**Lesson 1.2: Arithmetic Series Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

Specific Outcome: 1. Analyze arithmetic sequences and series to solve problems.

**Background**

We should already know what an *arithmetic sequence* is. The following is an example of an *arithmetic sequence*:

 2, 5, 8, 11, 14,...

Sometimes, it is helpful to be able to add up the sum of all the values in an arithmetic sequence. This is known as an **arithmetic series**. The *arithmetic series* of the first five terms of the above sequence is:

 2 + 5 + 8 + 11 + 14 = 40

We write this as S5 = 40

There is a formula that can be used to solve for the *arithmetic series* of an arithmetic sequence. We will investigate how this can be derived in the questions below:

**Investigation**

1. Select a number between 1 and 10. This value will be the first term in your arithmetic sequence (and thus, we will call it *t1*)
2. Select a number between -10 and 10 that you will use as the common difference (or *d*)
3. Using your values in **1** and **2** create an arithmetic sequence that has 10 terms in it.
4. To convert this arithmetic sequence to a series, we will replace the commas with addition symbols. For example, the sequence: 1, 2, 3, 4 would become . Do this with your values.
5. Because this is a series, we will use the letter *S* to indicate this. The series above would now be: . Do this for your values.
6. Write out the series directly below in reverse order. In the given example, you would get:



 Do this for your values.

1. Add the two systems together vertically. In the above example you would get:

 

Do this for your values. What do you notice?

1. Notice that this value will give us twice the sum. Divide both sides by 2. This should give you the value for the sum of the arithmetic sequence. Determine the value of the sum of the arithmetic sequence for your values.
2. Notice that we could solve for the general formula for the arithmetic series by using the general arithmetic sequence:

 

Using the same steps that we did in 6 – 8 should give us the following:

 

 Notice that all of the sums have the same value . We should know that there are *n* terms (why?). This means that we can rewrite the formula like so:

 

 Thus the formula can be rewritten as the following:

 

1. Sometimes this formula is written in a slightly different way. Remember that the formula for an arithmetic sequence is  . Rewrite  using this information and collect like terms.

**Guided Practice**

Solve for the following questions using one of the two formulas:

1. Find the sum of the first 60 terms of the series 
2. Find the sum of the arithmetic series 
3. Find the indicated sum for the following arithmetic series: 
4. Find the sum of the first 75 positive multiples of 4.

**Assignment:** Pg. 27 questions :1-4 (odd letters ex. a,c,e) 6c, 8, 10, 11 Challenge 15