

Math Sheet

Name _____ Score _____ / 12 Teacher _____ Date _____

Cramer's Rule - 2 x 2

Solve each system. If $D = 0$, determine whether there is no solution or infinitely many solutions.

1. Solve the system.

$$6x - 3y = 27$$

$$-5x + y = -27$$

2. Solve the system.

$$-x - 3y = 12$$

$$-2x - 6y = 25$$

3. Solve the system.

$$7x + y = 11$$

$$3x - 4y = -13$$

4. Solve the system.

$$x + 3y = 7$$

$$-3x - 9y = -21$$

5. Solve the system.

$$-3x - 4y = 0$$

$$8x + y = -29$$

6. Solve the system.

$$7x - 6y = 10$$

$$6x + 8y = -44$$

7. Solve the system.

$$-6x - 6y = -24$$

$$9x + 9y = 36$$

8. Solve the system.

$$7x - 7y = -21$$

$$-4x + 6y = 22$$

Math Sheet

Name _____ Score _____ / 12 Teacher _____ Date _____

Cramer's Rule - 2 x 2

Solve each system. If $D = 0$, determine whether there is no solution or infinitely many solutions.

9. Solve the system.

$$4x + 5y = -7$$

$$-8x - 6y = 18$$

10. Solve the system.

$$7x - 7y = 35$$

$$-7x + 6y = -29$$

11. Solve the system.

$$-6x - 3y = -15$$

$$4x + 2y = 11$$

12. Solve the system.

$$-3x - 3y = 9$$

$$-3x - 3y = 9$$

Math Sheet

Name _____ Score _____ / 12 Teacher _____ Date _____

Cramer's Rule - 2 x 2

Answer Key

Solve each system. If $D = 0$, determine whether there is no solution or infinitely many solutions.

1. Solve the system.

$$6x - 3y = 27$$

$$-5x + y = -27$$

Replace one coefficient column at a time with the constants.

$$D = \begin{vmatrix} 6 & -3 \\ -5 & 1 \end{vmatrix} = -9 \quad D_x = \begin{vmatrix} 27 & -3 \\ -27 & 1 \end{vmatrix} = -54 \quad D_y = \begin{vmatrix} 6 & 27 \\ -5 & -27 \end{vmatrix} = -27$$

D is nonzero. Divide each replacement determinant by D .

$$x = \frac{-54}{-9} = 6 \quad y = \frac{-27}{-9} = 3$$

2. Solve the system.

$$-x - 3y = 12$$

$$-2x - 6y = 25$$

$$D = \det(A) = 0$$

D is zero. Row-reduce the augmented matrix to check consistency.

$$\left[\begin{array}{cc|c} 1 & 3 & 0 \\ 0 & 0 & 1 \end{array} \right]$$

$$\text{rank}(A) = 1; \text{rank}([A|b]) = 2.$$

$$0 = 1$$

No solution: the reduced system contains a contradiction.

Math Sheet

Name _____ Score _____ / 12 Teacher _____ Date _____

Cramer's Rule - 2 x 2

Answer Key

Solve each system. If $D = 0$, determine whether there is no solution or infinitely many solutions.

3. Solve the system.

$$7x + y = 11$$

$$3x - 4y = -13$$

Replace one coefficient column at a time with the constants.

$$D = \begin{vmatrix} 7 & 1 \\ 3 & -4 \end{vmatrix} = -31 \quad D_x = \begin{vmatrix} 11 & 1 \\ -13 & -4 \end{vmatrix} = -31 \quad D_y = \begin{vmatrix} 7 & 11 \\ 3 & -13 \end{vmatrix} = -124$$

D is nonzero. Divide each replacement determinant by D.

$$x = \frac{-31}{-31} = 1 \quad y = \frac{-124}{-31} = 4$$

4. Solve the system.

$$x + 3y = 7$$

$$-3x - 9y = -21$$

$$D = \det(A) = 0$$

D is zero. Row-reduce the augmented matrix to check consistency.

$$\left[\begin{array}{cc|c} 1 & 3 & 7 \\ 0 & 0 & 0 \end{array} \right]$$

$$\text{rank}(A) = 1; \text{rank}([A|b]) = 1.$$

Free variables: y

Infinitely many solutions: the system is consistent and has a free variable.

Math Sheet

Name _____ Score _____ / 12 Teacher _____ Date _____

Cramer's Rule - 2 x 2

Answer Key

Solve each system. If $D = 0$, determine whether there is no solution or infinitely many solutions.

