CHAPTER 2 SOLVING LINEAR EQUATIONS

2.1 FIND SQUARE ROOTS AND COMPARE REAL NUMBERS

Square Root of a Number:

- _____

- EX:

- All positive real numbers have _____

  _____

- _____ numbers _____ have a square root:

- Zero only has _____ square root:

- Radical – the _____:

- Radicand – the _____ of the radical symbol

EX: Evaluate the expression

- **Note the sign!!!**

Perfect Square -

- A number whose square root is an _____ _____

- EX:

- If a number is _____, you will have to _____ its square root using a _____.

- EX: Approximate the square root to the nearest integer.

EX:

- The top of a square desk has an area of 560 square inches. Approximate the side length of the desk to the nearest inch.
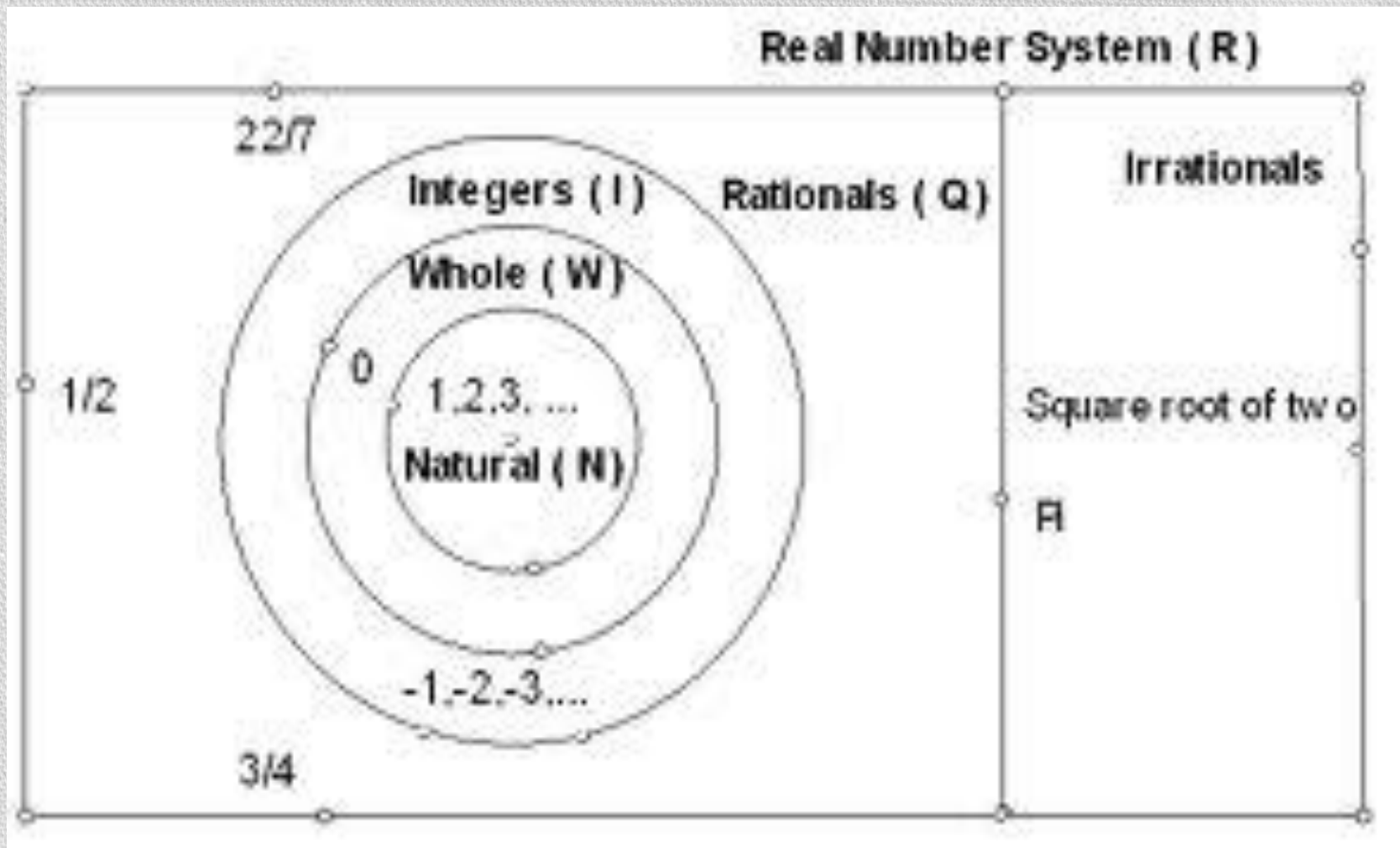
Sets of Numbers

