NUMBER PROPERTIES

1. UNDEFINED

On the ACT, *undefined* almost always means **division by zero.** The expression $\frac{a}{bc}$ is undefined if either b or c equals 0.

2. REAL/IMAGINARY

A real number is a number that has a **location on the number line.** On the ACT, imaginary numbers are numbers that involve the square root of a negative number. $\sqrt{-4}$ is an imaginary number.

3. INTEGER/NONINTEGER

Integers are **whole numbers;** they include negative whole numbers and zero.

4. RATIONAL/IRRATIONAL

A **rational number** is a number that can be expressed as a **ratio of two integers. Irrational numbers** are real numbers—they have locations on the number line—they just **can't be expressed precisely as a fraction or decimal.** For the purposes of the ACT, the most important **irrational numbers** are $\sqrt{2}$, $\sqrt{3}$, and π.

5. ADDING/SUBTRACTING SIGNED NUMBERS

To **add a positive and a negative,** first ignore the signs and find the positive difference between the number parts. Then attach the sign of the original number to the larger number part. For example, to add 23 and −34, first we ignore the minus sign and find the positive difference between 23 and 34—that's 11. Then we attach the sign of the number with the larger number part—in this case it's the minus sign from the −34. So, 23 + (−34) = −11.

Make **subtraction** situations simpler by turning them into addition. For example, think of −17 − (−21) as −17 + (+21).

To **add or subtract a string of positives and negatives,** first turn everything into addition. Then combine the positives and negatives so that the string is reduced to the sum of a single positive number and a single negative number.

6. MULTIPLYING/DIVIDING SIGNED NUMBERS

To multiply and/or divide positives and negatives, treat the number parts as usual and **attach a negative sign if there were originally**

an odd number of negatives. To multiply −2, −3, and −5, first multiply the number parts: $2 \times 3 \times 5 = 30$. Then go back and note that there were three—an odd number—negatives, so the product is negative: $(-2) \times (-3) \times (-5) = -30$.

7. PEMDAS

When performing multiple operations, remember PEMDAS, which means **Parentheses** first, then **Exponents,** then **Multiplication** and **Division** (left to right), then **Addition** and **Subtraction** (left to right).

In the expression $9 - 2 \times (5 - 3)^2 + 6 \div 3$, begin with the parentheses: $(5 - 3) = 2$. Then do the exponent: $2^2 = 4$. Now the expression is: $9 - 2 \times 4 + 6 \div 3$. Next do the multiplication and division to get $9 - 8 + 2$, which equals 3.

8. ABSOLUTE VALUE

Treat absolute value signs a lot like **parentheses.** Do what's inside them first and then take the absolute value of the result. Don't take the absolute value of each piece between the bars before calculating. In order to calculate $|(-12) + 5 - (-4)| - |5 + (-10)|$, first do what's inside the bars to get: $|-3| - |-5|$, which is $3 - 5$, or -2.

9. COUNTING CONSECUTIVE INTEGERS

To count consecutive integers, **subtract the smallest from the largest and add 1.** To count the integers from 13 through 31, subtract: $31 - 13 = 18$. Then add 1: $18 + 1 = 19$.