Sample Problems

Evaluate each of the algebraic expressions when $p = 7$ and $q = 3$.

1. $15 - p =$
2. $pq =$
3. $4p - q =$
4. $p - 2q =$
5. $p^2 - q^2 =$
6. $(p - q)^2 =$
7. $2q^2 =$
8. $(2q)^2 =$
9. $15 - \dfrac{p+q}{5} =$
10. $(p+q)^2 - (5q - 2p)^4 =$

Practice Problems

1. Evaluate each of the algebraic expressions when $x = 6$ and $y = 8$.

   a) $19 - y + x =$
   b) $19 - (y + x) =$
   c) $2x^2 - 5y + 3 =$
   d) $x^2 + y^2 =$
   e) $(x + y)^2 =$
   f) $3y - x =$
   g) $3(y - x) =$
   h) $\dfrac{5x - y}{2} =$
   i) $5x - \dfrac{y}{2} =$
   j) $\dfrac{x^2 - 5x + 4}{y - 3} =$

2. Consider the expression $\dfrac{6a - 3b - ab + 2a^2}{2a - b} - 3$. Evaluate this expression if

   a) if $a = 5$ and $b = 1$
   b) if $a = 5$ and $b = 2$
   c) if $a = 5$ and $b = 3$
   d) if $a = 4$ and $b = 1$

Sample Problems - Answers

1.) 8 2.) 21 3.) 25 4.) 1 5.) 40 6.) 16 7.) 18 8.) 36 9.) 13 10.) 99

Practice Problems - Answers

1. a) 17 b) 5 c) 35 d) 100 e) 196 f) 18 g) 6 h) 11 i) 26 j) 2

2.) a) 5 b) 5 c) 5 d) 4

Sample Problems - Solutions

Evaluate each of the algebraic expressions when $p = 7$ and $q = 3$.

1. $15 - p =$ 8
   Solution: Step 1. We re-write the expression with one modification: we replace each variable by an empty pair of parenthses.
   Step 2. We insert the values into the parentheses. Now the problem becomes an order of operations problem.
   Step 3. We drop the unnecessary parentheses and work out the order of operations problem. (It may appear awkward to create these parentheses but they will later become extremely helpful.)

$$\begin{array}{lrcl} \text{Step 1.} & 15 - p & = & 15 - (\ \ ) \\ \text{Step 2.} & & = & 15 - (7) \\ \text{Step 3.} & & = & 15 - 7 \\ & & = & 8 \end{array}$$

2. $pq =$ 21
   Solution:

$$\begin{array}{lrcl} \text{Step 1.} & pq & = & (\ \ )(\ \ ) \\ \text{Step 2.} & & = & (7)\,(3) \\ \text{Step 3.} & & = & 21 \end{array}$$

3. $4p - q =$ 25
   Solution:

$$\begin{array}{lrcll} \text{Step 1.} & 4p - q & = & 4(\ \ ) - (\ \ ) & \\ \text{Step 2.} & & = & 4\,(7) - (3) & \\ \text{Step 3.} & & = & 4 \cdot 7 - 3 & \text{multiplication} \\ & & = & 28 - 3 & \text{subtraction} \\ & & = & 25 & \end{array}$$

4. $p-2q=$ 1
Solution:

$$\begin{array}{lrcll}
\text{Step 1.} & p-2q & = & (\ )-2(\ ) & \\
\text{Step 2.} & & = & (7)-2(3) & \\
\text{Step 3.} & & = & 7-2\cdot 3 & \text{multiplication} \\
 & & = & 7-6 & \text{subtraction} \\
 & & = & 1 &
\end{array}$$

5. $p^2-q^2=$ 40
Solution:

$$\begin{array}{rcll}
p^2-q^2 & = & (\ )^2-(\ )^2 & \\
 & = & (7)^2-(3)^2 & \\
 & = & 7^2-3^2 & \text{exponents,} \\
 & = & 49-3^2 & \text{left to right} \\
 & = & 49-9 & \text{subtraction} \\
 & = & 40 &
\end{array}$$

6. $(p-q)^2=$ 16
Solution:

$$\begin{array}{rcll}
(p-q)^2 & = & [(\ )-(\ )]^2 & \\
 & = & [(7)-(3)]^2 & \\
 & = & (7-3)^2 & \text{subtraction in parentheses} \\
 & = & 4^2 & \text{exponentiation} \\
 & = & 16 &
\end{array}$$

7. $2q^2=$ 18
Solution:

$$\begin{array}{rcll}
2q^2 & = & 2(\ )^2 & \\
 & = & 2(3)^2 & \\
 & = & 2\cdot 3^2 & \text{exponentiation} \\
 & = & 2\cdot 9 & \text{multiplication} \\
 & = & 18 &
\end{array}$$

8. $(2q)^2=$ 36
Solution:

$$\begin{array}{rcll}
(2q)^2 & = & [2(\ )]^2 & \\
 & = & [2(3)]^2 & \\
 & = & (2\cdot 3)^2 & \text{multiplication in parentheses} \\
 & = & 6^2 & \text{exponents} \\
 & = & 36 &
\end{array}$$

9. $15 - \dfrac{p+q}{5} =$ 13

Solution: From here on, we show computations **in the form they should appear**. Once you wrote down the expression with little parentheses instead of the letters, you can insert the values into it. (In this problem, we skipped the line $15 - \dfrac{(\ )+(\ )}{5}$)

$$\begin{aligned} 15 - \frac{p+q}{5} &= 15 - \frac{(7)+(3)}{5} \\ &= 15 - \frac{7+3}{5} && \text{invisible parentheses!} \\ &= 15 - \frac{10}{5} && \text{division} \\ &= 15 - 2 && \text{subtraction} \\ &= 13 \end{aligned}$$

10. $(p+q)^2 - (5q-2p)^4 =$ 99

Solution:

$$(p+q)^2 - (5q-2p)^4 = [(7)+(3)]^2 - [5\,(3) - 2\,(7)]^4$$

$$\begin{aligned} &= (7+3)^2 - (5\cdot 3 - 2\cdot 7)^4 && \text{addition in parentheses} \\ &= 10^2 - (5\cdot 3 - 2\cdot 7)^4 && \text{multiplications in parentheses,} \\ &= 10^2 - (15 - 2\cdot 7)^4 && \text{left to right} \\ &= 10^2 - (15-14)^4 && \text{subtraction in parentheses} \\ &= 10^2 - 1^4 && \text{exponents, left to right} \\ &= 100 - 1^4 && \text{careful! } 1^4 \neq 4 \\ &= 100 - 1 \\ &= 99 \end{aligned}$$