Name _____ Date_____

Applying the Properties of Operations to Multiply and Divide Rational Numbers

1. Evaluate the expression below using the properties of operations.

$$18 \div \left(-\frac{2}{3}\right) \times 4 \div (-7) \times (-3) \div \left(\frac{1}{4}\right)$$

2. a. Given the expression below, what will the sign of the product be? Justify your answer.

$$-4 \times \left(-\frac{8}{9}\right) \times 2.78 \times \left(1\frac{1}{3}\right) \times \left(-\frac{2}{5}\right) \times (-6.2) \times (-0.2873) \times \left(3\frac{1}{11}\right) \times A$$

b. Give a value for A that would result in a positive value for the expression.

c. Give a value for A that would result in a negative value for the expression.

1. Evaluate the expression $-2.2 \times (-2) \div \left(-\frac{1}{4}\right) \times 5$

   a. Using the order of operations only.

   b. Using the properties and methods used in Lesson 16.

   c. If you were asked to evaluate another expression, which method would you use, (a) or (b), and why?

2. Evaluate the expressions using the distributive property.

   a. $\left(2\frac{1}{4}\right) \times (-8)$

   b. $\frac{2}{3}(-7) + \frac{2}{3}(-5)$

3. Mia evaluated the expression below but got an incorrect answer. Find Mia's error(s), find the correct value of the expression, and explain how Mia could have avoided her error(s).

   $0.38 \times 3 \div \left(-\frac{1}{20}\right) \times 5 \div (-8)$

   $0.38 \times 5 \times \left(\frac{1}{20}\right) \times 3 \times (-8)$

   $0.38 \times \left(\frac{1}{4}\right) \times 3 \times (-8)$

   $0.38 \times \left(\frac{1}{4}\right) \times (-24)$

   $0.38 \times (-6)$

   -2.28

1. Evaluate the expression below using the properties of operations.

$$18 \div \left(-\frac{2}{3}\right) \times 4 \div (-7) \times (-3) \div \left(\frac{1}{4}\right)$$

$$18 \times \left(-\frac{3}{2}\right) \times 4 \times \left(-\frac{1}{7}\right) \times (-3) \times \left(\frac{4}{1}\right)$$

$$-27 \times 4 \times \left(-\frac{1}{7}\right) \times (-3) \times \left(\frac{4}{1}\right)$$

$$-\frac{1296}{7}$$

Answer: $185\frac{1}{7}$ *or* $185.\overline{142857}$

2. a. Given the expression below, what will the sign of the product be? Justify your answer.

$$-4 \times \left(-\frac{8}{9}\right) \times 2.78 \times \left(1\frac{1}{3}\right) \times \left(-\frac{2}{5}\right) \times (-6.2) \times (-0.2873) \times \left(3\frac{1}{11}\right) \times A$$

There are five negative values in the expression. Because the product of two numbers with the same sign yield a positive product, pairs of negative factors have positive products. Given an odd number of negative factors, all but one can be paired into positive products. The remaining negative factor causes the product of the terms without A to be a negative value. If the value of A is negative, then the pair of negative factors forms a positive product. If the value of A is positive, the product of the two factors with opposite signs yields a negative product.

b. Give a value for A that would result in a positive value for the expression.

Answers will vary, but the answer must be negative. -2

c. Give a value for A that would result in a negative value for the expression.

Answers will vary, but the answer must be positive. 3.6

1. Evaluate the expression $-2.2 \times (-2) \div \left(-\frac{1}{4}\right) \times 5$

a. Using the order of operations only.

$$4.4 \div \left(-\frac{1}{4}\right) \times 5$$

$$-17.6 \times 5$$

$$-88$$

b. Using the properties and methods used in Lesson 16.

$$-2.2 \times (-2) \times (-4) \times 5$$

$$-2.2 \times (-2) \times 5 \times (-4)$$

$$-2.2 \times (-10) \times (-4)$$

$$22 \times (-4)$$

$$-88$$

c. **If you were asked to evaluate another expression, which method would you use, (a) or (b), and why?**

Answers will vary; however, most students should have found method (b) to be more efficient.

2. **Evaluate the expressions using the distributive property.**

a. $\left(2\frac{1}{4}\right) \times (-8)$

$2 \times (-8) + \frac{1}{4} \times (-8)$

$-16 + (-2)$

-18

b. $\frac{2}{3}(-7) + \frac{2}{3}(-5)$

$\frac{2}{3}(-7 + (-5))$

$\frac{2}{3}(-12)$

-8

3. **Mia evaluated the expression below but got an incorrect answer. Find Mia's error(s), find the correct value of the expression, and explain how Mia could have avoided her error(s).**

$0.38 \times 3 \div \left(-\frac{1}{20}\right) \times 5 \div (-8)$

$0.38 \times 5 \times \left(\frac{1}{20}\right) \times 3 \times (-8)$

$0.38 \times \left(\frac{1}{4}\right) \times 3 \times (-8)$

$0.38 \times \left(\frac{1}{4}\right) \times (-24)$

$0.38 \times (-6)$

-2.28

Mia made two mistakes in the second line; first, she dropped the negative symbol from $-\frac{1}{20}$ when she changed division to multiplication. The correct term should be (-20) because dividing a number is equivalent to multiplying its multiplicative inverse (or reciprocal). Mia's second error occurred when she changed division to multiplication at the end of the expression; she changed only the operation, not the number. The term should be $\left(-\frac{1}{8}\right)$. The correct value of the expressions is $14\frac{1}{4}$, or 14.25.

Mia could have avoided part of her error if she had determined the sign of the product first. There are two negative values being multiplied, so her answer should have been a positive value.