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Algebra in Real Life

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ABSTRACT
To know about the real life application where Algebra is used. Mathematics is applied in day to day life, so we can now review the concepts of Algebra & its uses in daily life. Here in our work we have made a small split up of items in a bag while shopping. Basic Algebra is where we finally put the algebra in pre-algebra. The concepts taught here will be used in every math class you take from here on. We'll introduce you to some exciting stuff like drawing graphs and solving complicated equations. Since we are learning Algebra, Geometry in the school days. But the is a real life application of Algebra which is used in Geometry. Now a days the social media has improved a lot. We can't able to solve those figured puzzles, hence we can solve them by using algebraic equations.

Keywords: *Variables, Polynomial, Equation, Variable Exponent, Geometry & Computer programming*

DEFINITION OF ALGEBRA

Algebra is a branch of mathematics that deals with relations, operations and their constructions. It is one of building blocks of mathematics and it finds a huge variety of applications in our day-to-day life.

Apart from its significance as a core subject of mathematics, Algebra helps students and kids a lot in developing an overall understanding of other advanced branches of mathematics such as Calculus, Geometry, Arithmetic etc.

A branch of mathematics in which arithmetical operations and relationships are generalized by using alphabetic symbols to represent unknown numbers or members of specified sets of numbers. The branch of mathematics dealing with more abstract formal structures, such as sets, groups, etc

ADVANCED DEFINITION OF ALGEBRA

Algebra (from Arabic al-jebr meaning "reunion of broken parts") is the branch of mathematics concerning the study of the rules of operations and relations, and the constructions and concepts arising from them, including terms, polynomials, equations and algebraic structures.

ALGEBRA BASICS

When it comes to studying Algebra, there are several basic mathematical terms that you will go through. Before we move into the detailed study of Algebra, it's good to familiarize yourself with a few basic Algebraic terms.

BASIC TERMS

EQUATION

An equation can be defined as a statement involving symbols (variables), numbers (constants) and mathematical operators (Addition, Subtraction, Multiplication, Division etc.) that asserts the equality of two mathematical expressions. The equality of the two expressions is shown by using a symbol "=" read as "***is equal to***".

Example: $3X + 7 = 16$ is an equation in the variable X.

VARIABLE

A variable is a symbol that represents a quantity in an algebraic expression. It is a value that may change with time and scope of the concerned problem.

Example: In the equation $3X + 7 = 16$, X is the variable.

Also in the polynomial $X^2 + 5XY - 3Y^2$, both X and Y is variables.

ONE, TWO & THREE VARIABLE EQUATION

An equation that involves only one variable is knows as *a One Variable Equation*.
Example:$3X + 7 = 16$

An equation that involves two variables is known as a Two Variable Equation.

Example:$2X + Y = 10$ is a Two Variable Equation of where X and Y are variables.

Note: Here both X and Y have a power or exponent of 1. Hence it is an equation with degree 1. The degree is equal to the highest power of the variable(s) involved.

$X^2 + 5XY - 3Y^2 = 25$ is also an example of a Two Variable Equation of degree 2.

An equation that comprises three variables / symbols is called *a Three Variable Equation* .

Example:
$$x + y - z = 1 \text{ ------------- } (1)$$
$$8x + 3y - 6z = 1 \text{ ------------- } (2)$$
$$4x - y + 3z = 1 \text{ ------------- } (3)$$

The above three equations form a system of 3 equations in 3 variables X, Y and Z. Each of these equations is a Three Variable Equation of degree 1. Also these equations are called *Linear equations* in three variables.

MONOMIAL

A monomial is a product of powers of variables. A monomial in a single variable is of the form $\mathbf{x}^n$ where X is a variable and n is a positive integer. There can also be monomials in more than one variable. For example $\mathbf{x}^m\mathbf{y}^n$ is a monomial in two variables where m,n are any positive integers. Monomials can also be multiplied by nonzero constant values. $24x^2 y^5 z^3$ is a monomial in three variables x,y,z with exponents 2,5 and 3 respectively.