- _____ - a number that can be written as the _____

  - All _____
  - Decimals that _____ or _____
  - EX:

- _____ – a number that _____ be written as the _____

  - Decimals that _____repeat or terminate
  - EX:

- Real numbers – the set of _____ _____numbers

Set of Numbers-

EX:

- Tell whether each of the following numbers is a real number, a rational number, and irrational number, an integer, or a whole number: -9/5, 5.2, 0, √7 , - √20, √4
- Then order the numbers from least to greatest.

EX: Evaluate the Expression

- NOTE: The square root symbol should be taken care of in the first step of the order of operations.

- $11 - \sqrt{x}$ when x = 81

- $-7 \cdot \sqrt{x}$ when x = 36

- $6 \cdot \sqrt{x} + 3$ when x = 100

2.2
SOLVE ONE-STEP EQUATIONS

Goal when Solving Equations -

- To get the variable _____.
- We will do this using _____.
  - Operations that "undo" each other.
    - EX:

When solving an equation, what ever you do to _____ of the equation you must _____!

- _____**Property of Equality** – adding the same number to both sides of an equation produces an equivalent equation
  - EX: x – 5 = 9

- _____ **Property of Equality** – subtracting the same number from both sides of an equation produces an equivalent equation
  - EX: x + 9 = 17

- _____**Property of Equality** – multiplying each side of an equation by the same number produces an equivalent equation
  - EX: $\frac{x}{6}$ = 8

- _____**Property of Equality** – dividing each side of the an equation by the same number produces an equivalent equation
  - EX: 4x = 48

EX: Solve each equation. Show all work.

- x + $\frac{2}{7}$ = $\frac{2}{3}$

- q – 11 = -5

- -65 = -5y

- $\frac{t}{-3}$ = 15

Reciprocal of a number:

- The number _____
  - The _____ of a number
  - Examples of reciprocals:

  - NOTE: The reciprocal of a _____ must be _____!

- To solve an equation that has a variable being multiplied by a fraction, **multiply each side by the _____ _____.**

- **EX:**

EX: Solve the equation.

- $\frac{-5}{4} x = 10$

- $\frac{1}{3} y = \frac{1}{5}$

- $3x = \frac{9}{10}$

EX: Write an solve an equation to solve the problem.

- In a school, 540 students play a sport. This accounts for $\frac{4}{5}$ of the entire school enrollment. How many students are enrolled at the school?

- Mallory scored a total of 473 points this basketball season. This was 19 point more than her total points scored last year. How many points did she score last year?

2.3
SOLVE TWO-STEP EQUATIONS

When Solving 2-Step Equations:

- 1) Look to _____ each side if necessary.
- 2) _____ the same thing from both sides.
- 3) _____ each side by the same thing.

- NOTE on Step 1:
- Like Terms – things that can be _____
    *Must have same exact _____ and _____

- EX: 5x + 8x
- EX: 4x² + 9x

EX: Solve. Show all work.

- $5x + 9 = 24$

$-16 = 5d - 9d$

- $\dfrac{4}{5}y - 4 = 16$

$-1 = \dfrac{z}{3} - 7$

EX:

- The output of a function is 4 less than 4 times the input. Find the input when the output is 3.

EX: Write an equation and solve.

- Kim has a job where she makes $8 per hour plus tips. Yesterday, Kim made $53 dollars, $13 of which was from tips. How many hours did she work?

- You have $320 to spend on a dining table and chairs. A table costs $180, and each chair costs $30. How many chairs can you buy in addition to the table?

2.4
SOLVE MULTI-STEP EQUATIONS

To Solve Multi-Step Equations:

- Before solving look to _____ each side of the equation using the _____.

- NOTE:

- If you cannot do what is inside of the parentheses you must use the _____ to get rid of them.

