

مادة الرياضيات للصف التاسع

الفصل الدراسي الأول

الوحدة 6



Mathematics

Grade 9

Unit 6



Name: -----

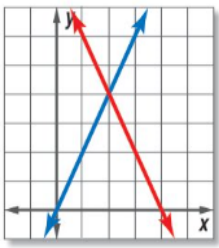
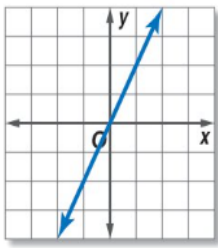
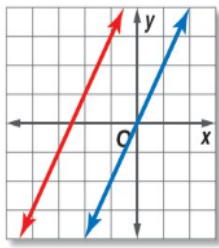
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6-1 Graphing Systems of Equations

Page 309-315

- 1 Determine the number of solutions a system of linear equations has.
- 2 Solve systems of linear equations by graphing.

Concept Summary Possible Solutions			
Number of Solutions	exactly one	infinite	no solution
Terminology	consistent and independent	consistent and dependent	inconsistent
Graph			

StudyTip

Number of Solutions

When both equations are of the form $y = mx + b$, the values of m and b can determine the number of solutions.

Compare m and b	Number of Solutions
different m values	one
same m value, but different b values	none
same m value, and same b value	infinite

Example 1 Number of Solutions

Use the graph at the right to determine whether each system is *consistent* or *inconsistent* and if it is *independent* or *dependent*.

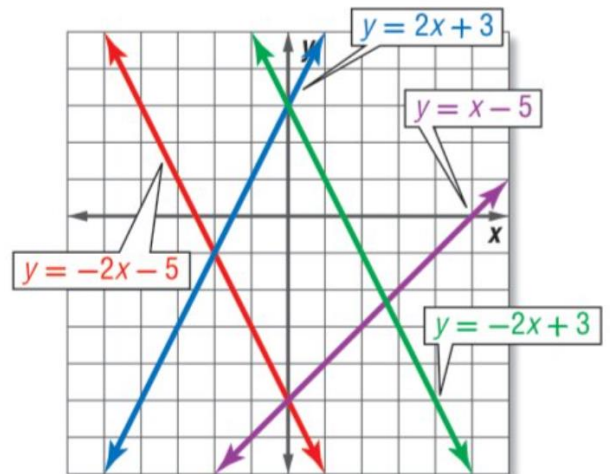
a. $y = -2x + 3$
 $y = x - 5$

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b. $y = -2x - 5$
 $y = -2x + 3$

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1A. $y = 2x + 3$
 $y = -2x - 5$

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1B. $y = x - 5$
 $y = -2x - 5$

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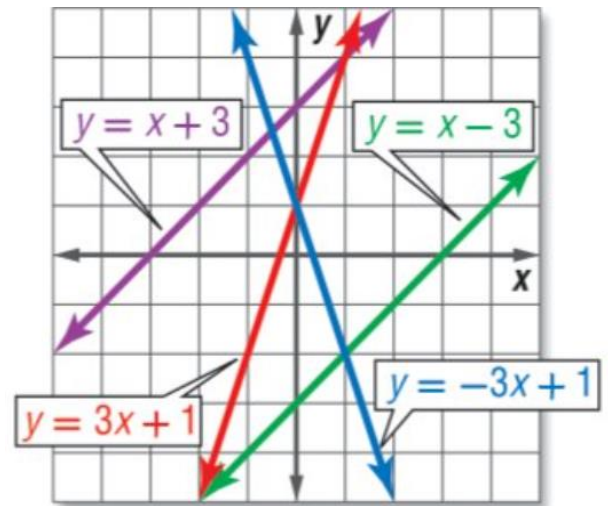
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Use the graph at the right to determine whether each system is *consistent* or *inconsistent* and if it is *independent* or *dependent*.



