Arithmetic

Adarsh Patel

July 7, 2025

1 What is arithmetic?

Arithmetic is the most basic form of mathematics and is used as the foundation for higher level mathematics. Arithmetic deals with numbers and the basic operations of additions, subtraction, multiplication and division.

1.1 Utility of arithmetic

Arithmetic is used for both basic and complex problem solving that involves the use of numerical values. These values can be measurements in meters for length, liters for volume and grams for weight. Arithmetic can be used for many applications such as counting, measuring and infringing.

1.2 Arithmetic and a leaky roof

Suppose we have a leaky roof and we have put a bucket over the leak to catch any water that may come through. We want to find how much time it will take for the bucket to be completely full. The bucket is labeled 20 liters and the water has reached the 5 liter mark. To find how much volume is left in the bucket we can use following equation.

$$20L - 5L = 15 \text{ Liters left}$$

This means that we have 15 liters left in the bucket. Now to find out how fast out bucket is filling up we wait one minute to see that the bucket is now 8 liters full. Let's use the same equation as last time to see how much water we get in the span of a minute and how much is left.

$$8L - 5L = 3 \text{ Liters per min}$$

$$20L - 8L = 12 \text{ Liters left}$$

Now that we know the amount left in the bucket and the rate at which it is filling up at, we can not calculate the amount of time left for the bucket to completely full up.

$$\frac{12 \text{ Liters left}}{3 \text{ Liters per min}} = 4 \text{ Minutes}$$

So in 4 minutes, the bucket will be completely full and will need to be replaced. Suppose we did swap the bucket for a new empty one that we do not

know the size of, how can we measure the size of the bucket when it becomes full? Let's say that we wait waited for the bucket to become full which took 12 minutes. Since we know that water is leaking at 3 liters per minute we can find the volume of the new bucket using the following.

$$3 \text{ Liters per min} \cdot 12 \text{ Minutes} = 36 \text{ Liters}$$

.

2 Arithmetic operations

2.1 Addition

Addition can be described as the action of combining two amounts.

$$a + b = c$$

AND

$$b + a = c$$

For example adding 3 apples to 4 apples to see how much apples we have combined.

$$3 + 4 = 7 \text{ Apples}$$

We can also switch the order and still get the same answer.

$$4 + 3 = 7 \text{ Apples}$$

2.2 Subtraction

Subtraction can be described as the opposite of addition, and except for combining two amounts, we remove one amount from another.

$$c - b = a$$

OR

$$c - a = b$$

So if we have 7 apples and we remove 2 apples we can find out how many we have left by subtracting.

$$7 - 2 = 5 \text{ Apples}$$

NOTE

Unlike in addition we CANNOT switch which side the number are on!

$$2 - 7 \neq 5 \text{ Apples}$$

BUT

We CAN swap the result and the amount be subtracted

$$7 - 5 = 2 \text{ Apples}$$

2.3 Multiplication

Multiplication can be described as repeated addition, by adding an amount a certain amount of times.

$$a \cdot b = c$$

AND

$$b \cdot a = c$$

Lets use $3 \cdot 4$ as a example.

$$3 \cdot 4 = 3 + 3 + 3 + 3 = 12$$

OR

$$3 \cdot 4 = 4 + 4 + 4 = 12$$

2.4 Division

Division can be described as counting the amount of time we can subtract an amount by another amount. Lets use $20 \div 5$ as a example.

1. $$20 - 5 = 15$$
2. $$15 - 5 = 10$$
3. $$10 - 5 = 5$$
4. $$5 - 5 = 0$$

Since we subtracted 4 times then,

$$20 \div 5 = 4$$