POLYNOMIAL

A polynomial is formed by a finite set of monomials that relate with each other through the operators of addition and subtraction. The order of the polynomial is defined as the order of the highest degree monomial present in the mathematical statement. $2x^3 + 4x^2 + 3x - 7$ is a polynomial of order 3 in a single variable.

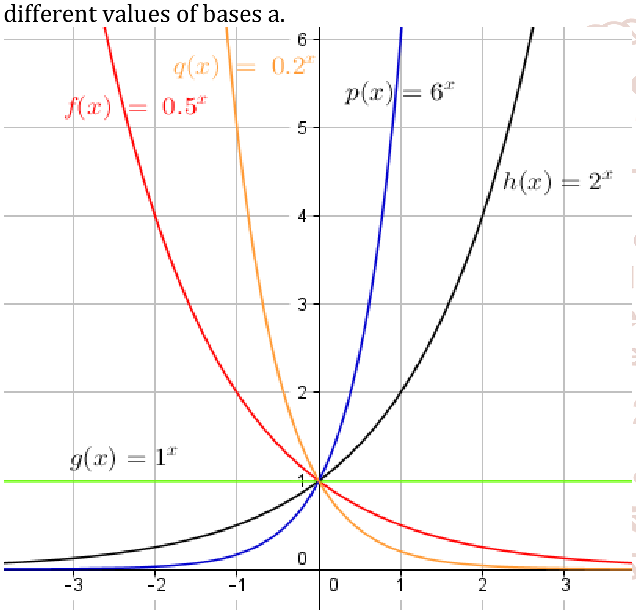
Polynomials also exist in multiple variables. $x^3 + 4x^2y + xy^5 + y^2 - 2$ is a polynomial in variables x and y.

EXPONENT

Exponentiation is a mathematical operation written as $\mathbf{a^n}$ where a is the base and n is called ***power*** or ***index*** or ***exponent*** and it is a positive number. We can say that in the process of exponentiation, a number is repeatedly multiplied by itself, and the exponent represents the number of times it is multiplied.

- In a^3, a is multiplied with itself 3 times i.e. a x a x a.
- a^5 translates to a x a x a x a x a (a multiplied with itself 5 times).

Shown below is a graph that shows exponentiation for different values of bases a.



By looking at the graph we conclude that the numbers less than one approach to zero as the exponent value grows. On the other hand, the exponentiation values tend to infinity as exponentiation index grows for numbers greater than 1.

So far, all the equations that we have come across are linear in type. The most common difference between the two types of equations is as follows

TYPES OF EQUATION

LINEAR EQUATIONS

- A simple linear equation is of the form: y = mx + c
- A linear equation looks like a straight line when graphed.
- It has a constant slope value.
- The degree of a linear equation is always 1.
- Superposition principle is applicable to a system characterized by a linear equation.
- The output of a linear system is directly proportional to its input.

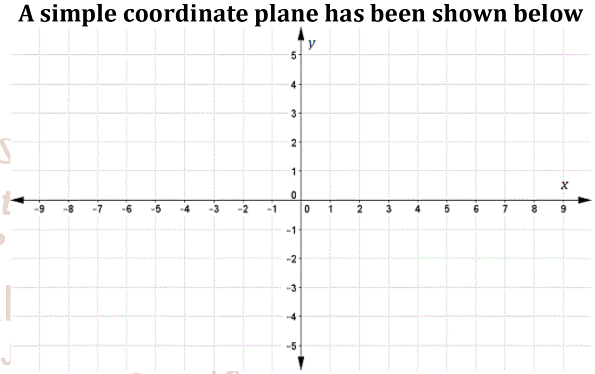
NON-LINEAR EQUATIONS

- A simple non-linear equation is of the form: $ax^2 + by^2 = c$
- A non-linear equation looks like a curve when graphed.
- It has a variable slope value.
- The degree of a non-linear equation is at least 2 or other higher integer values. With the increase in the degree of the equation, the curvature of the graph increases.
- Superposition principle does not apply to the systems characterized by non-linear equations.
- The input and output of a non-linear system is not directly related.