5. Solve the system.

$$-3x - 4y = 0$$

$$8x + y = -29$$

Replace one coefficient column at a time with the constants.

$$D = \begin{vmatrix} -3 & -4 \\ 8 & 1 \end{vmatrix} = 29 \quad D_x = \begin{vmatrix} 0 & -4 \\ -29 & 1 \end{vmatrix} = -116 \quad D_y = \begin{vmatrix} -3 & 0 \\ 8 & -29 \end{vmatrix} = 87$$

D is nonzero. Divide each replacement determinant by D.

$$x = \frac{-116}{29} = -4 \quad y = \frac{87}{29} = 3$$

6. Solve the system.

$$7x - 6y = 10$$

$$6x + 8y = -44$$

Replace one coefficient column at a time with the constants.

$$D = \begin{vmatrix} 7 & -6 \\ 6 & 8 \end{vmatrix} = 92 \quad D_x = \begin{vmatrix} 10 & -6 \\ -44 & 8 \end{vmatrix} = -184 \quad D_y = \begin{vmatrix} 7 & 10 \\ 6 & -44 \end{vmatrix} = -368$$

D is nonzero. Divide each replacement determinant by D.

$$x = \frac{-184}{92} = -2 \quad y = \frac{-368}{92} = -4$$

Cramer's Rule - 2 x 2

Answer Key

Solve each system. If $D = 0$, determine whether there is no solution or infinitely many solutions.

7. Solve the system.

$$-6x - 6y = -24$$

$$9x + 9y = 36$$

$$D = \det(A) = 0$$

D is zero. Row-reduce the augmented matrix to check consistency.

$$\left[\begin{array}{cc|c} 1 & 1 & 4 \\ 0 & 0 & 0 \end{array} \right]$$

$$\text{rank}(A) = 1; \text{rank}([A|b]) = 1.$$

Free variables: y

Infinitely many solutions: the system is consistent and has a free variable.

8. Solve the system.

$$7x - 7y = -21$$

$$-4x + 6y = 22$$

Replace one coefficient column at a time with the constants.

$$D = \begin{vmatrix} 7 & -7 \\ -4 & 6 \end{vmatrix} = 14 \quad D_x = \begin{vmatrix} -21 & -7 \\ 22 & 6 \end{vmatrix} = 28 \quad D_y = \begin{vmatrix} 7 & -21 \\ -4 & 22 \end{vmatrix} = 70$$

D is nonzero. Divide each replacement determinant by D.

$$x = \frac{28}{14} = 2 \quad y = \frac{70}{14} = 5$$

Math Sheet

Name _____ Score _____ / 12 Teacher _____ Date _____

Cramer's Rule - 2 x 2

Answer Key

Solve each system. If $D = 0$, determine whether there is no solution or infinitely many solutions.

9. Solve the system.

$$4x + 5y = -7$$

$$-8x - 6y = 18$$

Replace one coefficient column at a time with the constants.

$$D = \begin{vmatrix} 4 & 5 \\ -8 & -6 \end{vmatrix} = 16 \quad D_x = \begin{vmatrix} -7 & 5 \\ 18 & -6 \end{vmatrix} = -48 \quad D_y = \begin{vmatrix} 4 & -7 \\ -8 & 18 \end{vmatrix} = 16$$

D is nonzero. Divide each replacement determinant by D.

$$x = \frac{-48}{16} = -3 \quad y = \frac{16}{16} = 1$$

10. Solve the system.

$$7x - 7y = 35$$

$$-7x + 6y = -29$$

Replace one coefficient column at a time with the constants.

$$D = \begin{vmatrix} 7 & -7 \\ -7 & 6 \end{vmatrix} = -7 \quad D_x = \begin{vmatrix} 35 & -7 \\ -29 & 6 \end{vmatrix} = 7 \quad D_y = \begin{vmatrix} 7 & 35 \\ -7 & -29 \end{vmatrix} = 42$$

D is nonzero. Divide each replacement determinant by D.

$$x = \frac{7}{-7} = -1 \quad y = \frac{42}{-7} = -6$$

Cramer's Rule - 2 x 2

Answer Key

Solve each system. If $D = 0$, determine whether there is no solution or infinitely many solutions.

11. Solve the system.

$$-6x - 3y = -15$$

$$4x + 2y = 11$$

$$D = \det(A) = 0$$

D is zero. Row-reduce the augmented matrix to check consistency.

$$\left[\begin{array}{cc|c} 1 & \frac{1}{2} & 0 \\ 0 & 0 & 1 \end{array} \right]$$

$$\text{rank}(A) = 1; \text{rank}([A|b]) = 2.$$

$$0 = 1$$

No solution: the reduced system contains a contradiction.

12. Solve the system.

$$-3x - 3y = 9$$

$$-3x - 3y = 9$$

$$D = \det(A) = 0$$

D is zero. Row-reduce the augmented matrix to check consistency.

$$\left[\begin{array}{cc|c} 1 & 1 & -3 \\ 0 & 0 & 0 \end{array} \right]$$

$$\text{rank}(A) = 1; \text{rank}([A|b]) = 1.$$

Free variables: y

Infinitely many solutions: the system is consistent and has a free variable.