How Are Polynomials Used in Life?

By Paul Dohrman, eHow Contributor

Polynomials are equations of variables, consisting of two or more summed terms, each term consisting of a constant multiplier and one or more variables (raised to any power). Since polynomials include additive equations with more than one variable, even simple proportional relations, such as F=ma, qualify as polynomials. They are therefore very common.

1. Finance

- Assessment of present value is used in loan calculations and company valuation. It involves polynomials that back interest accumulation out of future liquid transactions, with the aim of finding an equivalent liquid (present, cash, or in-hand) value. Fortunately, numerous payments can be rewritten in a simple form, if the payment schedule is regular. Tax and economic calculations can usually be written as polynomials as well.

2. Electronics

- Electronics use many polynomials. The definition of resistance, V=IR, is a polynomial relating the resistance from a resistor to the current through it and the potential drop across it.
  This is similar, but not the same as, Ohm's law, which is followed by many (but not all) conductors. It states that the relation between voltage drop and current through a resistor is linear when graphed. In other words, resistance in the equation V=IR is constant.
  Other polynomials in electronics include the relation of power loss to resistance and voltage drop: P=IV=IR^2. Kirchhoff's junction rule (describing current at junctions) and Kirchhoff's loop rule (describing voltage drop around a closed circuit) are also polynomials.

3. Curve Fitting

- Polynomials are fit to data points in both regression and interpolation. In regression, a large number of data points is fit with a function, usually a line: y=mx+b. The equation may have more than one "x" (more than one dependent variable), which is called multiple linear regression.
  In interpolation, short polynomials are joined together so they pass through all the data points. For those who are curious to research this more, the name of some of the polynomials used for interpolation are called "Lagrange polynomials," "cubic splines" and "Bezier splines."

4. Chemistry

- Polynomials come up often in chemistry. Gas equations relating diagnostic parameters can usually be written as polynomials, such as the ideal gas law: PV=nRT (where n is mole count and R is a proportionality constant).
  Formulas of molecules in concentration at equilibrium also can be written as polynomials. For example, if A, B and C are the concentrations in solution of OH-, H3O+, and H2O respectively, then the equilibrium concentration equation can be written in terms of the corresponding equilibrium constant K: KC=AB.

5. Physics and Engineering

- Physics and engineering are fundamentally studies in proportionality. If a stress is increased, how much does the beam deflect? If a trajectory is fired at a certain angle, how far away will it land? Well-known examples from physics include F=ma (from Newton's laws of motion), E=mc^2 and F---r^2=Gm1---m2 (from Newton's law of gravitation, though usually the r^2 is written in the denominator).

How to Use Polynomials in the Business World

By Melissa Bajorek, eHow Contributor

Polynomials can be used to forecast sales trends over time.

Polynomials are used in the business world in dozens of situations. Polynomials -- algebraic expressions made with constants, variables and exponents -- can be used to forecast sales trends, develop profit margins and attract investors. Polynomials are combined using addition, subtraction and multiplication, but never division.

To use polynomials in business, start by working with the simplest forms. The most basic polynomials with just one term, called monomials, are used in everyday business. A supervisor can use a polynomial such as 12X, where X represents his average sales in a month, to determine the average sales of a whole year. Polynomials can also help figure overhead costs. For example, 12 months of rent may be figured as 12R. You can use more extensive polynomials to determine, for example, how much profit is left after accounting for overhead costs, wages and other liabilities, such as payroll taxes.

Once you have mastered the simplest polynomials, try using more-complicated ones for your payroll. For instance, a polynomial that describes an employee's regular wages plus 20 hours of overtime may read like:

40H + 20(H+ 1/2H) where H is the employees standard hourly pay.