GRAPHING A LINEAR EQUATION IN ONE VARIABLE

Graphing an equation requires a co-ordinate plane. It consists of two straight lines one in horizontal direction and the other in the vertical direction. The horizontal line is referred to as **x-axis** and the vertical line is called **y-axis**. The point where the two lines intersect is called **origin**.

A simple coordinate plane has been shown below



There exist infinitely many points on the coordinate plane. A single point can be specified with the help of two co-ordinate values x and y, and is represented in the form of an ordered pair **(x,y)**. Here x and y can take any real value.

In order to graph a linear equation in one variable, we make use of a coordinate plane Let us present it through an example.

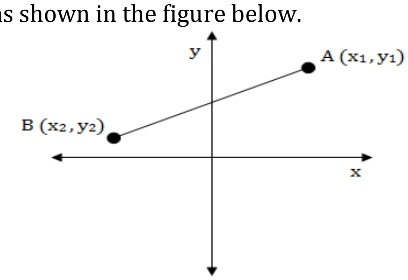
DISTANCE FORMULA

Distance Formula, as evident from its name, is used to measure the shortest (straight-line) distance between two points.

PYTHAGOREAN THEOREM

A simple derivation of the formula can be obtained by applying this famous theorem. According to this theorem, the hypotenuse of a right-angled triangle can be obtained by h2=x2+y2

In the case of distance formula, we can measure the value of x by subtracting x_1 from x_2. Similarly, the value of y is given by y_2-y_1 as shown in the figure below.



$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

Eventually, the straight line distance d between the two points (x_1,y_1) and (x_2,y_2) is given by

$$d=\sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$$

MIDPOINT FORMULA

The midpoint formula is used to find a point (its coordinate values) that is located exactly between two other points in a plane. The formula finds its tremendous application in geometry.

The coordinates of the point (x, y) that lies exactly halfway between the two points (x_1, y_1) and (x_2, y_2) are given by:

$$x = x_1 + x_2, y = y_1 + y_2$$

Similarly, if we want to find the midpoint of a segment in the 3-dimensional space, we can determine the midpoint using:

$$x = x_1 + x_2, y = y_1 + y_2, z = z_1 + z_2$$

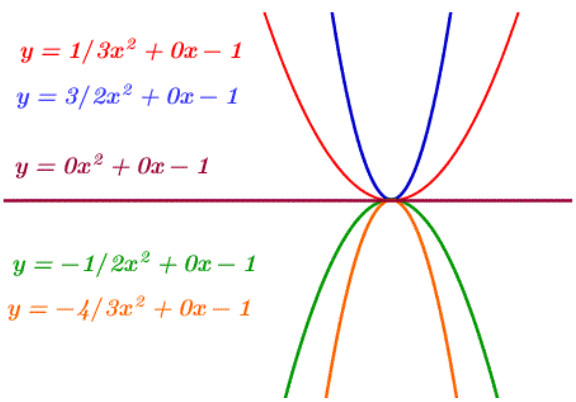
The figure shown below gives an illustration of the midpoint formula.

A quadratic equation is a polynomial of second degree in a single variable. It is expressed as

$$ax^2+bx+c=0$$

In the above equation, a,b,c are constants where a!= 0.

The figure below shows the plot of a quadratic equation $y=ax^2+bx+c$. The values of all the three coefficients are varied one by one, i.e. while a is varied b&c remain fixed and so on. From the figure, we conclude that the graph of a quadratic equation is a parabola and a variation in the values of the three coefficients shifts the position of this parabola on the coordinate axis.



QUADRATIC FORMULA

For a general quadratic equation of the form

$ax^2+bx+c=0$

wherea,b,c are constants (can be -ve) and where a !=0, the **quadratic formula** is given by

$$x= (-b\pm\sqrt{(b^2-4*a*c)})/2*a$$

According to this solution, there are two **roots** of the quadratic equation. And they are given as:

$$x= (-b+\sqrt{(b^2-4*a*c)})/2*a$$

$$x= (-b-\sqrt{(b^2-4*a*c)})/2*a$$

i.e. one with the positive sign, while the other has a negative sign.

