OBJECTIVE 1 - Multiplication and Division

Rules 1 and 2 apply for both multiplication and division.

RULE 1: If signs are the same, result is positive.

Ex 1: $(+2)(+1) = (+2)$ simplifies to $2 \bullet 1 = 2$

Ex 2: $(-2)(-1) = (+2)$ simplifies to $-2 \bullet (-1) = 2$

> A number with no sign makes it positive. The "•" symbol can replace parentheses.

> The parenthesis for (-2) can be removed since there is another parenthesis to the right of -2. **CAUTION:** That other parenthesis (-1) however **must** stay to indicate multiplication between the two signed numbers.

Division also follows Rule 1:

Ex 3: $(-2) \div (-1) = (+2)$ or as $\dfrac{(-2)}{(-1)} = (+2)$ simplifies to $\dfrac{-2}{-1} = 2$

CAUTION: Multiplication can be shown in three ways: (1) parenthesis "( )", (2) the "•" symbol, or (3) less often, the "×" symbol. If you do not see these around (or next to) a signed number, Rules 1 and 2 **do not** apply.
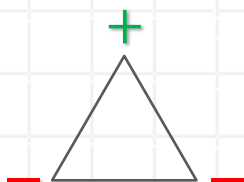
RULE 2: If signs are different, result is negative.

Ex 4: $(-2) \bullet (+1) = (-2)$ simplifies to $-2 \bullet 1 = -2$

Ex 5: $(+2) \bullet (-1) = (-2)$ simplifies to $2 \bullet (-1) = -2$

> It does not matter which number has the negative sign; the result is still negative.
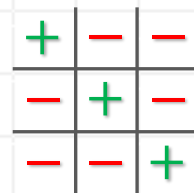
Division also follows Rule 2.

Aids for Both ✕ and ÷

Signs Triangle
1. Start at any sign.
2. Go clockwise or counterclockwise.
3. Last sign gives result.

Signs Grid
1. Start at any sign except middle "+".
2. Go across, down, or diagonal.
3. Last sign gives result.

CAUTION: Avoid using phrases like, "A negative AND a negative is…" because it is not clear what the word **AND** implies. Are we multiplying two negative numbers, or are we adding two negative numbers? Instead, say "A negative TIMES a negative is…" for multiplication.

OBJECTIVE 2 - Addition and Subtraction

It can be unclear as to whether we should add or subtract signed numbers. Instead, let's just "combine" them using Rules 3 or 4. We will then add or subtract by the appropriate rule, which depends on the sign of the numbers.

RULE 3: If signs are the same: (1) add the numbers, (2) result uses same sign.

Ex 6: $+2 + 1 = +3$ simplifies to $2 + 1 = 3$

Ex 7: $-2 - 1 = -3$

> For both Examples 6 and 7, the sign of the two numbers is the same. Add the numbers and use that same sign for the result.

If the signs are the same, we must "gather up" or "collect" all of the positives (if both signs are positive) or all of the negatives (if both signs are negative). We need to **add** so that we can count up those numbers to find their total. Thus, the result uses the **same sign** as the numbers that we summed.

RULE 4: If signs are different: (1) subtract the numbers, (2) result uses sign of bigger number.

Ex 8: $+2 - 1 = +1$ simplifies to $2 - 1 = 1$

Ex 9: $-2 + 1 = -1$

> For both Examples 8 and 9, the sign of the two numbers is different. Subtract the numbers and use sign of bigger number for the result.

If the signs are **different,** we must find out *how much* different the two numbers are from each other. We can find out how different they are by "taking the difference", which means to **subtract** those numbers.

If the positive number is bigger than the negative number, the result will be positive since there are more positives compared to negatives.

If the negative number is bigger than the positive number, the result will be negative since there are more negatives compared to positives.

WAR OF THE SIGNS – *an alternate perspective. A battle rages between positives and negatives. They try to eliminate each other. The sign allied with the biggest number wins. Winning sign coupled with the difference between the two numbers are "paraded" in result.*