

## MULTIPLICATION and DIVISION

Multiplication:

- multiplying by zero:

$$3 \cdot 0 = 0$$

$$x \cdot 0 = 0$$

$$0 \cdot 0 = 0$$

- signed multiplication:

- $\begin{pmatrix} \text{positive} \\ \text{value} \end{pmatrix} \times \begin{pmatrix} \text{negative} \\ \text{value} \end{pmatrix} = \text{negative value}$

- $\begin{pmatrix} \text{negative} \\ \text{value} \end{pmatrix} \times \begin{pmatrix} \text{negative} \\ \text{value} \end{pmatrix} = \text{positive value}$

Reciprocals:

- The reciprocal of  $\frac{3}{4}$  is  $\frac{4}{3}$

- The reciprocal of  $-\frac{2}{3}$  is  $-\frac{3}{2}$

Multiplying reciprocals always produces 1

↪ example 1: a)  $\frac{3}{4} \cdot \frac{4}{3} =$

↪ b)  $-\frac{2}{3} \cdot -\frac{3}{2} =$

↪ c)  $3 \cdot \frac{1}{3} =$

Division:

Recall:  $\frac{x}{y}$  means  $x \div y$ .

Zero and division:

example 2:

$$a) \frac{0}{2} = 0 \text{ because } 0 \cdot 2 = 0$$

b)  $\frac{2}{0}$  is UNDEFINED because there is no value that you can multiply by 0 to get 2.

Signed Division:

$$\left( \begin{array}{c} \text{negative} \\ \text{value} \end{array} \right) \div \left( \begin{array}{c} \text{positive} \\ \text{value} \end{array} \right) = \text{negative value}$$

$$\left( \begin{array}{c} \text{positive} \\ \text{value} \end{array} \right) \div \left( \begin{array}{c} \text{negative} \\ \text{value} \end{array} \right) = \text{negative value}$$

$$\left( \begin{array}{c} \text{negative} \\ \text{value} \end{array} \right) \div \left( \begin{array}{c} \text{negative} \\ \text{value} \end{array} \right) = \text{positive value}$$

example 3:

$$a) 8 \div 2 = 4 \text{ because } \cdot = 8$$

↪  $b) 8 \div (-2) = -4 \text{ because } \cdot = 8$

↪  $c) -8 \div 2 = -4 \text{ because } \cdot = -8$

↪  $d) -8 \div (-2) = \underline{\quad} \text{ because } \cdot =$

Recall: The word **product** always indicates multiplication and the symbols used for multiplication are (•) and (×). The word **quotient** always indicates division and the symbols used for division are (÷) and ( $\frac{\quad}{\quad}$ ).

example 4: write a numerical expression for each phrase, and simplify.

a) The product of 9 and -2 added to 7.

$$\begin{aligned}7 + 9 \cdot (-2) &= 7 + (-18) \\ &= 7 - 18 \\ &= -11\end{aligned}$$

b) The quotient of -20 and 4 subtracted from 7

$$\begin{aligned}7 - (-20 \div 4) &= 7 - (-5) \\ &= 7 + 5 \\ &= 12\end{aligned}$$

## Multiplication and Division Practice Problems

1. The reciprocal of  $-\frac{2}{5}$  is \_\_\_\_\_.

2.  $\frac{5}{3} \cdot \frac{3}{5} =$  \_\_\_\_\_

3.  $\frac{0}{52} =$  \_\_\_\_\_

4.  $\frac{52}{0} =$  \_\_\_\_\_

Write a numerical expression for each phrase and simplify:

5. The product of  $-4$  and  $3$  added to  $-10$

6. The quotient of  $42$  and  $-7$  subtracted from  $-3$ .