 2 \frac{2}{16}  
Answer in lowest terms: 2 \frac{1}{8}

6.) 89/35

**Solution:**

Quotient: 2  
Remainder: 19  
Denominator: 35

Answer: 2 \frac{19}{35}

7.) 114/6

**Solution:**

Quotient: 19  
Remainder: 0  
Denominator: 6

Answer: 19 \frac{0}{6} or simply 19.

8.) 81/33

**Solution:**

Quotient: 2  
Remainder: 15  
Denominator: 33

Answer: 2 \frac{15}{33} or 2 \frac{5}{11}.

9.) 76/15

**Solution:**

Quotient: 5  
Remainder: 1  
Denominator: 15

Answer: 5 \frac{1}{15}

10.) 19/3

**Solution:**

Quotient: 6  
Remainder: 1  
Denominator: 3

Answer: 6\frac{1}{3}

# How to Convert Mixed Fractions to Improper Fractions

BY [CIVIL SERVICE REVIEWER](http://civilservicereview.com/author/jrbautista/) · NOVEMBER 6, 2013

We have already learned how to convert [**improper fractions to mixed fractions**](http://civilservicereview.com/2013/10/improper-fractions-to-mixed-forms/).  In this post, we are going to learn how to convert mixed fractions to improper fractions.  In converting mixed fractions to improper fractions, the denominator stays as it is. You only have to calculate for the numerator.  To get the numerator of the improper fraction, multiply the denominator to the whole number and then add the numerator of the mixed fraction.

Let’s have three examples.

***Example 1***

Convert 6 \displaystyle \frac{2}{5} to improper fraction.

***Solution***

Denominator: 5

Numerator: 5 \times 6 + 2

Final Answer: \displaystyle \frac{32}{5}

***Example 2***

Convert \displaystyle 4 \frac{2}{3} to improper fraction.

***Solution***

Denominator: 3

Numerator: 3 \times 4 + 2 = 14

Final Answer: \displaystyle \frac{14}{3}

***Example 3***

Convert 8 \frac{21}{28} to improper fraction.

***Solution***

We can [reduce](http://civilservicereview.com/2013/10/exercises-converting-fractions-lowest-terms/) \frac{21}{28} to \frac{3}{4}, so given fraction can be converted to 8 \frac{3}{4}. Now, we can now convert the mixed fraction to improper fraction.

Denominator: 4

Numerator: 4 \times 8 + 3 = 35

Final Answer: \frac{35}{4}

From the pattern above, the fraction c \displaystyle \frac{a}{b}, where c is the whole number, a is the numerator and b is the denominator can be converted to the improper fraction

# How to Add Numbers with Decimals

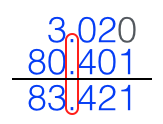
BY [CIVIL SERVICE REVIEWER](http://civilservicereview.com/author/jrbautista/) · FEBRUARY 8, 2014

Now that we have finished learning [fractions](http://civilservicereview.com/2014/01/operations-on-fractions/), we proceed to the learning about decimals. A decimal is another representation of numbers. For instance, the fraction \frac{1}{2} can be represented with 0.5 and the decimal 3 \frac{1}{5} can be represented with 3.2.

In this post, we are going to learn about addition of decimals. In learning decimals, there is just one simple rules: write the numbers, one under the other such that the decimal points are aligned.

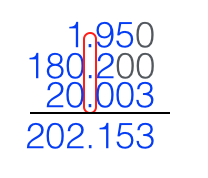
**Example 1: 3.02 + 80.401**

In adding 3.02 and 80.401, the decimal part of the 80.401 has more digits that that of 3.02. But there is no number to the right of 2, so we can just put 0.

[](http://i2.wp.com/civilservicereview.com/wp-content/uploads/2014/02/adding-decimals.png)

Remember that adding 0 to the right hand size of the last number in the decimal does not change its value. That is, 0.02, 0.020, 0.0200, 0.02000 are just the same, so we did not change its value.

**Example 2: 1.95 + 180.2 + 20.003**

[](http://i1.wp.com/civilservicereview.com/wp-content/uploads/2014/02/adding-decimals2.png)

**Example 3: 5.5 + 2.21 + 3.891**

Well, I think you can do this on your own. The answer is 11.601.

Of course, in the actual Civil Service Exam where time is essential, you do not really to put all the 0’s as I have done above. You can just align the decimal points and add the corresponding columns. In case there is just one number in one column, just copy the number on the sum.

# How to Subtract Numbers with Decimals

BY [CIVIL SERVICE REVIEWER](http://civilservicereview.com/author/jrbautista/) · FEBRUARY 11, 2014

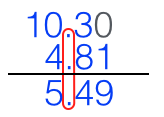
This is the second part of the Decimal Operations series and in this post, we are going to discuss subtraction of numbers with decimals.  This operation is very much the same with addition of decimals.

**How to Subtract Numbers with Decimals**

The rule in subtraction of decimals is the same with [addition of decimals](http://civilservicereview.com/2014/02/add-numbers-with-decimals/). First, position the numbers such that the decimal points are aligned. Then, add zeros to make the number of decimal places the same. Lastly, perform subtraction.

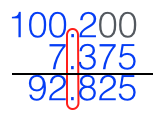
**Example 1: 10.3 – 4.81**

In the first example, we add 0 to the minuend 10.3 to make it 10.30. This way, we can subtract 1 from 0.

[](http://i0.wp.com/civilservicereview.com/wp-content/uploads/2014/02/subtraction-of-decimals.png)

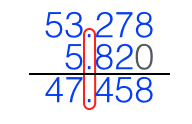
**Example 2: 100.2 – 7.375**

In example 2, we add two zeros to 100.2 so that we can subtract the three decimal numbers.

[](http://i2.wp.com/civilservicereview.com/wp-content/uploads/2014/02/Screen-Shot-2014-04-06-at-1.31.14-AM.png)

**Example 3: 53.278 – 5.82**

In the third example, we add 0 to the decimal part of the subtrahend to make the number of decimal places equal.

[](http://i1.wp.com/civilservicereview.com/wp-content/uploads/2014/02/how-to-subtract-decimals.png)

# How to Multiply Numbers with Decimals

BY [CIVIL SERVICE REVIEWER](http://civilservicereview.com/author/jrbautista/) · FEBRUARY 19, 2014

This is the third part of the Operations on Decimals Series and in this post, we discuss about Multiplication of Decimals. In multiplying decimals, the decimal point in the product has something to do with the number of decimals of the factors.

**How to Multiply Numbers with Decimals Examples**

**Example 1:**  What is  3.6 \times 4?

In this example, only one factor has a decimal number, the other is a whole number. To multiply, first, ignore the decimal point and then just multiply the numbers:

36 \times 4 = 144.

After multiplying, count the number of decimal numbers (numbers after on the right hand side of the decimal point) of the factors. There is only **one** decimal number which is 6. So, in the product, starting from the right, count **one** number and then place the decimal point before that number making it 14.4.

So, the final answer is 14.4.

**Example 2:** What is 8.3 \times 4.2?

Again, ignore the decimal points and multiply the numbers:

83 \times 42 = 3486.

There is one decimal number in the first factor and one in the second factor. Therefore, there are **two** decimal numbers. Now, count **two** numbers from the right, and place the decimal point before the last number on your count.

Therefore, the correct answer is 34.86.

**Example 3:** What is 3.28 \times 0.01?

Now, 328 \times 1 = 328. Notice that there are only three numbers in the product, but there are **four** decimal numbers in the two factors. So, in the product, we count**three** numbers from the right hand side and then add **one** 0 before 3 to make the number of decimals **four**. So, the correct answer is .0328 or 0.0328.

**Multiplying Decimal Numbers by 10**

In multiplying decimal numbers by 10 or its powers, just count the number of zeroes and move the decimal point to the right hand side the number of zeroes appear.

**Example 1:** What is 3.45 \times 10?

Ten has one zero, so, we move the decimal point one place to the right hand side. Therefore, the correct answer is 34.5.

**Example 2:** What is 76.98301 \times 100?

There are two zeros, so we move the decimal point two digits to the right hand side. Moving the decimal points gives us 7698.301

**Example 3:** What is 34.7 \times 1000?

There are three zeros, however, only one decimal point. So, we move the decimal point one time to the right of seven, and add two zeros. Therefore, the final answer is 34700.

# How to Divide Numbers with Decimals

BY [CIVIL SERVICE REVIEWER](http://civilservicereview.com/author/jrbautista/) · FEBRUARY 20, 2014

This is the fourth part and the conclusion of the Operations on Decimals series. In this post, we are going to discuss how to divide numbers with decimals.

In the examples below, it is assumed that you already know how to divide decimal numbers by whole numbers. Therefore, the basic idea is to eliminate the decimal point of the divisor. It can done by multiplying both the divisor and the dividend by powers of 10.

**Example 1:** What is 18.5 divided by 0.$?

To get rid of the decimal point in 0.2, we multiply it by 0. If we do this, we also multiply 8.5 by 10. This gives us 185 divided by 2 which 92.5.

**Example 2:** What is 4.26 divided by 0.3?

To get rid of the decimal point in 0.3, we multiply it with 10. We also multiply 4.26 by 10. This gives us 42.6 divided by 3. Well, we can actually do this mentally: 42 divided by 3 is 14 and 0.6 divided by 3 is 0.2. So, the correct answeris 14.2

**Example 3:** What is 32.85 divided by 0.203?

Well, just multiply 0.203 by 1000; this results to 203. Now, multiply 32.85 by 1000, this gives us 32850. So, the new given now is, 32850 divided by 203. Well, I’m sure you can do that.

