Year 9 simultaneous equations worksheet

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Name: _____ Date: _____

Question 1

Use substitution to solve the simultaneous equations y = 2x + 1 and x + y = 10.

Answer: _____

Question 2

Use elimination to solve x + y = 9 and x - y = 3.

Answer: _____

Question 3

A phone plan from Company A costs $20 per month plus $0.10 per minute of calls. Company B charges $35 per month with no call costs. Write an equation for the total monthly cost of each plan in terms of m minutes, then find the number of minutes at which both plans cost the same.

Answer: _____

Question 4

(a) Copy and complete the table of values for the lines y = x + 1 and y = -x + 5.

x	0	1	2	3	4
y = x + 1	☐	☐	☐	☐	☐
y = -x + 5	☐	☐	☐	☐	☐

(b) Use the table to find the point where the two lines intersect.

Answer: _____

Question 5

Use substitution to solve y = x - 4 and 3x + 2y = 17.

Answer: _____

Question 6

Use elimination to solve 2x + 3y = 13 and 2x - y = 1.

Answer: _____

Question 7

The sum of two numbers is 47 and their difference is 13. Write a pair of simultaneous equations and solve them to find the numbers.

Answer: _____

Question 8

The lines y = 2x - 1 and y = x + 2 are sketched on the same axes.

(a) State the y-intercept and gradient of each line.

(b) Find the point of intersection, and check that it lies on both lines.

Answer: _____

Question 9

Use substitution to solve x = 2y + 3 and 4x - 5y = 18.

Answer: _____

Question 10

Use elimination to solve 3x + 2y = 16 and x + 2y = 8.

Answer: _____

Year 9 simultaneous equations: answers and worked solutions

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Question 1

Key idea: Replace y in the second equation with the expression it equals from the first equation.

1. x + (2x + 1) = 10 2. 3x + 1 = 10, so x = 3 3. y = 2(3) + 1 = 7 (check: 3 + 7 = 10 ✓)

Answer: x = 3, y = 7

Question 2

Key idea: The y terms have opposite signs, so adding the equations eliminates y.

1. Add: 2x = 12, so x = 6 2. Substitute into x + y = 9: 6 + y = 9, so y = 3

Answer: x = 6, y = 3

Question 3

Key idea: Write a linear equation for each plan, then set them equal and solve for m.

1. Company A: C = 0.10m + 20. Company B: C = 35. 2. Set the costs equal: 0.10m + 20 = 35. 3. Subtract 20 from both sides: 0.10m = 15. 4. Divide both sides by 0.10: m = 150. 5. Check: 0.10(150) + 20 = 15 + 20 = 35. ✓

Answer: The plans cost the same at 150 minutes per month.

Question 4

Key idea: The lines intersect at the point where both rules give the same y-value for the same x-value.

1. (a) y = x + 1 gives 1, 2, 3, 4, 5 2. (a) y = -x + 5 gives 5, 4, 3, 2, 1 3. (b) At x = 2 both rules give y = 3, so the lines intersect at (2, 3)

Answer: (a) y = x + 1: 1, 2, 3, 4, 5; y = -x + 5: 5, 4, 3, 2, 1 (b) (2, 3)

Question 5

Key idea: Substitute x - 4 for y in the second equation.

1. 3x + 2(x - 4) = 17 2. 3x + 2x - 8 = 17, so 5x = 25 and x = 5 3. y = 5 - 4 = 1 (check: 3(5) + 2(1) = 17 ✓)

Answer: x = 5, y = 1

Question 6

Key idea: The x terms are the same, so subtracting one equation from the other eliminates x.

1. Subtract the second equation from the first: 3y - (-y) = 13 - 1, so 4y = 12 and y = 3
2. Substitute into 2x - y = 1: 2x - 3 = 1, so x = 2

Answer: x = 2, y = 3

Question 7

Key idea: Let the numbers be x and y, with x the larger. Adding the equations eliminates y.

1. x + y = 47 and x - y = 13 2. Add: 2x = 60, so x = 30 3. 30 + y = 47, so y = 17

Answer: 30 and 17

Question 8

Key idea: The point of intersection is the solution of the pair of equations. Reading it from a graph can be checked by substituting into both equations.

1. (a) From y = mx + c: the first line has m = 2, c = -1; the second has m = 1, c = 2 2. (b) Starting from the intercepts, the first line rises 2 per unit and the second rises 1 per unit, so the gap of 3 closes by 1 each unit: they meet at x = 3 3. (b) y = 2(3) - 1 = 5 and y = 3 + 2 = 5 ✓, so the point is (3, 5)

Answer: (a) y = 2x - 1: y-intercept -1, gradient 2; y = x + 2: y-intercept 2, gradient 1 (b) (3, 5)

Question 9

Key idea: Here x is the subject of the first equation, so substitute 2y + 3 for x.

1. 4(2y + 3) - 5y = 18 2. 8y + 12 - 5y = 18, so 3y = 6 and y = 2 3. x = 2(2) + 3 = 7 (check: 4(7) - 5(2) = 28 - 10 = 18 ✓)

Answer: x = 7, y = 2

Question 10

Key idea: Both equations contain 2y, so subtract to eliminate y.

1. Subtract: 3x - x = 16 - 8, so 2x = 8 and x = 4 2. Substitute into x + 2y = 8: 4 + 2y = 8, so y = 2

Answer: x = 4, y = 2