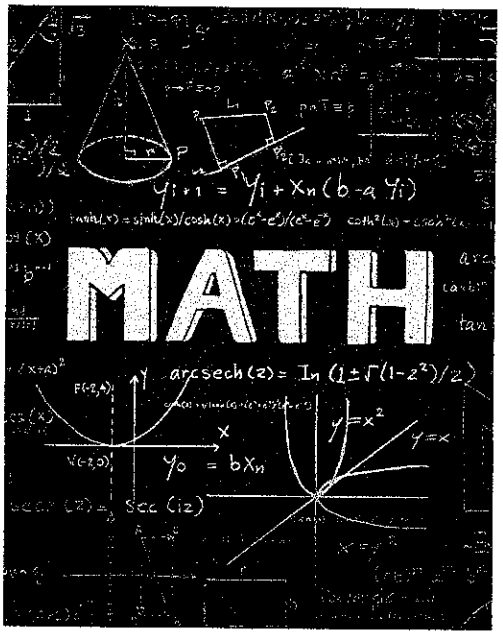
Pre-Algebra Summer Packet 2020-2021 School year

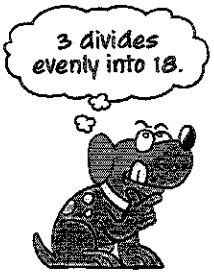


Name:_____

Divisibility Tests

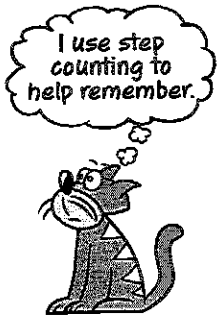
Name _____

Key Concept and Vocabulary



A number is divisible by

- **2:** if its last digit is 0, 2, 4, 6, or 8.
- **3:** if the sum of the digits is divisible by 3.
- **5:** if its last digit is 0 or 5.
- **10:** if its last digit is 0.



PRACTICE MAKES *PURR*-FECT™

Check your answers at BigIdeasMath.com.

Circle "Yes" or "No" in each box in the table.

	Number	Is the number divisible by 2?	Is the number divisible by 3?	Is the number divisible by 5?	Is the number divisible by 10?
1.	4	Yes No	Yes No	Yes No	Yes No
2.	5	Yes No	Yes No	Yes No	Yes No
3.	6	Yes No	Yes No	Yes No	Yes No
4.	7	Yes No	Yes No	Yes No	Yes No
5.	8	Yes No	Yes No	Yes No	Yes No
6.	9	Yes No	Yes No	Yes No	Yes No
7.	10	Yes No	Yes No	Yes No	Yes No
8.	11	Yes No	Yes No	Yes No	Yes No
9.	12	Yes No	Yes No	Yes No	Yes No

10. PATTERN Describe the pattern in this column.

_____

_____

_____

_____

_____

11. PATTERN Describe the pattern in this column.

_____

_____

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_____

_____

Name _____ Date _____

Adding and Subtracting Fractions

To add or subtract two fractions with *like denominators*, write the sum or difference of the numerators over the denominator.

Adding or Subtracting Fractions with Like Denominators

$\frac{a}{c} + \frac{b}{c} = \frac{a+b}{c}$, where $c \neq 0$ $\quad$ $\frac{a}{c} - \frac{b}{c} = \frac{a-b}{c}$, where $c \neq 0$

Example 1 **Find $\frac{7}{12} + \frac{1}{12}$.**

$\frac{7}{12} + \frac{1}{12} = \frac{7+1}{12}$ Add the numerators.

$= \frac{8}{12}$, or $\frac{2}{3}$ Simplify.

Example 2 **Find $\frac{7}{9} - \frac{2}{9}$.**

$\frac{7}{9} - \frac{2}{9} = \frac{7-2}{9}$ Subtract the numerators.

$= \frac{5}{9}$ Simplify.