**Why does multiplying by powers of 10 works?**

If you divide a by b, then you have the fraction \displaystyle \frac{a}{b}. Now, when we multiply the dividend and divisor with the same number, we are actually multiplying the numerator and denominator with that number. For instance, if we multiply a andb by 10, we have

\displaystyle \frac{a \times 10}{b \times 10} = \frac{10a}{10b} = \frac{a}{b}

we are not actually changing its value of the fraction. Therefore, we are still dividing the same numbers.

Now that concludes our series. In the next post, we will be discussing about percent.

# Introduction to the Concept of Percentage

BY [CIVIL SERVICE REVIEWER](http://civilservicereview.com/author/jrbautista/) · FEBRUARY 25, 2014

Now that we have already studied[**fractions**](http://civilservicereview.com/2014/01/operations-on-fractions/) and [**decimals**](http://civilservicereview.com/2014/02/operations-on-decimals/), we discuss percentage. You are likely to be aware that the concept of percentage is very useful in daily life. We always go to stores where there are discounts and we do not want loans with high interest. These calculations involve the concept of percentage.

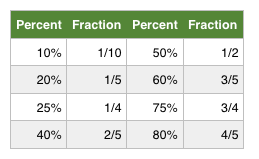
**What is percentage really?**

**Percentage** is a number ratio expressed as a fraction of 100. When we say 10 percent, what we really mean is 10 out of 100, or in fraction notation 10/100. Therefore, when we see that a shirt is sold for a 50 percent discount, we actually say 50 out of 100 or 50/100. Notice that 50/100 when [reduced to lowest terms](http://civilservicereview.com/2013/10/convert-fractions-to-lowest-terms/)is 1/2 which means that we only have to pay half of the price of the shirt. As we all know, we use the symbol % to denote percent.

Converting Percent to Fractions for Faster Calculations

Numbers in their percent form can be converted to fractions for quicker calculations. For example, when we say that a Php2400.00 wristwatch has a 25% discount, we can easily calculate by converting 25% to fraction. The equivalent of 25% discount is 1/4 in fraction, so, we deduct 1/4 of 2400 (which is equal to Php600) from Php2400. This means that we can buy the watch for only Php 1800.00

Percents, fractions, and decimals can be converted to one another, to whichever representation is more convenient for calculations. In examinations such as the Civil Service Exam, in most cases, fraction is the easiest to use but the problem is conversion also takes time. Therefore, it is also good to familiarize yourself with the conversion of the most commonly used fractions in problems such as shown in the table below.  You can memorize them if you want, but the conversion method is fairly easy that you can do them mentally.

[](http://i0.wp.com/civilservicereview.com/wp-content/uploads/2014/02/Screen-Shot-2014-02-25-at-11.49.31-PM.png)

# How to Convert Percent to Fraction

BY [CIVIL SERVICE REVIEWER](http://civilservicereview.com/author/jrbautista/) · MARCH 5, 2014

In Civil Service Examinations, as well as other examinations in basic mathematics, knowing how to convert  [percent](http://civilservicereview.com/2014/02/percentage/), [fractions](http://civilservicereview.com/2014/01/operations-on-fractions/), and[decimals](http://civilservicereview.com/2014/02/operations-on-decimals/) to each other is very advantageous especially if you can do it mentally. Let us try with the following example.

A P640 shirt is marked 25% discount. How much will you have to pay for it?

It seems that you need a pencil for this problem, but you can actually do it in your head. Read it to believe it.



The equivalent of 25% in fraction is 1/4, therefore, you have to take away the fourth of the price. Now, 1/4 of 640 seems difficult but what if we try to split it to 600 + 40? Now, 1/4 of 600 is 150, which means that from the 600, you have 450left. Now, 1/4 of 40 is 10, which means that you have 30 left. So, 450 + 30 is **480**and that is the discounted price of the t-shirt.

Now, with a little bit of practice, you would be able to do this on your own and you won’t have to use a pen to perform calculations for problems such as this.

**How to Convert Percent to Fraction**

There is one important concept to remember when converting percent to fraction. That is, when you say percent, it means per hundred. The word [cent](http://en.wikipedia.org/wiki/Cent_(currency)" \t "_blank)comes from the Latin word centum which means “hundred”. In effect, when you say, 60%, it means 60 per hundred, 0.4% means 0.4 per hundred, 125% means 125 per hundred. When you say x per hundred, you can also represent it by the fraction x/100. This means that the percentages above can be represented as

\displaystyle \frac{60}{100}, \frac{0.4}{100}, \frac{125}{100}

respectively. Now, all we have left to do is to convert these fractions to lowest terms.

Example 1: \frac{60}{100}

Recall that to [convert a fraction to lowest terms](http://civilservicereview.com/2014/02/convert-fractions-to-lowest-terms-2/), we find the[greatest common factor](http://civilservicereview.com/2014/02/video-greatest-common-factor/) (GCF) of its numerator and denominator and then divide them both by the GCF.  The GCF of 60 and 100 is 20, so

\displaystyle \frac{60 \div 20}{100 \div 20} = \frac{3}{5}

Therefore, the equivalent of 60% in fraction is \frac{3}{5}.

Example 2: \frac{0.4}{100}

In this example, we have a decimal point at the numerator and a whole number at the denominator. We have to “get rid” of the decimal point. To do this, we can multiply both the numerator and the denominator by 10 (since 0.4 x 10 = 4). Therefore, we have

\displaystyle \frac{0.4 \times 10}{100 \times 10} = \frac{4}{1000}.

Now, the greatest common factor of 4 and 1000 is 4, so we divide both the numerator and the denominator by 4. The final result is \frac{1}{250}.

Therefore, the equivalent fraction of 0.4% is \frac{1}{250}.

Example 3: \frac{125}{100}

The greatest common factor of 125 and 100 is 25, so we divide both the numerator and the denominator by 25. In doing this, we get \frac{5}{4}.

Therefore, the equivalent fraction of 125% is \frac{5}{4}

**Summary**

There are three steps to remember in converting percent to fractions.

1. Make a fraction from the given percent with the given as numerator and 100 as denominator.
2. Eliminate the decimal points (if there are any) by multiplying the numerator and denominator by the same number which is a power of 10 (10, 100, 1000 and so on).
3. Reduce the resulting fraction to lowest terms.

# How to Convert Fraction to Percent Part 1

BY [CIVIL SERVICE REVIEWER](http://civilservicereview.com/author/jrbautista/) · MARCH 6, 2014

In the previous post, we have learned [how to convert percent to fraction](http://civilservicereview.com/2014/03/convert-percent-to-fraction/). In these series of posts, we learn the opposite: how to convert fraction to percent. I am going to teach you three methods, the last one would be used if you forgot the other two methods, or if the first two methods would not work. Please be reminded though to understand the concept (please do not just memorize).

The first method can be used for fractions whose denominators can be easily related to 100 by **multiplication** or **division**. Recall that from [**Converting Percent to Fraction**](http://civilservicereview.com/2014/03/convert-percent-to-fraction/), I have mentioned that when we say percent it means “per hundred.” In effect, n% can be represented by n/100. Therefore, if you have a fraction and you can turn it into n/100 (by multiplication/division), then you have turned it into percent.

**Example 1**: What is the equivalent of 1/5 in percent?

How do we relate the denominator 5 to 100? By multiplying it by 20. Therefore, we also multiply its numerator by 20:

\displaystyle \frac{1 \times 20}{5 \times 20} = \frac{20}{100}

Now, since we have 100 as denominator, the answer in percent is therefore the numerator. Therefore, the equivalent of 1/5 in percent is 20%.

**Example 2:** What is 3/25 in percent?

Again, how do you related 25 to 100? By multiplying it by 4. Therefore,

\displaystyle \frac{3 \times 4}{25 \times 4} = \frac{12}{100}

Therefore, the equivalent of 3/25 in percent is 12%.

**Example 3:** What is 23/200 in percent?

In this example, we can relate 200 to 100 by dividing it by 2. So, we also divide the numerator by 2. That is

\displaystyle \frac{23 \div 2}{200 \div 2} = \frac{11.5}{100}

Therefore, the answer is 11.5%

There are two important things to remember in using the method above.

(1) in changing the form the fractions to n/100, the only operations that you can use are multiplication and division and

(2) whatever you do to the numerator, you also do to the denominator.

Note that multiplying the denominator (or dividing it) by the same number does not change its value, it only change its representation (fraction, percent or decimal).

**Why It Works**

When  you are relating a fraction a/b to n/100, you are actually using ratio and proprotion. For example, in the first example, you are actually solving the equation

\displaystyle \frac{1}{5} = \frac{n}{100}.

The equation will result to n = \frac{100}{5} which is equal to 20. Now, this is just the same as multiplying both the numerator and the denominator by 20.

Note that the method of “relating to 100 by multiplication or division” can only work easily for denominators that divides 100 or can be divided by 100. Other fractions (try 1/7), you have to use ratio and proportion and manual division.

# How to Convert Fraction to Percent Part 2

BY [CIVIL SERVICE REVIEWER](http://civilservicereview.com/author/jrbautista/) · MARCH 7, 2014

In the Part 1, we have learned[how to convert fraction to percent](http://civilservicereview.com/2014/03/convert-fraction-to-percent/)by relating the denominator to 100 by multiplication or division. In this post, we do its ‘algebraic version.’ This method is a generalized method to the previous post especially for numbers that do not divide 100 or cannot be divided by 100 easily. However, to see the relationship between the two methods, let us do the first example in [Part 1](http://civilservicereview.com/2014/03/convert-fraction-to-percent/) of this series.