OPERATIONS WITH POLYNOMIALS

POLYNOMIALS

A polynomial is a mathematical expression that is constructed from one or more variables and constants, using only the operations of addition, subtraction, and multiplication. The constants of the polynomials are real numbers, whereas the exponents of the variables are positive integers.

Example: $x^2+5x-3$is a polynomial in a single variable x.

DEGREE, COEFFICIENTS & VARIABLES OF A POLYNOMIAL

The highest power of the variable present in a polynomial is called *the degree of the polynomial.* In the above example, the degree of the polynomial is 2.

The constant values present in a polynomial are knows as *its coefficients / coefficient values.* The constants used in the above polynomial are 1, 5 and -3.

Variables are alphabets like a,b,c, x, y, z etc that are used in a polynomial. They are called variables because they can take up any value from a given range (thus called "vary-ables"). In the above example, x is the variable. There also exist polynomials that use more than one variable.

Example: $x^2+5xy-3y^2$is a polynomial of degree 2 in two variables x and y.

Note: Until this point, we have only mentioned what a polynomial is. However, for many reasons it is wise to make clear as to what is not a polynomial. Without this specification, it is likely that you render a non-polynomial to be a polynomial.

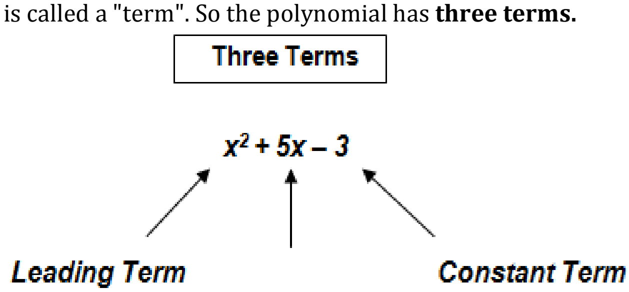
WHAT IS NOT A POLYNOMIAL?

A polynomial cannot have negative values of exponents.

Example:4x-2cannot be a polynomial term(A polynomial term cannot have the variable in the denominator).

A polynomial term cannot have a variable inside the radical sign.

Each part of a polynomial that is being added or subtracted is called a "term". So the polynomial has **three terms.**



Shown above is a simple example of the polynomial, and this is how polynomials are usually expressed. The term having the largest value of exponent (2 in this case) is written first, and is followed by the term with the next lower value of exponent which in turn is followed by a term with the next lower exponent value and so on. The term with the maximum value of exponent is called the "Leading Term" and the value of its exponent is called the "degree of the polynomial".

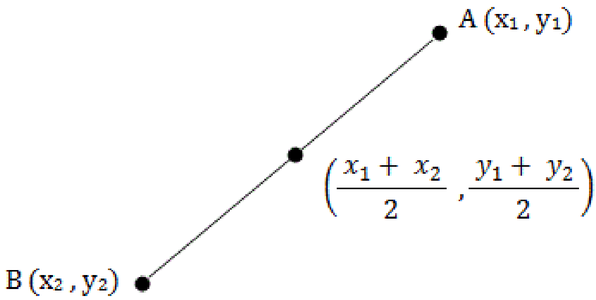
POLYNOMIAL ADDITION ALGORITHM

Addition of two polynomials involves combining like terms present in the two polynomials. By like terms we mean the terms having same variable and same exponent.

For example two terms are like only if:
- The two terms have same variable
- The two terms have same power of the variable

SUBTRACTING POLYNOMIALS CALCULATOR

Subtraction of polynomials is very much similar to addition of them. We can simply say that *" The subtraction of one polynomial from the second polynomial is a process of adding the second polynomial into the first polynomial with all the signs of the first polynomial inverted."*



EXPLANATION

While calculating the midpoint between two sets of coordinates of a line segment, if we assume, point A is x_1, y_1 and x_2, y_2. Using the above midpoint formula, the average of the x coordinates and y coordinates give the midpoint of Point A and Point B. It is possible to find the midpoint of a vertical, horizontal and even a diagonal line segment using this formula.