1. $y = -3x + 1$
 $y = 3x + 1$

2. $y = 3x + 1$
 $y = x - 3$

3. $y = x - 3$
 $y = x + 3$

4. $y = x + 3$
 $x - y = -3$

5. $x - y = -3$
 $y = -3x + 1$

6. $y = -3x + 1$
 $y = x - 3$

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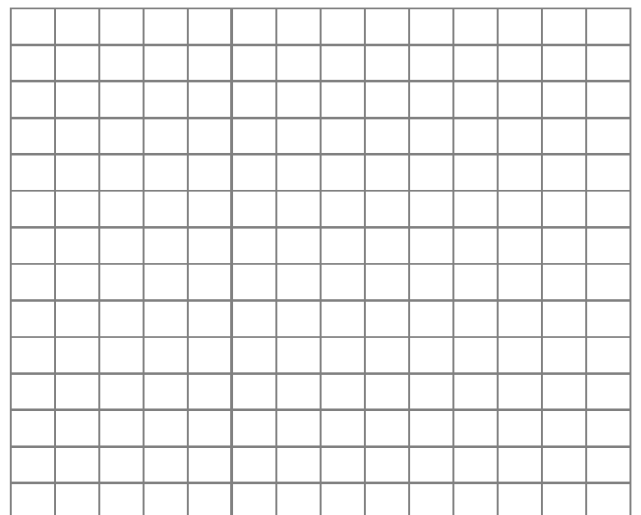
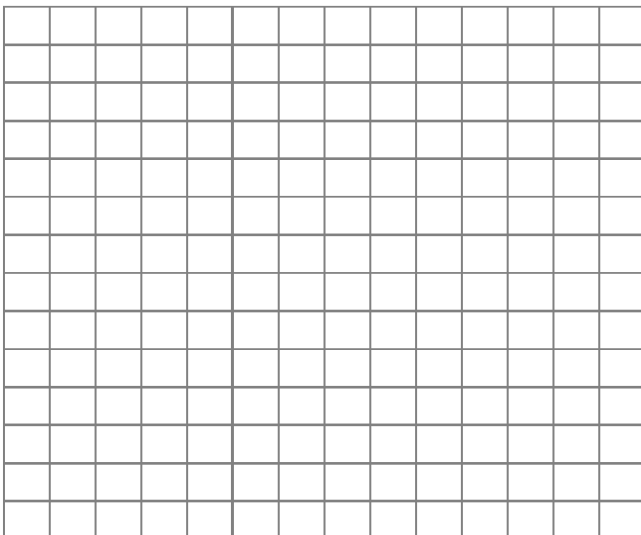
2 Solve by Graphing One method of solving a system of equations is to graph the equations carefully on the same coordinate grid and find their point of intersection. This point is the solution of the system.

Guided Practice

Graph each system and determine the number of solutions that it has. If it has one solution, name it.

2A. $x - y = 2$
 $3y + 2x = 9$

2B. $y = -2x - 3$
 $6x + 3y = -9$



StudyTip

Slope-Intercept Form

If both equations are in the form $y = mx + b$, they can simply be set equal to each other and then solved for x . The solution for x can then be used to find the value of y .

If a variable is not isolated in one of the equations in a system, solve an equation for a variable first. Then you can use substitution to solve the system.

Example 2 Solve and then Substitute

Use substitution to solve the system of equations.

$$\begin{aligned}x + 2y &= 6 \\3x - 4y &= 28\end{aligned}$$

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GuidedPractice

2A. $4x + 5y = 11$
 $y - 3x = -13$

2B. $x - 3y = -9$
 $5x - 2y = 7$

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Example 3 No Solution or Infinitely Many Solutions

Use substitution to solve the system of equations.

$$\begin{aligned}y &= 2x - 4 \\-6x + 3y &= -12\end{aligned}$$

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StudyTip

Dependent Systems

There are infinitely many solutions of the system in Example 3 because the equations in slope-intercept form are equivalent, and they have the same graph.

GuidedPractice Use substitution to solve each system of equations.