To add or subtract two fractions with *unlike denominators*, first write equivalent fractions with a common denominator. There are two methods you can use.

Adding or Subtracting Fractions with Unlike Denominators

Method 1 Multiply the numerator and the denominator of each fraction by the denominator of the other fraction.

Method 2 Use the **least common denominator** (LCD). The LCD of two or more fractions is the least common multiple (LCM) of the denominators.

Example 3 **Find $\frac{1}{8} + \frac{5}{6}$.**

Method 1: $\frac{1}{8} + \frac{5}{6} = \frac{1 \cdot 6}{8 \cdot 6} + \frac{5 \cdot 8}{6 \cdot 8}$ Rewrite using a common denominator of $8 \cdot 6 = 48$.

$= \frac{6}{48} + \frac{40}{48}$ Multiply.

$= \frac{46}{48}$, or $\frac{23}{24}$ Simplify.

Example 4 **Find $5\frac{3}{4} - 1\frac{7}{10}$.**

Method 2: Rewrite the difference as $\frac{23}{4} - \frac{17}{10}$.

The LCM of 4 and 10 is 20. So, the LCD is 20.

$\frac{23}{4} - \frac{17}{10} = \frac{23 \cdot 5}{4 \cdot 5} - \frac{17 \cdot 2}{10 \cdot 2}$ Rewrite using the LCD, 20.

$= \frac{115}{20} - \frac{34}{20}$ Multiply.

$= \frac{81}{20}$, or $4\frac{1}{20}$ Simplify.

Practice

Check your answers at BigIdeasMath.com.

Evaluate.

1. $\frac{1}{14} + \frac{5}{14}$
2. $\frac{2}{5} + \frac{1}{5}$
3. $\frac{9}{10} - \frac{1}{10}$
4. $\frac{11}{16} - \frac{3}{16}$
5. $\frac{5}{8} + \frac{7}{8}$
6. $\frac{1}{6} + \frac{1}{6}$
7. $\frac{7}{9} + \frac{2}{3}$
8. $\frac{3}{5} + \frac{4}{7}$
9. $\frac{3}{4} - \frac{1}{6}$
10. $\frac{7}{12} - \frac{5}{9}$
11. $\frac{9}{10} - \frac{5}{6}$
12. $\frac{5}{12} + \frac{11}{16}$
13. $2\frac{3}{5} + 1\frac{2}{5}$
14. $4\frac{6}{7} - 2\frac{4}{7}$
15. $5\frac{5}{12} + 3\frac{3}{8}$
16. $8\frac{1}{3} - 3\frac{2}{11}$
17. $\frac{1}{2} + 3\frac{2}{9}$
18. $4\frac{3}{14} - \frac{1}{7}$
19. $\frac{2}{7} + \frac{3}{4} + \frac{1}{2}$
20. $\frac{13}{16} - \frac{1}{4} - \frac{3}{8}$
21. $2\frac{1}{6} - \frac{5}{9} + \frac{2}{3}$

Name _____ Date _____

Multiplying and Dividing Fractions

To multiply two fractions, multiply the numerators and multiply the denominators.

Multiplying Fractions

$\frac{a}{b} \cdot \frac{c}{d} = \frac{a \cdot c}{b \cdot d}$, where $b, d \neq 0$

Example 1 **Find $\frac{2}{5} \cdot \frac{3}{8}$.**

$\frac{2}{5} \cdot \frac{3}{8} = \frac{2 \cdot 3}{5 \cdot 8}$ Multiply the numerators. Multiply the denominators.

$= \frac{{}^{1}\cancel{2} \cdot 3}{8 \cdot \cancel{8}_{4}}$ Divide out common factors.

$= \frac{3}{20}$ Simplify.

Example 2 **Find $5\frac{1}{2} \cdot \frac{3}{4}$.**

$5\frac{1}{2} \cdot \frac{3}{4} = \frac{11}{2} \cdot \frac{3}{4}$ Rewrite $5\frac{1}{2}$ as $\frac{11}{2}$.

