Algebra

The door to higher mathematics.

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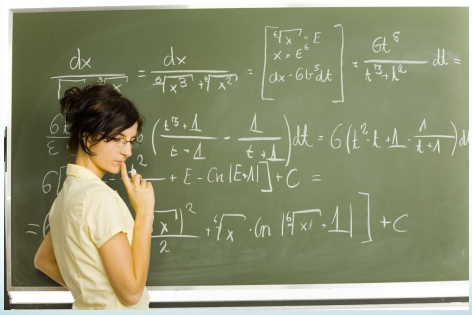
PathsToMath.com

What is Algebra to you?



- Y = 2x + 3
- Apples and oranges problems.
- Mixture and speed problems.
- Any other things.
- Perhaps not such a pleasant memory.

The study Algebra is the first opportunity for students to work with variables.

Algebra is the branch of Mathematics that studies the quantity in the most general way.

A little game:

- Think of a number.
- Double it.
- Add 10 to your result.
- Now divide your result by 2.
- Subtract 5 from it.

Did you get back your number?

Surprised?

This is the reason it works:

While you all worked with different numbers I worked with a variable.

Let's look at the steps again.

What you did	What I did
• Think of a number.	• N = your number
• Double it.	• 2N
• Add 10 to your result.	• 2N+10 =
	• 2(N+5)
• Now divide your result by 2.	• N+5
• Subtract 5 from it.	• -5

I got N which was your number.

You got your number!

The study of Algebra relies on many skills about operations with variables as well as on the learner's understanding of number properties.

Algebra in the branch of mathematics that uses variables to:

- Study models.
- Study patterns.
- Generalize findings.
- Create a rule or formula.
- Make predictions.

We will look at some examples now:

Examples of Expressions

- Assume that a cat's age is **a** years. Now express the following sentences about the cat's age in mathematical terms.

The cat's age in :

- 2 years: a+2
- 3 years ago: a-3
- When the cat is twice as old as now: 2a

Assume that a cat's weight is **m** kilograms. Now express the following sentences about the cat's weight in mathematical terms.

- When the cat weighs half as much as now: ½ m
- When the cat is 12 lbs heavier than now: m+12

Generalizing and formulas.

Peter is painting wooden cubes for his little sister Patricia.

1. How many sides does he have to paint if there are 20 wooden cubes? 120 sides.
2. There are N wooden cube. How many sides are there all together? 6N sides.

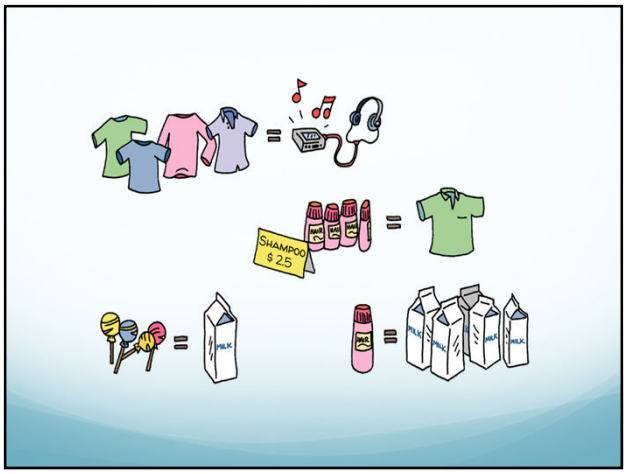
Notice that we have used the fact that a cube has 6 faces to calculate the total number of faces for 20 cubes:

6 X 20 = 120

To create the formula:
6N
To count the total number of faces in any number of cubes.

Solving Equations:

The goal of Algebra.



