

Algebra 1 · Interpreting Expressions and Real Numbers · Lesson

Common Core A-SSE.A.1a, A-SSE.A.1b, N-RN.B.3 · mathovore.fr

Interpreting an expression means naming its terms, factors and coefficients and linking each part to a quantity in context. In $P(1+r)^n$, P is the starting amount and $1+r$ is the growth factor. A rational plus an irrational number is irrational, while two irrational numbers can combine to a rational one.

Algebra 1 Common Core: A-SSE.A.1a · A-SSE.A.1b · N-RN.B.3

Key facts:

- Standards A-SSE.A.1a, A-SSE.A.1b and N-RN.B.3: interpret parts of expressions and reason about sums and products of rational and irrational numbers.
- Terms are added; factors are multiplied; a coefficient is the number factor of a term.
- In $P(1+r)^n$, the factor $1+r$ multiplies the amount once per period.
- Rational plus irrational is irrational, and nonzero rational times irrational is irrational.
- Two irrational numbers can have a rational sum or product.

What are terms, factors and coefficients?

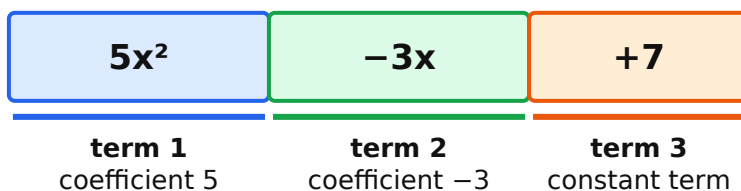
An algebraic expression is built from **terms** that are added or subtracted. Each term is a product of **factors**, and the number factor is the **coefficient**. Reading the structure first makes an expression easier to interpret and to rewrite.

Vocabulary

Term: a number, a variable, or a product of numbers and variables, separated from other terms by $+$ or $-$.

Factor: a quantity multiplied in a product. In $7xy^2$ the factors are 7, x , y and y .

Coefficient: the numerical factor of a term. **Constant term:** a term with no variable.



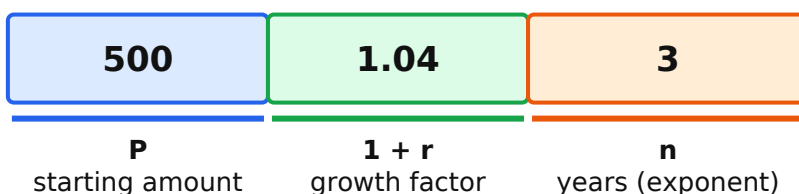
The expression $5x^2-3x+7$ has three terms. The sign belongs to the term that follows it.

How do you interpret an expression in context?

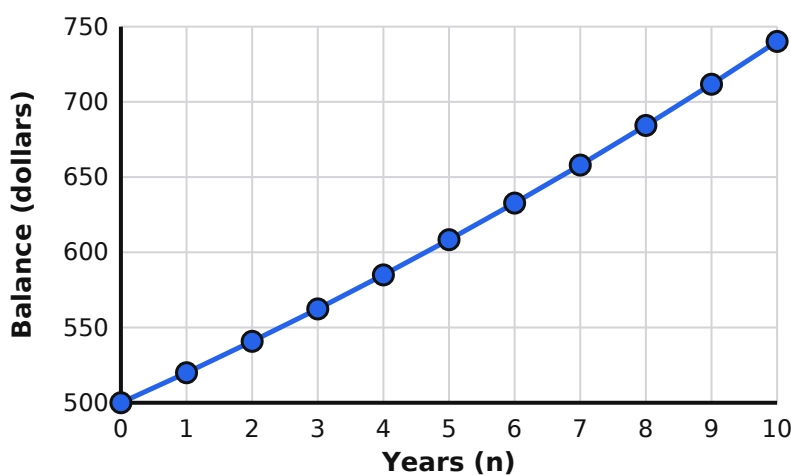
Match each part to a quantity in the story. A parking garage charges a \$2 entry fee plus \$3.50 per hour, so the cost for h hours is $2+3.5h$. The constant term 2 is the entry fee, the coefficient 3.5 is the hourly rate, and the term $3.5h$ is the cost of parking time alone. A product such as $3.5h$ is one term, while $2+3.5h$ is a sum of two terms.

