Algebra 2 (basic) ~ 2.1 Real Numbers & Their Properties (hrw.ret)
Goal: evaluate using order of operations; identify & use real number properties and apply

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◆ Skill A   Classifying real numbers

Recall   You can classify a real number as belonging to the natural numbers, whole numbers, integers, rational numbers, or irrational numbers. A real number can belong to more than one set of numbers.
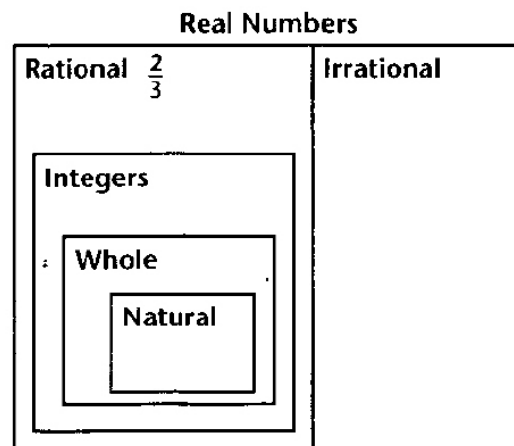
◆ **Example**
Classify -4 in as many ways as possible.

◆ **Solution**
-4 is not a natural number because natural numbers are positive whole numbers.
-4 is not a whole number because whole numbers are either positive or 0.
-4 is an integer because integers are all the whole numbers and their opposites.
-4 is a rational number because it can be written as the terminating decimal -4.0.
-4 is a real number.
The number -4 is an integer, a rational number, and a real number.

Use the diagram to classify each number in as many ways as possible by writing it in the *smallest* rectangle in which it belongs. For example, $\frac{2}{3}$ is placed in the rectangle labeled *rational*.

1. -8

2. 25

3. 6.8

4. $\sqrt{2}$

5. $5\frac{1}{3}$

6. $-1.\overline{6}$

7. $\frac{3}{11}$

8. $-\sqrt{25}$

9. $\frac{0}{5}$

10. 3π

Real Numbers

Rational $\frac{2}{3}$	Irrational
Integers **Whole** **Natural**	

◆ Skill B   Identifying properties of real numbers

Recall   The real numbers are characterized by the Commutative and Associative Properties of Addition and Multiplication and by the Distributive Property.

◆ **Example**
Tell if the statement is true or false. Justify your response.

   a. $3ab^2 = 3b^2a$ **b.** $x - (y - z) = (x - y) - z$ **c.** $-4(a - b) = -4a + 4b$

◆ **Solution**

   a. True   Commutative Property of Multiplication
   b. False   Subtraction is not associative.
   c. True   Distributive Property

Tell whether each statement is true or false. State the property that is illustrated in each true statement. All variables represent real numbers.

11. $(16a)b = 16(ab)$ _____

12. $5x + (-5x) = 0$ _____

13. $7x\left(\dfrac{1}{7x}\right) = 0$ _____

14. $5 - x = x - 5$ _____

15. $abd = adb$ _____

16. $1 \cdot ax = ax$ _____

17. $3(x - wy) = 3x - 3wy$ _____

18. $5(3 + y) = 5(y + 3)$ _____

◆ **Skill C** Simplifying numerical expressions by using the order of operations

Recall The order of operations can be remembered by using the following sentence.

| Please | Excuse | My | Dear | Aunt | Sally |

Parentheses, Exponents, Multiplication and Division, Addition and Subtraction

◆ **Example**

Simplify $\dfrac{2^3}{6 - (3 + 1)} + 5$.

◆ **Solution**

$\dfrac{2^3}{6 - (3 + 1)} + 5 = \dfrac{2^3}{6 - 4} + 5$ *Work inside parentheses first.*

$\quad = \dfrac{2^3}{2} + 5$ *The fraction bar is a grouping symbol.*

$\quad = \dfrac{8}{2} + 5$ *Perform exponentiation.*

$\quad = 4 + 5$

$\quad = 9$

Check: Enter $2^\wedge 3/(6 - (3 + 1)) + 5$ into a calculator. Note the use of parentheses around $6 - (3 + 1)$. The display will show 9.

Simplify each expression. Use a calculator to check.

