NAME _____ DATE _____

2–9 Dividing Real Numbers

Objective: To divide real numbers and to simplify expressions involving quotients.

Definition of Division

To divide by a nonzero real number b, multiply by the reciprocal of b.

$a \div b$ or $\frac{a}{b} = a \cdot \frac{1}{b}$. For example, $24 \div 3 = 24 \cdot \frac{1}{3}$.

Rules for Division

If two numbers have the same sign, their quotient is positive.
If two numbers have opposite signs, their quotient is negative.

CAUTION 1 You can't divide by zero since zero has no reciprocal.

CAUTION 2 Division is not commutative. For example, $4 \div 2 = 2$, but $2 \div 4 = \frac{1}{2}$.

CAUTION 3 Division is not associative. For example, $(12 \div 6) \div 2 = 2 \div 2 = 1$, but $12 \div (6 \div 2) = 12 \div 3 = 4$.

Example 1 Simplify: **a.** $\frac{30}{6}$ **b.** $\frac{30}{-6}$ **c.** $\frac{-30}{6}$ **d.** $\frac{-30}{-6}$

Solution **a.** $\frac{30}{6} = 30 \div 6 = 30 \cdot \frac{1}{6} = 5$ **b.** $\frac{30}{-6} = 30 \div (-6) = 30\left(-\frac{1}{6}\right) = -5$

c. $\frac{-30}{6} = -30 \div 6 = -30 \cdot \frac{1}{6} = -5$ **d.** $\frac{-30}{-6} = -30 \div (-6) = -30\left(-\frac{1}{6}\right) = 5$

Simplify.

1. $42 \div 14$ **2.** $-56 \div 7$ **3.** $-24 \div (-6)$ **4.** $-32 \div (-8)$

5. $\frac{-144}{12}$ **6.** $\frac{96}{-16}$ **7.** $\frac{-100}{-5}$ **8.** $\frac{-75}{-3}$

Example 2 Simplify: **a.** $8 \div \left(-\frac{4}{5}\right)$ **b.** $\frac{-4}{-\frac{1}{2}}$

Solution **a.** $8 \div \left(-\frac{4}{5}\right) = 8\left(-\frac{5}{4}\right) = -10$ **b.** $\frac{-4}{-\frac{1}{2}} = (-4) \div \left(-\frac{1}{2}\right) = (-4)(-2) = 8$

Simplify.

9. $6 \div \left(-\frac{1}{3}\right)$ **10.** $12 \div \left(-\frac{1}{4}\right)$ **11.** $0 \div \frac{5}{6}$ **12.** $-8 \div \left(-\frac{1}{2}\right)$ **13.** $0 \div \left(-\frac{2}{7}\right)$

14. $\frac{-12}{-\frac{1}{4}}$ **15.** $\frac{8}{-\frac{1}{2}}$ **16.** $\frac{-20}{\frac{1}{5}}$ **17.** $\frac{0}{\frac{1}{9}}$ **18.** $\frac{-8}{-\frac{1}{8}}$

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2–9 *Dividing Real Numbers* *(continued)*

Example 3 Simplify: **a.** $\frac{32x}{-8}$ **b.** $\frac{w}{12} \cdot 12$

Solution **a.** $\frac{32x}{-8} = 32x\left(-\frac{1}{8}\right)$ Multiply by the reciprocal of -8.

$= 32\left(-\frac{1}{8}\right)x$ Regroup the factors.

$= -4x$ Simplify.

b. $\frac{w}{12} \cdot 12 = w \cdot \frac{1}{12} \cdot 12$

$= w \cdot 1$

$= w$

Simplify.

19. $\frac{-18x}{3}$ **20.** $\frac{-42x}{6}$ **21.** $\frac{50x}{-10}$ **22.** $\frac{-36x}{-6}$

23. $5 \cdot \frac{x}{5}$ **24.** $\frac{-w}{8} \cdot 8$ **25.** $(-6)\left(\frac{-y}{2}\right)$ **26.** $(-10)\left(\frac{x}{-2}\right)$

27. $\frac{144b}{12}$ **28.** $\frac{121b}{-11}$ **29.** $\frac{-48x}{6}$ **30.** $\frac{-108x}{-36}$

Example 4 Find the average of 14, -2, -8, -12.

Solution Find the sum of the numbers and divide by the number of numbers.

$$\frac{14 + (-2) + (-8) + (-12)}{4} = \frac{-8}{4} = -2$$

Find the average of the given numbers.

31. $-12, 5, -10, -7$ **32.** $15, -21, -8, 6$ **33.** $13, -5, -16, -4$

34. $23, -13, -18, 20$ **35.** $11, -15, -22, 16, 0$ **36.** $23, -12, -17, 21, 5$

Mixed Review Exercises

Solve if $x \in \{0, 1, 2, 3, 4, 5, 6\}$.

1. $x + 5 = 7$ **2.** $\frac{1}{2}x = 3$ **3.** $x - 1 = 4$

4. $3x = 9$ **5.** $3x + 1 = 7$ **6.** $x \div 3 = 1$

Solve over the domain $\{0, 1, 2, 3, 4, 5\}$.

7. $\frac{1}{3}n = 1$ **8.** $3y - 1 = 14$ **9.** $x + 2 = 6$

10. $2x = 2$ **11.** $x \cdot x = 4$ **12.** $3n = n \cdot 3$