Example 1: What is the equivalent of 1/5 in percent.

Recall that in Part 1, we multiplied both the numerator and the denominator by 20, to make the denominator 100. That is,

\displaystyle \frac{1 \times 20}{5 \times 20} = \frac{20}{100}

Now, notice how it is related to the new method. In this method, we related 1/5 to n/100. That is, what is the value of n in

\displaystyle \frac{1}{5} = \frac{n}{100}.

To simplify the equation, we multiply both sides of the equation by 100, and we get

\displaystyle \frac{100}{5} = \frac{100n}{100}

Simplifying and switching the position of the expressions, we get the n = 20. This means that \frac{1}{5} = 20%.

Of course, Part 1 seems to be easier, but the good thing about putting it into equation is that it applies to all fractions. For instance, it is quite hard to convert7/12 using the method in part 1.

Example 2: What is the equivalent of \frac{7}{12} in percent?

We set up the equation with \frac{n}{100} on the left.

\displaystyle\frac{n}{100} = \frac{7}{12}

To eliminate the fraction, multiply both sides by denominator. This results to

\displaystyle n = \frac{7}{12}(100) = \frac{700}{12} \approx 58.33

or about 58.33%.

The curly equal sign means approximately equal to since 3 is a non-terminating decimal.

Now, try to examine the expression

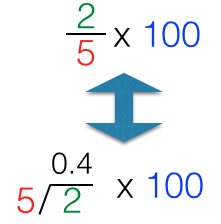
\frac{7}{12}(100)

because this is where they derived the rule. Recall the rule in converting fraction to percent: **Divide the fraction and then multiply the result to 100**. That is exactly it.

So, when you have the fraction, 2/5 just divide it manually, and then multiply the result to 100. That is,

\frac{2}{5} (100) = \frac{200}{5} = 40%.

Do not forget though that the divisor during division is the denominator (5 in 2/5). as shown below.

[](http://i0.wp.com/civilservicereview.com/wp-content/uploads/2014/03/Screen-Shot-2014-03-07-at-11.06.53-PM.png)

That’s it. I think we don’t have to have the third part, since we already derived the rule here.

# A Teaser on Answering Number Series Questions

BY [CIVIL SERVICE REVIEWER](http://civilservicereview.com/author/jrbautista/) · AUGUST 22, 2013

First of all, I would like to point out the term series in the “Number Series” questions in the CivilService Examinations is a bit incorrect. Technically, the list of numbers in the examinations is actually called a **sequence.**A[**series**](http://en.wikipedia.org/wiki/Series_(mathematics)) is a sequence of sums — well, I will not go into details since it is not included in the examinations.  You can  click the link though if you want to know about it.

Second, this is quite a premature discussion since I have only written a few posts about integers. I planned to write about this later, but I thought that a teaser would be nice. In this post, I will show you that it is a must to master all the topics in mathematics because they are all connected. We will not discuss the strategies on how to answer the sequence problems here; I will have a separate post about them later. Don’t stop reading though because you are going to miss half of your life if you do (kidding).

A **sequence** or a **progression** is an ordered list of objects which can be numbers, letters, or symbols.  The list 3, 7, 11, 15, 19 is a sequence where 3 is the first term and 19 is the fifth term. Of course, it is easy to see the sixth term is 23 since each term is the sum of 4 and term before it.

There are also sequences that are in decreasing order such as 12, 5, -2, -9, -16 and so on. As you can observe, to get the next term, 7 is subtracted from the term before it. Notice also that this sequence needs knowledge on subtraction of negative integers.

The list

\displaystyle \frac{3}{5}, \frac{11}{10}, \frac{8}{5}, \frac{21}{10}, \frac{13}{5}

is also an example of a sequence. This sequence involves addition of fractions. The next term can be easily solved by converting the given into similar fractions which when done will result to

\displaystyle \frac{6}{10}, \frac{11}{10}, \frac{16}{10}, \frac{21}{10}, \frac{26}{10}.

Clearly, we only need to add \frac{5}{10} to the last term to get the next term which equals\frac{31}{10}.

In the sequences above, we have only used two number representations (integers and fractions) and two operations (addition and subtraction). In the actual Civil Service Examinations, the sequences can also include one or a mixture of other number representations such as percent, decimal, mixed numbers, and a combination of these representations. They can also include the four fundamental operations (addition, subtraction multiplication and division). When I took the Civil Service Examination in [2002 and 2003](http://civilservicereview.com/about/), there are fractions, whole numbers, and decimals in a single given number sequence.  I know that 2002 was a long time ago, but the format of the examination had not changed since.

For now, we will abandon sequences and return to basic Mathematics and English in the next few posts. When all the pre-requisite knowledge are discussed, we will learn the strategies on answering number sequence

How to Solve Civil Service Exam Number Series Problems 1

BY [CIVIL SERVICE REVIEWER](http://civilservicereview.com/author/jrbautista/) · DECEMBER 30, 2013

First of all let me clarify that what you are solving in the Civil Service Examination are number sequences (or letter sequences) and not a number series. A [series](http://mathworld.wolfram.com/Series.html" \t "_blank)has a different meaning inmathematics.

Before proceeding with the discussion below, first, try to find the next term in the following sequences.

1. 4, 7, 10, 13, \_\_\_

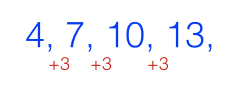
2.  17, 11, 5, -1,  \_\_\_

3. C, F, I, L, \_\_\_

4. \frac{1}{3}, \frac{5}{6}, \frac{4}{3}, \frac{11}{6}.

***Solution and Explanation***

Numbers 1 and 2 are the easiest type of sequence to solve. This is because they are integers and you just add (or subtract) a constant number to each term to get the next term.  In solving this type of sequence, you can see this pattern by subtracting adjacent terms (13 – 10 = 3, 10 – 7 = 3, 7- 4 = 3) to see if the difference is constant. If it is, then you will know that you will just have to add the same number to get the next term. Therefore, the next term to the first sequence is 13 + 3 = 16.

[](http://i0.wp.com/civilservicereview.com/wp-content/uploads/2013/12/number-sequence.png)

Of course, sequences can also be decreasing. In the second example, the  difference is 6 or it means that 6 is subtracted from a number to get the next term (see [Subtraction of Integers](http://civilservicereview.com/2013/08/subtract-positive-and-negative-integers/)). Therefore, the next term is -1 – 6 = -7.

[](http://i1.wp.com/civilservicereview.com/wp-content/uploads/2013/12/Screen-Shot-2013-12-30-at-10.51.18-AM.png)

The third example is composed of letters but the principle is the same: constant difference or constant skips.  C and F, for instance has two letters in between. This is also true between F and I and I and L. Therefore, the next letter in the sequence is O (L, M, N, O).

[sequence and series](http://i2.wp.com/civilservicereview.com/wp-content/uploads/2013/12/sequence-and-series.png)

[**Fractions**](http://civilservicereview.com/2014/01/operations-on-fractions/)and decimals are also included in the sequence problems, so it is important that you master them. In the following example, one half is added each time. As you can see, it is not easy to find the next term of this sequence without manually solving it. The first strategy in solving fraction sequences problems is to subtract the adjacent terms such as

\frac{11}{6} - \frac{4}{3} = \frac{3}{6} which is equal to \frac{1}{2} (since \frac{4}{3} = \frac{8}{6}I

\frac{4}{3} - \frac{5}{6} = \frac{3}{6} which is equal to \frac{1}{2}

\frac{5}{6} - \frac{1}{3} = \frac{3}{6} which is equal to \frac{1}{2} since \frac{1}{3} = \frac{2}{6}.

There is however a better strategy than subtracting the adjacent terms when it comes to sequences on fractions. Sometimes, it is easier to see the pattern if you convert them to similar fractions (fractions with the same denominator). Converting the sequence above to similar fractions gives us

\frac{2}{6}, \frac{5}{6}, \frac{8}{6}, \frac{11}{6}.

From here, it is clear that the next term in the sequence is \frac{14}{6}. Note however that this strategy is best only for sequences with constant difference and may be difficult to use in other types of sequences.

# How to Solve Civil Service Exam Number Series Problems 2

BY [CIVIL SERVICE REVIEWER](http://civilservicereview.com/author/jrbautista/) · JANUARY 3, 2014

In the [previous post](http://civilservicereview.com/2013/12/solve-number-series-problems-1/), we have learned how to solve number sequence (for the Civil Service Exam Number Series test) and letter sequence problems that involves constant difference or constant skips. In this post, we are going to discuss another type of sequence. Before we discuss, see if you can find the next term of the following sequences.

1. 3, 6, 12, 24, 48, \_\_\_

2. 18, 6, 2, 0.66…, \_\_\_

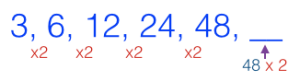
3. 1, 4, 9, 16, 25, \_\_\_

4. 3, 12, 27, 48, 75, \_\_\_

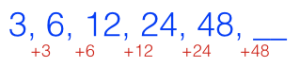
Solution and Explanation

**First Sequence: 3, 6, 12, 24, 48, \_\_\_**

In the first sequence, the first that you will notice is that the second term is twice the first term. So, the next thing that you should ask is, “Is the third term twice the second term?” Yes, 12 is twice 6. What about the next term? Yes. So, each term in the sequence is multiplied to 2 to get the next term. Therefore, the missing term is 96 which is 48 multiplied by 2.

