

# ACT Math: Essential Number Properties & Strategies

*The "Hidden" 2-3 Points on Your Composite Score*



**Lesson 1:** Building the Foundation

# Why This Lesson Matters (The ACT Score Booster)

1. **Frequency:** Appears on every test (8–12 questions).
2. **Impact:** Mastering this adds +2–3 Points to composite.
3. **Efficiency:** Low hanging fruit. Solve fast to save time.

*Don't let these easy points rot!*



# Concept I: The Logic of Parity (Odd & Even)

**Even:** Divisible by 2 (Formula:  $2n$ )

**Odd:** Not divisible by 2 (Formula:  $2n + 1$ )

Add (+)

Odd + Odd = Even  
*(Pairing Rule:  $3+5=8$ )*

Even + Odd = Odd  
*( $4+3=7$ )*

Multiply (x)

Odd x Even = Even  
*(Overpowering Rule:  $4 \times 3 = 12$ )*

Odd x Odd = Odd  
*( $3 \times 5 = 15$ )*

★ *Even always wins  
in multiplication!*

# Parity in Action (Guided Example)

**Problem:** If  $x$  is an odd integer and  $y$  is an even integer, which of the following **MUST** be odd?

- A)  $x + y$
- B)  $x + x$
- C)  $xy$
- D)  $x^2 + y$

*Board Work:*

*Step 1: Substitution.*

*Let  $x = 3$  and  $y = 2$ .*

*Step 2: The Test.*

A) $x + y$	$3 + 2 = 5$	(Odd)
B) $x + x$	<del><math>3 + 3 = 6</math></del>	(Even)
C) $xy$	<del><math>3 \times 2 = 6</math></del>	(Even)
D) $x^2 + y$		

*Odd + Even is  
ALWAYS Odd*



# Concept II: The Sign Language (+ & -)

## The Sign Flipper



Positive Result

Same Signs  
(+ x + or - x -)

Different Signs  
(+ x -)



Negative Result

*Opposite Rule:*

$$(-3) \times (-4) = 12$$

Take the  
opposite of -3...

... 4 times.

**Trap Alert**

Warning: This applies  
to Division too!

$$15 / -3 = -5$$

# Navigating Negatives (Inequalities)

**Problem:** If  $a < 0$  and  $b > 0$ , which must be negative?

1.  $ab$
2.  $a^2b$
3.  $a - b$

*Setup: Pick numbers!*  
*Let  $a = -2$  and  $b = 3$ .*

1.  $(-2)(3) = -6$  (Negative) ✓

2.  $(-2)^2(3) = 4 \times 3 = 12$  (Positive) ✗

3.  $-2 - 3 = -5$  (Negative) ✓

*Teacher Insight: Subtracting a positive from a negative makes it MORE negative.*

# Concept III: The Speed Hacks (Divisibility)

## Cheat Sheet

2: Last digit is Even (0, 2, 4, 6, 8).

3: Sum of digits is divisible by 3 (e.g., 123  $\rightarrow$  1+2+3=6).

4: Last 2 digits are divisible by 4 (e.g., 1316).

5: Ends in 0 or 5.

6: The Combo Rule: Must pass Rule 2 AND Rule 3.

9: Sum of digits is divisible by 9.

10: Ends in 0.

The Sum Group

The Last Digit Group

# Divisibility in Action (The Rule of 6)

Which number is divisible by 6? 216 vs 315 vs 428

Number: 315 **X**

Step 1: Even? **NO (Odd)**

Number: 428 **X**

Step 1: Even? **YES**

Step 2: Sum?

Divisible by 3? **NO**

$$4+2+8 = 14$$

Number: **216** **WINNER**

Step 2: Sum?

Divisible by 3?

Step 1: Even? **YES**

$$2+1+6 = 9$$

**YES**

# The Zero Debate (Don't Get Trapped)

Is it Even? **YES.** ( $0 = 2 \times 0$ ).



0



Is it an Integer?  
**YES.**



Is it Positive? **NO.** (It is Neutral).

Vocabulary Check:

“Non-negative”  
includes 0.

“Positive” does  
NOT include 0.

# Strategy Break: Calculator vs. Brain

## The Machine



Best for:  
Number  
verification  
( $456 / 3$ ).

Time Cost:  
10-15 Seconds.

## The Logic



Best for:  
Variable rules  
( $x$  is even).

Time Cost:  
3-5 Seconds.

Golden Rule: Use the calculator to **VERIFY**. Use the rules to **SOLVE**.

# Advanced Logic: "Must Be True" Scenarios

If  $x < 0 < y$  and  $|x| > |y|$ , is  $x + y < 0$ ?



Substitution Method:

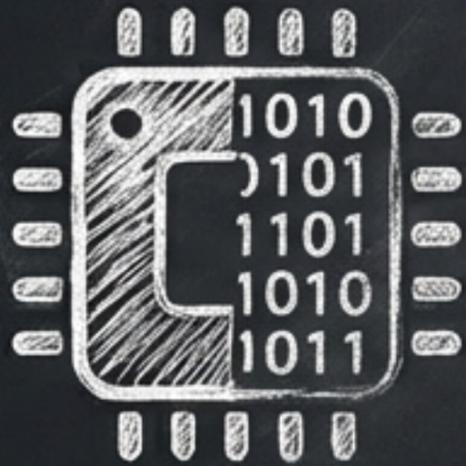
Let  $x = -5$ . Let  $y = 3$ .

Calculation:  $-5 + 3 = -2$ .

Result:  $-2$  is less than  $0$ . The statement is TRUE. ✓

*Key Insight: Big Negative + Small Positive = Negative Result.*

# Beyond the Test: Real World Applications



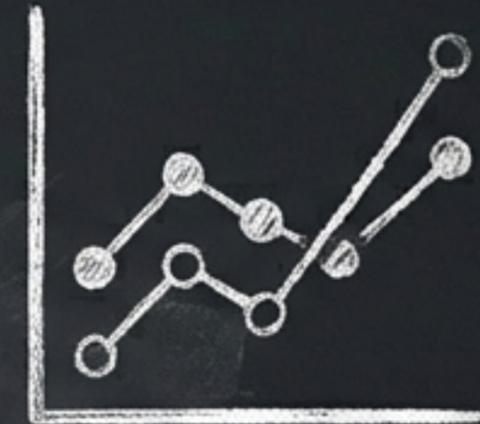
## Computer Science

- Parity checks detect data errors.
  - Loops use integer counters.
- Odd/Even check



## Finance

- Debits (-) and Credits (+) rule accounting.
- Divisibility aids interest calculations.



## Data Science

- Odd/Even analysis reveals alternating trends.
- Patterns hide in the numbers.

# The Masterclass Checklist

- ✓ 1. Parity:  $\text{Odd} + \text{Odd} = \text{Even}$ . Multiply by Even  $\rightarrow$  Always Even.
- ✓ 2. Signs: Same Signs = Positive. Different Signs = Negative.
- ✓ 3. Divisibility: Sum of digits for 3 & 9. Last digit for 2, 5, 10.
- ✓ 4. Zero: It is Even. It is Integer. It is Neutral.
- ✓ 5. Strategy: When in doubt with variables... PLUG IN NUMBERS!

# Your Strategy Moving Forward

Mastering these basics saves you time for the hardest problems.

## Call to Action

Next Steps:

1. Go to the Practice Section.
2. Try the 'Substitute Numbers' method on the next 5 questions.

+3 Points