A polynomial describing another employee who works part time but earns a 20 percent commission on sales may read like:

20H + 0.2S

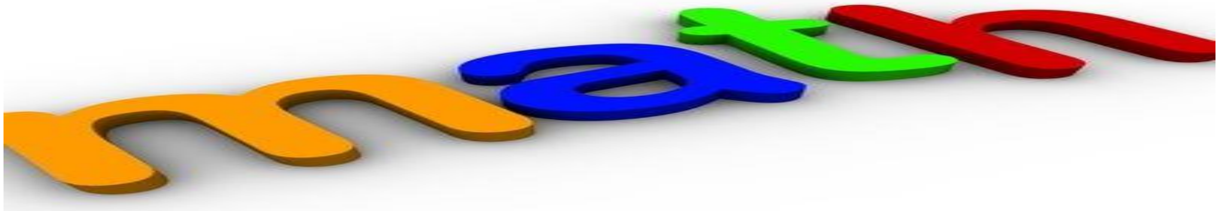
Each of these polynomials uses two terms, making them binomials.

For complicated polynomials that will affect whether your business succeeds, get professional help. Retail businesses use market research companies to set prices and develop pricing strategies over time. Polynomials can be used in a demand equation to show how much money people will pay for a product, depending on how much of that product is available. A good example is fuel. When fuel prices are low, consumers may buy much more and use their cars more often. When fuel prices are high (meaning fuel is less available), consumers will curtail their driving habits. So, a demand equation uses polynomials to figure how high or low you can price a product. Marketing companies use these polynomials to determine that at a certain high price point, no one will purchase a product. At a very low price, the items will sell quickly but create no profit.

Accuracy is key when using polynomials for business. Many professionals rely on spreadsheet software and graphing calculators to figure more-complicated polynomials. If you plan on using polynomials often, consider taking a few algebra classes and investing

What Are Some Careers for Using Polynomials?

By Linda Donahue, eHow Contributor



Lots of careers use math

The study of algebra (along with other higher math disciplines) revolves around using and manipulating polynomials. Polynomials are used in engineering, computer and math based jobs, in management, business and even in farming. In all careers requiring knowledge of polynomials, variables and constants are used to create expressions defining quantities which are known and unknown. These relationships, between the known and unknown, are balanced in equations then solved for unknown quantities. Any career which uses measurement uses quantities.

1. Professional Careers

- Careers in computer science and mathematical applications depend on algebraic constructs. Consider work as an actuary, or a computer programmer or software engineer. Mathematicians, statisticians and engineers of all sciences employ the use of polynomials. Among engineering career options there are aerospace engineers, chemical engineers, civil engineers, electrical engineers, environmental engineers, industrial engineers, materials engineers, mechanical engineers and nuclear engineers. Consider also work as a drafter or engineering technician.
  Scientists, too, use polynomials in their work. Fields include life science, biology, physical sciences, chemistry, physics and astronomy. Algebra is instrumental in working with data in social sciences as well. Related social science occupations include working as an economist or a math or science teacher.
  In the health field, polynomials are used by those who diagnose and treat conditions. Registered nurses, health technologists and technicians, medical records and health information technicians, veterinary technologists and technicians all use algebra in their line of work.

2. Management Careers

- Management occupations often use algebraic polynomials in solving their organizational based problems. Management positions include computer and information systems managers, engineering and natural sciences managers, along with farmers, ranchers, and agricultural managers. Even funeral directors, industrial production managers, medical and health services managers, and property, real estate, and community association managers all use math in their daily work. Other career paths could lead you to become a purchasing manager, buyer, or purchasing agent. Business and financial operations occupations, along with budget analysts and insurance underwriters all use polynomials.

Other Careers

- In the service industry, health care support occupations, such as nursing, psychiatric, and home health aides required knowledge of polynomials and their uses. Other fields employing algebra (or calculus, etc.) include farming, forest, conservation, and logging work. Workers in installation fields, such as electrical and electronic equipment mechanics, installers, and repairers benefit from understanding how to work with polynomials. Likewise, that knowledge is useful to electronic home entertainment equipment installers and repairers. And in the field of metal workers and plastic workers, computer control programmers and operators will solve problems using polynomials.

When Are Polynomials Used in Daily Life?

By Brandon Huebner, eHow Contributor

Polynomials serve many purposes.

Polynomials are a combination of several terms that can be added, subtracted or multiplied but not divided. They are one of the most basic algebraic operations, and many algebra students may wonder why they need to bother learning about them. While polynomials are in sophisticated applications, they also have many uses in everyday life.