$= \frac{11 \cdot 3}{2 \cdot 4}$ Multiply the numerators. Multiply the denominators.

$= \frac{33}{8}$, or $4\frac{1}{8}$ Simplify.

Two numbers whose product is 1 are **reciprocals**. To write the reciprocal of a number, write the number as a fraction. Then invert the fraction. Every number except 0 has a reciprocal.

To divide a number by a fraction, multiply the number by the reciprocal of the fraction.

Dividing Fractions

$\frac{a}{b} \div \frac{c}{d} = \frac{a}{b} \cdot \frac{d}{c} = \frac{a \cdot d}{b \cdot c}$, where $b, c, d \neq 0$

Example 3 **Find $\frac{3}{7} \div \frac{5}{6}$.**

$\frac{3}{7} \div \frac{5}{6} = \frac{3}{7} \cdot \frac{6}{5}$ Multiply by the reciprocal of $\frac{5}{6}$, which is $\frac{6}{5}$.

$= \frac{3 \cdot 6}{7 \cdot 5}$ Multiply.

$= \frac{18}{35}$ Simplify.

Example 4 **Find $8 \div 2\frac{1}{3}$.**

$8 \div 2\frac{1}{3} = 8 \div \frac{7}{3}$ Rewrite $2\frac{1}{3}$ as $\frac{7}{3}$.

$= 8 \cdot \frac{3}{7}$ Multiply by the reciprocal of $\frac{7}{3}$, which is $\frac{3}{7}$.

$= \frac{8 \cdot 3}{7}$ Multiply.

$= \frac{24}{7}$, or $3\frac{3}{7}$ Simplify.

Practice

Check your answers at BigIdeasMath.com.

Write the reciprocal of the number.

1. $\frac{3}{8}$
2. 7
3. -12
4. $-\frac{6}{5}$

Evaluate.

5. $\frac{3}{4} \cdot \frac{1}{6}$
6. $\frac{3}{10} \cdot \frac{2}{3}$
7. $\frac{4}{9} \cdot \frac{2}{9}$
8. $\frac{5}{8} \cdot \frac{7}{12}$
9. $4 \cdot \frac{3}{16}$
10. $3\frac{1}{2} \cdot \frac{6}{7}$
11. $1\frac{7}{20} \cdot 2\frac{4}{5}$
12. $\frac{1}{10} \cdot 10$
13. $\frac{1}{6} \div \frac{1}{2}$
14. $\frac{7}{8} \div \frac{7}{8}$
15. $\frac{9}{10} \div \frac{3}{5}$
16. $\frac{3}{4} \div \frac{5}{8}$
17. $18 \div \frac{2}{3}$
18. $7\frac{1}{2} \div 2\frac{1}{10}$
19. $6\frac{3}{7} \div 3$
20. $1\frac{3}{25} \div \frac{1}{5}$

21. **AREA** Find the area of a rectangular court that is $21\frac{3}{5}$ meters long and $13\frac{3}{4}$ meters wide.

22. **CARPENTRY** How many $1\frac{1}{4}$-foot pieces can you cut from a piece of wood that is 20 feet long?

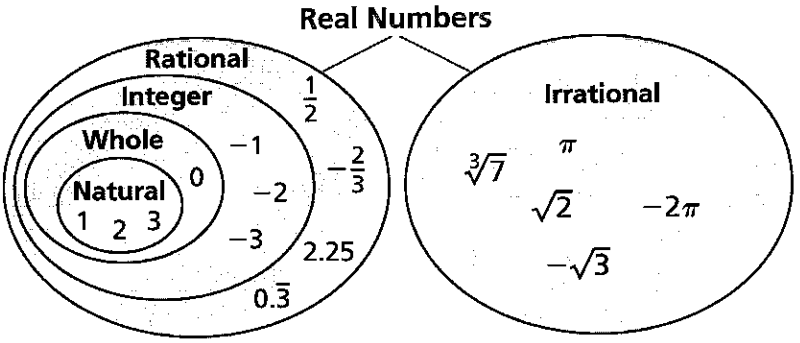
Name _____ Date _____

Classifying Real Numbers

A **rational number** is a number that can be written as the ratio of two integers. An **irrational number** cannot be written as the ratio of two integers.