[](http://i0.wp.com/civilservicereview.com/wp-content/uploads/2014/01/sequences.png)

If we look at the difference of the numbers in the sequence above, we can see that the number we add is also increasing twice. To get 6, we added 3. To get12, we added 6. To get 24, we add 12 and so on. As we can see, the sequence of the numbers we add (the numbers in red color) is the same as the original sequence (numbers in blue color).

[](http://i2.wp.com/civilservicereview.com/wp-content/uploads/2014/01/sequence-and-series.png)

**Second Sequence: 18, 6, 2, 0.66…, \_\_\_**

In the second sequence, the number is reduced each time. Since they are integers, it can either be subtraction or division. As we can see, 6 is a third of 18. This means that to get 6, 18 is divided by 3. Now, look at the next term. It’s 2. So it is also a third of 6. Can you see the pattern now?

Each term is divided by 3 to get the next term. So, we must divide 0.66… by 3. therefore, the next term is 0.22… The three dots means that the 2’s are infinitely many.

**Third Sequence: 1, 4, 9, 16, 25, \_\_\_**

What is familiar with this sequence? They are all square numbers! That is,

1^2, 2^2, 3^2, 4^2 and 5^2.

So the next term is 6^2 which is 36.

**Fourth Sequence: 3, 12, 27, 48, 75, \_\_\_**

The fourth sequence seems difficult, but I have just multiplied each number in the third sequence by 3. So, if the sequence is not familiar, try to see if you can divide it by any number. As you can see,

3, 12, 27, 48, 75  = 3 (1, 4, 9, 16, 25)

or the product of 3 and the square numbers.

# How to Solve Civil Service Exam Number Series Problems 3

BY [CIVIL SERVICE REVIEWER](http://civilservicereview.com/author/jrbautista/) · FEBRUARY 1, 2014

This is the third part of the solving number series problems. The [first part](http://civilservicereview.com/2013/12/solve-number-series-problems-1/)includes dealing with patterns that contains addition and subtraction and the [second part](http://civilservicereview.com/2014/01/solve-civil-service-exam-number-series-problems-2/) discusses patterns that contains multiplication or division.

In this post, we are going to learn some “alternating sequences.” I put a quote in [alternating sequence](http://en.wikipedia.org/wiki/Alternating_series) because inmathematics, it has a slightly different meaning. Note that it is likely that these type of sequence will appear in examinations such as the Civil Service Exam.

Before we continue with the discussion,  try to see if you can answer the following questions.

1. 2, -5, 4, -8, 6, -11, 8, -14, \_\_\_, \_\_\_

2. 4, 7, 12, 15, 20, 23, 28, \_\_\_\_

3. A, 3, D, 8, G, 13, \_\_\_, \_\_\_

4. \frac{1}{2}, 5, 1, 9, \frac{3}{2}, 13, \_\_\_\_, \_\_\_\_\_

**Solutions and Explanations**

First Sequence: 2, -5, 4, -8, 6, -11, 8, -14, \_\_\_, \_\_\_

The first sequence seems hard, but it is actually easy. If you perform addition and subtraction among consecutive terms, you will surely see a pattern (left as an exercise). However, before doing it, notice that the sign of the numbers are alternating: that is, positive, then negative, then positive, and so on.

Now, what if, we separate the two sequences? What if we treat the positive numbers as a sequence, and the negative numbers as another sequence. Well, we just put different colors on them, so it is easy to see the pattern.

2, -5, 4, -8, 6, -11, 8, -14, \_\_\_, \_\_\_

Do you see now? Can you answer the problem?

As you can see, the red numbers are just increasing by 2 and the blue numbers are decreasing by 3. Therefore, the next numbers are 10 and -17.

Second Sequence:. 4, 7, 12, 15, 20, 23, 28, \_\_\_\_

In the second sequence, 4 is increased by 3 to become 7. Then, 7 is increased by 5. The increase in the numbers are also in alternating pattern. So the correctanswer is 31 which is equal to 28 + 3.

[alternating number pattern](http://i0.wp.com/civilservicereview.com/wp-content/uploads/2014/02/alternating-number-pattern.png)

Further, what is interesting is that the “coloring strategy” that we used in the first sequence can be also used in this sequence. As you can see in the colored numbers below, it becomes two sequences as well. The sequence composed of blue numbers and the other red. In both sequences, the numbers is increased by 8. Since the next number is blue, then it is equal to 23 + 8 = 31.

 4,7,12,15,20,23,28,\_\_\_\_

Third Sequence:  A, 3, D, 8, G, 13, \_\_\_, \_\_\_

In the third sequence, the answers are already obvious after learning the strategy above. There are two letters in between the letter terms in the sequence (A, B, C,D, E, F,G, H, I,J). Further, each number term is 5 greater greater than the previous number term. So, the correct answer answers are J, 18.

 A,3,D,8,G,13,\_\_\_,\_\_\_

Fourth Sequence: \frac{1}{2}, 5, 1, 9, \frac{3}{2}, 13, \_\_\_\_, \_\_\_\_\_

Sequence 4 is alternating addition.  The red numbers as shown in the next figure are added by 1/2 to get the next term while the blue numbers are added by 4.

[](http://i2.wp.com/civilservicereview.com/wp-content/uploads/2014/02/number-pattern-4.png)

We have done several examples and it is impossible for us to exhaust all patterns, so it is up to you to be able to spot them. The patterns could be different, but the principle of solving them is the same.

# How to Solve Civil Service Exam Number Series Problems 4

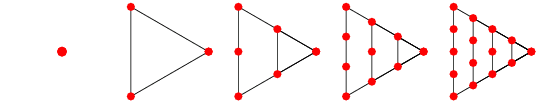
BY [CIVIL SERVICE REVIEWER](http://civilservicereview.com/author/jrbautista/) · FEBRUARY 8, 2014

This is the fourth part of the solving number series problems. The [first part](http://civilservicereview.com/2013/12/solve-number-series-problems-1/) discussed patterns that contains addition and subtraction and the [second part](http://civilservicereview.com/2014/01/solve-civil-service-exam-number-series-problems-2/) discusses patterns that contains multiplication or division. The [third part](http://civilservicereview.com/2014/02/solve-civil-service-exam-number-series-problems-3/)was aboutalternating patterns.

In this post, we are going to discuss some special number patterns. Although there is a small probability that these types of patterns will appear in the Civil Service Examination (I didn’t see any when I took the exams, both professional and subprofessional), it is better that you know that such patterns exist.

**Triangular Numbers**

1, 3, 6, 10, 15, 21, 28, 36, 45, …

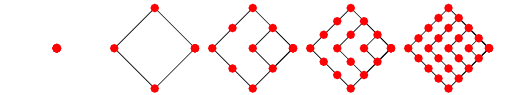


Triangular numbers are numbers that are formed by arranging dots in triangular patterns. Therefore, the first term is 1, the second term is 1 + 2, the third term is 1 + 2 + 3 and so on.

**Square Numbers**

1, 4, 9, 16, 25, 36, …

The square numbers is a sequence of perfect squares: 1^2, 2^2, 3^2, 4^2, 5^2, 6^2, and so on.



**Cube Numbers**

1, 8, 27, 64, 125, …

Well, from square numbers, you surely have guessed what are cube numbers. They are a sequence of cube of integers.

1^3, 2^3, 3^3, 4^3, …

**Fibonacci Sequence**

1, 1, 2, 3, 5, 8, 13, 21, …

Technically, a Fibonacci sequence is a sequence that starts with (0, 1), or (1, 1), and each term is the sum of the previous two. For example, in the sequence above, 5 is the sum of 2 and 3, while 21 is the sum of 8 and 13. In the actual examination, they may give Fibonacci-like sequences (technically called Lucas Sequence) where they start with two different numbers. For example, a Lucas sequence that starts with 1 and 3 will generate

1, 3, 4, 7, 11, 18, …

Of course, they can also combine positive and negative numbers to create such sequences. For example, a Lucas sequence that starts with -8 and 3 will generate the sequence

-8, 3, -5, -2, -7, -9, …

Well, this looks like a difficult sequence, but remember that if you can see the pattern, it is easy to look for the next terms.

# A Tutorial on Solving Equations Part 1

BY [CIVIL SERVICE REVIEWER](http://civilservicereview.com/author/jrbautista/) · MARCH 8, 2014

**Solving equations** is one of the most fundamental concepts that you should learn to be able to solve a lot of mathematical problems such as those in the Civil Service Examinations. For example, for you to be able to solve a word problem, you need to translate words into expressions, set up the equation, and solve it. Therefore, you should learn this post and its continuation by heart.

In this series of posts, we are going to learn how to solve equations and then learn how to solve different types of problems  (number, age, coin, Geometry, motion, etc). These types of problems usually appear in the Civil ServiceExaminations.

**So, what is an equation really?**

An equation are two expressions (sometimes more) with the equal sign in between. The equation

2x + 3 = 9

means that the algebraic expression on the left hand side which is 2x + 3 has the same value as the numerical expression on the right hand side which is 9. Now, you can think of the equal sign as a **balance.**If you put two different objects and they balance, it means if you take away half of the object on the left, you also have to take half of the object on the left. Or, if you double the amount (or weight) of the object on the left, you also double what’s on the right to keep the balance.



The fancy name of this ‘principle’ in mathematics is [**Properties of Equality**](http://en.wikipedia.org/wiki/Equality_(mathematics)). It basically means that whatever you do on the left hand side, you also do on the right hand side of the equation. Here are a few examples to illustrate the idea.

