

1.2 ALGEBRAIC EXPRESSIONS & MODELS

$$2^3 = 2 \cdot 2 \cdot 2$$

Exponential
Form

Words

Meaning

4^2

four to the second
power or four
squared

$4 \cdot 4$

8^3

eight to the third
power or eight cubed

$8 \cdot 8 \cdot 8$

x^5

x to the fifth power

$x \cdot x \cdot x \cdot x \cdot x$

EXAMPLE 1: Evaluate the following.

a) $(-3)^4$

b) -3^4

c) 4^4

d) -2^5

e) 5^3

f) $(-2)^6$

g) -2^6

ORDER OF OPERATIONS

1. Do operations that occur within grouping symbols.

 Parenthesis () and brackets []

2. Evaluate powers.

3. Do multiplication and division from left to right.

4. Do addition and subtraction from left to right.

EXAMPLES: Use the order of operations.

2. $15 + 6 \cdot 2$

3. $2 \cdot 3^2 + 5$

$2 \cdot 9 + 5$

$18 + 5$

23

4. $2^4 - 5 \cdot 3$

$16 - 5 \cdot 3$

$16 - 15$

1

5. $16 \div 4 \cdot 2 + 5^2$

$16 \div 4 \cdot 2 + 25$

$4 \cdot 2 + 25$

$8 + 25 = 33$

Variable - a letter used to represent a number

Algebraic expression - consists of variables, numbers, operations, and/or grouping symbols

Evaluate means to replace the variables with numbers and simplify.

Evaluate the variable expression when $m = 3$.

6. $m^2 - 2 \cdot 3$

$$\begin{aligned} & 3^2 - 2 \cdot 3 \\ & 9 - 2 \cdot 3 \\ & 9 - 6 = 3 \end{aligned}$$

7. $\frac{15}{3} + 2^3 - 10$

$$\begin{aligned} & \frac{15}{3} + 2^3 - 10 \\ & 5 + 8 - 10 \end{aligned}$$

$$9. \frac{24}{3} \cdot 5$$

$$\begin{aligned} & \frac{24}{3} \cdot 5 \\ & 8 \cdot 5 \\ & 40 \end{aligned}$$

8. $m + 3m^4$

$$\begin{aligned} & 3 + 3(3^4) \\ & 3 + 3(81) \\ & 3 + 243 \end{aligned}$$

$$246$$

10. Evaluate $-4x^2 + 6x - 5$ when $x = -3$.

$$-4(-3)^2 + 6(-3) - 5$$

$$-4(9) + 6(-3) - 5$$

$$-36 + 6(-3) - 5$$

$$-36 + -18 - 5 = -54 - 5 = -59$$

11. Evaluate $2x^3 + 3x^2 + 27$ when $x = -4$.

$$2(-4)^3 + 3(-4)^2 + 27$$

$$2(-64) + 3(16) + 27$$

$$-128 + 48 + 27$$

$$-80 + 27 = -53$$

The fraction bar is another grouping symbol. It indicates that the numerator and denominator should each be treated as a single value.

$$\frac{16 + 8}{8 - 2} \longrightarrow (16 + 8) \div (8 - 2)$$

Try $\frac{9 \cdot 4 + 2 \cdot 6}{5^2 - 1} = (9 \cdot 4 + 2 \cdot 6) \div (5^2 - 1)$

$$(36 + 12) \div (25 - 1)$$

$$48 \div 24$$

2

12. Evaluate the variable expression when $x = 4$.

$$\frac{x - 2}{x^2 - 2 \cdot 5} = (x - 2) \div (x^2 - 2 \cdot 5)$$

$$(4 - 2) \div (4^2 - 2 \cdot 5)$$

$$2 \div (16 - 2 \cdot 5)$$

$$2 \div (16 - 10)$$

$$2 \div 6 = \frac{2}{6}$$

13. $\frac{13 - 4}{18 - 4^2 + 1} = \frac{2}{6} = \frac{1}{3}$

14. Evaluate $\frac{x^2}{2y + 1}$ when $x = -3$ and $y = 2$.

15. Evaluate $\frac{4(x - 2y)}{x + y}$ when $x = 4$ and $y = -2$.

Terms - the parts that are being added or subtracted

Coefficient - the number in front of the variable

Like terms - MUST have the same variable(s) and exponent(s)

Constant terms - numbers without variables

Example 16: Simplify by combining like terms.

a) $7x + 4x$

b) $3n^2 + n - n^2$

c) $7(x^2 - 3) - 3(x + 4)$

d) $2(x + 1) - (x + 4)$

e) $7x^2 + 12x - x^2 - 40x$