

8.1 & 8.2 Introduction to Working with Exponents (vi) Date _____ Period _____

8.1) Simplify. Your answer should contain only positive exponents.

1) $-3m^1 \cdot -2m^2$

$$\begin{array}{l} \text{1} \\ -3 \cdot m^1 \cdot -2 \cdot m \cdot m = 6m^3 \\ -3 \cdot -2 = 6 \\ m \cdot m \cdot m = m^3 \end{array}$$

3) $-3x^3y^4 \cdot -2x^4y^3$

$$-3xxxxyyyy \cdot -2xxxxyyy = 16x^7y^7$$

5) $2x^2y^4 \cdot 4y$

$$2xxyyyy \cdot 4y = 8x^2y^5$$

7) $3u^3v^2 \cdot 3u^1$

$$9u^4v^2$$

9) $12a^4b^3 \cdot a^3b^3$

Mental $b^{4+3+3} a^{3+3}$

11) $4x^1 \cdot 4x^2y^3$

$$16x^3y^3$$

2) $-x^4y^3 \cdot -x^4y^3$

$$\begin{array}{l} -1xxxxyy \cdot -1xxxxyy \\ 1x^8y^6 \end{array}$$

4) $4x^2y^2 \cdot -y^3 \cdot -x^2y^2$

$$4 \cdot xx \cdot yy \cdot -1yyy \cdot -1xxyy$$

$$4x^4y^7$$

6) $-mn^2 \cdot -3n^3$

$$3mn^5$$

8) $-4x^4 \cdot -2y^2$

$$8x^4y^2$$

10) $x^3y^3 \cdot -4x^2y^4 \cdot 3x^2y^2$

$$-12x^7y^9$$

12) $2m^3n^3 \cdot 3nm^4$

$$6m^7n^4$$

NOTES

① $x^3 = x \cdot x \cdot x$

② $2^4 = \text{EXPAND}$
 $2 \cdot 2 \cdot 2 \cdot 2$
 EVALUATE
 (Value of expression)
 16

- ③ Rules to Simplify
- ① mult numbers
 - ② Same variable add exponents
 - ③ order variables ABC...

8.2) Simplify. Leave answers with improper fractions and negative exponents.

$$13) \left(\frac{4k^3}{-2k} \right)^{-1} = -2k^{3-1} = \boxed{-2k^2}$$

$$14) \left(\frac{4x^{-1}}{-4x^{-2}} \right)^{-1} = -1 \times x^{-1-(-2)} = -1 \times x^1 = \boxed{-x}$$

Simplify

① numbers

-divide

• fractions simplify
• reduce

• Keep as improper fractions

② Variable

subtract exponents

$$15) \left(\frac{b^{-1}}{-4b} \right)^{-1} = -\frac{1}{4} b^{-1-(-1)} = \boxed{-\frac{1}{4} b^{-2}}$$

$$16) \left(\frac{1x^3}{4x^3} \right)^{-1} = \frac{1}{4} x^{3-3} = \frac{1}{4} x^0 = \boxed{\frac{1}{4}}$$

$$\frac{x^3}{x^3} = 1$$

Rule $x^0 = 1$

$x^1 \Leftrightarrow x$

$$17) \left(\frac{4x^4}{x^{-4}} \right)^{-1} = -4x^{4-(-4)} = \boxed{-4x^8}$$

$$18) \left(\frac{-3v^4}{-2v} \right)^{-1} = \frac{3}{2} v^{4-1} = \boxed{\frac{3}{2} v^3}$$

$$\boxed{\frac{3}{2} v^3} \text{ or } \boxed{\frac{3v^3}{2}}$$

$$\cancel{\frac{3}{2} v^3}$$

$$19) \left(\frac{1n^2}{3n^3} \right)^{-1} = \frac{1}{3} n^{2-3} = \boxed{\frac{1}{3} n^{-1}}$$

$$20) \left(\frac{2v^4}{v^{-3}} \right)^{-1} = 2v^{4-(-3)} = \boxed{2v^7}$$

$$21) \left(\frac{-4x^2}{-3x^4} \right)^{-1} = \frac{4}{3} x^{2-4} = \boxed{\frac{4}{3} x^{-2}}$$

$$22) \frac{2x^{-4}}{x} = 2x^{-4-1} = \boxed{2x^{-5}}$$

Method 1

$$23) \frac{2x^4}{x^4} = 2 \cdot 1 = \boxed{2} \quad \frac{x^4}{x^4} = 1$$

$$24) \frac{-2n^4}{-3n^{-2}} = \frac{2}{3} n^{4-(-2)} = \boxed{\frac{2}{3} n^6}$$

Method 2

$$\frac{2x^4}{x^4} = 2x^{4-4} = 2x^0 = 2 \cdot 1 = \boxed{2}$$

8.1 & 8.2 Intro to Working with Exponents (V2)

Date _____ Period _____

Simplify.