- EX: 2(x + 7) = 3

EX: Solve.

- $9x - 2x + 4 = 32$

$6x - 2(x - 5) = 46$

- $2w + 3(w + 4) = 27$

$11x - 9 - 7x = 15$

EX: Special Case

- **Sometimes** you can multiply by the _____, instead of having to distribute a _____.

- EX: Solve
- $\frac{3}{2}(3x + 5) = -24$ $\frac{-4}{5}(4a - 1) = 28$

EX: Write and solve an equation.

- A family went to the movie theater and spent $8.50 per ticket. Each member of the family got a small pop for $2.25 and they bought one large popcorn to share for $5.50. If the family spent a total of $59.25 at the movie theater, how many members does the family have?

EX:

- Find the value of x for the rectangle. Be sure to use the same units for the side lengths and the perimeter.
- Perimeter = 2800 centimeters
- The side lengths are measured in meters.

$(2x + 1)$

$(x + 1)$
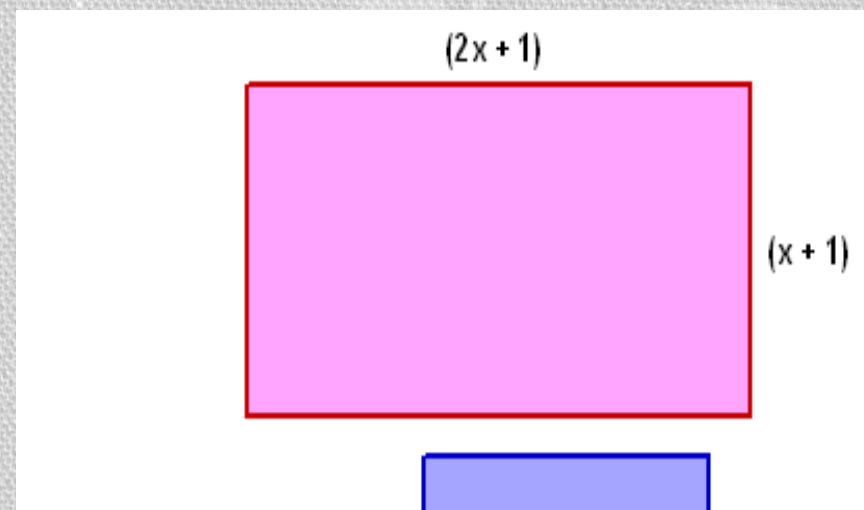
2.5 SOLVE EQUATIONS WITH VARIABLES ON BOTH SIDES

To Solve Equations with Variables in Both Sides:

- 1) Look to _____.
- **2) Get all of your variables _____.**
- 3) _____.

- **EX: Solve**

- 20 + c = 4c − 7   9 − 3k = 17 − 2k

- $5z - 2 = 2(3z - 4)$

$8y - 6 = \frac{2}{3}(6y + 15)$

Equations do not always have one solution.

- _____ – an equation that true for _____ _____ of the variable.

- Solution is _____.

- You know you have an identity if while solving the equation you _____ your variable and the resulting equation is _____.

- EX:

- 2x + 10 = 2(x + 5)

- Some equations have _____.
  - You know an equation has no solution if, while solving, you _____ your variable and the resulting equation is _____.
  - EX:
  - 3x = 3(x + 4)

EX: Solve the equation, if possible.

- 9z + 12 = 9(z + 3)

- 3(2a + 2) = 2(3a + 3)

$$n - 10 = \frac{5}{6}\,n - 7 - \frac{1}{3}\,n$$

# EX: Write an equation and solve.

- A car dealership sold 50 new cars and 67 used cars this year. The number of new cars sold has been increasing by 6 cars each year. The number of used cars sold has been decreasing by 4 cars each year. If these trends continue, in how many years will the number of new cars sold be twice the number of used cars sold?

- To become a member at a gym, you have to pay a $30 membership fee. The cost of admission is $5 for members and $7 for nonmembers. After how many visits to the rink is the total cost for members, including the membership fee, the same as the total cost for nonmembers.

EX: Find the perimeter of the square.

