Adding Integers

Adding Integers with the Same Signs:

1. **Add** the absolute values of the numbers (without their signs).
2. **Keep the sign** (either positive or negative) of both numbers.

Adding Integers with Different Signs:

1. **Subtract** the absolute value of the numbers (without their signs) having the largest number on top.
2. Keep the **sign of the largest absolute value**. (larger number determines the sign)

EXAMPLES:

Same Signs:	Different Signs:
7 + 10 = 17	4 + (-9) = -5
-6 + (-5) = -11	-7 + 18 = 11

Find each sum.

1. 21 + 15	2. -11 + 81
3. -1 + 39	4. -8 + (-24)
5. 90 + (-79)	6. 31 + 96
7. 25 + (-90)	8. 15 + 31 + (-20)
9. 8 + 41 + 35	10. 18 + (-80) + (-45)

Subtracting Integers

SAME, CHANGE, CHANGE

When Subtracting ANY Numbers:

1. Change any minus sign to a plus.
2. Change the sign of the number immediately **after** each minus to its opposite (change a positive number to a negative and vice-versa).
3. Follow the rules for adding integers.

EXAMPLES:

Two Numbers:	More Than Two:
-4 – 1 →	6 – 1 – (-3) →
-4 **+** (**-1**) = -5	6 **+** (**-1**) **+** **3** = 8

Find each difference.

1. 39 – 18	2. 65 – 72
3. -85 – (-42)	4. -15 – (-86)
5. -21 – 24	6. -15 – (-57)
7. 652 – (-57)	8. 346 – 865
9. -8 – (-4) – (-6)	10. 90 – (-26) – (-48)

Multiplying/Dividing Integers

When Multiplying ANY Numbers:

1. **Multiply** or **divide** the absolute values of the numbers.
2. For the **sign of the product/quotient**, follow the rules below.
   - Positive x Positive = Positive — Positive ÷ Positive = Positive
   - Negative x Negative = Positive — Negative ÷ Negative = Positive
   - Positive x Negative = Negative — Positive ÷ Negative = Negative
   - Negative x Positive = Negative — Negative ÷ Positive = Negative
   - If there are an even number of negative integers being multiplied/divided, the product will be positive.
   - If there are an odd number of negative integers being multiplied, the product will be negative.

EXAMPLES:

2(8) = 16	-8 · 6 = -48	16 ÷ -8 = -2
-10 × -10 = 100	2(-5) = -10	$\frac{-28}{-4} = 7$

Find each product/quotient.

1. -8(6)	2. -10 · -10
3. -24 ÷8	4. $\frac{-21}{7}$
5. -14(-4)	6. -96 ÷ -4
7. $\frac{48}{16}$	8. -15 ÷ -15
9. 5(11)(-3)	10. 10(-8)(-2)

Adding/Subtracting Rational Numbers

When Adding/Subtracting ANY fraction:

1. Use GCF to get common denominators.
   - Add/Subtract numerators.
   - Denominators stay the same.
2. Add/subtract the whole numbers if needed.
   __When subtracting, the largest absolute value goes on top__
3. Reduce to lowest terms.
4. Use the sign of the number with the larger absolute value.

When Adding/Subtracting ANY numbers in decimal form:

1. Line up the place values.
2. Use zeros as place holders.
3. Integer rules apply.

EXAMPLES:

$\frac{-2}{3}+\frac{5}{9}=\frac{-6}{9}+\frac{5}{9}=\frac{-1}{9}$

$-2\frac{3}{5}-5\frac{4}{9}=-2\frac{27}{45}+-5\frac{20}{45}=-7\frac{47}{45}=-8\frac{2}{45}$

$$\begin{array}{r} 43.29 + 3.127 \\ 43.290 \\ +\ 3.127 \\ \hline 46.417 \end{array}$$

Find each sum or difference.

1. $8\frac{5}{12}-2\frac{7}{12}$	2. $\frac{14}{21}+\frac{-2}{7}$
3. $\frac{5}{8}-\frac{2}{3}$	4. $-1\frac{3}{4}+\frac{-3}{16}$
5. $\frac{4}{7}+\frac{-2}{7}$	6. $\frac{14}{25}+\frac{2}{5}$
7. 85.3 – 37.07	8. 27 + 5.19
9. -34.1 + (-17.63)	10. -18.21 – (-7.3)

Multiplying/Dividing Rational Numbers

When Multiplying ANY fractions:

1. Rewrite all numbers (whole numbers, mixed numbers, integers) as a fraction.
2. Reduce by simplifying a numerator with a denominator.
3. Multiply numerators. Multiply denominators.
4. Integer rules apply for the sign.