**How to Solve Equations**

**Example 1**: x + 4 = 9

There is really nothing to solve in this example. What will you add with 4 to get 9. Of course 5. However, we use the Properties of Equality future reference. The idea is to isolate x on one side and all the other numbers on the other side. Since,x is on the left hand side, we want to get rid of 4. So, since 4 was added to x, we have to subtract 4 from both sides to get rid of it. So,

x + 4 - 4 = 9 - 4.

This gives us x = 5.

**Example 2**: 3x = 18

This example can be again solved mentally. What will you multiply with 3 to get 18, of course, it’s 6. But, solving it as above, to get rid of 3 in 3x, since it is multiplication, we divide it by 3.

\displaystyle \frac{3x}{3} = \frac{18}{3}.

Of course, if you divide the left hand side by 3, you also divide the right hand side of the equation by 3.

This gives us x = 6.

**Example 3**: \frac{x}{5} = 12

In this example, \frac{x}{5} is a fraction which mean that we have to get rid of 5. To do this, we multiply both sides by 5. That is,

5(\frac{x}{5}) = 5(12)

Therefore,  x = 60.

Like Examples 1 and 2, this can be solved mentally.

**Example 4:** 2x + 3 = 9

In this example, we have 2 times x and then added to 3. Well, intuitively, we can eliminate 3 first by subtracting it from both sides. That is

2x + 3 - 3 = 9 - 3

which results to

2x = 6.

Now, it’s multiplication, so we eliminate 2 by on the left hand side by dividing both sides by 2. That is

\displaystyle \frac{2x}{2} = \frac{6}{2}.

This results to x = 3

**Example 5**: 4x - 4 = 9.

We first need to eliminate 3 from the left hand side. Since it is subtraction, to eliminate it, we have to perform addition (because -4 + 4 = 0) on both sides of the equation. Doing this, we have

4x - 4 + 4 = 9 + 4

4x = 13

Now, we solve for x by dividing both sides by 4. That is

\displaystyle \frac{4x}{4} = \frac{13}{4}.

That is, x = \frac{13}{4} or 3 \frac{1}{4} in [mixed fraction](http://civilservicereview.com/2013/10/improper-fractions-to-mixed-forms/) or 3.25 in decimals.

In the [next part](http://civilservicereview.com/2014/03/tutorial-solving-equations/) of this series, we are going to learn how to solve more complicated equations.

Image Credit:[*The Daniel Fast*](http://danielfast.wordpress.com/2013/01/07/balance-for-your-daniel-fast/)

# A Tutorial on Solving Equations Part 2

BY [CIVIL SERVICE REVIEWER](http://civilservicereview.com/author/jrbautista/) · MARCH 9, 2014

This is a continuation of [Solving Equations Part 1](http://civilservicereview.com/2014/03/solving-equations/).  As I have mentioned in that post, being able to solve equations is very important since it is used for solving more complicated problems (e.g. word problems).

In this post, we are going to solve a slightly more complicated equations. We already discussed [5 examples](http://civilservicereview.com/2014/03/solving-equations/) in the first post, so we start with our sixth example.

**Example 6**: 8x = 4x - 12

As I have mentioned in the previous examples, we need to isolate x on one side of the equation and all the numbers on the other side. Here, we decide to put all x‘s on the left hand side, so we remove 4x on the right hand side. To do this, we subtract 4x from both sides of the equation.

8x - 4x = (4x - 12) - 4x

Of course, 4x - 4x = 0, so, simplifying, we have

4x = -12

Then, we want to eliminate 4 on the left hand side. Since it is multiplication, we therefore divide both sides of the equation by 4.

\displaystyle \frac{4x}{4} = \frac{-12}{4}

Therefore, x = -3.

**Example 7:** x + 4 = 4x - 12

In this example, we want to avoid a negative x, so it is better to put all x‘s on the right hand side of the equation. This means that we have to eliminate x from the left hand side. So, we subtract x from the left hand side, and of course, the right hand side as well.

x + 4 - x = 4x -12 - x

4 = 3x - 12

Next, since we want to eliminate all the numbers on the right, the easiest to eliminate first is -12. To do this, we just add 12 on both sides of the equation.

4 + 2 = 3x - 12 + 12

16 = 3x.

Next, we only have one number on the right hand side which is 3. To eliminate it, we divide 3x by 3. Of course, we also need to divide the other side by 3.

\displaystyle \frac{16}{3} = \frac{3x}{3}

\displaystyle \frac{16}{3} = x

Therefore, the answer is x = \displaystyle \frac{16}{3}.

Notice also that we can add 2 and subtract x immediately resulting to x + 4 + 12 - x = 4x - 12 + 1 2 - x making the process faster. You will be able to discover such strategy on your own if you solve more equations.

**Example 8**: 2(2x - 3) = 5

In this example, we have the form a(b + c) in the left hand side of the equation. To simplify this, we simply distribute the multiplication of a over b + c. That is

a(b + c) = ab + ac.

This is called the **distributive property** of multiplication over addition.

So, solving the problem above, we have

2(2x) - 2(3) = 5

4x - 6 = 5

Adding 6 to both sides of the equation, we hhave

4x = 11

Dividing both sides of the equation by 4 we have

x = \frac{11}{4}.

**Example 9:** \frac{3x}{5} + 4 = 7

In equations with fractions, the basic strategy is to eliminate the denominator. In this example, the denominator is 5. Since \frac{3x}{5} means 3x divided by 5, we cancel out5 by multiplying the equation by 5. Notice how 5 is distributed over the left hand side.

5 (\frac{3x}{5} + 4) = (5)(7) which is the same as

5 (\frac{3x}{5}) + 5(4) = 35.

Simplifying, we have 3x + 20 = 35.

Subtracting 20 from both sides, we have

3x = 15

Dividing both sides by 3, we have x = 5.

**Example 10:** \frac{3x + 3}{2} = x - 5.

We eliminate fraction by multiplying both sides of the equation by 2. That is

\displaystyle 2(\frac{3x + 3}{2}) = 2(x - 5)

In the left hand side, 2 cancels out 2, so only 3x + 3 is left. On the right hand side, we use distributive property.

3x + 3 = 2(x) - 2(5)

3x + 3 = 2x - 10

Subtracting 2x from both sides, we have

x + 3 = -10

Subtracting 3 from both sides, we have

x = -13

# A Tutorial on Solving Equations Part 3

BY [CIVIL SERVICE REVIEWER](http://civilservicereview.com/author/jrbautista/) · MARCH 13, 2014

This is the third part of the series of tutorials on solving equations. In this part, we will solve more complicated equations especially those that contain fractions.  The[first part](http://civilservicereview.com/2014/03/solving-equations/) and the [second part](http://civilservicereview.com/2014/03/tutorial-solving-equations/)of this series discuss 10 sample equations. We start with the 11th example.

**Example 11**: -5x – 3 = -4x + 12

This example deals with the question of what if x is negative? Let us solve the equation. We want x on the left and all the numbers on the right. So, we add 4xto both sides.

-5x – 3 + 4x = -4x + 4x + 12

-x- 3 = 12

Next, we add 3 to both sides to eliminate -3 from the left hand side of the equation.

-x - 3 + 3 = 12 + 3

-x = 15

You cannot have a final equation like this where there is a negative sign on x. To eliminate the negative sign on x, multiply both sides by -1.  That is

(-1)(-x) = (-1)(15)

So, **x = -15** is the final answer.

**Example 12**: 2(x - 3) = 4(x + 8) - x

This example highlights the distributive property. Notice that distributive property is also needed on equations with fractions. The idea is that if you have an expression that looks like a(b+c); that is, a multiplied by the quantity b + c, you must “distribute a” over them. That is,

a(b + c) = ab + ac and a(b-c) = ab - ac.

Solving the equation above, we have

2(x) - 2(3) = 4(x) + 4(8) - x

Notice on the right hand side that 4 is not distributed to the second x because the second x is outside the parenthesis. We now simplify.

2x - 6 = 4x + 32 - x.

Next, we simplify the expression 4x - x on the right hand side.

2x - 6 = 3x + 32

Now, we want to put x on the left and all the numbers on the right. We do this simultaneously. We subtract 3x from the right hand side and add 6 on the left hand side, so we add 6 - 3x to both sides of the equation. You can do thisseparately if you are confused.

2x - 6 + [6 - 3x] = 3x + 32 + [6 - 3x]

On the left hand side: -6 + 6 = 0 and 2x - 3x = -x. On the right hand side, 3x - 3x =0 and 32 + 6 = 38

This gives us -x = 36. Multiplying both sides by -1, as we have done in Example 11, we have

x = -38

as the final answer.

**Example 13:** \frac{x}{2} + \frac{2x}{3} = \frac{3}{4}.

This type of equation usually appears in work and motion problems which we will discuss later. Just like in solving fractions, all you have to do is get the [least common denominator](http://civilservicereview.com/2013/09/least-common-multiple/). Now, the least common denominator of 2, 3, and 4 is 12. So, all we have to do is to multiply everything with 12. That is

12(\frac{x}{2} + \frac{2x}{3}) = 12 (\frac{3}{4})

\frac{12x}{2} + \frac{12(2x)}{3} = \frac{12(3)}{4}

\frac{12x}{2} + \frac{24x}{3} = \frac{36}{4}

6x + 8x = 9

14x = 9

Dividing both sides by 14, we have

x = \frac{9}{14}.