PARENTHESES RULES DEFINITION

Parentheses are used in Algebraic / Mathematical expressions primarily to modify the normal order of operations. Therefore in an expression involving parentheses, the terms present inside the parentheses () are evaluated first.
- a+(−b)=a−b
- a−(−b)=a+b
- a⋅(−b)=−ab
- (−a)(−b)=ab

We present some examples involving Parentheses Rules that will help you understand their significance and the way they are used.

MULTIPLYING POLYNOMIALS CALCULATOR

Polynomial multiplication is a very common operation throughout Algebra and Mathematics in general. We use following three properties very frequently all the way along as we work on multiplication of polynomials.

Note: What remain are the **rules of exponents.** We explain these rules first and then we move forward to polynomial multiplication.

RULES OF EXPONENT

Let a be a real number, and let m,n be any positive integers then **am□an=am+n**

If a is any real number, and m,n are two positive integers then **(am)n=amn**

Let a,b be two real numbers, and let n be a positive integer then **(ab)n=an.bn**

These properties are very simple and easy to verify. You must learn them by heart before you move ahead towards the multiplication of polynomials.

POLYNOMIAL LONG DIVISION CALCULATOR

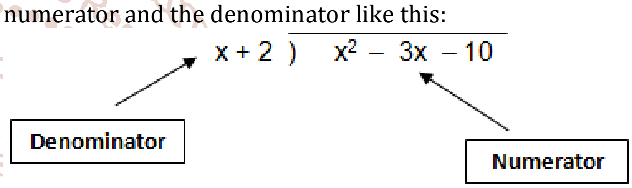
Polynomial long division is a method/technique by which we can divide a polynomial by another polynomial of the same or a lower degree. Division of a polynomial (ax^2+bx+c) by another polynomial (dx + e) can be expressed in the form: **ax^2+bx+cdx+e** Where a,b,c,d and e are any constant values.

The polynomial on the top is called the "**numerator**" whereas the polynomial on the bottom is termed as "**denominator**". These terms are useful to remember, as we will use them frequently in the coming text.

Note: Remember denominator from down & A function of the form

f(x)=anxn+an−1xn−1+...+a1x+a0is called a **polynomial function.** Here n is a non-negative integer and an,an−1,...a2,a1,a0are constant coefficients.

While dividing using Long Division method, we write the numerator and the denominator like this:



Polynomial and Rational Functions

ALGEBRA IN REAL LIFE

We use algebra quite frequently in our everyday lives, and without even realizing it! We not only use algebra, we actually need algebra, to solve most of our problems that involves calculations.

EXAMPLE OF USING ALGEBRA IN EVERYDAY LIFE

1. You purchased 10 items from a shopping plaza, and now you need plastic bags to carry them home. If each bag can hold only 3 items, how many plastic bags you will need to accommodate 10 items?

Solution: Let x=10 & y=3

So $\frac{x}{y} = \frac{10}{3}$ = 3.33

We need **4** bags to carry 10 items

2. Let us consider another one example, here we have purchased 100 items in a grocery shop and it needs bay to carry them. So if a carry bag can hold 10 items we can calculate how much bag we need it.

Solution: Let x=100 & y=10

So $\frac{x}{y} = \frac{100}{10}$ =10

We need **10** bags to carry 100 items.

From example 2 it is very hard to carry 10 bags. So if we have a large bag i.e. a bag can carry 25 items then the number of bag can be reduced.

Now our solution of example 2 becomes,

x=100 & y=25

$\frac{x}{y}=\frac{100}{25}$=4.

WHAT IS ALGEBRA AND ITS ROLE IN THE REAL WORLD?

Algebra is a field of mathematics. Usually, students in high school or elementary will be the first ones who will experience this subject. Most of them will say that it is probably one of the hardest and complicated subjects there is. Well, anything that is connected to Mathematics could really be.