5x

3x + 6
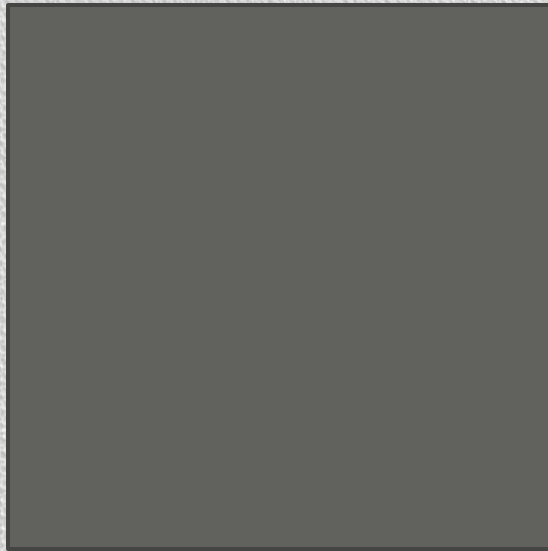
2.6
WRITE RATIOS AND PROPORTIONS

Ratio -

- The _____ of two quantities using _____.
- Can be written in 3 ways:

- EX: When making salsa, the ratio of **tomatoes to onions** is **4 to 1.**
  - Meaning:
  - if you use 4 tomatoes you need 1 onion.
  - If you use 8 tomatoes, you need 2 onions.

EX:

- Derek has 44 CDs and his brother has 52 CDs. Find the specified ratio.

- NOTE: Always reduce all ratios!!!

- 1) The number of Derek's CDs to the number of his brother's CDs.

- 2) The number of Derek's CDs to the total number of CDs the brothers have.

Proportion -

- An equation that states that _____ are _____.

- In general: $\dfrac{a}{b} = \dfrac{c}{d}$

- To solve a proportion with a missing number, use _____ _____.

- EX: $\dfrac{11}{6} = \dfrac{x}{12}$

EX: Solve the proportion.

- $\dfrac{w}{35} = \dfrac{4}{7}$

- $\dfrac{x}{9} = \dfrac{5}{15}$

EX: Write the sentence as a proportion. Then solve the proportion.

- 12 is to 18 as d is to 27.

EX:

- When two full moons appear in the same month, the second full moon is called a blue moon. On average, 2 blue moons occur every 5 years. Find the number of blue moons that are likely to occur in the next 25 years.

• An elevator is programmed so that the ratio of feet traveled to time in seconds is 30:1. How long will it take this particular elevator to go up 1029 feet?

2.7
SOLVE PROPORTIONS USING CROSS PRODUCTS

Remember -

- You can solve a proportion using _____.
- Other names:
- **Cross Products Property**
- **Means-Extremes Property**
  - The "means" of a proportion – the _____ numbers
  - The "extremes" of a proportion – the _____ numbers

  - EX: $\frac{2}{3} = \frac{10}{15}$ or   2:3 = 10:15

NOTE:

- Anytime a proportion has a sum or difference in it, the **sum or difference must be put in** _____ before you cross multiply.
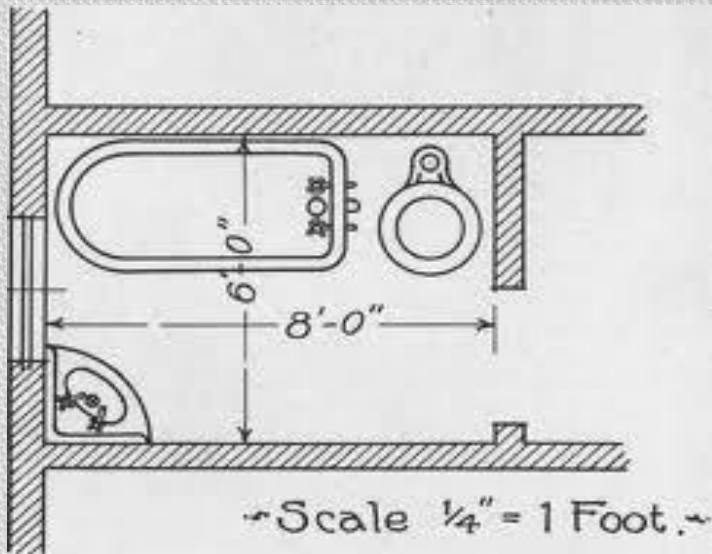
EX: Solve the proportion.