**Example 14**: \frac{3x + 1}{5} = \frac{2x}{3}

This is almost the same the above example. We get the least common denominator of 5 and 3 which is equal to 15. Then, we multiply everything with 15. That is

15 (\frac{3x + 1}{5}) = 15(\frac{2x}{3})

\frac{15(3x + 1)}{5} = \frac{15(2x)}{3}

Now, on the left hand side, 15/5=3 and on the right hand side 15/3 = 5. This gives us

3(3x + 1) = 5(2x).

Simplifying the left hand side, we have

9x + 3 = 10x

Now, 9x - 10x = - 3 gives us -x = - 3. Multiplying both sides by -1 to make xpositive gives us the final answer

x = 3.

**Example 15**: \frac{3}{x} + \frac{1}{4} = \frac{2}{5}

This example discusses the question “what if x is in the denominator?” If x is just in the denominator just like this example, the solution is quite similar to Example 13. However, if x is both found in the numerator and denominator, this will result to a quadratic equation (something with x^2). This seldom comes out, and we will discuss this separately. For now, let us solve this example.

The strategy here is to get the least common denominator of the numbers and then include x during the multiplication. In this example, we want to get the least common denominator of 4 and 5 which is 20. Now, we include x and the least common denominator of the equation above is 20x. Now, we multiply everything with 20x. That is,

20x(\frac{3}{x} + \frac{1}{4}) = 20x(\frac{2}{5})

\frac{(20x)(3)}{x} + \frac{(20x)(1)}{4} = \frac{(20x)(2)}{5}

\frac{60x}{x} + \frac{20x}{4} = \frac{40x}{5}

60 + 5x = 8x

60 = 3x

20 = x. Therefore, the answer is 20.

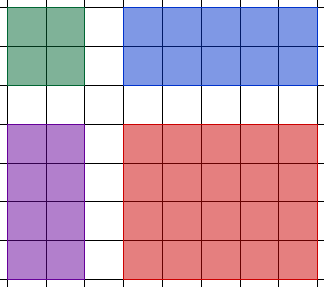
This ends the third part of this series, in the next part of this series (I am not sure if I will discuss this soon), we will discuss about dealing equations with [radicals](http://en.wikipedia.org/wiki/Radical_symbol)(square root and cube root).

# Calculating Areas of Geometric Figures

BY [CIVIL SERVICE REVIEWER](http://civilservicereview.com/author/jrbautista/) · JUNE 14, 2014

Area of geometric figures are very common in Civil Service Exams and also other types of examinations. Area is basically the number of square units that can fit inside a closed region. In a closed region, if all the unit squares fit exactly, you can just count them and the number of squares is the area. For example, the areas of the figures below are 4, 10, 8 and 20 square units.

The figures blow are rectangles (yes, [**a square is a rectangle**](http://mathandmultimedia.com/2010/07/26/is-a-square-a-rectangle-2/)!). Counting the figures and observing the relationship between their side lengths and their areas, it is easy to see that the area is equal to the product of the length and the width (Why?).

[](http://i1.wp.com/civilservicereview.com/wp-content/uploads/2014/06/calculating-areas.png)

The blue rectangle has length 5 and width 2, and counting the number of squares, we have 10. Of course, it is easy to see that we can group the squares into two groups of 5, or five groups of 2. From this grouping, we can justify why the formula for the area of a rectangle is described by the formula

A_R = l \times w

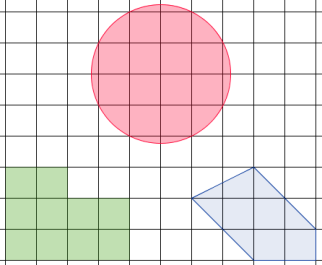
where A_R is the area of the rectangle, l is the length and w is the width. Since the square has the same side length, we can say that

A_S = s \times s = s^2

where A_S is its area and s is its side length.

There are also certain figures whose areas are difficult to calculate intuitively such as the area of a circle, but mathematicians have already found ways to calculate the areas for these figures.

Challenge: Find the area of the green and blue figure below and estimate the area of the circle.

[](http://i0.wp.com/civilservicereview.com/wp-content/uploads/2014/06/area.png)

Below are some formulas for the most common shapes used in examinations. Don’t worry because we will discuss them one by one.

Triangle: A = \frac{1}{2}bh, b is base, h is height.

Parallelogram: A = bh, b is base, h is height

Trapezoid: A = \frac{1}{2}h(b_1 + b_2), b_1 and b_2 are the base, h is the height

Circle: A = \pi r^2 r is radius

In this series, we are going to discuss the areas of the most commonly used figure in examinations and we will discuss various problems in calculating areas of geometric figures. We are also going to discuss word problems about them. Questions like the number of tiles that can be used to tile a room is actually an area problem.

How to Solve Rectangle Area Problems Part 1

BY [CIVIL SERVICE REVIEWER](http://civilservicereview.com/author/jrbautista/) · JUNE 15, 2014

The area of a rectangle including square are the simplest to calculate.  As we have discussed in the [**previous post**](http://civilservicereview.com/2014/06/calculating-areas-geometric-figures/), they can be calculated by multiplying their length and the width. That is if a rectangle has area A, length l and width w, then,

A = l \times w or simply A = lw.

In this post, we are going to solve various problem involving area of rectangles.

**Problem 1**

The length of a rectangle is 12 centimeters and its width is 5 centimeters. What is its area?

*Solution*

Using the representation above, l = 12 and w = 5. Calculating the area, we have

A = 12(5) = 60.

The area is 60 square centimeters.

**Problem 2**

The area of a rectangular garden is 20 square meters. Its width is 2.5 meters. What is its length?

*Solution*

In this problem, the missing is the length and the given are the area and the width. So, A = 20 and w = 2.5. Using the formula, we have

A = lw.

Substituting the values of A and w, we have

20 = l(2.5).

Since we are looking for l, we divide both sides of equation by 2.5. That is

\frac{20}{2.5} = \frac{l(2.5)}{2.5}.

Simplifying, we have 8 = l.

Therefore, the length of the rectangular garden is equal to 8 meters.

**Problem 3**

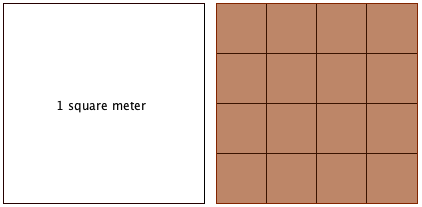
The floor of a room 8 meters by 6 meters is to be covered with square tiles. The tiles dimensions is 25 centimeters by 25 centimeters. How many tiles are needed to covered the room? Note: 1 meter = 100 centimeters

*Solution*

This problem has at least two solutions. I will show one solution and leave you to look for another solution. Using the area formula, we can calculate the area of the room in square meters. That is,

A = lw = 6(8) = 48.

So, the area of the room is 48 square meters. However, we are looking for the number of tiles that can cover the room and not the area in square meters. Now, the easiest solution is to find the number of tiles that can fit inside 1 square meter. Since the side of a square is 1 meter which is equal to 100 centimeters, it can fit 4 tiles as shown below.

[](http://i0.wp.com/civilservicereview.com/wp-content/uploads/2014/06/area-of-a-rectangle.png)

*1 square meter contains 16 tiles*

Now, four tiles at the side means 1 square meter contains 4(4) = 16 square tiles. Since there are 48 square meters, the number of tiles needed is

16 \times 48 = 768.

Therefore, we need at least 768 square tiles to cover the entire floor.

# In the [next post](http://civilservicereview.com/2014/06/solve-rectangle-area-problems-part-2/), we will continue our discussion about rectangle area problems. How to Solve Rectangle Area Problems Part 2

BY [CIVIL SERVICE REVIEWER](http://civilservicereview.com/author/jrbautista/) · JUNE 16, 2014

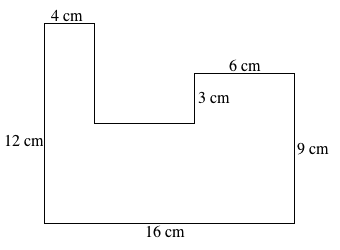
We have already learned the concept of [area of a rectangle](http://civilservicereview.com/2014/06/calculating-areas-geometric-figures/) and[solved sample problems](http://civilservicereview.com/2014/06/rectangle-area-problems/) about it. In this post, we continue the rectangle area problems series. We discuss three more problems about rectangle area.

The fourth problem below involves area preservation, the fifth is calculating the area given its perimeter, and the sixth requiring the use of quadratic equations.

Let’s begin.

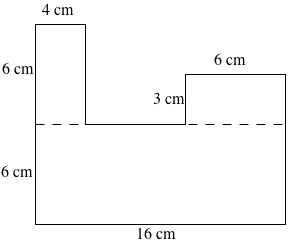
**Problem 4**

What is the area of the figure below?

[](http://i1.wp.com/civilservicereview.com/wp-content/uploads/2014/06/rectangle.png)

Solution

The figure above can be divided into 3 rectangles. One way to do this is to draw the dashed line below (can you find other ways?). Notice that drawing the lines give us rectangles with dimensions 6c m by 4 cm, 6 cm by 3 cm, and 6cm by 16 cm.

[](http://i2.wp.com/civilservicereview.com/wp-content/uploads/2014/06/rectangle-area-.png)

Now, the area of the figure is the sum of the areas of the three rectangles.