- The square root of any whole number that is not a perfect square is irrational. The cube root of any integer that is not a perfect cube is irrational.
- The decimal form of an irrational number neither terminates nor repeats.

Rational numbers and irrational numbers together form the set of **real numbers.**



Example 1 **Classify each real number in as many ways as possible.**

	Number	Subset(s)	Reasoning
a.	$\sqrt{18}$	Irrational	18 is not a perfect square.
b.	$0.\overline{33}$	Rational	$0.\overline{33}$ is a repeating decimal.
c.	$-\sqrt{4}$	Integer, Rational	$-\sqrt{4}$ is equal to -2.
d.	$\frac{56}{7}$	Natural, Whole, Integer, Rational	$\frac{56}{7}$ is equal to 8.
e.	$\sqrt[3]{5}$	Irrational	5 is not a perfect cube.

Practice

Check your answers at BigIdeasMath.com.

Classify the real number in as many ways as possible.

1. $\sqrt{17}$
2. $\frac{1}{5}$
3. 0.25
4. $\frac{48}{6}$
5. $-\sqrt{25}$
6. $\sqrt[3]{32}$

Determine whether the statement is *always*, *sometimes*, or *never* true. Explain your reasoning.

7. A natural number is a whole number.
8. An integer is a natural number.
9. A natural number is negative.
10. A real number is an irrational number.
11. A rational number is a real number.
12. A whole number is an irrational number.

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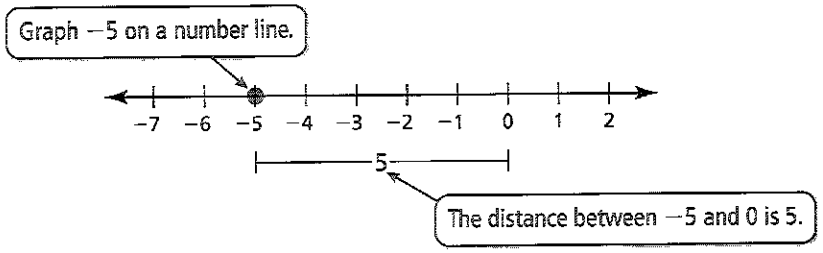
Operations with Integers

Adding and Subtracting Integers

The **absolute value** of an integer is the distance between the number and 0 on a number line. The absolute value of a number x is written as $|x|$.

Example 1 **Find the absolute value of -5.**



▶ So, $|-5| = 5$.

Rules for Adding and Subtracting Integers	
Adding:	To add integers with the *same* sign, add the absolute values of the integers. Then use the common sign. To add integers with *different* signs, subtract the lesser absolute value from the greater absolute value. Then use the sign of the integer with the greater absolute value.
Subtracting:	To subtract an integer, add its opposite.

Example 2 **Find (a) $-3 + (-8)$ and (b) $-9 + 6$.**

a. $-3 + (-8) = -11$ Add $|-3|$ and $|-8|$. Use the common sign.

▶ The sum is -11.

b. $-9 + 6 = -3$ $|-9| > |6|$. So, subtract $|6|$ from $|-9|$. Use the sign of -9.

▶ The sum is -3.

Example 3 **Find (a) $5 - (-12)$ and (b) $1 - 7$.**

a. $5 - (-12) = 5 + 12$ Add the opposite of -12.

$= 17$ Add.

▶ The difference is 17.

b. $1 - 7 = 1 + (-7)$ Add the opposite of 7.

