

1. Exponent.

Exponentiation is a mathematical operation, written as b^n , involving two numbers, the **base** b and the **exponent** n . When n is a positive integer, exponentiation corresponds to repeated multiplication of the base: that is, b^n is the product of multiplying n bases:

$$b^n = \underbrace{b \times \cdots \times b}_n$$

In that case, b^n is called the n -th power of b , or b raised to the power n .

Properties of exponent:

If the same base raised to the different power and then multiplied:

$$b^3 \times b^4 = (b \times b \times b) \times (b \times b \times b \times b) = b \times b \times b \times b \times b \times b \times b = b^{3+4} = b^7$$

Or in a more general way:

$$b^n \times b^m = b^{n+m}$$

If the base raised to the power of n then raised again to the power of m :

$$(b^2)^3 = (b \cdot b)^3 = (b \cdot b) \cdot (b \cdot b) \cdot (b \cdot b) = b^{2 \cdot 3} = b^6$$

$$(b^n)^m = b^{n \cdot m}$$

$$b^1 = b;$$

$$b^0 = 1, \text{ for any } b \text{ except } 0.$$

If two different bases raised to the same power, then:

$$(a \cdot b)^3 = (a \cdot b) \cdot (a \cdot b) \cdot (a \cdot b) = a \cdot a \cdot a \cdot b \cdot b \cdot b = a^3 b^3$$

$$(a \cdot b)^n = a^n b^n$$

The exponent indicates how many copies of the base are multiplied together. For example, $3^5 = 3 \cdot 3 \cdot 3 \cdot 3 \cdot 3 = 243$. The base 3 appears 5 times in the repeated multiplication, because the exponent is 5. Here, 3 is the *base*, 5 is the *exponent*, and

243 is the *power* or, more specifically, *the fifth power of 3, 3 raised to the fifth power, or 3 to the power of 5.*

$$2^3 \cdot 2^2 =$$

$$(2^3)^2 =$$

$$5^2 \cdot 5 =$$

$$(3^7)^2 =$$

$$2^5 \cdot 2^3 \cdot 2 =$$

$$(n^5)^3 =$$

1. Factorize (represent as a product of two or more factors):

$$\frac{3}{4}x + \frac{3}{4}y =$$

$$5a - a^2 =$$

$$-3x - 3m =$$

2. A person is walking along a narrow bridge. When he passed exactly $\frac{1}{3}$ of the length of the bridge he noticed a cyclist who was catching up with him. If he will run toward the cyclist, they will meet at the beginning of the bridge. If he will run toward the end of the bridge, cyclist will catch up with him at the end of the bridge. How many times the speed of the cyclist is higher the speed of the walker?



3. Find

a) 1% from 100

f) 120% from 250

b) 7% from 200

g) 5% from 50

c) 100% from 49

h) 25% from 48

d) 1% from 300

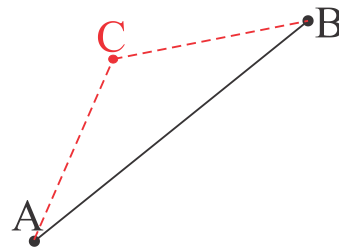
i) 200% from 30

e) 20% from 15

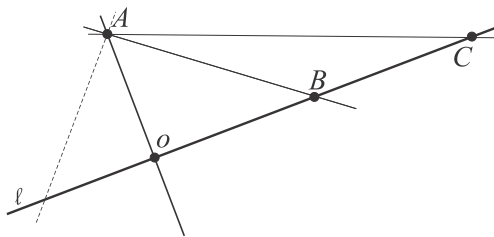
4. The speed of the boat going downstream the river is 19 km/h, and the speed of the same boat going upstream this river is 15 km/h. What is the speed of the river stream and what is the speed of the boat in a still water on a lake?

Geometry.

The shortest distance between two points is a part of a straight line passing through these two points (a segment).



The distance between a point and a line is the distance between the point and the point of intersection of the line and the perpendicular drawn from the point to the line.



AO is a perpendicular drawn from the point A to the line. $|AO|$ is the distance between the point A and the line l .

Distance between two parallel lines is a distance between any point of one line and the other line.

*On a picture on the right the caterpillar wants to go from vertex G to vertex E on the cube. Draw the shortest way for it to go. What will be the shortest way to go from the vertex G to vertex A? Find all possible solutions.

