# Introduction to Variables and Equations

Introduction to Variables and Equations: Find, Fix, and Work Backward

**Name** _____ **Date** _____ **Score** _____ / 8

**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.** A student gives $x = 11$ for $x + 3 = 13$. Substitute to test it and find the correct value.

**2.** Create the input needed for a machine with rule $x - 4$ to output $7$. Give an equation and check.

**3.** For $x \times 5 = 60$, is $x$ greater than $10$? Solve and give the gap.

**4.** A student gives $x = 14$ for $x \div 6 = \frac{13}{6}$. Substitute to test it and find the correct value.

**5.** Complete an input-output row with rule $x + 3$. The output is $17$. Find $x$.

**6.** An unknown number decreased by $4$ gives $11$. Write an equation and solve.

**7.** Create the input needed for a machine with rule $x \times 5$ to output $80$. Give an equation and check.

**8.** A child says $x = 9$ makes $x \div 3 + 4 = 9$ true. Test that value, then solve and check the correct input.

# Answer Key

1. $x = 10$.
2. $x - 4 = 7$; $x = 11$.
3. $x = 12$. Greater by $2$.
4. $x = 13$.
5. $x = 14$.
6. $x - 4 = 11$; $x = 15$.
7. $x \times 5 = 80$; $x = 16$.
8. $x = 15$.

## Step-by-Step Solutions

Follow each calculation, then check your own work.

### Problem 1

1. The proposed value gives $11 + 3 = 14$, not $13$.
2. Undo the operation: $x = 13 - 3$.
3. Calculate: $13 - 3 = 10$.
4. Substitute: $10 + 3 = 13$, so $x = 10$.

### Problem 2

1. Let $x$ be the unknown input. Set its result equal to the given output: $x - 4 = 7$.
2. Undo the operation: $x = 7 + 4$.
3. Calculate: $7 + 4 = 11$.
4. Substitute: $11 - 4 = 7$, so $x = 11$.

### Problem 3

1. Undo the operation: $x = 60 \div 5$.
2. Calculate: $60 \div 5 = 12$.
3. Substitute: $12 \times 5 = 60$, so $x = 12$.
4. $12 - 10 = 2$, so $x$ is greater by $2$.

### Problem 4

1. The proposed value gives $14 \div 6 = \frac{7}{3}$, not $\frac{13}{6}$.
2. Undo the operation: $x = \frac{13}{6} \times 6$.
3. Calculate: $\frac{13}{6} \times 6 = 13$.
4. Substitute: $13 \div 6 = \frac{13}{6}$, so $x = 13$.

### Problem 5

1. Undo the operation: $x = 17 - 3$.
2. Calculate: $17 - 3 = 14$.
3. Substitute: $14 + 3 = 17$, so $x = 14$.

### Problem 6

1. Let $x$ be the unknown input. Set its result equal to the given output: $x - 4 = 11$.
2. Undo the operation: $x = 11 + 4$.
3. Calculate: $11 + 4 = 15$.
4. Substitute: $15 - 4 = 11$, so $x = 15$.

### Problem 7

1. Let $x$ be the unknown input. Set its result equal to the given output: $x \times 5 = 80$.
2. Undo the operation: $x = 80 \div 5$.
3. Calculate: $80 \div 5 = 16$.
4. Substitute: $16 \times 5 = 80$, so $x = 16$.

### Problem 8

1. Test $x = 9$: $9 \div 3 + 4 = 7$, not $9$.
2. Undo adding $4$: $x \div 3 = 9 - 4 = 5$.
3. Undo division by $3$: $x = 5 \times 3 = 15$. Check $15 \div 3 + 4 = 9$.

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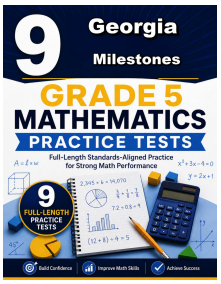


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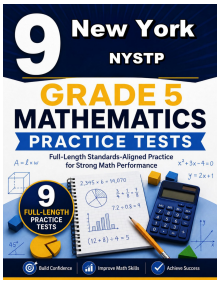


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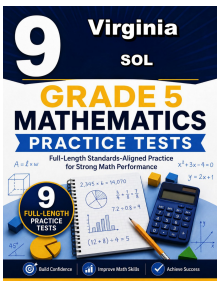


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