Algebra 1 SOL Review Session

Day: 5 **Topics**: Linear Systems of Equations (A.4 d, e) and Inequalities (A.5 d), and Quadratic Equations (A.4 b)

Systems and Quadratic Equations

System of Linear Equations

- A **system** of linear equations is a **set** of two or more linear equations with the **same variables**.
- The solution to system of linear equations is usually an **ordered pair**, but it can also be **infinitely many solutions** or **no solution**.
  - If the graphs of the equations intersect, then the **point of intersection** is the solution.
  - If the equations represent the **same line**, then there are **infinitely many solutions.**
  - If the equations represent **parallel lines**, then there is **no solution**.
- You probably learned three methods to solve a system: **graphing**, **substitution**, and **elimination**.

With Desmos, we can use the graphing method to solve all systems.

Open www.desmos.com/testing/virginia/graphing and type each equation in its own field.

Find the solution to the system:

$$\begin{cases} 3x+2y=22 \\ -x+4y=2 \end{cases}$$

$(6, 2)$

Find the solution to the system:

$$\begin{cases} 15x+5y=20 \\ y=8-3x \end{cases}$$

No solution

Because we can use Desmos, you may be asked to do more than simply find the solution.

Skyler buys 8 T-shirts and 5 hats for $220. The next day, he buys 5 T-shirts and 1 hat for $112. How much does each T-shirt and each hat cost? Write a system of equations that can be used to solve the problem. Then solve the problem.

x: cost T-shirt

y: cost hat

$8x+5y=220$

$5x+1y=112$

$$\begin{aligned} 5x + 6y &= 18 \\ 2x - 3y &= 12 \end{aligned}$$

As a first step in solving the systems shown, Yumiko multiplies both sides of the equation $2x - 3y = 12$ by 6. By what factor should she multiply both sides of the other equation so she can add the equations and eliminate a variable?

$6(2x-3y=12)$

$12x-18y=72$

$3(5x+6y=18)$

3

$12x-18y=72$

$15x+18y=54$

System of Linear Inequalities

- A **system** of linear inequalities is a **set** of two or more linear inequalities with the **same variables**.
- The solution to system of linear inequalities is usually a **set of ordered pairs in a shaded region on a graph**, but it can also have **no solution**.
- The solution to a system of linear inequalities can only be found by **graphing**.

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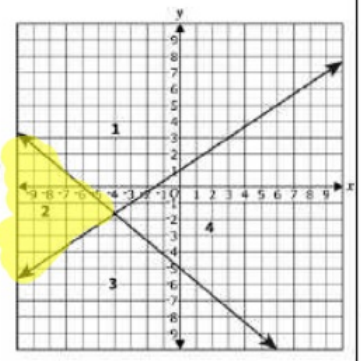
Graph this system on Desmos and give three ordered pairs that are part of the solution set.

$$\begin{cases} y > \frac{1}{2}x + 1 \\ y + 3x \le 6 \end{cases}$$

(-5,5) (-4,0) (-6,4)

Eli began graphing the system shown. Which region on the graph must he shade to complete the graph?

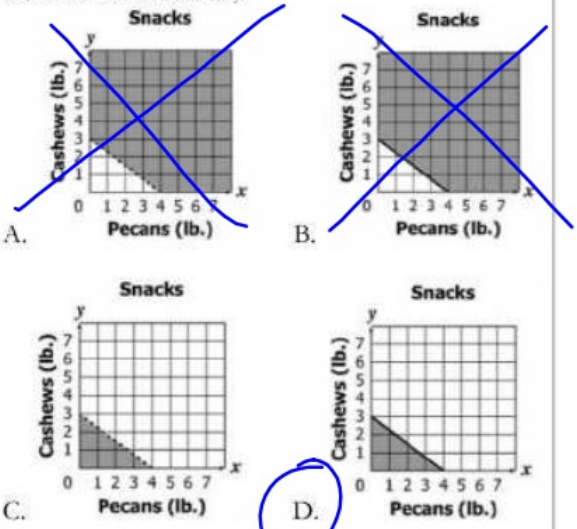
$$\begin{cases} y \ge \frac{2}{3}x + 1 \\ 5x + 6y \le -30 \end{cases}$$



A. 4 C. 1

B. 3 D. 2

Malik can spend no more than $24 to buy pecans and cashews. He will pay $6 per pound for pecans and $8 per pound for cashews. Which graph best represents the number of pounds of pecans and cashews Malik can buy?



Quadratic Equations

- A **quadratic equation** usually has **two solutions**, but it could also have just **one solution** or **no solution**.
- The **graph** of a quadratic equation is a parabola. The **solutions** are the ***x*-intercepts**.
- **To graph:** set the equation equal to zero, type the other side into Desmos.

Solve the equation. (Find the *x*-intercepts on the graph.)

$2x^2 + 5x + 3 = 0$

$\{-\frac{3}{2}, -1\}$

How many solutions does the equation $12x = 3x^2 + 15$ have?

$-12x \quad -12x$

$0 = 3x^2 - 12x + 15$

0 solutions

What are the solutions of the equation $-5x + 2 = -3x^2$?

