Equations with Variables on Both Sides

Name: _____	Date: _____	Score: _____ / 18

Quick Review and Helpful Hints

When the variable appears on *both* sides, first move all the variable terms to one side (subtract the smaller one from both sides) and the constants to the other side. Then solve the two-step equation that remains.

▷ **Example:** Solve $5x + 3 = 2x + 18$. **Work:** Subtract $2x$ from both sides: $3x + 3 = 18$. Subtract 3: $3x = 15$. Divide by 3: $x = 5$.

★ **Answer:** $x = 5$

Move variables to one side first.

Practice Problems

Solve each equation.

1. $5x + 3 = 2x + 18$ _____

2. $4x + 1 = 2x + 9$ _____

3. $7x - 2 = 3x + 10$ _____

4. $6x + 5 = 4x + 13$ _____

5. $3x + 8 = x + 14$ _____

6. $9x - 4 = 5x + 8$ _____

7. $2x + 7 = 5x - 2$ _____

8. $8x - 3 = 3x + 12$ _____

9. $10x + 1 = 6x + 9$ _____

10. $4x + 6 = x + 18$ _____

11. $5x - 7 = 2x + 5$ _____

12. $6x + 2 = 2x + 10$ _____

13. $7x + 4 = 4x + 19$ _____

14. $3x + 15 = 8x$ _____

Word Problems

15. Plan A costs $\$30$ plus $\$2$ per item; Plan B costs $\$10$ plus $\$4$ per item. For how many items do they cost the same?

_____

16. A number plus 12 equals four times the number. Find the number.

_____

17. One tree is 8 ft tall and grows 2 ft per year; another is 2 ft tall and grows 4 ft per year. After how many years are they the same height?

_____

18. Two repair companies quote $5x - 8$ dollars and $3x + 2$ dollars for the same job. For what value of x are the quotes equal?

_____

Answer Keys

1. $x = 5$	**7.** $x = 3$	**13.** $x = 5$
2. $x = 4$	**8.** $x = 3$	**14.** $x = 3$
3. $x = 3$	**9.** $x = 2$	**15.** 10 items
4. $x = 4$	**10.** $x = 4$	**16.** 4
5. $x = 3$	**11.** $x = 4$	**17.** 3 years
6. $x = 3$	**12.** $x = 2$	**18.** $x = 5$

Step-by-Step Explanations

1. Start by naming the process: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Subtract $2x$: $3x + 3 = 18$. Subtract 3: $3x = 15$, so $x = 5$. So the final answer is $x = 5$.

2. A good way to think about this is: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Subtract $2x$: $2x + 1 = 9$. Subtract 1: $2x = 8$, so $x = 4$. So the final answer is $x = 4$.

3. Step by step: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Subtract $3x$: $4x - 2 = 10$. Add 2: $4x = 12$, so $x = 3$. So the final answer is $x = 3$.

4. Take it one move at a time: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Subtract $4x$: $2x + 5 = 13$. Subtract 5: $2x = 8$, so $x = 4$. So the final answer is $x = 4$.

5. Start by naming the process: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Subtract x: $2x + 8 = 14$. Subtract 8: $2x = 6$, so $x = 3$. So the final answer is $x = 3$.

6. A good way to think about this is: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Subtract $5x$: $4x - 4 = 8$. Add 4: $4x = 12$, so $x = 3$. So the final answer is $x = 3$.

7. Step by step: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Subtract $2x$: $7 = 3x - 2$. Add 2: $9 = 3x$, so $x = 3$. So the final answer is $x = 3$.

8. Take it one move at a time: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Subtract $3x$: $5x - 3 = 12$. Add 3: $5x = 15$, so $x = 3$. So the final answer is $x = 3$.

9. Start by naming the process: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Subtract $6x$: $4x + 1 = 9$. Subtract 1: $4x = 8$, so $x = 2$. So the final answer is $x = 2$.

10. A good way to think about this is: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Subtract x: $3x + 6 = 18$. Subtract 6: $3x = 12$, so $x = 4$. So the final answer is $x = 4$.

11. Step by step: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Subtract $2x$: $3x - 7 = 5$. Add 7: $3x = 12$, so $x = 4$. So the final answer is $x = 4$.

12. Take it one move at a time: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Subtract $2x$: $4x + 2 = 10$. Subtract 2: $4x = 8$, so $x = 2$. So the final answer is $x = 2$.

13. Start by naming the process: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Subtract $4x$: $3x + 4 = 19$. Subtract 4: $3x = 15$, so $x = 5$. So the final answer is $x = 5$.

14. A good way to think about this is: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Subtract $3x$: $15 = 5x$. Divide by 5: $x = 3$. So the final answer is $x = 3$.

15. Step by step: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Set $30 + 2x = 10 + 4x$. Subtract $2x$: $30 = 10 + 2x$; then $20 = 2x$, so $x = 10$ items. So the final answer is 10 items.

16. Take it one move at a time: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Set $x + 12 = 4x$. Subtract x: $12 = 3x$, so $x = 4$. So the final answer is 4.

17. Start by naming the process: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Set $8 + 2t = 2 + 4t$. Subtract $2t$: $8 = 2 + 2t$; then $6 = 2t$, so $t = 3$ years. So the final answer is 3 years.

18. A good way to think about this is: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Subtract $3x$: $2x - 8 = 2$. Add 8: $2x = 10$, so $x = 5$. So the final answer is $x = 5$.

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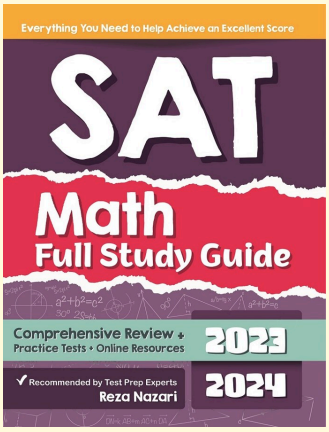

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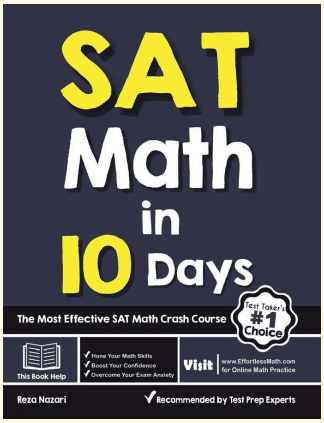

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