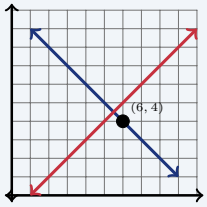
Systems of Equations

Name: _____	Date: _____	Score: _____ / 18

Quick Review and Helpful Hints

A system is two equations with two variables; the solution is the (x, y) pair that makes *both* true. Solve by *elimination* (add or subtract the equations to cancel a variable) or *substitution* (replace one variable using the other equation). Then back-substitute to find the second variable.

▷ **Example:** Solve $x + y = 10$ and $x - y = 2$. **Work:** Add the two equations to cancel y: $2x = 12$, so $x = 6$. Put $x = 6$ into $x + y = 10$: $6 + y = 10$, so $y = 4$. ★ **Answer:** $(6, 4)$



The lines cross at the solution.

Practice Problems

Solve each system. Write the answer as (x, y).

1. $x + y = 5,\ x - y = 1$ _____

2. $x + y = 8,\ x - y = 2$ _____

3. $x + y = 10,\ x - y = 4$ _____

4. $x + y = 9,\ x - y = 3$ _____

5. $x + y = 7,\ x - y = -1$ _____

6. $y = x + 1,\ x + y = 7$ _____

7. $y = 2x,\ x + y = 9$ _____

8. $x + y = 12,\ x - y = 2$ _____

9. $y = x - 2,\ x + y = 10$ _____

10. $2x + y = 10,\ x - y = 2$ _____

11. $x + 2y = 11,\ x - y = 2$ _____

12. $x + y = 6,\ 2x + y = 8$ _____

13. $x - y = 5,\ x + y = 11$ _____

14. $3x + y = 10,\ x + y = 4$ _____

Word Problems

15. Two numbers add up to 20 and differ by 4. Find the two numbers. _____

16. A pen and a pencil together cost $\$5$. The pen costs $\$3$ more than the pencil. Find each price. _____

17. The sum of two numbers is 15 and their difference is 3. Find the numbers. _____

18. A student buys x notebooks and y pens for a total of 7 items. The number of pens is 1 more than twice the notebooks. Solve the system $x + y = 7$ and $y = 2x + 1$. _____

Answer Keys

1. $(3, 2)$	**7.** $(3, 6)$	**13.** $(8, 3)$
2. $(5, 3)$	**8.** $(7, 5)$	**14.** $(3, 1)$
3. $(7, 3)$	**9.** $(6, 4)$	**15.** $(12, 8)$
4. $(6, 3)$	**10.** $(4, 2)$	**16.** $\$4$ and $\$1$
5. $(3, 4)$	**11.** $(5, 3)$	**17.** $(9, 6)$
6. $(3, 4)$	**12.** $(2, 4)$	**18.** $(2, 5)$

Step-by-Step Explanations

1. Add the two equations so y cancels: $(x+y)+(x-y) = 5+1$ gives $2x = 6$, so $x = 3$. Put $x = 3$ into $x + y = 5$ to get $y = 2$. The solution is $(3, 2)$.

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 Add to cancel y: $2x = 10$, so $x = 5$. Then $5 + y = 8$ gives $y = 3$. So the final answer is $(5, 3)$.

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 Add: $2x = 14$, so $x = 7$. Then $7+y = 10$ gives $y = 3$. So the final answer is $(7, 3)$.

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 Add: $2x = 12$, so $x = 6$. Then $6 + y = 9$ gives $y = 3$. So the final answer is $(6, 3)$.

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 Add: $2x = 6$, so $x = 3$. Then $3 + y = 7$ gives $y = 4$. So the final answer is $(3, 4)$.

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 Substitute $y = x+1$ into $x+y = 7$: $x+(x+1) = 7$, so $2x = 6$, $x = 3$. Then $y = 3 + 1 = 4$. So the final answer is $(3, 4)$.

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 Substitute $y = 2x$: $x + 2x = 9$, so $3x = 9$, $x = 3$. Then $y = 2(3) = 6$. So the final answer is $(3, 6)$.

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 Add: $2x = 14$, so $x = 7$. Then $7 + y = 12$ gives $y = 5$. So the final answer is $(7, 5)$.

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 Substitute $y = x - 2$: $x + (x - 2) = 10$, so $2x = 12$, $x = 6$. Then $y = 6 - 2 = 4$. So the final answer is $(6, 4)$.

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 Add the equations so y cancels: $3x = 12$, so $x = 4$. Then $4 - y = 2$ gives $y = 2$. So the final answer is $(4, 2)$.

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 the second from the first so x cancels: $3y = 9$, so $y = 3$. Then $x - 3 = 2$ gives $x = 5$. So the final answer is $(5, 3)$.

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 the first from the second so y cancels: $x = 2$. Then $2 + y = 6$ gives $y = 4$. So the final answer is $(2, 4)$.

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 Add: $2x = 16$, so $x = 8$. Then $8 + y = 11$ gives $y = 3$. So the final answer is $(8, 3)$.

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 the second from the first so y cancels: $2x = 6$, so $x = 3$. Then $3 + y = 4$ gives $y = 1$. So the final answer is $(3, 1)$.

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 Write $x + y = 20$ and $x - y = 4$. Add them: $2x = 24$, so $x = 12$, then $y = 8$. The numbers are 12 and 8. So the final answer is $(12, 8)$.

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 Write $p + c = 5$ and $p - c = 3$. Add them: $2p = 8$, so the pen is $p = \$4$ and the pencil is $c = \$1$. So the final answer is $\$4$ and $\$1$.

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 Write $x + y = 15$ and $x - y = 3$. Add: $2x = 18$, so $x = 9$, then $y = 6$. So the final answer is $(9, 6)$.

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 Substitute $y = 2x + 1$ into $x + y = 7$: $x + (2x + 1) = 7$, so $3x = 6$, $x = 2$. Then $y = 5$. The solution is $(2, 5)$. So the final answer is $(2, 5)$.

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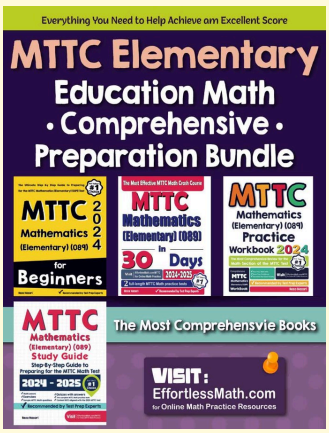

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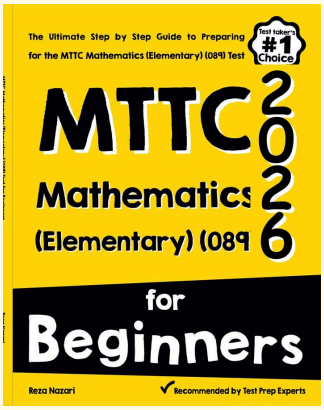

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