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).

1. $y = x,\ \ x + y = 10$ _____

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

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

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

5. $y = 3x,\ \ 2x + y = 20$ _____

6. $x = y + 3,\ \ x + y = 11$ _____

7. $y = 2x - 1,\ \ x + y = 8$ _____

8. $y = 4x,\ \ x + y = 15$ _____

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

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

11. $x + y = 9,\ \ x - y = 5$ _____

12. $2x + y = 11,\ \ x + y = 7$ _____

13. $3x + y = 14,\ \ x + y = 6$ _____

14. $x + 2y = 13,\ \ x + y = 8$ _____

15. $2x + y = 9,\ \ x - y = 3$ _____

16. $x + y = 6,\ \ 2x - y = 6$ _____

17. $y = x + 4,\ \ 2x + y = 19$ _____

18. $3x + 2y = 16,\ \ x = 2y$ _____

19. $x + y = 0,\ \ x - y = 8$ _____

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. $(5, 5)$
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. $(4, 3)$
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

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 $x = 8 - 5 = 3$.
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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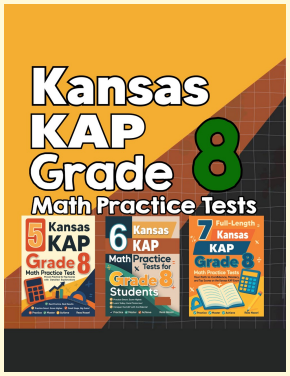

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