$= -6$ Add.

▶ The difference is -6.

Example 4 **Simplify $|-14 - (-10)|$.**

$-14 - (-10) = |-14 + 10|$ Add the opposite of -10.

$= |-4|$ Add.

$= 4$ Find the absolute value.

▶ So, $|-14 - (-10)| = 4$.

Name _____ Date _____

Operations with Integers

Multiplying and Dividing Integers

Rules for Multiplying and Dividing Integers
Multiplying and Dividing: The product or quotient of two integers with the *same* sign is *positive*. The product or quotient of two integers with *different* signs is *negative*.

Example 5 **Find (a) $-7 \cdot (-1)$ and (b) $-9 \cdot 4$.**

a. $-7 \cdot (-1) = 7$ The integers have the same sign, so the product is positive.

▶ The product is 7.

b. $-9 \cdot 4 = -36$ The integers have different signs, so the product is negative.

▶ The product is -36.

Example 6 **Find (a) $18 \div (-2)$ and (b) $-25 \div (-5)$.**

a. $18 \div (-2) = -9$ The integers have different signs, so the quotient is negative.

▶ The quotient is -9.

b. $-25 \div (-5) = 5$ The integers have the same sign, so the quotient is positive.

▶ The quotient is 5.

Practice

Check your answers at BigIdeasMath.com.

Find the absolute value.

1. $|13|$
2. $|-8|$
3. $|0|$
4. $|-297|$

Evaluate.

5. $5 + (-11)$
6. $4 - 9$
7. $-15 + (-10)$
8. $9 + (-6)$
9. $0 - (-50)$
10. $-8 + 20$
11. $-11 - 11$
12. $-14 + 0$
13. $20 - (-21)$
14. $-34 - (-25)$
15. $-8 + (-3) + 6$
16. $1 + 7 - 9$

Simplify the expression.

17. $|-15 - 9|$
18. $|18 - (-11)|$
19. $|-14 + 17|$
20. $|-24 - (-19)|$

Evaluate.

21. $-8 \cdot 25$
22. $-33 \div (-3)$
23. $-13(-1)$
24. $-24 \div 4$
25. $0(-4)$
26. $-15(8)$
27. $\frac{0}{-12}$
28. $-1(-1)$
29. $\frac{-16}{-1}$
30. $240 \div (-8)$
31. $5 \cdot (-7) \cdot (-4)$
32. $12 \div (-3) \cdot 2$

33. **ELEVATION** The highest elevation in California is 14,494 feet, on Mount Whitney. The lowest elevation in California is -282 feet in Death Valley. Find the range of elevations in California.

34. **GOLF** The table shows a golfer's score for each round of a tournament. Find the golfer's total score and the golfer's mean score per round.

	Round 1	Round 2	Round 3
Score	-3	-4	$+1$

Name _____ Date _____

Order of Operations

To evaluate numerical expressions, use a set of rules called the **order of operations**.

Order of Operations
1. Perform operations in Parentheses.
2. Evaluate numbers with Exponents.
3. Multiply or Divide from left to right.
4. Add or Subtract from left to right.

Example 1 **Evaluate each expression.**

a. $20 - 5 \cdot 6$

$20 - 5 \cdot 6 = 20 - 30$ Multiply 5 and 6.

$= -10$ Subtract 30 from 20.

b. $12 \cdot 3 + 4^2 \div 8$

$12 \cdot 3 + 4^2 \div 8 = 12 \cdot 3 + 16 \div 8$ Evaluate 4^2.

$= 36 + 16 \div 8$ Multiply 12 and 3.

$= 36 + 2$ Divide 16 by 8.

$= 38$ Add 36 and 2.

c. $7(5 - 3) + 6^2 \div (-3)$

$7(5 - 3) + 6^2 \div (-3) = 7(2) + 6^2 \div (-3)$ Perform operation in parentheses.

