Solving One-Step Equations

Solving one-step equations: Models and calculations

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QUICK REVIEW

An equation is a balance. Undo an operation on both sides. From $x + 7 = 19$, subtract 7 to get $x = 12$ and check $12 + 7 = 19$. From $4x = 28$, divide by 4 to get $x = 7$ and check $4(7) = 28$. Multiplication/division and addition/subtraction are inverse pairs.

Worked example

Show an inverse operation and check. Solve $x + 5 = 13$.

1. Apply -5 to both sides: $x + 5 - 5 = 13 - 5$.
2. Simplify: $x = 13 - 5 = 8$.
3. Substitute: $(8) + (5) = 13$, so both sides match.
Answer: $x = 8$.

Practice Problems

Show your thinking.

1. Solve $x + 6 = 15$.

2. Solve $x - 5 = 7$.

3. Represent equal groups. Solve $8x = 56$.

4. Solve $\frac{x}{6} = 4$.

5. Use exact fractions. Solve $x + \frac{5}{2} = 6$.

6. Four equal tickets cost 60 dollars; let x be dollars per ticket. Solve $4x = 60$.

7. Show both sides stay balanced. Solve $x - 9 = 5$.

8. Find an exact fractional solution. Solve $4x = 10$.

Answer Key

1. $x = 9$.
2. $x = 12$.
3. $x = 7$.
4. $x = 24$.
5. $x = \frac{7}{2}$.
6. 15 dollars per ticket.
7. $x = 14$.
8. $x = \frac{5}{2}$.

Step-by-Step Solutions

Follow each calculation, then check your own work.

Problem 1

1. Apply -6 to both sides: $x + 6 - 6 = 15 - 6$.
2. Simplify: $x = 15 - 6 = 9$.
3. Substitute: $(9) + (6) = 15$, so both sides match.

Problem 2

1. Apply $+5$ to both sides: $x - 5 + 5 = 7 + 5$.
2. Simplify: $x = 7 + 5 = 12$.
3. Substitute: $(12) - (5) = 7$, so both sides match.

Problem 3

1. Eight equal groups of x make 56: $8x = 56$.

x	x	x	x	x	x	x	x

Total 56

2. Divide both sides by 8: $\frac{8x}{8} = \frac{56}{8}$.
3. Simplify: $x = 56 \div 8 = 7$.
4. Substitute: $(7) \times (8) = 56$, so both sides match.

Problem 4

1. Multiply both sides by 6: $6\left(\frac{x}{6}\right) = 6 \cdot 4$.
2. Simplify: $x = 4 \times 6 = 24$.
3. Substitute: $(24) \div (6) = 4$, so both sides match.

Problem 5

1. Apply $-\frac{5}{2}$ to both sides: $x + \frac{5}{2} - \frac{5}{2} = 6 - \frac{5}{2}$.
2. Simplify: $x = 6 - \frac{5}{2} = \frac{7}{2}$.
3. Substitute: $(\frac{7}{2}) + (\frac{5}{2}) = 6$, so both sides match.

Problem 6

1. Divide both sides by 4: $\frac{4x}{4} = \frac{60}{4}$.
2. Simplify: $x = 60 \div 4 = 15$.
3. Check: $4(15) = 60$ dollars. Each ticket costs 15 dollars.

Problem 7

1. Apply $+9$ to both sides: $x - 9 + 9 = 5 + 9$.
2. Simplify: $x = 5 + 9 = 14$.
3. Substitute: $(14) - (9) = 5$, so both sides match.

Problem 8

1. Divide both sides by 4: $\frac{4x}{4} = \frac{10}{4}$.
2. Simplify: $x = 10 \div 4 = \frac{5}{2}$.
3. Substitute: $(\frac{5}{2}) \times (4) = 10$, so both sides match.

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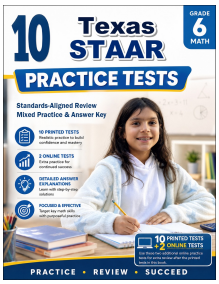

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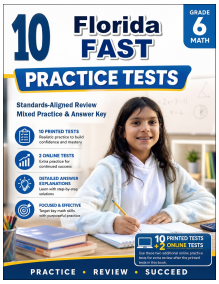

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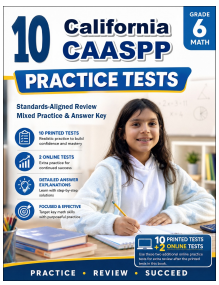

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