Mastering Linear Equations & Inequalities

The Essential 'Blackboard' Guide to ACT Math

3
5
y
x z
5
+
=

10
2
2x
4y 6z
10
+
=
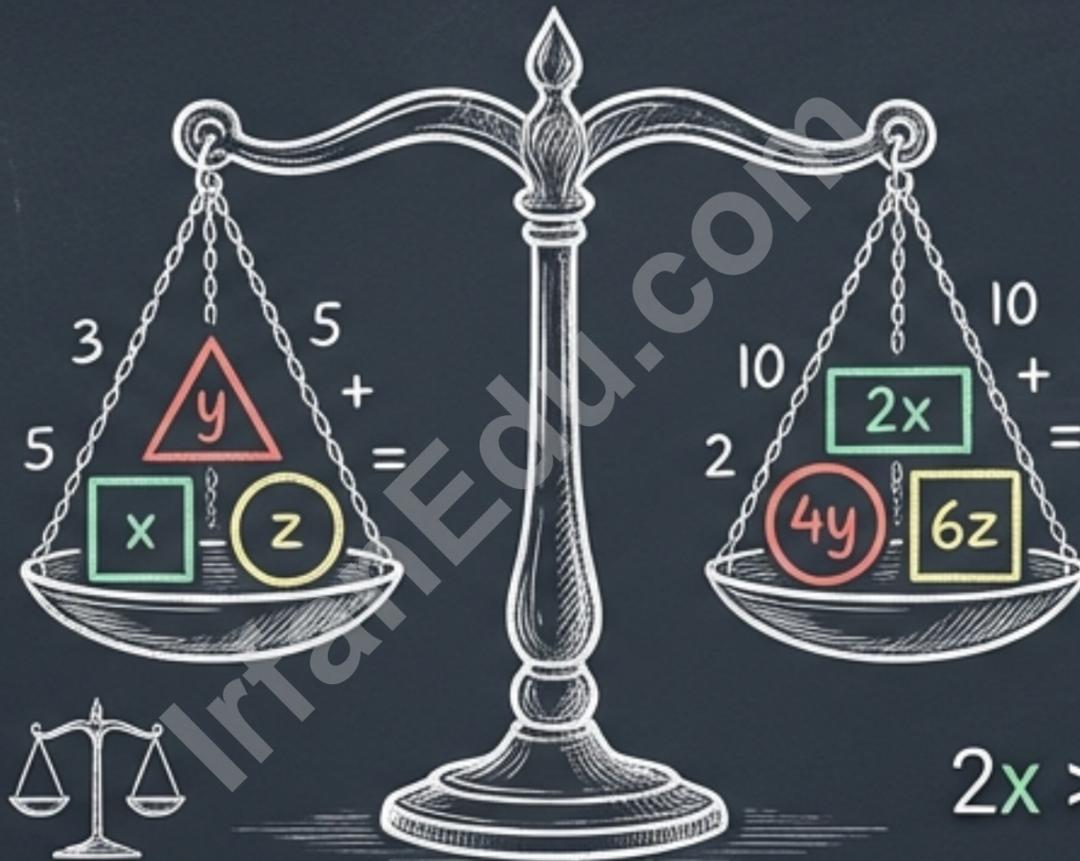
$3x + 5y - 2z = 10$ →

$2x > y + 4z$ →

- **Solving Linear Equations**: Finding the value that makes the equation true.
- **Understanding Inequalities**: Determining ranges of values using $<, >, \leq, \geq$.
- **Systems of Equations**: Finding the intersection point of multiple linear equations.

Strategies by Irfan Mansuri, ACT Specialist | IrfanEdu.com

The Stakes & The Strategy

High Impact
Roboto Mono
8–12 questions per test.

Target Speed
60

Roboto Mono
Solve in < 60 seconds.

The Golden Rule
Whatever you do to one side, do to the other.

Equation Goal: Isolate the variable. | **Inequality Goal:** Watch for the Negative Flip.

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The Toolkit: Properties of Equality

If $a = b$, then:

$$a + c = b + c$$

If $a = b$, then:

$$a - c = b - c$$

If $a = b$, then:

$$a \cdot c = b \cdot c$$

If $a = b$, then:

$$\frac{a}{c} = \frac{b}{c}$$

The Key: Maintain the balance.

The Toolkit: Inequality Rules & The Trap

Safe Zone

✓

Add / Subtract

Multiply / Divide by POSITIVE

Direction stays the same.

Danger Zone

⚠️

Multiply / Divide by NEGATIVE

CRITICAL FLIP!