1. Financial Planning

- Polynomials can be used in financial planning. For instance, a polynomial equation can be used to figure the amount of interest that will accrue for an initial deposit amount in an investment or savings account at a given interest rate. If a savings account with an initial deposit of $3,000 gains 3 percent interest, then this polynomial equation shows the interest gained for three years: Interest = (3,000)(3%)(3). In this situation, the savings account would accrue $270 dollars of interest during the three years.

Construction or Materials Planning

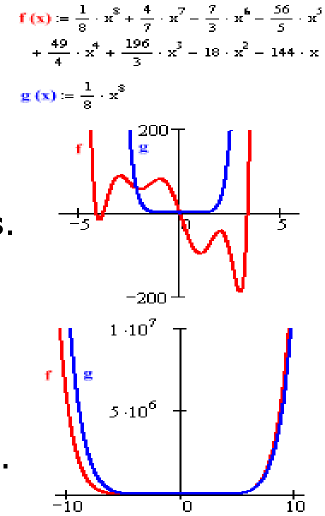
Polynomials help in calculating the amount of materials needed to cover surfaces. Polynomials are applied to problems involving construction or materials planning. A polynomial equation can be used in any 2-D construction situation to plan for the amount of materials needed. For example, polynomials can be used to figure how much of a garden's surface area can be covered with a certain amount of soil. The same method applies to many flat-surface projects, including driveway, sidewalk and patio construction.

Expense Budgeting

Polynomials are useful for money matters. Polynomials are useful when it comes to budgeting or expense planning. When you need to earn a given amount of money within a certain time period, polynomials can help you determine the exact amount of time you need to earn that amount. By predicting your expenses and knowing your rate of income, you easily can determine the amount of time you need to work. If you need to earn $4,000, can earn $350 per week and your expenses total $75 per week, then the equation is 350x-75x=4,000, where x is the amount of weeks needed to work. The equation's solution is 14 1/2, which means you would need to work 14 1/2 weeks in order to save $4,000.

Gravitational Acceleration

- The rate at which objects fall can be calculated using polynomials. Polynomials also are used in scientific problems, including gravitational acceleration problems. The polynomial equation needs to include the object's initial position, which is its distance from Earth's center, its initial velocity and its acceleration due to gravity, which is a constant figure. The accepted standard acceleration due to gravity is 32.17 feet per second squared. That is a basic formula, and many other aspects such as air resistance or air density are factored in by a scientist seeking a highly specific solution.



Polynomial Functions

Modeling Representation

Polynomial functions are nothing more than a **sum of power functions**. As a result, certain properties of polynomials are very "power-like." When *many* different power functions are added together, however, polynomials begin to take on unique behaviors.

To understand polynomial behavior, it is important to separate the **long term** from the **short term**. Long term behavior refers to what a polynomial does far from the origin – with inputs of large absolute value. behavior refers to what a polynomial does close to the origin – with inputs of small absolute value. The terms "long," "short," "large," and "small," of course, are all relative. They depend very much on the particular polynomial.

The long term behavior of a polynomial is very simple: It is indistinguishable from a single power function. A polynomial may be composed of many power functions, but one of these power functions always, eventually, dominates all of the others. The lesser power functions become insignificant by comparison, and the polynomial settles into the long term behavior of its dominant term.

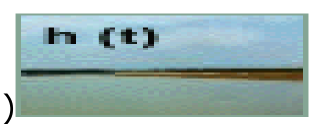
It is the short term behavior of polynomials that makes them most interesting. Near the origin, polynomials may wiggle up and down – crossing the x-axis at many **roots** and hitting many highs and lows – before the dominant power function can take long term control. The area around the origin is the polynomial party shack. All of a polynomial's exuberance is expressed here.

It is this exuberant wiggling that ultimately distinguishes polynomials in modeling situations:

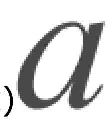
Polynomial functions model data with multiple **maxima** and **minima** in the short term, and power trends in the long term.

Here are some places to look for a polynomial's peaks and valleys:

- The stock market. (price vs. time) 

- Water levels in a reservoir. (height vs. time) 

- Demand for electricity. (watts vs. time) 

- The curves of a scalable computer font. (y vs. x) 
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