When Dividing ANY fractions:

1. Rewrite all numbers (whole numbers, mixed numbers, integers) as a fraction.
2. Change the division sign to multiplication and take the reciprocal of the fraction immediately **after** the division sign.
2. Reduce by simplifying a numerator with a denominator.
3. *Follow rules for multiplying fractions.*

When Multiplying ANY numbers:

1. Multiply the numbers.
2. Count how many total numbers **after** the decimal.
3. Put the decimal in so that there are the same amount of numbers after the decimal.
4. Integer rules apply for the sign.

When Dividing ANY numbers:

1. Move the decimal out of the divisor and then that many times in the dividend.
2. Use zeros as place holders.
3. Divide and bring decimal straight up in the quotient.
4. Integer rules apply for the sign.

EXAMPLES:

$\frac{1}{2} \bullet \frac{-2}{7} = \frac{-1}{7}$

$-1\frac{1}{9} \div \frac{2}{3} = \frac{-10}{9} \bullet \frac{3}{2} = \frac{-5}{3}$

$0.63 \div 0.9 = .9\overline{)}\,.63$ (.7; - 63; 0)

Find each product or quotient.

1. $-\frac{5}{6}\left(-\frac{2}{5}\right)$	2. $2\frac{5}{6} \bullet 3\frac{1}{3}$
3. $-10 \div \frac{3}{8}$	4. $\frac{-16}{7} \div \left(-\frac{12}{35}\right)$
5. 85(0.07)	6. **$-0.104 \div (-0.13)$**
7. $13.42 \div 67.1$	8. 2.001(0.05)

Evaluating Expressions

When Evaluating ANY Expression:

1. **Substitute** each variable with its assigned value.
2. **Simplify** the expression using order of operations.

★ Be careful! When replacing a variable with a **negative value**, put **parentheses** around the value in the expression.

EXAMPLES:

Evaluate the expression 4xy, if x = -5 and y = -6.

4**xy** → 4(**-5**)(**-6**) → 180

Evaluate each expression.

1. Evaluate 3x when x = -6.	2. Evaluate -8x when x = -5.
3. Evaluate 0 ÷ y when y = -12.	4. Evaluate $\frac{x}{4}$ when x = -8.
5. Evaluate $\frac{-144}{y}$ when y = -12.	6. Evaluate -2(x + y) when x= -1 and y = 4.
7. Evaluate 3(y + x) when x = 6 and y = 1.	8. Evaluate (a + c) – b when a = 0.4, b = 3.5, and c = 15.61.
9. Evaluate c – d – a when a = 0.4, c =15.61, and d = 0.03.	10. Evaluate x + y when x = $\frac{3}{8}$ and y = $\frac{3}{4}$.

Translating Into Expressions

To Translate Sentences into Algebraic Expressions:

1. Identify the variable by telling what phrase the variable stands for in the sentence. (This could be the phrase "a number" or it could be the unknown information in the sentence).
2. Translate the sentence into related numbers, operations, and variable(s). Usually, the order of the translation will mimic the order of the sentence. (It is helpful to know what words and phrases represent the four main operations, addition, subtraction, multiplication, and division.)

EXAMPLES:

"**Seven less than some number**" Let n = some number → **n – 7**

"**Thirteen** dollars **plus** the **cost of food**" Let f = cost of food → **13 + f**

Identify the variable. Then, translate into an expression.

1. A number more than seven	2. The product of some number and six
3. Some number decreased by twelve	4. The quotient of ninety and a number
5. Eight less than some number	6. Twice the number
7. Half of some number	8. Seventeen more than a number
9. Brian is triple his nephew's age	10. Maria ran 4½ miles more than Amy

Two-Step Equations

To Solve Two–Step Equations:

1. **Isolate** the **variable** by using inverse operations
2. **Check** your solution by replacing the variable with the integer.

Examples:

$2x - 10 = 12$	$7x + 9 = -12$	$-3x + 4 = 19$	$\frac{x}{3} + 7 = 10$
$+10 \quad +10$	$-9 \quad -9$	$-4 \quad -4$	$-7 \quad -7$
$2x = 22$	$7x = -21$	$-3x = 15$	$\frac{x}{3} = 3$
$\div 2 \quad \div 2$	$\div 7 \quad \div 7$	$\div -3 \quad \div -3$	$\bullet 3 \quad \bullet 3$
$x = 11$	$x = -3$	$x = -5$	$x = 9$

Solve and check. Show all of your work.

1. $6m + 1 = -23$	2. $5 + 4d = 37$
3. $3 - 7y = -25$	4. $6 - 5b = -14$
5. $\frac{11}{12}e + 25 = 47$	6. $15 - \frac{1}{7}w = -3$
7. $8(x + 3) = 72$	8. $-7(z - 6) = -70$
9. $-0.6(r + 0.2) = 1.8$	10. $\frac{-2}{3}(w - \frac{4}{9}) = -\frac{4}{5}$