When someone will say the word Algebra out loud, numbers and equations will immediately pop into one's mind. What they do not usually know is what and who and how Algebra started. A brief history of Algebra will be read in this article, to understand why and how and who started Algebra in the first place.

The Greeks first introduced Algebra in the third century and eventually it was also traced to the early Babylonians. The Babylonians were the ones who created formulas and equations that we still use to solve situations until today. Diophantus was eventually named Algebra's Father. In the 16th century, Rene Descartes was one of the names that were famous because of the book that he wrote entitled La Geometrie. What he did was more modern and is still used and taught until today.

Now that you know enough about the history of Algebra, do you now think that it is something important? You would probably still say and still wonder what Algebra has to do in the real world. Is it useable? Does it help with every day life? Do you really need to know Algebra to live? Those questions might be answered in this article.

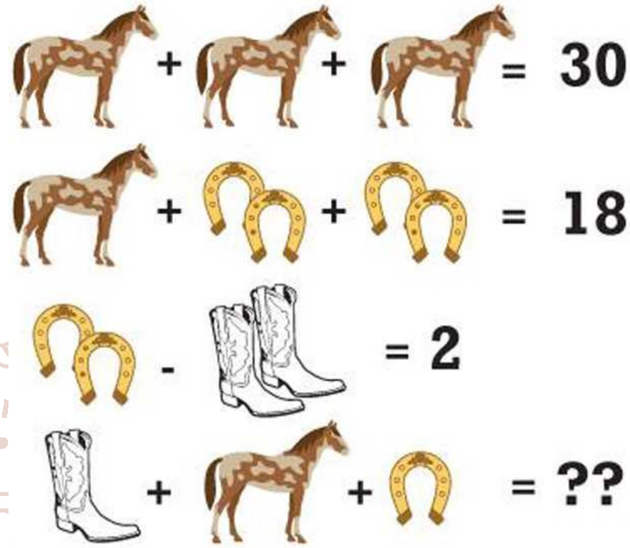
Whether you like it or not, Algebra is actually needed in your everyday life. Number and equations are actually used in almost anywhere in the world. Take for example the time when you are out getting groceries. What would probably help you in computing and for staying budgeted is learning how to add and subtract items from your cart. But in this situation, there is still a cashier that could help you with this dilemma. How about in situations wherein you are on your own, like in a gas station? You will fill up your own gas tank, put it back by yourself and swipe your credit card onto the machine, then poof, it is done. The price of gas differs from one another each day, changes really fast day by day. The only thing that will help you with your problem on how many gallons you could take with your budget is learning Algebra.

Economy is really on the rocks today. Money is always the problem so people tend to budget every single thing that they can. People get double or triple jobs just to pay the bills and to always have something for their necessities. If there is money involved and economy is the topic, numbers will always appear. There is no doubt that Algebra might be the only thing that is left to help you get through your everyday problems with how to subtract every debt or loan that you gained throughout the years.

Professional people also need to know how to add and subtract and compute equations. Even if they are not the ones who have to budget the house bills, the electrical bills or the ones who will buy the groceries, they still need to know how to work their way around numbers. There is no second thinking when we are talking about bank tellers who should always be alert on what they give and what they should not give to the customers. How about the people in the real estate, stock exchange or even mini grocery store owners? They still have to have the capability to learn and work their way around numbers in order to succeed.

SOLVING PUZZLE USING ALGEBRA

Now a day's Aptitude is very important for job. There are many divisions in aptitude from that I have chosen puzzle to solve it. So we have to solve the questions in a short period of time so if we use the concept of Algebra it is very easy.