Area of a 6 cm by 4 cm is 6 cm × 4 cm = 24 square cm.  
Area of a 6 cm by 4 cm is 6 cm × 3 cm = 18 square cm.  
Area of a 6 cm by 4 cm is 6 cm × 16 cm = 96 square cm

So, the area of the figure is 24 + 18 + 96 = **138 sq. cm.**

**Problem 5**

The perimeter of a rectangle 54 cm. Its length is twice than its width. What is its area?

Solution

We have already discussed how to calculate the [perimeter of a rectangle](http://civilservicereview.com/2014/03/perimeter-of-rectangle/) and we have learned its formula. A rectangle with perimeter P, length l and width w has perimeter

 P = 2l + 2w.

Now, we let the width be equal to  x. Since the length is twice, it is 2x. Substituting them to the formula above, we have

54 = 2(2x) + 2x.

Simplifying, we have

54 = 6x

resulting to x = 9. Therefore, the width is 9 and the length which is twice the width is 18. So, the area is 9(18) = **162 sq. cm.**

**Problem 6**

The length of a rectangle is 5 more than its width. Its area is 84 square centimeters. What are its dimensions?

Solution

Guess and Check

This problem can be solved using guess and check but I wouldn’t recommend it. For example, you can choose two numbers where one is 5 greater than the other and find their product. Choosing 4 and 9 results to the product 36. It is quite small, so you might want to try 10 and 15 but the product is 150, quite large, so, you can go down, and you will eventually find 7 and 12 which is the correct answer.  Another guess and check strategy in this problem is to find the factors of 84 (left as an exercise).

Now, remember that guess and check does not always work and it takes time, so you better learn the solution below.

Algebra (Quadratic Equation)

If we let x be the width of the triangle, then it’s length is 5 greater than the width, so it is therefore, x + 5. Since the area of a rectangle is the product of its length and width, so,

A = x(x + 5) = 84.

 This results to the quadratic equation x(x + 5) = 84 which is equivalent to

x^2 + 5x - 84 = 0.

If you still remember factoring, then this is an easy problem to factor. This gives us

(x + 12)(x - 7) = 0

which gives us x = 7 which is its width. This also gives us the length x + 5 = 12.

This solution which uses quadratic equation is a bit advanced, but there is no way that you can solve problems like the one above if you don’t know it. I am afraid that you have to learn it again if you have forgotten it. You must practice factoring and memorize the quadratic formula (I will discuss this after this series). Then and only then, that you would be able to solve such problems with better speed and accuracy.

Exam Tip

If you encounter problems such as this and you don’t know what to do, it is important that you do not spend too much time on them. Just guess the answerfirst, mark them, and come back to them when you still have time at the end of the exam. However, be sure not to skip too many items.

In the [**next post**](http://civilservicereview.com/2014/06/rectangle-area-quiz/), we will have a quiz on solving rectangle area problems.

Rectangle Area Quiz

BY [CIVIL SERVICE REVIEWER](http://civilservicereview.com/author/jrbautista/) · JUNE 19, 2014

This is the conclusion of the S**olving Problems on Rectangle Area Series**. In the [first part](http://civilservicereview.com/2014/06/rectangle-area-problems/), we have discussed the intuition basics of rectangle area formula and solved basic problems about it. In the [second part](http://civilservicereview.com/2014/06/solve-rectangle-area-problems-part-2/), we have solved more complicated rectangle area problems. In this post, you are allowed to test what you have learned in the previous parts of the series.

Ideal Time Limit: 15 minutes

**Rectangle Area Quiz**

1. The length of a rectangle is 8 cm and its width is 7 cm. What is its area?

Answer

2. Fill in the blank: A rectangular pool has area 180 square meters. Its dimensions are 12m by \_\_\_ m.

Answer

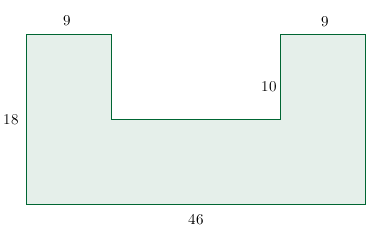
3. The bottom of a rectangular pool is 18m by 25m is to be covered with 50 cm by 50 cm tiles. How many tiles are needed to combined the bottom of the pool?

Answer

4. The length of a rectangular rose garden is 40 meters. Its area is 1020 square metes. What is its width?

Answer

5. What is the area of the figure below?

[](http://i0.wp.com/civilservicereview.com/wp-content/uploads/2014/06/rectangle-quiz.png)

Answer

6. The length of a rectangle is 5 cm more than its width. Its perimeter is 26 cm. What is its area?

Answer

7. Anna wants to frame her picture with a 1 inch margin on its side.  If her pictureis 12 inches by 15 inches, what is the area of the frame?

Answer

8. Fill in the blanks: A theater stage is covered with with 187 tiles with no tiles cut. The dimensions of the stage in terms of tiles are \_\_\_\_ by \_\_\_\_ tiles.

Answer

9.  What is the area of a rectangle with length 8.5 cm and width 4.5 cm?

Answer

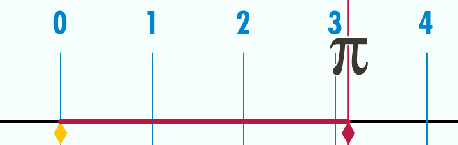
10. What is the least dimensions of a gift wrapper that can cover a box measuring 6 cm by 8 cm by 10cm?

Answer

# How to Calculate the Circumference of a Circle

BY [CIVIL SERVICE REVIEWER](http://civilservicereview.com/author/jrbautista/) · JULY 22, 2014

In the previous post, we have learned about the [**basic terminologies about circles**](http://civilservicereview.com/2014/07/circles/). We continue this series by understanding the meaning of circumference of a circle. The circumference of a circle is basically the distance around the circle itself. If you want to find the circumference of a can, for example, you can get a measuring tape and wrap around it.

The animation below shows, the meaning of circumference. As we can see, the circle with diameter 1 has circumference \pi or approximately 3.14.

Note: If you want to know where \pi came from, read [Calculating the Value of Pi](http://mathandmultimedia.com/2013/06/27/calculating-the-value-of-pi/).

***Example 1***

What is the perimeter of a circle with diameter 1 unit?

Solution

The formula of finding the circumference of a circle is with circumferenceC and diameter d is C = \pi d. So,

C = \pi d = \pi(1) = \pi.

***Example 2***

Find the circumference of a circle with radius 2.5 cm.

Solution

The circumference C of a circle with radius r is

C = 2 \pi r

So, C = 2(3.14)(2.5) = 15.7

Therefore, the circumference of a circle with radius 2.5 cm is 15.7 cm.

***Example 3***

Find the radius of a circle with a circumference 18.84 cm. Use \pi = 3.14.

Solution

C = 2 \pi r

18.84 = 2 (3.14) r

18.84 = 6.28 r

Dividing both sides by 6.28, we have

3 = r.

Therefore, the radius of a circle with circumference 18.84 cm is 3 cm.

**Example 4**

Mike was jogging in circular park. Halfway completing the circle, he went back to where he started through a straight path. If he traveled a total distance of 514 meters, what is the total distance if he jogged around the park once? (Use \pi = 3.14).

Solution

The distance traveled by Mike is equal to half the circumference of the circular park and its diameter. Since the circumference of a circle is 2 \pi r and the diameter is equal to 2r, the distance D traveled by Mike is

So, D = \frac{1}{2}(2 \pi r) + 2r.

Substituting, we have 514 = \pi r + 2r.

Factoring out r, we have 514 = r( \pi + 2)

514 = r(3.14 + 2)

514 = r (5.14).

Dividing both sides by 5.14, we get

r = 100.

Now, we are looking for the distance around the park (cirumfrence of the circle). That is,

C = 2 \pi r = 2 (3.14)(100)

C = 628 meters.

In the next post, we will discuss how to calculate the area of a circle.

# How to Calculate the Area of a Circle

BY [CIVIL SERVICE REVIEWER](http://civilservicereview.com/author/jrbautista/) · JULY 31, 2014

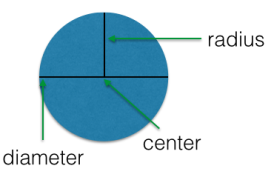
Last week, we have discussed[**how to calculate the circumference of a circle**](http://civilservicereview.com/2014/07/calculate-circumference-circle/). In this post, we learn how to calculate the area of a circle. The area of a circle which we will denote by A is equal to the product of \pi and the square of its radius r. Putting it in equation, we have

A = \pi r^2.

In the examinations, the value of \pi is specified. They usually use 3.14, 3.1416 or \frac{22}{7}.

If you can recall, the radius is the segment from the center to the point on the circle as shown below. The radius is half the diameter. The diameter is the longest segment that you can draw from one point on the circle to another. It always passes through the center.

Note: We also use the term **radius** to refer to the length of the radiusand**diameter** as the length of the diameter.

[](http://i0.wp.com/civilservicereview.com/wp-content/uploads/2014/07/circle1.png)

Now that we have reviewed the [**basic terminologies**](http://civilservicereview.com/2014/07/circles/), let us have some examples on how to calculate the area of a circle.

***Example 1***

What is the area of a circle with radius 8 centimeters. Use \pi = 3.14.

Solution

A = \pi r^2

A = (3.14)(8^2)

A = (3.14)(64)

A = 200.96

So, the area of the circle is 200.96**square centimeters** (sometimes abbreviated as sq. cm.)

**Be Careful!** Length is measured in **units** and area is measured in **square units**. For example, the radius given is in inches (length), the answer for area is in square inches. So, since the Civil Service Exam is multiple choice, the examiner could place units and square units in the choices.

