Evaluating Expressions/Substitution

Fill in the guided notes as you watch the video in the Digital Toolbox.

- Use order of operations when **evaluating** expressions.
  - In math, evaluating means to **calculate** the value of something.
- Evaluating is often used when an expression contains a **variable**.
  - If you know the value of a variable, evaluate the expression by **substituting** that value into the expression wherever that variable is.
  - Then, use order of operations to **simplify** the expression and determine its final value.

Example 1

Complete the example as you watch the video in the Digital Toolbox.

Evaluate the expression when $a = 1, b = 2, c = 3, d = 4$.

$$-a^2 + \frac{bc}{d}$$

Implement

$$-(1)^2 + \frac{2(3)}{4}$$

$$-1 + \frac{6}{4}$$

$$-1 + \frac{3}{2} = -\frac{2}{2} + \frac{3}{2}$$

$$\frac{1}{2}$$

Explain

Substitute all known values of the variables

Simplify using order of operations

Example 2

Complete the example as you watch the video in the Digital Toolbox.

Evaluate the expression when $x = 3, y = 12, z = -2$.

$xyz - x + y \div z^2$

Implement

$(3)(12)(-2) - 3 + 12 \div (-2)^2$

$-72 - 3 + 12 \div 4$

$-72 - 3 + 3$

$\boxed{-72}$

Explain

Substitute all known values of the variables

Simplify using order of operations

Example 3

Complete the example as you watch the video in the Digital Toolbox.

Determine which value of x makes the equation true.

$\frac{2}{3}x - 6 = 5$ when $x = 3$ or $x = \frac{33}{2}$

Implement

$\frac{2}{3}(3) - 6 = 5$

$2 - 6 = 5$

$-4 = 5$ ☒

$\frac{\cancel{2}^{1}}{\cancel{3}_{1}}\left(\frac{\cancel{33}^{11}}{\cancel{2}_{1}}\right) - 6 = 5$

$11 - 6 = 5$

$5 = 5$ ✓

$x = \frac{33}{2}$

Explain

Substitute in the value for x

Simplify the left side of the expression

When both sides are equal you have found the correct solution to the equation

Practice

Complete the problems. Show your work.

Evaluate the expressions using $x = -1, y = -2$

1) $2xy^2 + 3x^3y$

$2(-1)(-2)^2 + 3(-1)^3(-2)$

$2(-1)(4) + 3(-1)(-2)$

$-8 + 6$

$\boxed{-2}$

2) $-3y + 7x - xy$

$-3(-2) + 7(-1) - (-1)(-2)$

$6 - 7 - 2$

$-1 - 2$

$\boxed{-3}$

Evaluate the expression using $a = 5, b = 15$

3) $-ab + \frac{b}{a}$

$-(5)(15) + \frac{15}{5}$

$-75 + 3$

$\boxed{-72}$

4) $-\frac{1}{3}b + a$

$-\frac{1}{3}(15) + 5$

$-5 + 5$

$\boxed{0}$

Evaluate the expressions using $x = 2, y = -3$

5) $\frac{1}{4}x^2(xy)^2$

$\frac{1}{4}(2)^2((2)(-3))^2$

$\frac{1}{4}(4)(-6)^2$

$1(36)$

$\boxed{36}$

6) $\frac{4}{xy} \div x^2y$

$\frac{4}{(2)(-3)} \div (2)^2(-3)$

$\frac{-4}{6} \div (4)(-3) = \frac{-2}{3} \div -12$

$\frac{1}{3} \cdot \frac{1}{-12_{6}} = \boxed{\frac{1}{18}}$

Evaluate the expressions using $a = 4$, $b = 5$, $c = -1$

7) $ab + bc$

$$4(5) + 5(-1)$$
$$20 - 5$$
$$\boxed{15}$$

8) $\frac{b}{a} - \frac{c}{a}$

$$\frac{5}{4} - \frac{-1}{4}$$
$$\frac{5}{4} + \frac{1}{4} = \frac{6}{4} = \boxed{\frac{3}{2}}$$

Determine which value is true for the equation.

9) $-3x + 16 = 43$ when $x = 9$ or $x = -9$

$$-3(9) + 16 = 43 \qquad -3(-9) + 16 = 43$$
$$-27 + 16 = 43 \qquad 27 + 16 = 43$$
$$-11 = 43 \ \boxtimes \qquad 43 = 43 \ \checkmark$$

$x = -9$

10) $\frac{x}{4} - 7 = -11$ when $x = -16$ or $x = 1$

$$\frac{(-16)}{4} - 7 = -11 \qquad \frac{(1)}{4} - 7 = -11$$
$$-4 - 7 = -11 \qquad \frac{1}{4} - \frac{28}{4} = -11$$
$$-11 = -11 \ \checkmark \qquad -\frac{27}{4} = -11 \ \boxtimes$$

$x = -16$

11) $\frac{5}{2}(3x + 2) = 9$ when $x = \frac{8}{15}$ or $x = 30$

$$\frac{5}{2}\left(3\left(\frac{8}{15}\right) + 2\right) = 9 \qquad \frac{5}{2}(3(30) + 2) = 9$$
$$\frac{5}{2}\left(\frac{8}{5} + 2\right) = 9 \qquad \frac{5}{2}(90 + 2) = 9$$
$$\frac{40}{10} + \frac{10}{2} = 9 \qquad \frac{5}{2}(92) = 9$$
$$4 + 5 = 9 \qquad 230 = 9 \ \boxtimes$$
$$9 = 9 \ \checkmark$$

$x = \frac{8}{15}$

12) $12 - 7x = -2$ when $x = -2$ or $x = 2$

$$12 - 7(-2) = -2 \qquad 12 - 7(2) = -2$$
$$12 + 14 = -2 \qquad 12 - 14 = -2$$
$$28 = -2 \ \boxtimes \qquad -2 = -2 \ \checkmark$$

$x = 2$