Name: _____

<u>Check-In Problem:</u> Evaluate $\sqrt{39 - 3^2 + (2^2 + 9)}$

Solution

$$\begin{aligned}
\sqrt{39 - 3^2 + (2^2 + 9)} &= \sqrt{39 - 9 + (4 + 9)} \\
&= \sqrt{30 + 13} \\
&= \boxed{\sqrt{43}}
\end{aligned}$$

$\square$

<u>Challenge Problem:</u> Why is this a poorly written expression?

$$6 \div 2(1 + 2)$$

Solution   The placement of the division sign with the parenthetical makes the problem ambiguous. There are two ways that people could reasonably solve this, and they do not produce the same answer.

$$\begin{aligned}
6 \div 2(1 + 2) &= 6 \div 2(3) \\
&= 6 \div 6 \\
&= \boxed{1}
\end{aligned}$$

$$\begin{aligned}
6 \div 2(1 + 2) &= 6 \div 2(3) \\
&= 3 \cdot 3 \\
&= \boxed{9}
\end{aligned}$$

$\square$

1. Evaluate each exponential expression.

   (a) $2^2 \cdot 2^5$

   (b) $7^2 \cdot 7^{-3}$

   (c) $\dfrac{3^4}{3^7}$

Solution

(a)

$$2^2 \cdot 2^5 = 2^{2+5}$$
$$= 2^7$$
$$= \boxed{128}$$

(b)

$$7^2 \cdot 7^{-3} = 7^{2-3}$$
$$= 7{-1}$$
$$= \boxed{\dfrac{1}{7}}$$

(c)

$$\dfrac{3^4}{3^7} = 3^{4-7}$$
$$= 3^{-3}$$
$$= \dfrac{1}{3^3}$$
$$= \boxed{\dfrac{1}{27}}$$

$\square$

2. Simplify each exponential expression.

(a) $x^{-3}y$

(b) $x^3 \cdot x^2$

(c) $x^{-4}y$

(d) $\dfrac{x^{36}}{x^{29}}$

(e) $(3x)^3$

(f) $(8x^3)^2$

(g) $\left(-\dfrac{2}{x}\right)^2$

Solution

(a)
$$x^{-3}y = \boxed{\dfrac{y}{x^3}}$$

(b)
$$x^3 \cdot x^2 = x^{3+2}$$
$$= \boxed{x^5}$$

(c)
$$x^{-4}y = \boxed{\dfrac{y}{x^4}}$$

(d)
$$\dfrac{x^{36}}{x^{29}} = x^{36-29}$$
$$= \boxed{x^7}$$

(e)
$$(3x)^3 = (3)^3(x)^3$$
$$= \boxed{27x^3}$$

(f)
$$(8x^3)^2 = (8)^2(x^3)^2$$
$$= 64x^{3\cdot 2}$$
$$= \boxed{64x^6}$$

(g)
$$\left(-\dfrac{2}{x}\right)^2 = \dfrac{(-2)^2}{(x)^2}$$
$$= \boxed{\dfrac{4}{x^2}}$$

□

3. Simplify each exponential expression.

(a) $(-6x^3y)(-2x^5y^2)$

(c) $\left(\dfrac{-10a^{13}b^6}{30a^{18}b^{-3}}\right)^2$

(b) $\left(\dfrac{x^{-2}y^8}{x^{-4}y^{12}}\right)^{-2}$

(d) $\left(\dfrac{30x^{26}y^{45}}{41x^{-32}y}\right)^0$

Solution

(a)

$$(-6x^3y)(-2x^5y^2) = (-6)(-2)x^3x^5yy^2$$
$$= 12x^{3+5}y^{1+2}$$
$$= \boxed{12x^8y^3}$$

(b)

$$\left(\frac{x^{-2}y^8}{x^{-4}y^{12}}\right)^{-2} = \left(\frac{x^{-2}}{x^{-4}} \cdot \frac{y^8}{y^{12}}\right)^{-2}$$
$$= (x^{-2-(-4)}y^{8-12})^{-2}$$
$$= (x^{-2+4}y^{-4})^{-2}$$
$$= (x^2y^{-4})^{-2}$$
$$= (x^2)^{-2}(y^{-4})^{-2}$$
$$= x^{-4}y^8$$
$$= \boxed{\frac{y^8}{x^4}}$$

(c)

$$\left(\frac{-10a^{13}b^6}{30a^{18}b^{-3}}\right)^2 = \left(\frac{-10}{30} \cdot \frac{a^{13}}{a^{18}} \cdot \frac{b^6}{b^{-3}}\right)^2$$
$$= \left(-\frac{1}{3}a^{13-18}b^{6-(-3)}\right)^2$$
$$= \left(-\frac{1}{3}a^{-5}b^9\right)^2$$
$$= \left(-\frac{1}{3}\right)^2(a^{-5})^2(b^9)^2$$
$$= \frac{1}{9}a^{-10}b^{18}$$
$$= \boxed{\frac{b^{18}}{9a^{10}}}$$

(d)

$$\left(\frac{30x^{26}y^{45}}{41x^{-32}y}\right)^0 = \boxed{1}$$

□