1) $-2yx^{-4}z^3 \cdot -2yx^4$

$$4y^2z^3$$

2) $2y^3z^{-3} \cdot -5xzy^2 \cdot -2y^5z^4$

$$20y^{10}xz^2 \rightarrow$$

$$20x y^{10} z^2$$

3) $4x^3y^3 \cdot -x^{-1}y^{-2}$

$$-4x^2y$$

4) $5z^{-2} \cdot -3x^4z^5$

$$-15x^4z^3$$

5) $-x^{-1}y^3z^4 \cdot 3x^3z^3$
 $-3y^3z^7x^2 \rightarrow$

$$-3x^2y^3z^7$$

6) $4p^{-5}q^2 \cdot 3p^5q^4$

$$12pq^6$$

$$12p^0q^6r \rightarrow 12q^6r$$

$$p^0 = 1$$

7) $-2x^{-3}z^3 \cdot 3x^3z^{-2}$

$$-6z$$

$$x^{-3+3} = x^0 = 1$$

8) $-4a^2 \cdot -c^5$

$$4a^2c^5$$

9) $2y^{-1}z^2 \cdot -xy^4z^2$

$$-2xy^3z^4$$

10) $5a^5b^{-3}c^2 \cdot 4b^3c^3 \cdot 2ca^2b^4$

$$40a^7c^6b^4$$

11) $\frac{-4kh^4j^4}{-3h^3j^3k^{-3}}$

$$\frac{4h^4jk^4}{3}$$

COVER LATER

12) $\frac{z^4}{x^{-1}y^{-2}z^{-3}}$

$$-xy^2z^7$$

xxx

13) $\frac{5m^5p^5q^3}{-mp^2}$

$$-5m^4p^3q^3$$

14) $\frac{2x^3y^5z^5}{3x^{-3}y^5z^{-2}}$

$$\frac{2x^6z^7}{3}$$

$$\frac{-2x^{3-(-3)}y^{5-5}z^{5-(-2)}}{3} = \frac{-2x^6z^7}{3}$$

$$y^0 = 1$$

Cover later

$$(15) \frac{-4m^3n^0}{-m^{-3}n^{-4}}$$

$$4m^6n^4$$

$$(16) \frac{-3h^4j^4k^3}{-5j^{-1}k^2}$$

$$\frac{3j^5h^4k}{5}$$

$$\frac{3h^4j^5k}{5}$$

$$(17) \frac{3m^3n^5p^4}{4m^{-1}n^{-2}p^4}$$

$$\frac{3m^4n^7}{4}$$

$$(18) \frac{4x^4z^3}{2z^{-5}}$$

$$-2x^4z^8$$

Cover later

$$(19) \frac{3x^2y^0z^0}{-3x^{-2}y^{-4}z^{-3}}$$

$$-x^4y^4z^3$$

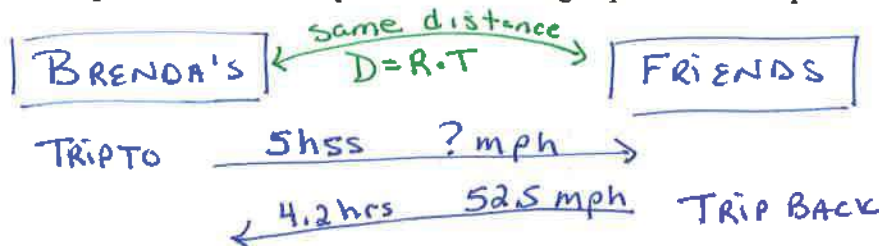
Cover later

$$(20) \frac{zx^5y^5z^0}{xyz^{-1}}$$

$$-x^4y^4z^2$$

- 21) Brenda traveled to her friend's house and back. The trip there took five hours and the trip back took 4.2 hours. She averaged 52.5 mph on the return trip. Find the average speed of the trip there.

Key Info (draw picture):



Define Variable(s) – remember units:

X = average speed to friends (mph)

Define Equation(s):

To = From
5X = 4.2 (52.5)

Solve:

$$\frac{5X}{5} = \frac{220.5}{5}$$

$$X = 44.1$$

Answer (in words)

44.1 mph

The average speed on the trip to Brenda's friend was 44.1 mph.