***Example 2***

Find the area of a circle with diameter 14 centimeters. Use \pi = \frac{22}{7}.

Solution

Notice that the given is the diameter, so we find the radius. Since the diameter is twice its radius, we divide 14 centimeters by 2 giving us 7 centimeters as the radius. Now, let’s calculate the area.

A = \pi r^2

A = (\frac{22}{7}) (7^2)

A = 22(7)

A = 154 square centimeters.

**Example 3**

Find the radius of a circle with area 6.28 square meters. Use \pi = 3.14.

Solution

In this problem, area is given. We are looking for the radius. We still use the original formula and make algebraic manipulations later, so we don’t have to memorize a lot of formulas.

A = \pi r^2

We substitute the value of area and \pi.

6.28 = 3.14 r^2

We are looking for r, so we isolate r to the right side (recall how to solve equations).

\displaystyle \frac{6.28}{3.14} = \frac{3.14r^2}{3.14}

2 = r^2

Since, we have a square, we get the square root of both sides. That is

\sqrt{2} = \sqrt{r^2}

\sqrt{2} = r

So, radius is square root of 2 meters or about 1.41 meters.

In this calculation, 2 is not a perfect square. Since **you are not allowed to use calculator**, they probably won’t let you calculate for the square root of number. So, in this case,  the final answer is that the radius of the circle is square root of 2 meters (meters, not square meters).

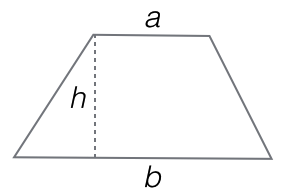
That’s all for now. In the next post, we will be working on problems involving area of a circle.

# How to Find the Area of a Trapezoid

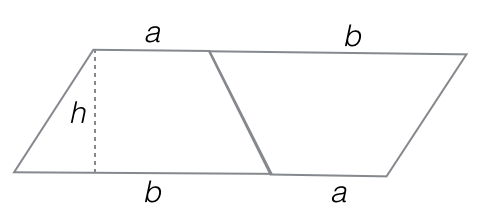
BY [CIVIL SERVICE REVIEWER](http://civilservicereview.com/author/jrbautista/) · SEPTEMBER 24, 2014

We have learned how to calculate the areas of a [**square, rectangle**](http://civilservicereview.com/2014/06/calculating-areas-geometric-figures/),**[parallelogram](http://civilservicereview.com/2014/09/calculate-area-parallelogram-2/" \t "_blank)**, and [**circle**](http://civilservicereview.com/2014/07/calculate-area-circle/). In this post, we are going to learn how to find the area of a trapezoid. This is the first post of [**Finding the Area of a Trapezoid Series**](http://civilservicereview.com/2014/09/finding-area-trapezoid-series/).

A trapezoid is a polygon whose exactly one pair of sides are parallel\*. The figure below is a trapezoid where sides a and b are parallel.

[](http://i1.wp.com/civilservicereview.com/wp-content/uploads/2014/09/trapezoid.png)

Notice that if we make another trapezoid which has the same size and shape as above, flip one trapezoid, and make one pair of the non-parallel sides meet, we can form the figure below. That figure is a parallelogram. Can you see why?



Now, observe that the base of the parallelogram from the figure is a + b.  Its height is h.

We have learned that the [**area of a parallelogram**](http://civilservicereview.com/2014/09/calculate-area-parallelogram-2/)is the product of its base and height.  So, the expression that describes its area is

h(a + b).

Now, when we calculated for the area of the parallelogram above, we actually calculated the area of two trapezoids. Therefore, to get the area of a trapezoid, the have divide the formula above by 2 or multiply it by \frac{1}{2}. That is, if we let A be the area of a trapezoid is

A = \frac{1}{2}h( a + b)

where a andb are the base  (parallel sides) and h is the height.

\*Please take note that there are other definitions of this polygon. In some books, it is defined as polygons whose at least one pair of sides are parallel.

**Example 1**

What is the area of a trapezoid whose base are 12 cm and 18 cm and whose height is 15 cm.

Solution

Using the notation above, in this problem we have a = 12, b = 18 and h = 15?

The formula for area is

A = \frac{1}{2}h(a + b)

So, substituting we have

A = \frac{1}{2} (15)(18 + 12) = 225

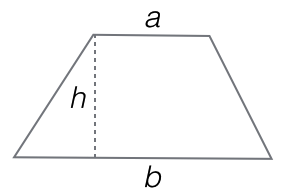
So, the area of the trapezoid is 225 square units.

# How to Find the Area of a Trapezoid Part 2

BY [CIVIL SERVICE REVIEWER](http://civilservicereview.com/author/jrbautista/) · SEPTEMBER 24, 2014

In the previous post, we have learned the formula for [**finding the area of a trapezoid**](http://civilservicereview.com/2014/09/find-area-trapezoid/). We derived that the formula for the area A of a trapezoid with base aand b (the base are the parallel sides), and height h is A = \frac{1}{2}h (a + b)

In this post, which is the second part of [**Finding the Area of a Trapezoid Series**](http://civilservicereview.com/2014/09/finding-area-trapezoid-series/), we are going to continue with some examples. We will not only find the area of a trapezoid, but other missing dimensions such as base and height. Now, get your paper and pencils and try to solve the problems on your own before reading the solution.



We have already discussed one example in the previous post, so we start with the second example.

**Example 2**

What is the area of a trapezoid whose parallel sides measure 6 cm and 8 cm and whose altitude is 2.5 cm?

Solution

In this example, the parallel sides are the base, so we can substitute them to aand b. Since we are looking for the sum of a and b, we can substitute them interchangeably. The term altitudeis also another term for height. So, a = 6, b = 8and h = 2.5.

We now substitute.

A = \displaystyle \frac{1}{2}h(a + b)

A = \displaystyle \frac{1}{2} (2.5)(6 + 8)

A = \displaystyle \frac{1}{2}(2.5)(14)

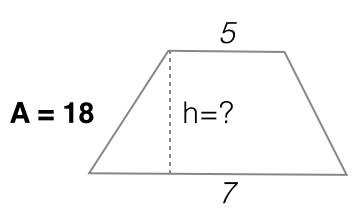
A = 17.5

So the area is 17.5 square centimeters.

**Be Careful!**: Again, remember that if we talk about area, we are talking about square units, and in this case square centimeters. If you choose an option which is **17.5 centimeters**, then it is WRONG. It should be **7.5 square centimeters!**

**Example 3**

Find the height of a trapezoid whose base lengths are 5 and 8 units and whose area is 18 square units.

[](http://i2.wp.com/civilservicereview.com/wp-content/uploads/2014/09/area-of-a-trapezoid1.png)

Solution

In this problem, we look for the height. But don’t worry, we will still use the same formula, and manipulate the equation later to find h. So here, we have A = 18, a = 5, and b = 7.

A = \displaystyle \frac{1}{2}h (a + b)

18 = \displaystyle \frac{1}{2}h(5 + 7)

18 = \frac{1}{2}h(12)

Multiplying 1/2 and 12, we have

18 = 6h.

We are looking for h, so to eliminate 6, we divide both equations by 6.  That is,

\frac{18}{6} = \displaystyle \frac{6h}{6}

3 = h.

So, the height of the trapezoid is 3 units (not square units!).

# How to Find the Area of a Trapezoid Part 3

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This the third part of [**a series**](http://civilservicereview.com/2014/09/finding-area-trapezoid-series/) on finding the area of a trapezoid here in [**PH Civil Service Review**](http://civilservicereview.com/). In the first post, we discussed the derivation of the area of a trapezoid and give a worked example. In the second post, we discussed how to find the area given the base and the height as well as to find the height given the area and the base.

In this post, we are going to find the base, given the height and the area. We continue with the fourth example.

**Example 4**

A trapezoid has area 65 square centimeters, height 13 cm, and base of 4 cm. Find the other base.

*Solution*

In this example, we have A = 65, h = 13 and a = 4. We are looking for b.

A = \frac{1}{2}h(a + b)

65 = \frac{1}{2}(13)(4 + b)

In equations with fractions, we always want to eliminate the fractions. In the equation above, we can do this by multiplying both sides of the equation by 2.  That is,

2(65) = 2(\frac{1}{2})(13)(4 + b).

The product of 2 and 1/2 is 1, so,

130 = 13(4 + b).

Next, we use distributive property on the right hand side. Recall: a(b + c) = ab + ac.

130 = 13(4) + 13(b)

130 = 52 + 13b.

We want to find b, so we subtract 52 from both sides giving us

78 = 13b.

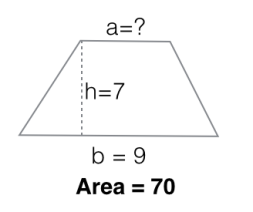
Next, we divide both sides by 13

6 = b.

So, the other base is 6 centimeters which is our answer to the problem.

**Example 5**

The figure below is a trapezoid. Find the value of a.

[](http://i1.wp.com/civilservicereview.com/wp-content/uploads/2014/09/area-of-a-trapezoid21.png)

Solution

A = \frac{1}{2}h(a + b)

70 = \frac{1}{2}(7) (a + 9)

We eliminate the fraction by multiplying both sides by 2 to get

140 = 7(a + 9).

Note: It will be shorter if we divide both sides of equation by 7. You might want to try it.

Using the distributive property, we have

140 = 7(a) + 7(9)

140 = 7a + 63.

Subtracting 63 from both sides, we have

77 = 7a.

Dividing both sides by 7, we have

11 = a,

So, the other base of the trapezoid is 11 units.