$+3x^2 \quad +3x^2$

$3x^2 - 5x + 2 = 0$

$\{\frac{2}{3}, 1\}$

How many solutions does the equation $\frac{1}{2}x^2 + 2x = -2$ have?

1

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Day: 5 **Topics**: Linear Systems of Equations (A.4 d, e) and Inequalities (A.5 d), and Quadratic Equations (A.4 b)

Key Concepts:

- The types of solutions possible for systems and quadratic equations.
- Using Desmos to help determine the solutions of linear systems and quadratic equations.

Guided Practice:
Systems and Quadratic Equations (Handout)

Independent Practice

1. What is the solution to this system of equations?

$$\begin{cases} 2x+4y=22 \\ 7x+y=12 \end{cases}$$

(1, 5)

2. What is the y-value of the solution to this systems of equations?

$$\begin{cases} 3x+y=2 \\ x+3y=-18 \end{cases}$$

−7

3. What is the solution to this system of equations?

$$\begin{cases} 2x+4y=28 \\ -2y=x-14 \end{cases}$$

infinitely many solutions

4. Steve buys 2 lb of grapefruit and 3 lb of oranges for $7.20. Kennedy buys 4 lb of grapefruit and 2 lb of oranges for $8.80. Write a systems of equations to model the situation. What is the price per pound for oranges?

$2g+3r=7.20$
$4g+2r=8.80$

$1.50 grapefruit
$1.40 oranges

*5. Which of the following gives a valid reason for using the given solution method to solve the system of equations shown?

Equation A: $4x-5y=4$
Equation B: $2x+3y=22$

A. Elimination; a coefficient in Equation A is an integer multiple of a coefficient in Equation B.

B. Elimination; a coefficient in Equation B is an integer multiple of a coefficient in Equation A.

C. Substitution; equation A can be solved for x in one step by dividing both sides by 4.

D. Substitution; equation B can be solved for x in one step by subtracting $3y$ from both sides.

*6. Which of the systems of equations below is equivalent to the system shown?

$$\begin{cases} 4x+5y=3 \\ 2x+3y=1 \end{cases}$$

A. $\begin{cases} 4x+5y=3 \\ -4x-6y=2 \end{cases}$

B. $\begin{cases} 12x+15y=9 \\ -12x+18y=6 \end{cases}$

C. $\begin{cases} 4x+5y=3 \\ -4x-3y=1 \end{cases}$

D. $\begin{cases} 12x+15y=9 \\ -12x-18y=-6 \end{cases}$

7. Is (-1, 3) a solution to the system shown?

$$\begin{cases} y \geq -\frac{1}{2}x+2 \\ 2x+5>y \end{cases}$$

No

8. Circle each ordered pair that is a solution to the system.

$$\begin{cases} y>\frac{1}{2}x+1 \\ y+3x \leq 6 \end{cases}$$

(-1, -3)

(1, 2)

(2, 0)

(4, 6)

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9. Solve the equation $x^2 - 2x - 3 = 0$.

$X = 3$

$X = -1$

10. What are the solutions to the equation $-12x - 9 = 4x^2$?

$\{-1.5\}$

11. Find the solutions of $2 - x^2 = -x$.

$\{-1, 2\}$

12. How many solutions does the equation $x^2 - 9 = -5x$ have?

2 solutions

More Independent Practice (Multiple Choice)

Look at the system of equations.

$$\begin{cases} y = -x + 2 \\ 7x + 4y = -1 \end{cases}$$

What is the value of x for the solution to this system of equations?

A. -5 B. -3

C. 3 D. 5

For which system of inequalities is (-3, 1) a solution?

A. $\begin{cases} x + y < -2 \\ 2x - 3y < -9 \end{cases}$ B. $\begin{cases} x + y < -2 \\ 2x - 3y \le -9 \end{cases}$

C. $\begin{cases} x + y \le -2 \\ 2x - 3y < -9 \end{cases}$ D. $\begin{cases} x + y \le -2 \\ 2x - 3y \le -9 \end{cases}$

A total of 243 adults and children are at a movie theater. There are 109 more adults than children in the theater. If a represents the number of adults and b represents the number of children, which system of equations could be used to find the number of adults and the number of children in the theater?

A. $\begin{cases} a + b = 243 \\ a = 109b \end{cases}$ B. $\begin{cases} a + b = 243 \\ b = 109a \end{cases}$

C. $\begin{cases} a + b = 243 \\ a = b + 109 \end{cases}$ D. $\begin{cases} a + b = 243 \\ b = a + 109 \end{cases}$

What values of x are solutions of $3x^2 + 11x = 20$?

A. $-\frac{4}{3}$ and 5 B. $-\frac{5}{3}$ and 4

C. -4 and $\frac{5}{3}$ D. -5 and $\frac{4}{3}$

Which equation(s) have only one real solution? Select all that apply.

A. $x^2 + 6x + 7 = 6x + 7$ B. $7x^2 = 5$

C. $3x^2 + x - 5 = x + 5$ D. $3x^2 + 2x = 2x$

The equation $ax^2 + bx + c = 0$ has no real solutions. Which statement about the graph of $f(x) = ax^2 + bx + c$ could be true?

A. It could pass through the origin. B. Its vertex could be at (-6, 0).

C. It could have a maximum at (-3, 2). D. It could have a minimum at (0, 4).

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