

**3.3 Order of Operations** Warm Up:

BEDMAS (Brackets, Exponents, Division, Multiplication, Addition, Subtraction)

In the expression  $5 \times 3^4$ , 5 represents the coefficient, 3 represents the base and 4 represents the exponent

1. Evaluate each expression. Show your work.

a)  $5(3)^3 = 5(27) = 135$

b)  $6(-5)^2 = 6(25) = 150$

c)  $4(-2^4) = 4(-16) = -64$

d)  $-7(4^3) = -7(64) = -448$

2. Write each expression, using a coefficient and a power. Then, find the value of each expression. Show your work.

a)  $4 \times 3 \times 3 \times 3 = 4(3^3)$   
 $= 4(27)$   
 $= 108$

b)  $5 \times (-2) \times (-2) \times (-2) \times (-2) \times (-2) = 5(-2)^5$   
 $= 5(-32)$   
 $= -160$

c)  $-1 \times 10 \times 10 \times 10 \times 10 \times 10 \times 10 \times 10 \times 10$   
 $= -1(10)^8$   
 $= -100\,000\,000$

d)  $6(-10)(-10)(-10)(-10)(-10)$   
 $= 6(-10)^5$   
 $= -600\,000$

e)  $3(-y)(-y)(-y)(-y)$   
 $= 3(-y)^4$   
 $= 3y^4$

f)  $2(-b)(-b)(-b)$   
 $= 2(-b)^3$   
 $= -2b^3$

g)  $-(4^3) \times 2(4^5)$   
 $= -2(4^8)$   
 $= -2(65\,536)$   
 $= -131\,072$

h)  $2(-3)^4 \times -5(-3)^1$   
 $= -10(-3)^5$   
 $= -10(-243)$   
 $= 2430$

i)  $\frac{-15(-2)^4}{5(-2)^4}$   
 $= -3(-2)^0$   
 $= -3 \times 1$   
 $= -3$

j)  $20(-4)^5 \div (10(-4)^5)$   
 $= \frac{20(-4)^5}{10(-4)^5}$   
 $= 2(-4)^0$   
 $= 2$

k)  $2 \times 3^1 \times 4 \times 3^5$   
 $= 8 \times 3^6$   
 $= 8 \times 729$   
 $= 5832$

l)  $\frac{70(-2)^6}{10(-2)^3}$   
 $= 7(-2)^3$   
 $= 7(-8)$   
 $= -56$

3. Evaluate using your calculator.

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a)  $-6(4)^6$

$$= -6(4096)$$

$$= -24\ 576$$

b)  $7 \times 8^3$

$$= 7 \times 512$$

$$= 3584$$

c)  $-4(-9)^3$

$$= -4(-729)$$

$$= 2916$$

d)  $-7^4$

$$= -1 \times 2401$$

$$= -2401$$

4. Evaluate. Show your work.

a)  $(6+3)^2 - 21$

$$= 9^2 - 21$$

$$= 81 - 21$$

$$= 60$$

b)  $6^2 - 5^2$

$$= 36 - 25$$

$$= 11$$

c)  $12 + (-4)^2 - (-3^3)$

$$= 12 + 16 - -27$$

$$= 28 + 27$$

$$= 55$$

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

$$= 125 - 4(-64)$$

$$= 125 + 256$$

$$= 381$$

e)  $(-2)^0 - (-3)^0$

$$= 1 - 1$$

$$= 0$$

f)  $\frac{0^5}{5^0} = \frac{0}{1} = 0$

g)  $-\left(\frac{3}{4}\right)^0 = -1$

5. Find the value of each expression. Show your work.

a)  $[(9-(-2))]^2 + (-3)^3$

$$= [11]^2 + -27$$

$$= 121 - 27$$

$$= 94$$

b)  $12 - 3(4^2)$

$$= 12 - 3(16)$$

$$= 12 - 48$$

$$= -36$$

c)  $36 - 5^2 + (4^3 - 6^2)$

$$= 36 - 25 + (64 - 36)$$

$$= 11 + 28$$

$$= 39$$

d)  $-(-3^2) + (-9)^2$

$$= -(-9) + 81$$

$$= 9 + 81$$

$$= 90$$

e)  $3^2 \times 2^3$

$$= 9 \times 8$$

$$= 72$$

f)  $(2^2 \times 2^3)^4$

$$= (2^{2+3})^4$$

$$= (2^5)^4$$

$$= 2^{5 \times 4}$$

$$= 2^{20}$$

$$= 1\ 048\ 576$$

g)  $\frac{2^3 \times 2^1}{(3^2)^5} = \frac{2^4}{3^{10}}$

$$= \frac{16}{59049}$$

h)  $(4^2)^3 \times (4^3)^4 \div 4^{16}$

$$= 4^{2 \times 3} \cdot 4^{3 \times 4} \div 4^{16}$$

$$= 4^6 \cdot 4^{12} \div 4^{16}$$

$$= 4^{6+12} \div 4^{16}$$

$$= 4^{18} \div 4^{16}$$

$$= 4^2 = 16$$

i)  $3(2^4)$

j)  $4(3^2)$

$$\begin{aligned} \text{i) } 3(2^4) &= 3(16) \\ &= 48 \end{aligned}$$

$$\begin{aligned} \text{k) } 10^3 + 10^3 &= 1000 + 1000 \\ &= 2000 \end{aligned}$$

$$\begin{aligned} \text{m) } (5 \times 3)^2 &= 15^2 \\ &= 225 \end{aligned}$$

$$\begin{aligned} \text{o) } \frac{(-3)(-3)^5}{(-3)^3} &= (-3)^{1+5-3} \\ &= (-3)^3 \\ &= -27 \end{aligned}$$

$$\begin{aligned} \text{q) } \frac{(-5)^4(7^7)}{(-5)^3(7^6)} &= (-5)^{4-3}(7)^{7-6} \\ &= (-5)^1(7)^1 \\ &= -35 \end{aligned}$$

$$\begin{aligned} \text{s) } \frac{(-2)^5 + (-2)^2}{(-2)^2} & \quad \text{Use Bedmas} \\ & \quad \text{No shortcut} \\ & \quad \text{for Adding} \\ &= \frac{-32 + 4}{-4} \\ &= \frac{-28}{-4} \\ &= 7 \end{aligned}$$

$$\begin{aligned} \text{j) } 4(3^2) &= 4(9) \\ &= 36 \end{aligned}$$

$$\begin{aligned} \text{l) } (10 + 10)^3 &= (20)^3 = 8000 \end{aligned}$$

$$\begin{aligned} \text{n) } 5^2 \times 3^2 &= 25 \times 9 \\ &= 225 \end{aligned}$$

$$\begin{aligned} \text{p) } (-2)^3(4)^0(-2)^5(4) &= (-2)^{3+5}(4)^{0+1} \\ &= (-2)^8(4)^1 \\ &= 256 \times 4 \\ &= 1024 \end{aligned}$$

$$\begin{aligned} \text{r) } (-6)^2 \times 6 + (-6)^5 \div (-6)^2 &= 36 \times 6 + (-6)^{5-2} \\ &= 216 + (-6)^3 \\ &= 216 + -216 \\ &= 0 \end{aligned}$$

$$\begin{aligned} \text{t) } 12^9 \div (12^5 \times 12^1) \div 12^3 &= 12^9 \div 12^6 \div 12^3 \\ &= 12^{9-6} \div 12^3 \\ &= 12^3 \div 12^3 \\ &= 12^{3-3} \\ &= 12^0 = 1 \end{aligned}$$