$= 7(2) + 36 \div (-3)$ Evaluate 6^2.

$= 14 + 36 \div (-3)$ Multiply 7 and 2.

$= 14 + (-12)$ Divide 36 by -3.

$= 2$ Add 14 and -12.

Practice

Check your answers at BigIdeasMath.com.

Evaluate the expression.

1. $8 + 2 \cdot 5$

2. $40 \div 8 - 7$

3. $5 \cdot 4^2 \div 8$

4. $1 - 7 + 5^2$

5. $\frac{3 - (-9)}{-10 + 6}$

6. $\frac{2 + 4}{1 - 5} - 1$

7. $(12 - 8)^2 \div 2^5$

8. $18 + 9^2 - 7 \cdot (-3)$

9. $32 \div 8 + 2 \cdot 8^2$

10. $6 \div (7 \div 28)$

11. $36 \div \left(1 - |2 - 7|\right)$

12. $(-2)^2 \cdot 5 - 7(9 - 5)$

13. $4(3 + 8) - 8^2 \div 32$

14. $10(3 - 6)^3 + 41$

15. $(2 - 5)^2 - (4 \cdot 5^2)$

16. **RESTAURANT** There are 82 people in a restaurant. Four groups of 3 leave and then five groups of 2 enter. Evaluate the expression $82 - 4(3) + 5(2)$ to find how many people are in the restaurant.

Name _____ Date _____

The Distributive Property

To multiply a sum or difference by a number, multiply each number in the sum or difference by the number outside the parentheses, then evaluate.

Distributive Property	
With addition: $5(7 + 3) = 5(7) + 5(3)$	$a(b + c) = a(b) + a(c)$
With subtraction: $5(7 - 3) = 5(7) - 5(3)$	$a(b - c) = a(b) - a(c)$

Example 2 **Simplify each expression.**

a. $6(x + 9)$

$6(x + 9) = 6(x) + 6(9)$

$= 6x + 54$

b. $10(12 + z + 7)$

$10(12 + z + 7) = 10(12) + 10(z) + 10(7)$

$= 120 + 10z + 70$

$= 10z + 190$

c. $16(8w - 3)$

$16(8w - 3) = 16(8w) - 16(3)$

$= 128w - 48$

d. $5(4m - 3n - 1)$

$5(4m - 3n - 1) = 5(4m) - 5(3n) - 5(1)$

$= 20m - 15n - 5$

Practice

Check your answers at BigIdeasMath.com.

Evaluate.

1. $25(7 + 11)$ **2.** $4(13 - 5)$ **3.** $9(16 + 7 - 8)$ **4.** $-4(10 - 9 - 6)$

Simplify the expression.

5. $4(y + 7)$ **6.** $-2(z + 5)$ **7.** $5(b - 11)$ **8.** $-8(d - 1)$

9. $12(4a + 13)$ **10.** $9(20 + 17m)$ **11.** $11(2k - 11)$ **12.** $-7(-2n - 9)$

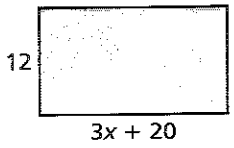
13. $3(x + 4 + 9)$ **14.** $6(25 + 6z + 10)$ **15.** $8(p - 6 - 5)$ **16.** $-10(4 + v - 1)$

17. $7(2x + 7 + 9y)$ **18.** $-4(4r - s + 17)$ **19.** $-3(-12 - 3d - 8)$ **20.** $2 - 6(2n - 9)$

21. $1.5(6c + 10d + 3)$ **22.** $\frac{3}{4}\left(q + \frac{1}{6} + \frac{7}{8}\right)$ **23.** $-2.4(5h - 10 + 4)$ **24.** $0.5(2.6x + 5.8)$

Write and simplify an expression for the area of the rectangle.

7.



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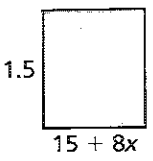

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