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Module 2 Writing and Simplifying Algebraic Expressions

Lesson 5 Evaluating Expressions

independent practice

Evaluate each expression for the given values of the variables.

1. $-12xy^2$ for $x = 3$, $y = -1$ **−36**
2. $2(v^2 - 8) + w^3$ for $v = 5$, $w = -3$ **7**
3. $12 - |-ab| + b^3$ for $a = 2$, $b = -4$ **−60**
4. $2\pi r$ for $\pi = 3.14$, $r = 11$ **69.08**
5. πr^2 for $\pi = \frac{22}{7}$, $r = 7$ **154**
6. $\frac{2x + 3y}{3}$ for $x = -12$, $y = 5$ **−3**
7. $\frac{x - y^3}{2 - 3xy}$ for $x = 0$, $y = -6$ **108**
8. $c^2 - b^2$ for $c = 12$, $b = 8$ **80**
9. $\sqrt{x} - \sqrt[3]{y}$ for $x = 36$, $y = -8$ **8**
10. $\frac{x^2 + y^2}{x^3 - y^3}$ for $x = -1$, $y = -3$ **$\frac{5}{13}$**

Evaluate each expression when $a = -1$, $b = 4$, and $c = -3$.

11. $a^3 - |2ac| - c^2$ **−16**
12. $\frac{6a^2 - 10a - 7}{b + 2c}$ **$-\frac{9}{2}$ or $-4\frac{1}{2}$**
13. $a^2 + b^2 - 2ac^3$ **−37**
14. $b^2 - 4ac$ **4**
15. $\frac{-b + \sqrt{b^2 - 9a}}{2a}$ **$-\frac{1}{2}$**
16. $\frac{-b + \sqrt[3]{b^2 - 11a}}{2a}$ **$\frac{1}{2}$**

Evaluate the expression $\frac{-b - \sqrt{b^2 - 4ac}}{2a}$ for the given values of the variables.

17. $a = 1$, $b = 6$, $c = 5$ **−5**
18. $a = 1$, $b = 7$, $c = 12$ **−4**
19. $a = 1$, $b = -6$, $c = 8$ **2**
20. $a = 3$, $b = -4$, $c = -4$ **$-\frac{2}{3}$**

Journal

1. Explain why the expression $-x^3$ will always be a negative number, if x is positive, and will always be a positive number if x is negative.
2. Use the order of operations to describe how the expressions $(-x)^3$ and $-x^3$ are different.
3. In your own words, explain why the order of operations is important. Create your own example to show how the process works.
4. Give an example to show why it is important to perform the operations of multiplication and division from left to right.
5. Explain how squaring a number and doubling a number are different.

Possible Journal Responses

1. $-x^3$ means the "opposite of the cube of x". If x is a positive number, the cube of x is a positive number and the opposite of a positive number is a negative number. If x is a negative number its cube is negative and the opposite of a negative number is a positive number. That makes $-x^3$ negative whenever x is a positive number and $-x^3$ positive whenever x is negative.

(Possible Journal Responses continued on p. 90)

Cumulative Review

Simplify each expression.

1. $3\frac{1}{2} - 5^2$ **$-21\frac{1}{2}$**

2. $6[-2(5 + |-7|) - 3] + 12$ **-150**

3. $\frac{2}{3}(-9) - 5$ **-11**

4. $\left(\frac{4}{5}\right)(-15) + 7$ **-5**

5. $-3 \cdot 0 - 2$ **-2**

Identify the algebraic property used to get the expression that appears on each indicated line.

6. $3x^2 + 5x^2 + 3(x - 4) + 6$
   a) $3x^2 + 5x^2 + 3x - 12 + 6$
   $8x^2 + 3x - 6$

   a) **Distributive Property**

7. $(5x + 7y) + 3x$
   a) $5x + (7y + 3x)$
   b) $5x + (3x + 7y)$
   c) $(5x + 3x) + 7y$
   $8x + 7y$

   a) **Associative Property of Addition**
   b) **Commutative Property of Addition**
   c) **Associative Property of Addition**

8. $45 + 9(1) + 4[7 + (-7)]$
   a) $45 + 9(1) + 4(0)$
   b) $45 + 9 + 4(0)$
   c) $45 + 9 + 0$
   d) $45 + 9$
   e) 54

   a) **Additive Inverse Property**
   b) **Multiplicative Identity Property**
   c) **Zero Property of Multiplication**
   d) **Additive Identity Property**

9. $2x(5 + x) + 7(1)$
   a) $2x(5) + 2x(x) + 7(1)$
   b) $2(5)x + 2x(x) + 7(1)$
   $10x + 2x^2 + 7(1)$
   c) $10x + 2x^2 + 7$
   d) $2x^2 + 10x + 7$

   a) **Distributive Property of Multiplication over Addition**
   b) **Commutative Property of Multiplication**
   c) **Multiplicative Identity Property**
   d) **Commutative Property of Addition**

(Possible Journal Responses continued)

2. **In the expression $(-x)^3$, the opposite of x is inside the grouping symbol, which means it is the opposite of x that is being cubed, not x. You must distribute the negative sign to the x first and then cube. If $x = -2$, then $(-x)^3 = (-(-2))^3$ or $(2)^3$ which equals 8. If $x = 2$, then $(-x)^3 = (-2)^3$ and $(-2)^3 = -8$. In the expression $-x^3$, where there are no grouping symbols, the value of x will be cubed first and then the opposite of that value will be taken. If $x = 2$, then $-x^3 = -2^3$. Cube the 2 first and then take its opposite, so $-2^3 = -8$. If $x = -2$, then $-x^3 = -(-2)^3$ and $-(-8) = 8$.**
3. **Without the order of operations, the same expression could have different values. By using the order of operations, there will be one correct value for a given expression. If we have a table with length 40 inches and width 30 inches the area is 1200 in^2. If we increase the length of our table by 10 inches, the new area is found as follows: $30(40 + 10) = 30(50) = 1{,}500$. If someone tried to find the new area without using the order of operations, they might get: $30(40) + 10 = 1{,}200 + 10 = 1{,}210$ (this is incorrect).**
4. **From left to right, $100 \div 10 \times 2 = 10 \times 2 = 20$ (this is correct). Not using the left-to-right rule, someone might get: $100 \div 10 \times 2 = 100 \div 20 = 5$ (this is incorrect).**
5. **Squaring a number is multiplying the number by itself and doubling a number is multiplying the number by two.**