Expressions, Part 1

Expressions in mathematics consist of:	**Examples of expressions:**
• numbers; • mathematical operations (+ , − , · , ÷ , exponents); • letters, such as x, y, a, T and so on. These letters signify numbers whose value might *vary*. They are called *variables*.	$5 + 6$ $\frac{bh}{2}$ $12 \cdot 9 - 7 \cdot 5$ $2^4 - x$ $\frac{x+y}{2}$ $T - 5$

Note 1. Expressions do *not* have an "equals" sign (=)! (It is *equations* that do.)

Note 2. In algebra, the multiplication sign · is omitted between two variables and between a number and a variable. So, bh means b times h, and $9t^2$ means 9 times t^2.

What do we do with expressions?

One main thing is that we can find the *value* of an expression by calculating it. This is also called *evaluating the expression*. For example, the value of 5 + 6 is 11. The value of $12 \cdot 9 - 7 \cdot 5$ is 73.

If the expression contains a variable, such as T − 5, then we cannot find its value unless we know the value of the variable. For example, if T is 12, then the expression T − 5 has the value 12 − 5 = <u>7</u>.

Example 1. Evaluate the expression $x^4 - y$ when x has the value 2, and y has the value 7.

Simply write "2" in place of x and "7" in place of y, and calculate:

$$2^4 - 7 = 16 - 7 = \underline{9}$$

Example 2. Evaluate $24 - 6p$ when p has the value 3.

Here, $6p$ signifies 6 times p. The multiplication sign is omitted between a number and a variable. We substitute 3 in place of p, and get:

$$24 - 6 \cdot 3 = 24 - 18 = \underline{6}$$

1. Evaluate the expressions when the value of the variable is given.

a. 7z when $z = 3$	**b.** $5x^2$ when $x = 2$
c. $2x + 18$ when $x = 5$	**d.** $\frac{35}{z} \cdot 13$ when $z = 5$
e. mn^2 when $m = 5$ and $n = 3$	**f.** $\frac{3}{5}s$ when $s = 25$
g. $\frac{x^4}{x^2}$ when $x = 10$	**h.** $\frac{1}{9}y - 4$ when $y = 81$

2. Evaluate the expression $100 - x^2$ for the given values of the variable x.

Variable	**Expression** $100 - x^2$	**Value**
$x = 3$	$100 - 3^2$	91
$x = 4$		
$x = 5$		
$x = 6$		

3. Find the value of the expressions if $p = 14$ and $s = 5$.

a. $80 - p - s$	**b.** $80 - (p - s)$
c. $80 + p + s$	**d.** $80 - (p + s)$

4. **a.** Which of the expressions (3a), (3b), (3c) and (3d) had the same value?

b. Check if those same expressions still have the same value if you use some other values for p and s.

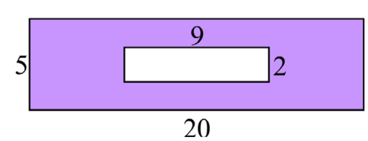
c. What do you think: do those expressions *always* have the same value, no matter what p and s are? If so, they are called **equivalent expressions**.

5. Write a single expression for each problem. (Make sure that you write an expression, not just the answer! We are practicing writing expressions with numbers only now, so that you will be able to write them with variables later on.)

a. What is the total value, in cents, of five 10-cent coins, five 5-cent coins, two 20-cent coins and seven 50-cent coins?

b. Margaret has 64 marbles. Tom has 15 less than Margaret. Henry has twice the amount of marbles Tom has. How many marbles does Henry have?

c. What is the area of the colored part?



d. What is the area of the colored part?