19. $5 \cdot 3^2 - 7$ _____

20. $(10 - 3) - (2 + 3)$ _____

21. $18 \div 6 \cdot 3$ _____

22. $\dfrac{8 - 2}{5 - 2}$ _____

23. $2 \cdot 5^{(3-2)}$ _____

24. $\dfrac{3 + 15}{3^2} - 1$ _____

25. $48 - 6 \div 2 + 5 \cdot 4$ _____
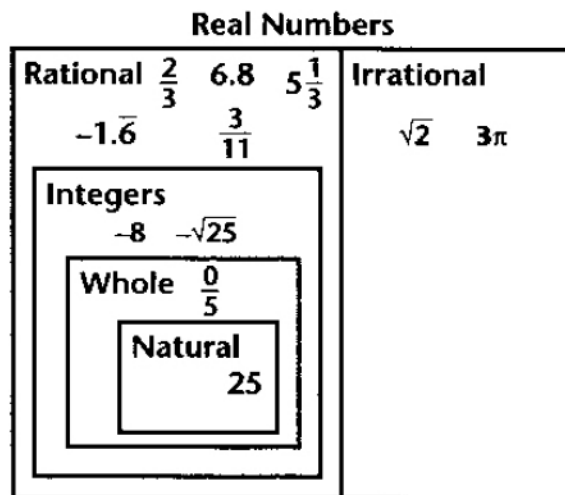
26. $\dfrac{(7 - 3)^2}{7 - 3} - 4$ _____

27. $6 - \{6 - [6 - (6 - 2)] + 2\}$ _____

SOLUTIONS

1–10.

Real Numbers

Rational $\frac{2}{3}$ 6.8 $5\frac{1}{3}$	Irrational
$-1.\overline{6}$ $\frac{3}{11}$	$\sqrt{2}$ 3π

Integers
-8 $-\sqrt{25}$

Whole $\frac{0}{5}$

Natural
25

11. True; Associative Property of Multiplication

12. True; Inverse Property of Addition

13. False   **14.** False

15. True; Commutative Property of
Multiplication

16. True; Identity for Multiplication

17. True; Distributive Property

18. True; Commutative Property of Addition

19. 38   **20.** 2   **21.** 9   **22.** 2   **23.** 10

24. 1   **25.** 65   **26.** 0   **27.** 0

Algebra 2 (basic) ~ 2.1 Real Numbers & Their Properties (hrw.pra)

Goal: evaluate using order of operations; identify & use real number properties and apply

Classify each number in as many ways as possible.

1. $\dfrac{13}{17}$ _____

2. $\sqrt{91}$ _____

3. $3.12112111211112\ldots$ _____

4. 801.35 _____

5. $-\sqrt{900}$ _____

6. $501.\overline{07}$ _____

State the property that is illustrated in each statement.
Assume that all variables represent real numbers.

7. $75 + (-75) = 0$ _____

8. $181 \cdot 1 = 181$ _____

9. $-2 + (33 + 18) = (-2 + 33) + 18$ _____

10. $\dfrac{54}{k} \cdot \dfrac{k}{54} = 1,$ where $k \neq 0$ _____

11. $47y \cdot 3x = 3x \cdot 47y$ _____

12. $14(x + 91) = 14x + 14(91)$ _____

13. $\dfrac{7}{8} + 0 = \dfrac{7}{8}$ _____

Evaluate each expression by using the order of operations.

14. $-2 \cdot 4^2 - 1$ _____

15. $52 \div (2 + 11)$ _____

16. $27 + 8 \cdot 2$ _____

17. $45 - 16 \div 8$ _____

18. $13 \times 3 + 2 \times 5$ _____

19. $12 + 8^2 \div 4$ _____

20. $\dfrac{150 - 38}{4} - 4 + 2$ _____

21. $(13 - 7)^2 \div 5$ _____

22. $(77 - 50) - (13 - 42)$ _____

23. $7 \cdot 12 + 30 \div 5$ _____

SOLUTIONS

1. rational, real

2. irrational, real

3. irrational, real

4. rational, real

5. integer, rational, real

6. rational, real

7. Inverse Property of Addition

8. Identity Property of Multiplication

9. Associative Property of Addition

10. Inverse Property of Multiplication

11. Commutative Property of Multiplication

12. Distributive Property

13. Identity Property of Addition

14. -33 15. 4   16. 43   17. 43   18. 49

19. 28   20. 26   21. 7.2   22. 56   23. 90