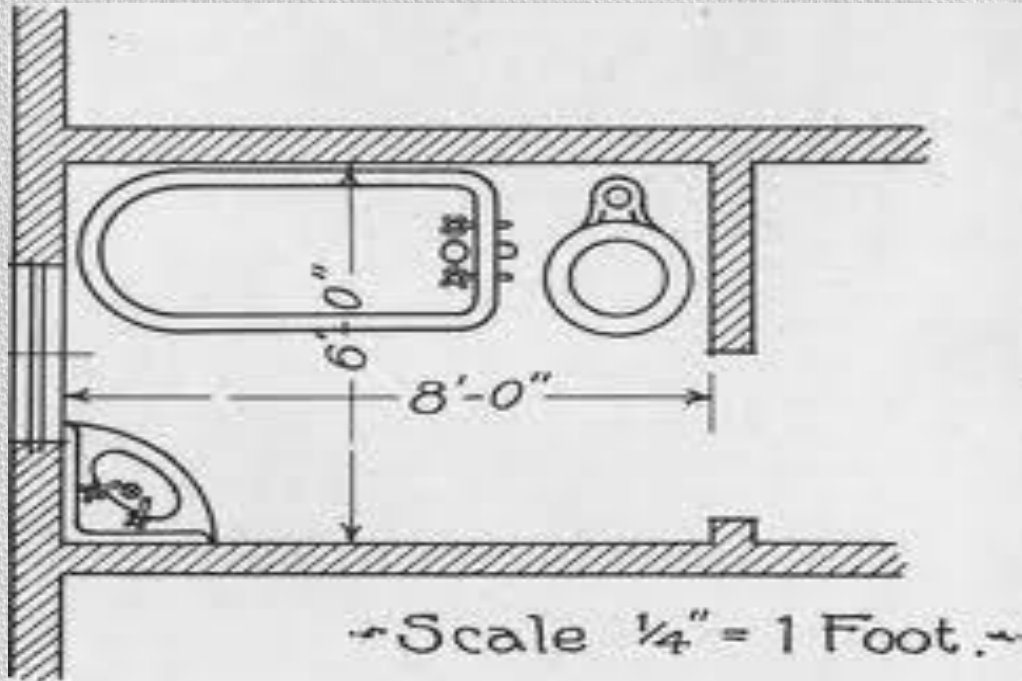- $\dfrac{k-8}{7+k} = \dfrac{-1}{5}$

$\dfrac{3}{x} = \dfrac{2}{x-6}$

Scales

- **Scale Drawing** – a _____ drawing of an object in which the dimensions of the drawing are _____ to the dimensions of the object.
- **Scale Model** - a _____ model of an object in which the dimensions of the model are _____ to the dimensions of the object.

~Scale ¼" = 1 Foot.~

- **Scale** (of a scale drawing or model) – relates the dimensions to the actual dimensions of the object
- EX:

EX:

- The ship model kits at a hobby store have a scale of 1 ft: 600 ft. A completed model of the *Queen Elizabeth II* is 1.6 ft long. Estimate the actual length of the ship.

2.8
REWRITE EQUATION AND FORMULAS

Equations in 2 variables -

- An equation/formula with 2 or more _____.
- EX:

- EX:

- To rewrite an equation so that one variable _____ _____ of another variable means to get that variable _____and everything else on the other side of the equation.

- EX: Write 3x + 2y = 8 so that **y is a function of x**.
  - Meaning get y by itself and everything else on the other side of the equal sign.

EX:

- Write 5x + 4y = 20 so that y is a function of x.

EX:

- The perimeter P of a rectangle is given by the formula $P = 2l + 2w$ where l is the length and w is the width. Solve for w.

EX:

- The area A of a triangle is given by the formula $A = \frac{1}{2}bh$ where b is the base and h is the height. Solve the formula for the height h.

EX:

- You are in Toronto, Canada. The high for the day is 22 degrees Celsius. Rewrite the formula $C = \frac{5}{9}(F - 32)$ so that F is a function of C. Then find the temperature high in degrees Fahrenheit.