Expressions

Expressions in mathematics consist of:

- 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*.

Examples of expressions:

$5 + 6$ $\quad \frac{bh}{2} \quad$ $12 \cdot 9 - 7 \cdot 5$

$2^4 - x$ $\quad \frac{x+y}{2} \quad$ $T - 5$

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

What do we do with expressions?

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. However, once we know the value of T, then we can calculate the value of $T - 5$. For example, if T is 12, then the expression $T - 5$ has the value 7.

Example. Evaluate the expression $2^4 - x$ when x has the value 7.
Simply write "7" in place of x and calculate: $2^4 - 7 = 16 - 7 = 9$.

1. Find the value of the expressions.

a. $\frac{8 \cdot 10}{9}$	**b.** $3^3 - 15$	**c.** $\frac{10^4}{10^2}$
d. $10^3 - 5 \cdot 120$	**e.** $\frac{1}{9} \cdot 81 - 4$	**f.** $\frac{200 \cdot 30}{50 \cdot 10}$

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
$x = 4$		
$x = 5$		
$x = 6$		
$x = 7$		

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

a. $2x + 18$ when $x = 5$	**b.** $\frac{35}{z} \cdot 13$ when $z = 5$
c. mn^2 when $m = 5$ and $n = 3$	**d.** $\frac{3}{5}s$ when $s = 25$

4. 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.** $80 - (p + s)$

5. **a.** Which of the expressions (4a), (4b), (4c), and (4d) 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***.

6. Write an expression for each scenario.

a. The difference of s and 300, multiplied by 30.

b. The sum of 35 and x divided by 7.

c. The quotient of 200 and 40, subtracted from y.

7. Find the value of the expressions you wrote in 6 when

a. the variable s has the value 1200

b. the variable x has the value 42

c. the variable y has the value 800