8.1 & 8.2 Intro to Working with Exponents (V3)

Date _____ Period _____

Simplify.

$$1) 2kh^2j^{-2} \cdot 5h^3j^4k^1$$

$$\boxed{10h^5j^2}$$

$$2) 3p^2q^3r^3 \cdot -2p^{-1}q^4$$

$$\boxed{-6p^1q^7r^3}$$

$$3) -5xz^3 \cdot 5yx^2z^3$$

$$\boxed{-25x^3y^1z^6}$$

$$4) 4ba^4c^4 \cdot 2a^5c^2$$

$$\boxed{8a^9b^1c^6}$$

$$5) \frac{x^2y^2z^4}{3x^{-1}y^{-2}}$$

$$\boxed{\frac{x^3y^4z^4}{3}}$$

$$\text{OR } \boxed{\frac{1}{3}x^3y^4z^4}$$

$$6) -\frac{4p^2q^4r^{-5}}{5qr^{-5}}$$

$$\boxed{-\frac{4}{5}p^2q^3r^0}$$

Simplify. Your answer should contain only positive exponents.

$$7) (2x^2y^4 \cdot (x^2)^4 \cdot 2y)^4$$

$$\boxed{256x^{40}y^{20}}$$

$$8) (ba^2)^3 \cdot (a^3b^4)^2$$

$$\boxed{a^{12}b^3}$$

$$9) (2yx^4 \cdot 2x^0y^2)^2$$

$$\boxed{16x^8y^6}$$

$$10) (x^4y^4)^3 \cdot x^3y^3$$

$$\boxed{x^{15}y^{15}}$$

$$11) 2m^2 \cdot (mn^4)^4$$

$$\boxed{2m^6n^{16}}$$

$$12) (ab^4)^4 \cdot (2a)^2$$

$$\boxed{4a^6b^{16}}$$

$$13) x^0y^0 \cdot (2x^4)^3$$

$$\boxed{8x^{12}}$$

$$14) (m^0n^3)^4 \cdot n^0$$

$$\boxed{n^{12}}$$

$$15) (x^4 y^2)^0 \cdot y^3 \cdot 2x^2$$

$$\xrightarrow{2y^3 x^2} \boxed{2x^2 y^3}$$

$$16) (a^2 b^4)^3 \cdot a^3 b^3 \cdot b^0$$

$$\xrightarrow{a^6 b^{12} a^3 b^3} \boxed{a^9 b^{15}}$$

$$17) \frac{2a^3 \cdot ba^3}{ba^3} \rightarrow \frac{2a^6 b}{a^3 b}$$

$$\boxed{2a^3}$$

$$18) \frac{2x^2 y^4 \cdot 4x^3 y^4}{2y^4} \rightarrow \frac{8x^5 y^8}{2y^4}$$

$$\boxed{4x^5 y^4}$$

$$19) \frac{2x^4 y^2}{4y^0 \cdot x^3} = \frac{2x^4 y^2}{4x^3} = \frac{1}{2} x y^2$$

$$\boxed{\frac{xy^2}{2}} \leftarrow \text{OR}$$

$$20) \frac{3u^3 \cdot 4u^4 v^4}{2u} = \frac{12u^7 v^4}{2u}$$

$$\boxed{6u^6 v^4}$$

$$21) \frac{4b^3}{2a^0 \cdot a} = \frac{4b^3}{2a}$$

$$\boxed{\frac{2b^3}{a}} \leftarrow \boxed{2 \frac{b^3}{a}}$$

better

$$22) \frac{x^0 \cdot 2yx^0}{2x^2 \cdot (2x^2)^2} = \frac{2x^0 y}{2x^2 (4x^4)} = \frac{2y}{8x^6}$$

$$\boxed{\frac{y}{4x^6}} \leftarrow \text{OR } \frac{1}{4} \cdot \frac{y}{x^6}$$

better

$$23) \frac{x^4 y^2}{(2y^4)^3} = \frac{x^4 y^2}{8y^{12}} \cdot \text{Simplify}$$

$$\text{OR } \frac{x^4 y^{-10}}{8}$$

$$\boxed{\frac{x^4}{8y^{10}}}$$

$$24) \frac{(x^3 y^3)^2}{(2x^2 y^2)^2 \cdot 2x^0 y^2} = \frac{x^6 y^6}{4x^4 y^4 \cdot 2y^2} = \frac{x^6 y^6}{8x^4 y^6}$$

$$\boxed{\frac{x^2}{8}}$$

$$25) \frac{(yx^2)^4 \cdot x^3 y^4}{2y^4}$$

$$\xrightarrow{\frac{x^8 y^4 \cdot x^3 y^4}{2y^4}} = \frac{x^{11} y^8}{2y^4}$$

$$= \boxed{\frac{x^{11} y^4}{2}}$$

$$26) \frac{2x^4 y^4}{(y^2)^2 \cdot (2x^4)^4} = \frac{2x^4 y^4}{y^4 \cdot 16x^{16}} = \frac{2x^4 y^4}{16x^{16} y^4}$$

$$\boxed{\frac{1}{8x^{12}}}$$