Let x be horse, y be shoe horn and z be gumboot,
We shall now consider the equations,
x+x+x=30-------(1)
x+2y+2y=18------(2)
2y-2z=2-----------(3)
y+x+z=?----------(4)

From (1) 3x=30
x=10

put x in (2)
10+4y=18
4y=8
y=2

Put y in (3)
4-2z=2
-2z=-2
z=1

Put x,y&z in (4)
2+10+1=13

ALGEBRA IN GEOMETRY

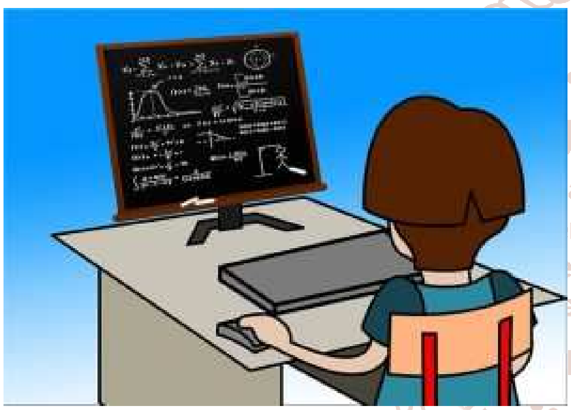
Two-dimensional shapes can be represented using a co-ordinate system. Saying that a point has the co-ordinates *(4,2)* for example, means that we get to that point by taking four steps into the horizontal direction and 2 in the vertical direction, starting from the point where the two axes meet.

Using algebra, we can represent a general point by the co-ordinates *(x,y)*. You may have already learnt that a straight line is represented by an equation that looks like *y=mx+b*, for some fixed numbers *m* and *b.* There are similar equations that describe circles and more complicated curves. Using these algebraic expressions, we can compute lots of things without ever having to draw the shapes. For example we can find out if and where a circle and a straight line meet, or whether one circle lies inside another one. See the article on geometry to find out about its uses.

ALGEBRA IN COMPUTER PROGRAMMING

As we have seen, algebra is about recognising general patterns. Rather than looking at the two equations $3x+1=5$ and $6x+2=3$ as two completely different things, Algebra sees them as being examples of the same general equation $ax+b=c$. Specific numbers have been replaced by symbols.

Computer programming languages, like C++ or Java, work along similar lines. Inside the computer, a character in a computer game is nothing but a string of symbols. The programmer has to know how to present the character in this way. Moreover, he or she only has a limited number of commands to tell the computer what to do with this string. Computer programming is all about representing a specific context, like a game, by abstract symbols. A small set of abstract rules is used to make the symbols interact in the right way. Doing this requires algebra.



CONCLUSION

Mathematics is an intrinsic part of the problem-solving, investigation, testing, design and analysis work undertaken by the Australian Bureau of Statistics. It makes it possible to develop a comprehensive data-base of information in a cost-effective way. It enables us to draw value from the data through exploration of the patterns in it, and estimation of the confidence that might reasonably be put in the inferences drawn. A fascinating aspect of the application of mathematics in industry is that, in the practical environment, no particular solution ever seems directly applicable. Rather, the principles of past findings must be understood as a basis for drawing out further solutions, thereby enhancing and developing new theory to fit the real world. Researchers and graduate practitioners, having a very strong understanding of the principles behind the known theory and the basis on which it has been developed, are needed to be able to extend and apply that theory appropriately in the practical environment.

REFERENCES

[1] https://www.google.com/search?q=algebra+in+real+life&ie=utf-8&oe=utf-8&client=firefox-b-ab

[2] https://www.google.co.in/search?tbm=isch&q=Decision+making+in+algebra&chips=q:decision+making+in+algebra,online_chips:problem+solving,online_chips:worksheet&sa=X&ved=0ahUKEwjOuM3pgJTbAhVBLo8KHZp_A4EQ4lYIJigA&biw=1429&bih=677&dpr=0.9#imgrc=12ojl1ukBS-rdM:

[3] https://www.google.co.in/search?biw=1429&bih=677&tbm=isch&sa=1&ei=8H_Wo7uJcWw0AT23rFo&q=algebra+EQUATION&oq=algebra+EQUATION&gs_l=img.3..0l10.1001160.1003660.0.1003955.8.2.0.6.6.0.202.383.0j1j1.2.0....0...1c.1.64.img..0.8.530....0.DhPDeM6fi_8