

Solving Systems of Two Equations

Name: _____ Date: _____ Score: _____ / 24

Quick Review

A **system of equations** is two equations sharing the same two variables. The **solution** is the (x, y) pair that makes *both* equations true at once — on a graph, it is the point where the two lines cross. Two handy methods: **substitution** (solve one equation for a variable, then plug it into the other) and **elimination** (add or subtract the equations to cancel a variable). Always find both x and y , and check your pair in both equations.

◇ **Example:** Solve the system $y = 2x + 1$ and $3x + y = 16$.
 ⇒ The first equation already tells us what y equals, so this is a perfect setup for substitution. Wherever we see y in the second equation, we replace it with $2x + 1$: that gives $3x + (2x + 1) = 16$. Combine like terms: $5x + 1 = 16$, so $5x = 15$ and $x = 3$. Now back-substitute into the first equation to get y : $y = 2(3) + 1 = 7$. So the lines cross at $(3, 7)$.

Answer: $(3, 7)$

PRACTICE

Solve each system. Write the solution as an ordered pair (x, y) .

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|-----------------------------|-------|------------------------------|-------|
| 1. $y = x, x + y = 10$ | _____ | 11. $x + y = 9, x - y = 5$ | _____ |
| 2. $y = 2x, x + y = 9$ | _____ | 12. $2x + y = 11, x + y = 7$ | _____ |
| 3. $y = x + 1, x + y = 7$ | _____ | 13. $3x + y = 14, x + y = 6$ | _____ |
| 4. $y = x - 2, x + y = 8$ | _____ | 14. $x + 2y = 13, x + y = 8$ | _____ |
| 5. $y = 3x, 2x + y = 20$ | _____ | 15. $2x + y = 9, x - y = 3$ | _____ |
| 6. $x = y + 3, x + y = 11$ | _____ | 16. $x + y = 6, 2x - y = 6$ | _____ |
| 7. $y = 2x - 1, x + y = 8$ | _____ | 17. $y = x + 4, 2x + y = 19$ | _____ |
| 8. $y = 4x, x + y = 15$ | _____ | 18. $3x + 2y = 16, x = 2y$ | _____ |
| 9. $x + y = 10, x - y = 4$ | _____ | 19. $x + y = 0, x - y = 8$ | _____ |
| 10. $x + y = 12, x - y = 2$ | _____ | 20. $2x + y = 5, x + y = 1$ | _____ |

Word Problems

21. Two numbers add to 20, and their difference is 6. Find the two numbers. _____
22. At a snack stand, 2 pretzels and 1 juice cost \$8, while 1 pretzel and 1 juice cost \$5. Find the price of each. _____
23. A theater sold 30 tickets in all. Adult tickets cost \$10 and child tickets \$6, for a total of \$236. How many adult tickets were sold? _____
24. A farmer has chickens and cows totaling 12 animals with 34 legs in all. How many chickens are there? _____



Answer Keys

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| <ol style="list-style-type: none"> 1. (5, 5) 2. (3, 6) 3. (3, 4) 4. (5, 3) 5. (4, 12) 6. (7, 4) 7. (3, 5) 8. (3, 12) 9. (7, 3) 10. (7, 5) 11. (7, 2) 12. (4, 3) | <ol style="list-style-type: none"> 13. (4, 2) 14. (3, 5) 15. (4, 1) 16. (4, 2) 17. (5, 9) 18. (4, 2) 19. (4, -4) 20. (4, -3) 21. 13 and 7 22. pretzel \$3, juice \$2 23. 14 adult tickets 24. 7 chickens |
|---|--|

Step-by-Step Explanations

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| <ol style="list-style-type: none"> 1. Substitute $y = x$: $x + x = 10$, so $x = 5$ and $y = 5$. 2. Substitute: $x + 2x = 9$, so $3x = 9$, $x = 3$, $y = 6$. 3. Substitute: $x + (x + 1) = 7$, so $2x = 6$, $x = 3$, $y = 4$. 4. Substitute: $x + (x - 2) = 8$, so $2x = 10$, $x = 5$, $y = 3$. 5. Substitute: $2x + 3x = 20$, so $5x = 20$, $x = 4$, $y = 12$. 6. Substitute: $(y + 3) + y = 11$, so $2y = 8$, $y = 4$, $x = 7$. 7. Substitute: $x + (2x - 1) = 8$, so $3x = 9$, $x = 3$, $y = 5$. 8. Substitute: $x + 4x = 15$, so $5x = 15$, $x = 3$, $y = 12$. 9. Add the equations: $2x = 14$, so $x = 7$, then $y = 3$. 10. Add: $2x = 14$, so $x = 7$, then $y = 5$. 11. Add: $2x = 14$, so $x = 7$, then $y = 2$. 12. Subtract the second from the first: $x = 4$, then $y = 3$. 13. Subtract: $2x = 8$, so $x = 4$, then $y = 2$. 14. Subtract: $y = 5$, then $x = 8 - 5 = 3$. | <ol style="list-style-type: none"> 15. Add the equations: $3x = 12$, so $x = 4$, then $y = 1$. 16. Add: $3x = 12$, so $x = 4$, then $y = 2$. 17. Substitute: $2x + (x + 4) = 19$, so $3x = 15$, $x = 5$, $y = 9$. 18. Substitute $x = 2y$: $3(2y) + 2y = 16$, so $8y = 16$, $y = 2$, $x = 4$. 19. Add: $2x = 8$, so $x = 4$, then $y = -4$. 20. Subtract: $x = 4$, then $y = 1 - 4 = -3$. 21. With $x + y = 20$ and $x - y = 6$, add them: $2x = 26$, so $x = 13$ and $y = 7$. 22. Let p and j be the prices: $2p + j = 8$ and $p + j = 5$. Subtract: $p = 3$, then $j = 2$. 23. With $a + c = 30$ and $10a + 6c = 236$, substitute $c = 30 - a$: $10a + 6(30 - a) = 236$, so $4a = 56$ and $a = 14$. 24. With $c + w = 12$ and $2c + 4w = 34$, substitute $w = 12 - c$: $2c + 4(12 - c) = 34$, so $-2c = -14$ and $c = 7$. |
|--|--|



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