What do the parts of $P(1+r)^n$ mean?

The expression $P(1+r)^n$ models growth by a fixed percent each period. P is the starting amount, r is the rate written as a decimal, $1+r$ is the growth factor, and n is the number of periods. Each period multiplies the amount by $1+r$. For \$500 at 4% for 3 years: $500(1.04)^3 \approx \$562.43$. A factor below 1, such as 0.92, models decay of 8% per period.



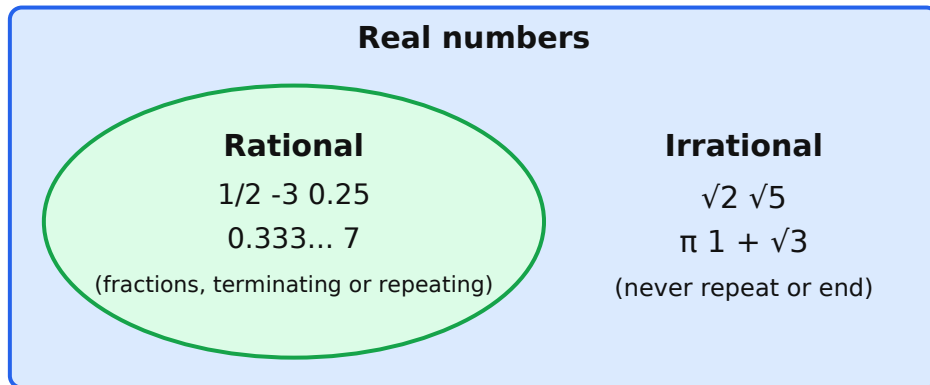
In $500(1.04)^3$, the base 1.04 is the growth factor and the exponent 3 counts the years.



The balance $500(1.04)^n$ after n years rises faster each year.

What are rational and irrational numbers?

A **rational number** can be written as a fraction of two integers, so its decimal ends or repeats. An **irrational number** such as $\sqrt{2}$ or π has a decimal that never ends and never repeats. Square roots of numbers that are not perfect squares are irrational.



Rational and irrational numbers together make up the real numbers.

What happens when you add or multiply them?

Sums and products of rationals are rational. A rational plus an irrational is always irrational. A nonzero rational times an irrational is irrational. Two irrational numbers can give either kind: $\sqrt{2} \cdot \sqrt{8} = 4$ is rational, but $\sqrt{2} \cdot \sqrt{3} = \sqrt{6}$ is not.

Operation	Example	Result
rational + rational	$\frac{1}{2} + \frac{3}{4} = \frac{5}{4}$	rational
rational + irrational	$3 + \sqrt{2}$	irrational
nonzero rational x irrational	$2 \times \sqrt{5} = 2\sqrt{5}$	irrational
irrational + irrational	$\sqrt{2} + (-\sqrt{2}) = 0$	either
irrational x irrational	$\sqrt{2} \times \sqrt{8} = 4$	either

Rules for sums and products. The word nonzero matters because $0 \cdot \sqrt{5} = 0$.

Interpreting Expressions and Real Numbers: frequently asked questions

What is the difference between a term and a factor?

Terms are added or subtracted, and factors are multiplied. In $3x+5$, the terms are $3x$ and 5 , and the factors of the first term are 3 and x .

What is the coefficient of a term like $-x$?

The coefficient of $-x$ is -1 , because $-x = -1 \cdot x$. The coefficient of x alone is 1 . Always include the sign when naming a coefficient.

What does the $1 + r$ in $P(1 + r)^n$ represent?

It is the growth factor for one period. If $r = 0.04$, the factor is 1.04 , and the amount becomes 104% of its previous value each period.

Why is a rational number plus an irrational number always irrational?

Suppose $q + s$ were a rational number t , with q rational. Then $s = t - q$ would be rational, which contradicts that s is irrational.

Can two irrational numbers have a rational sum or product?

Yes. $\sqrt{2} + (-\sqrt{2}) = 0$ and $\sqrt{2} \cdot \sqrt{2} = 2$ are both rational. That is why the rule for two irrational numbers is only that the result can be either type.