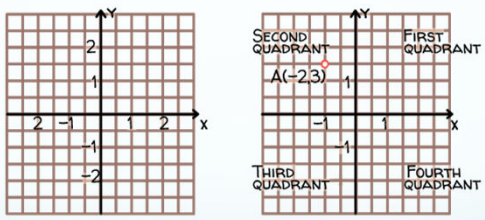
Use the following letters in your calculations:
s = the price of a sweater
b = the price of a bottle of shampoo
m = the price of a gallon of milk
l = the price of a lollypop
w = the price of a walkman

1. John wants a walkman. How much does it cost?
2. How much does a lollypop cost?
3. John wants a walkman while his little brother a sweater and two lollypops. How much would all of these items cost?
4. Dad bought a sweater and mother 3 gallons of milk. How much did all the items cost?

In the interest of time I will leave this to you to do by carefully working with the picture of the equations.

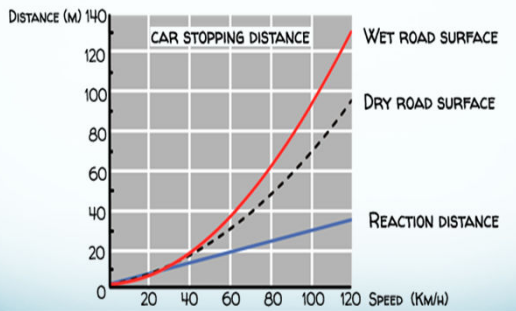
René Descartes, French (1596,1650)
revolutionized mathematics in the 17th century by providing the first systematic link between Euclidean Geometry and Algebra.

The Cartesian Coordinate System.



Coordinates help us to provide a geometric model for many branches of mathematics, like linear algebra.
For that reason they are a significant part of any Algebra course today.

Following is an example:



This graph contains information which allows us to answer :

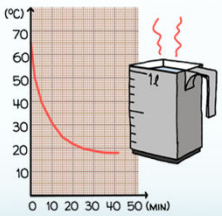
1. What is a car stopping distance?
2. Which factors affect it?
3. How far will a car travel after breaking when moving at 30 km/h?

A more difficult problem:

While driving a car in a snow covered road a deer crosses you at 50 meters from the car's front. You hit the brakes and manage to stop a couple of inches from the deer.

1. At what speed were you going?
2. If the road had been icy, what would have been the greatest speed from which you could have stopped the car on time?

Another example from real life:



This graph shows us the time in minutes that it takes for 1 litter of liquid to cool down from
60° C (140° F) to

15° C (59° F)

To Summarize:

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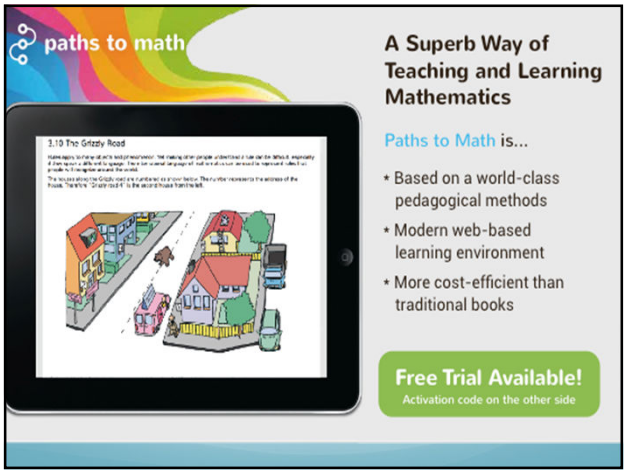
The study of Algebra with its use of variables provides the learner with the foundation to move from the concrete or real to the more abstract, intrinsic nature of mathematics.

With the development of algebraic thinking we provide students with opportunities to study, recognize, describe, extend and generalize patterns.

With the inclusion of the coordinate system in Algebra we are able to create multiple representations of simple situations and to search for rules and formulas.

A solid course in Algebra, provides the basis for the study of Geometry, Trigonometry, Statistics and Calculus, since all of these branches of mathematics require the language of Algebra.



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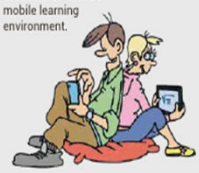

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