Integers + Negatives Notes

What Are They?

- Integers: $-3, -2, -1, 0, 1, 2, 3, \ldots$ etc.
- Absolute Value: $|x|$ is the distance from 0. (always non negative).
- Opposite/Addictive Inverse: The number that sums to zero with x. (opposite of 7 is -7.)

Adding and Subtracting Integers:

- Same Sign: Add magnitudes, keep sign.
- Different sign: Subtract magnitudes, take sign of larger magnitude.
  - Subtraction: "Add the opposite": (ex. $18-(-5) = 18+5$)

Multiply and Dividing Sign Rules:

$(+) \times (+) = (+)$ $(+) \times (-) = (-)$

$(-) \times (-) = (+)$ $(-) \times (+) = (-)$

- Same sign = positive
- Different sign = negative

Order of Operations: PEMDAS

- Parentheses → Exponents → Multiply/Divide → Add/Subtract
- Keep parentheses around negatives when substituting.

Integers and Negatives Drills + Excersises

Addition and Subtraction Drills:

Friendly Reminders:

- Always re-write subtraction as addition
- for different signs, continue to repeat in my head: subtract magnitudes, Keep bigger sign.

1. $-12 + 20 = 8$ ✓
2. $34 - (-16) = 50$ ✓
3. $-50 + 23 = -27$ ✓
4. $18 - (-7) = 25$ ✓
5. $-9 + 15 = 6$ ✓
6. $60 - (-25) = 85$ ✓
7. $-42 + 30 = -12$ ✓
8. $-100 - (-45) = -55$ ✓
9. $75 + (-120) = -45$ ✓
10. $-8 - (-8) = 0$ ✓

Multiply and Dividing Drills:

Key Rules and Reminders:

- 2 Factor Multiplication or Division is based on sign rules.
- Greater than 2 Factor multiplication or division of integers is based on new rules:
  - Even # of negatives = positive.
  - Odd # of negatives = negative.

1. $(-7)(-2) = 14$ ✓
2. $(-4)(6) = -24$ ✓
3. $(3)(-5)(-2) = 30$ ✓
4. $(-2)(-3)(-4)(-5) = 120$ ✓
5. $81 / (-9) = -9$ ✓
6. $(-6)(-1)(-2)(-3)(-4) = -144$ ✓
7. $(-10)(-10) = 100$ ✓
8. $(-8)(-2)(5) = 80$ ✓
9. $(-120) / (-12) = 10$ ✓
10. $(-1)^{15} = -1$ ✓

Fractions Basics and Notes:

- A fraction represents part of a whole.
- A fraction is written as: a/b
  - a = numerator
  - b = denominator
- Example: 3/4 means 3 parts out of a total of 4 equal parts.

Simplifying Fractions:

- Reduce by dividing top and bottom by there greatest common factor.
- Example: 18/24 → Divide top and bottom by 6. which equals 3/4.

Improper Fractions + Mixed Numbers:

- Proper Fraction = numerator < Denominator $\frac{2}{4}$
- Improper Fraction = numerator > Denominator $\frac{8}{2}$
- Mixed Number = Whole number + Fraction $2\frac{1}{2}$
- Converting Improper → mixed by diving numerator by denominator

$\frac{8}{2} = 4\frac{0}{2}$ or 4 $\quad \frac{11}{4} = 2\frac{3}{4}$

Operators with Fractions:

Addition + Subtraction:

- Need common denominator, find LCD. (Least common denominator)
- Example: $1/4 + 1/6$ LCD = 12 → So we multiply each fraction with the correct numbers to reach 12 as common denominator.

$$\frac{3}{12} + \frac{2}{12} = \frac{5}{12}$$

Multiplication:

- Multiply just straight across bottom and top.

Example: $\frac{2}{3} \times \frac{4}{5} = \frac{8}{15}$

Division:

- Multiply by reciprocal.

Example: $\frac{3}{4} \div \frac{2}{5} = \frac{3}{4} \times \frac{5}{2} = \frac{15}{8}$

Fractions to decimals:

- Convert a fraction to a decimal, by dividing numerator by denominator.
- Convert decimal to percent by multiplying by 100.

Example: $\frac{3}{8} = 0.375 = 37.5\%$

Linear equations Concepts Breakdown:

What is a linear equation?

- An equation where the highest power of the variable is 1.
- Graphs as a straight line on the coordinate plane.
- Examples:

$$2x + 3 = 11$$
$$y = 3x + 5$$

- Not linear:

$x^2 + 2 = 0$ (Quadratic)

$\frac{1}{x} = 2$ (rational)

General Forms of Linear Equations

1. Slope-Intercept Form

$$y = mx + b$$

- m = slope (rise/run)
- b = y-intercept

2. Standard Form

$$Ax + By = C$$

(can be rearranged into slope intercept).

3. Point Slope Form

$$y - y_1 = m(x - x_1)$$

Used when slope and a single point are known.

Solving Linear Equations

1. Simplify both sides
2. Move variables to one side.
3. Move constants to one side.
4. Isolate the variable by dividing by it coefficent.

Example: $3x + 5 = 14$

$-5 \quad -5$

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

$x = 3$

Linear Equations with Fractions

1. First clear denominators by multiplying everything by LCD.
2. Then solve normally.

Example: $\frac{2}{3}x - 4 = 8$

$\times 3 \quad \times 3$

$2x - 12 = 24$

$+12 \quad +12$

$\frac{2x}{2} = \frac{36}{2}$

$x = 18$

Linear equations with variables on both sides:

1. Collect variable terms together, constants together

Example:

$$5x - 12 = -2x + 9$$
$$+2x \qquad +2x$$
$$7x - 12 = 9$$
$$+12 \quad +12$$
$$\frac{7x}{7} = \frac{21}{7}$$
$$x = 3$$

The Coordinate Plane

- A grid formed by two perpendicular number lines.
  - x-axis: horizontal
  - y-axis: vertical
- The origin is where they intersect. (0,0).

Quadrants:

- The plane is divided into 4 quadrants:

  Quadrant 1: (+, +) → right, up

  Quadrant 2: (−, +) → left, up

  Quadrant 3: (−, −) → left, down

  Quadrant 4: (+, −) → right, down.

- Always start from the origin and move:
  - x first (left or right), then y (up or down).

Plotting Points:

- Each point is written as an ordered pair (x, y).
- Example: (4, 2) means go right 4, down 2.

Distance between points:

- To find out the distance between two points horizontally or vertically, subtract their coordinates.

  (2, 3) to (2, 7) = |7 − 3| = 4

The Slope Line:

- Slope (m) measures steepness of a line

Formula:

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

Positive Slope = rises left to right

Negative Slope = falls left to right

Zero slope = horizontal line

undefined slope = vertical line.