Year 10 simultaneous equations worksheet

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Name: _____ Date: _____

Question 1

Solve the simultaneous equations:\ y = 2x - 1 3x + y = 9

Answer: _____

Question 2

Solve the simultaneous equations:\ 3x + 2y = 16 5x - 2y = 8

Answer: _____

Question 3

Two friends, Aiden and Brianna, buy items at a school canteen. Aiden buys 2 pies and 1 drink and pays $8.70. Brianna buys 1 pie and 1 drink and pays $5.20. Find the cost of one pie and one drink.

Answer: _____

Question 4

Solve using substitution: y = 3x - 2 and 2x + y = 13. Give your answer as x, then y.

Answer: _____

Question 5

Solve the following pair of simultaneous equations using any method.

3x + 2y = 16\ x - y = 2

Find the value of x.

Answer: _____

Question 6

A school sold 240 tickets to its musical. Adult tickets cost $15 and student tickets cost $9. Ticket sales came to $2760.

(a) How many adult tickets were sold?

(b) How many student tickets were sold?

Answer: _____

Question 7

Solve using substitution: x = 2y + 1 and 3x - 4y = 9. Give your answer as x, then y.

Answer: _____

Question 8

Solve the simultaneous equations:\ 4x + 3y = 5 2x - 3y = 7

Answer: _____

Question 9

For each pair of equations, state whether there is no solution, exactly one solution or infinitely many solutions. Explain your answer by describing the graphs.

(a) y = 3x + 2 and y = 3x - 4

(b) 2x + y = 5 and 4x + 2y = 10

(c) y = x + 1 and y = -2x + 7

Answer: _____

Question 10

(a) Is (2, 3) a solution of the pair of equations x + y = 5 and 2x - y = 1? Show how you know.

(b) Is (1, 4) a solution of the same pair of equations? Show how you know.

Answer: _____

Year 10 simultaneous equations: answers and worked solutions

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Question 1

Key idea: Substitute the expression for y from the first equation directly into the second equation.

1. Substitute y = 2x - 1 into 3x + y = 9:\ 3x + (2x - 1) = 9 2. Simplify and solve for x:\ 5x - 1 = 9 5x = 10 x = 2 3. Substitute x = 2 back into y = 2x - 1:\ y = 2(2) - 1 = 3 4. Check in 3x + y = 9: 3(2) + 3 = 9 ✓

Answer: x = 2,; y = 3

Question 2

Key idea: Add the equations to eliminate y, since the y-coefficients are opposites.

1. Add the two equations:\ (3x + 2y) + (5x - 2y) = 16 + 8 8x = 24 x = 3 2. Substitute x = 3 into 3x + 2y = 16:\ 9 + 2y = 16 2y = 7 y = 3.5 3. Check in 5x - 2y = 8: 5(3) - 2(3.5) = 15 - 7 = 8 ✓

Answer: x = 3,; y = 3.5

Question 3

Key idea: Define variables, write two equations from the given information, then solve.

1. Let p = cost of one pie (dollars) and d = cost of one drink (dollars). Write the equations:\ 2p + d = 8.70 (1) p + d = 5.20 (2) 2. Subtract equation (2) from equation (1) to eliminate d:\ (2p + d) - (p + d) = 8.70 - 5.20 p = 3.50 3. Substitute p = 3.50 into equation (2):\ 3.50 + d = 5.20 d = 1.70 4. Check in equation (1): 2(3.50) + 1.70 = 7.00 + 1.70 = 8.70 ✓

Answer: One pie costs $3.50 and one drink costs $1.70.

Question 4

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

1. Substitute y = 3x - 2 into 2x + y = 13: 2x + 3x - 2 = 13. 2. 5x = 15, so x = 3. 3. y = 3(3) - 2 = 7.

Answer: x = 3, y = 7

Question 5

Key idea: Use substitution by rearranging the simpler equation, then substitute into the other equation.

1. From the second equation, rearrange for x:\ x = y + 2 2. Substitute x = y + 2 into the first equation:\ 3(y + 2) + 2y = 16 3. Expand and simplify:\ 3y + 6 + 2y = 16 5y = 10 y = 2 4. Substitute y = 2 back into x = y + 2:\ x = 2 + 2 = 4 5. Check in the first equation: 3(4) + 2(2) = 12 + 4 = 16 ✓

Answer: x = 4

Question 6

Key idea: Write one equation for the number of tickets and one for the money, then eliminate.

1. Let a be adult tickets and s student tickets: a + s = 240 and 15a + 9s = 2760. 2. Multiply the first equation by 9: 9a + 9s = 2160. 3. Subtract: 6a = 600, so a = 100. 4. s = 240 - 100 = 140.

Answer: (a) 100 (b) 140

Question 7

Key idea: Replace x in the second equation with 2y + 1.

1. Substitute x = 2y + 1: 3(2y + 1) - 4y = 9. 2. 6y + 3 - 4y = 9, so 2y = 6 and y = 3. 3. x = 2(3) + 1 = 7.

Answer: x = 7, y = 3

Question 8

Key idea: Add the equations to eliminate y, since the y-coefficients are already opposites.

1. Add the two equations:\ (4x + 3y) + (2x - 3y) = 5 + 7 6x = 12 x = 2 2. Substitute x = 2 into 4x + 3y = 5:\ 8 + 3y = 5 3y = -3 y = -1 3. Check in 2x - 3y = 7: 2(2) - 3(-1) = 4 + 3 = 7 ✓

Answer: x = 2,; y = -1

Question 9

Answer: (a) No solution: same gradient, different y-intercepts, so the lines are parallel and never meet (b) Infinitely many: the second equation is double the first, so both are the same line (c) Exactly one, at (2, 3): different gradients, so the lines cross once

Question 10

Answer: (a) Yes: 2 + 3 = 5 and 2(2) - 3 = 1 (b) No: 1 + 4 = 5 but 2(1) - 4 = -2, not 1