Introduction to Variables and Equations

Introduction to Variables and Equations: Models and Computation

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QUICK REVIEW

A variable stands for an unknown number. In $x + 7 = 19$, undo $+7$ with $19 - 7 = 12$, then check $12 + 7 = 19$. For $4x = 28$, divide: $x = 28 \div 4 = 7$. An equation states that both sides have the same value.

Worked example

Solve $x + 6 = 15$. Show an inverse step and substitution.

1. Undo the operation: $x = 15 - 6$.
2. Calculate: $15 - 6 = 9$.
3. Substitute: $9 + 6 = 15$, so $x = 9$.
Answer: $x = 9$.

Practice Problems

Show your thinking.

1. Solve $x + 3 = 12$. Show an inverse step and substitution.

2. Complete an input-output row with rule $x - 4$. The output is 6. Find x.

3. An unknown number multiplied by 5 gives 55. Write an equation and solve.

4. A machine applies the rule divide by 6 to a hidden input and displays 2. Find the input.

5. A student gives $x = 14$ for $x + 3 = 16$. Substitute to test it and find the correct value.

6. For $x - 4 = 10$, is x greater than 12? Solve and give the gap.

7. Solve $x \times 5 = 75$. Show an inverse step and substitution.

8. Each of 4 boxes has x pencils. There are 6 loose pencils and 54 pencils total. Write an equation and find x.

Answer Key

1. $x = 9$.
2. $x = 10$.
3. $x \times 5 = 55$; $x = 11$.
4. $x = 12$.
5. $x = 13$.
6. $x = 14$. Greater by 2.
7. $x = 15$.
8. $4x + 6 = 54$; 12 pencils per box.

Step-by-Step Solutions

Follow each calculation, then check your own work.

Problem 1

1. Undo the operation: $x = 12 - 3$.
2. Calculate: $12 - 3 = 9$.
3. Substitute: $9 + 3 = 12$, so $x = 9$.

Problem 2

1. Undo the operation: $x = 6 + 4$.
2. Calculate: $6 + 4 = 10$.
3. Substitute: $10 - 4 = 6$, so $x = 10$.

Problem 3

1. Let x be the unknown input. Set its result equal to the given output: $x \times 5 = 55$.
2. Undo the operation: $x = 55 \div 5$.
3. Calculate: $55 \div 5 = 11$.
4. Substitute: $11 \times 5 = 55$, so $x = 11$.

Problem 4

1. Undo the operation: $x = 2 \times 6$.
2. Calculate: $2 \times 6 = 12$.
3. Substitute: $12 \div 6 = 2$, so $x = 12$.

Problem 5

1. The proposed value gives $14 + 3 = 17$, not 16.
2. Undo the operation: $x = 16 - 3$.
3. Calculate: $16 - 3 = 13$.
4. Substitute: $13 + 3 = 16$, so $x = 13$.

Problem 6

1. Undo the operation: $x = 10 + 4$.
2. Calculate: $10 + 4 = 14$.
3. Substitute: $14 - 4 = 10$, so $x = 14$.
4. $14 - 12 = 2$, so x is greater by 2.

Problem 7

1. Undo the operation: $x = 75 \div 5$.
2. Calculate: $75 \div 5 = 15$.
3. Substitute: $15 \times 5 = 75$, so $x = 15$.

Problem 8

1. Four equal boxes contain $4x$ pencils; the loose pencils give $4x + 6 = 54$.
2. Remove the loose pencils: $4x = 54 - 6 = 48$.
3. Share among boxes: $48 \div 4 = 12$ pencils per box. Check $4(12) + 6 = 54$.

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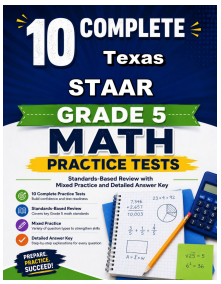

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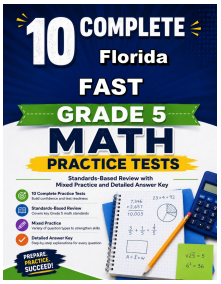

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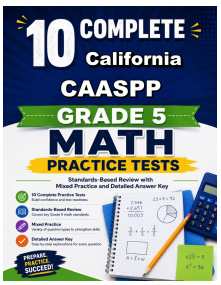

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