

Solving Systems of Two Equations

Name: _____ Date: _____ Score: _____ / 24

Q 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) .

- | | | | |
|-----------------------------|-------|------------------------------|-------|
| 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

- | | |
|------------|----------------------------|
| 1. (5, 5) | 13. (4, 2) |
| 2. (3, 6) | 14. (3, 5) |
| 3. (3, 4) | 15. (4, 1) |
| 4. (5, 3) | 16. (4, 2) |
| 5. (4, 12) | 17. (5, 9) |
| 6. (7, 4) | 18. (4, 2) |
| 7. (3, 5) | 19. (4, -4) |
| 8. (3, 12) | 20. (4, -3) |
| 9. (7, 3) | 21. 13 and 7 |
| 10. (7, 5) | 22. pretzel \$3, juice \$2 |
| 11. (7, 2) | 23. 14 adult tickets |
| 12. (4, 3) | 24. 7 chickens |

Step-by-Step Explanations

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|---|---|
| <p>1. Substitute $y = x$: $x + x = 10$, so $x = 5$ and $y = 5$.</p> <p>2. Substitute: $x + 2x = 9$, so $3x = 9$, $x = 3$, $y = 6$.</p> <p>3. Substitute: $x + (x + 1) = 7$, so $2x = 6$, $x = 3$, $y = 4$.</p> <p>4. Substitute: $x + (x - 2) = 8$, so $2x = 10$, $x = 5$, $y = 3$.</p> <p>5. Substitute: $2x + 3x = 20$, so $5x = 20$, $x = 4$, $y = 12$.</p> <p>6. Substitute: $(y + 3) + y = 11$, so $2y = 8$, $y = 4$, $x = 7$.</p> <p>7. Substitute: $x + (2x - 1) = 8$, so $3x = 9$, $x = 3$, $y = 5$.</p> <p>8. Substitute: $x + 4x = 15$, so $5x = 15$, $x = 3$, $y = 12$.</p> <p>9. Add the equations: $2x = 14$, so $x = 7$, then $y = 3$.</p> <p>10. Add: $2x = 14$, so $x = 7$, then $y = 5$.</p> <p>11. Add: $2x = 14$, so $x = 7$, then $y = 2$.</p> <p>12. Subtract the second from the first: $x = 4$, then $y = 3$.</p> <p>13. Subtract: $2x = 8$, so $x = 4$, then $y = 2$.</p> <p>14. Subtract: $y = 5$, then $x = 8 - 5 = 3$.</p> | <p>15. Add the equations: $3x = 12$, so $x = 4$, then $y = 1$.</p> <p>16. Add: $3x = 12$, so $x = 4$, then $y = 2$.</p> <p>17. Substitute: $2x + (x + 4) = 19$, so $3x = 15$, $x = 5$, $y = 9$.</p> <p>18. Substitute $x = 2y$: $3(2y) + 2y = 16$, so $8y = 16$, $y = 2$, $x = 4$.</p> <p>19. Add: $2x = 8$, so $x = 4$, then $y = -4$.</p> <p>20. Subtract: $x = 4$, then $y = 1 - 4 = -3$.</p> <p>21. With $x + y = 20$ and $x - y = 6$, add them: $2x = 26$, so $x = 13$ and $y = 7$.</p> <p>22. Let p and j be the prices: $2p + j = 8$ and $p + j = 5$. Subtract: $p = 3$, then $j = 2$.</p> <p>23. With $a + c = 30$ and $10a + 6c = 236$, substitute $c = 30 - a$: $10a + 6(30 - a) = 236$, so $4a = 56$ and $a = 14$.</p> <p>24. With $c + w = 12$ and $2c + 4w = 34$, substitute $w = 12 - c$: $2c + 4(12 - c) = 34$, so $-2c = -14$ and $c = 7$.</p> |
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