$-2x > 6$

↓ Divide by -2

$x < -3$

The Standard Solving Process

1. Simplify
Distribute and combine like terms on both sides.

↓

2. Group Variables
Move all "x" terms to one side.

↓

3. Group Constants
Move all number terms to the other side.

↓

4. Isolate
Multiply or divide to get "x" alone.

↓

5. Check
Substitute answer back into original equation.

Blackboard Walkthrough: Basic Equation

$$4x - 9 = 23$$
$$+9 \quad +9$$
$$\overline{}$$
$$\frac{4x}{4} = \frac{32}{4}$$

$$\boxed{x = 8}$$

Check:
$$4(8) - 9$$
$$= 32 - 9$$
$$= 23$$

Blackboard Walkthrough: Variables on Both Sides

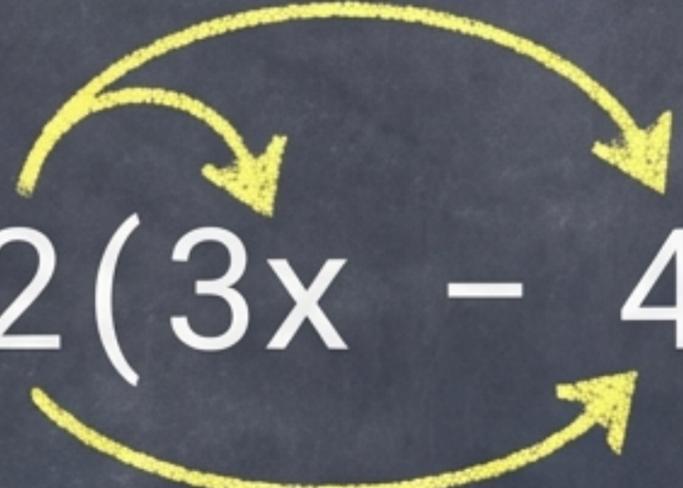$$7x + 5 = 3x + 21$$

$-3x$ ↺ ↻ -5

$$4x = 16$$

$$\boxed{x = 4}$$

Group variables left, constants right.

Blackboard Walkthrough: Distribution First

$$2(3x - 4) = 5x + 6$$

$$6x - 8 = 5x + 6$$

$$x - 8 = 6$$

$$\boxed{x = 14}$$

Blackboard Walkthrough: The Inequality Trap

$$-3x + 8 > 20$$

$$-3x > 12$$

$$\frac{-3x}{-3} > \frac{12}{-3}$$

$$x < -4$$

Dividing by a negative REVERSES the order.

The Danger Zone: Common Mistakes

❌ Wrong Way	✔ Right Way
$-2x > 6 \Rightarrow x > -3$ ❌	$x < -3$ ✔
	Flip on negative!
$3(x + 2) = 3x + 2$ ❌	$3x + 6$ ✔
	Multiply BOTH terms!
$x - 7 = 12 \Rightarrow x = 5$ ❌	$x = 19$ ✔
	Add 7, don't subtract!

Specialized Tactics & FAQ

Hate Fractions?	Strange Results	Calculators
Cross-multiply if you see: a/b = c/d Or: Multiply entire equation by the LCD to clear denominators.	0 = 0 (True) → **Infinite Solutions** 5 = 3 (False) → **No Solution**	Algebra is faster. Use calculator only to CHECK answers.

Test Yourself: Basic & Intermediate

1. If 5x – 12 = 33, what is x?

Add 12 (5x=45) → Divide by 5.

x = 9

2. Solve: 3(2x – 5) = 4x + 7

6x – 15 = 4x + 7 → 2x = 22

x = 11

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Test Yourself: Advanced Applications

3. Solutions to $-4x + 6 \leq 18$?

$-4x \leq 12 \rightarrow$ Divide by -4 & FLIP.

$$x \geq -3$$

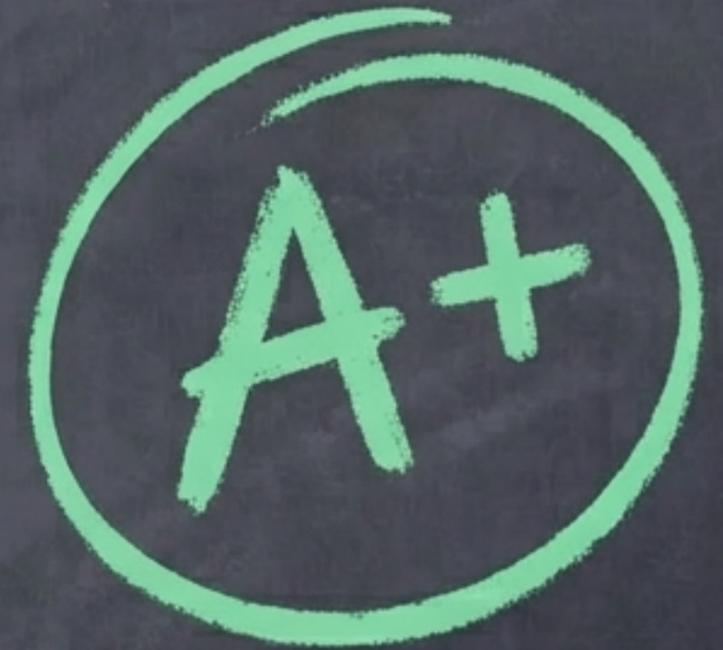4. Solve: $(2x + 5)/3 = (x - 1)/2$

Cross-Multiply: $2(2x+5) = 3(x-1)$
$4x + 10 = 3x - 3$

$$x = -13$$

Your Path to Success

☒ Simplify First: Distribute & Combine.

☒ Inverse Operations: Balance the scale.

☒ Watch the Negative: FLIP on inequalities.

"Mastering these questions is a high-impact investment. Keep practicing, stay confident, and watch your score improve!"

A+

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