3A. $2x - y = 8$
 $y = 2x - 3$

3B. $4x - 3y = 1$
 $6y - 8x = -2$

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2 Solve Real-World Problems You can use substitution to find the solution of a real-world problem involving constraints modeled by a system of equations.

Real-World Example 4 Write and Solve a System of Equations

MUSIC A store sold a total of 125 car stereo systems and speakers in one week. The stereo systems sold for AED 104.95, and the speakers sold for AED 18.95. The sales from these two items totaled AED 6926.75. How many of each item were sold?

Number of Units Sold	c	t	125
Sales (AED)	$104.95c$	$18.95t$	6926.75

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GuidedPractice

4. BASEBALL As of 2009, the New York Yankees and the Cincinnati Reds together had won a total of 32 World Series. The Yankees had won 5.4 times as many as the Reds. How many World Series had each team won?

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- 1 Solve systems of equations by using elimination with addition.
- 2 Solve systems of equations by using elimination with subtraction.

1 Elimination Using Addition If you add these equations, the variable b will be eliminated. Using addition or subtraction to solve a system is called **elimination**.

Key Concept Solving by Elimination

- Step 1** Write the system so like terms with the same or opposite coefficients are aligned.
- Step 2** Add or subtract the equations, eliminating one variable. Then solve the equation.
- Step 3** Substitute the value from Step 2 into one of the equations and solve for the other variable. Write the solution as an ordered pair.

Example 1 Elimination Using Addition

Use elimination to solve the system of equations.

$$4x + 6y = 32$$

$$3x - 6y = 3$$

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Guided Practice

1A. $-4x + 3y = -3$
 $4x - 5y = 5$

1B. $4y + 3x = 22$
 $3x - 4y = 14$

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Example 2 Write and Solve a System of Equations

Negative three times one number plus five times another number is -11 .
Three times the first number plus seven times the other number is -1 .
Find the numbers.

StudyTip

Coefficients When the coefficients of a variable are the same, subtracting the equations will eliminate the variable. When the coefficients are opposites, adding the equations will eliminate the variable.

Problem-SolvingTip

Perseverance Checking your answers in both equations of a system helps ensure there are no calculation errors.

CHECK

GuidedPractice

2. The sum of two numbers is -10 . Negative three times the first number minus the second number equals 2. Find the numbers.

2 Elimination Using Subtraction Sometimes we can eliminate a variable by subtracting one equation from another.

Standardized Test Example 3

Solve the system of equations.

$$2t + 5r = 6$$

$$9r + 2t = 22$$

A $(-7, 15)$

B $(7, \frac{8}{9})$

C $(4, -7)$

D $(4, -\frac{2}{5})$

Use elimination to solve each system of equations.

1. $2x - y = 4$
 $7x + 3y = 27$

2. $2x + 7y = 1$
 $x + 5y = 2$

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Multiply Both Equations to Eliminate a Variable

Use elimination to solve each system of equations.

2A. $5x - 3y = 6$
 $2x + 5y = -10$

2B. $6a + 2b = 2$
 $4a + 3b = 8$

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1C. $x - y = 9$
 $7x + y = 7$

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1D. $5x - y = 17$
 $3x + 2y = 5$

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2 Apply Systems of Linear Equations When applying systems of linear equations to problems, it is important to analyze each solution in the context of the situation.

Guided Practice

2. **VOLUNTEERING** Salem has volunteered 50 hours and plans to volunteer 3 hours in each coming week. Saeed is a new volunteer who plans to volunteer 5 hours each week. Write and solve a system of equations to find how long it will be before they will have volunteered the same number of hours.

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6-6 Systems of Inequalities

Page 346-350

- 1 Solve systems of linear inequalities by graphing.
- 2 Apply systems of linear inequalities.

1 Systems of Inequalities The graph above is a graph of two inequalities. A set of two or more inequalities with the same variables is called a **system of inequalities**.

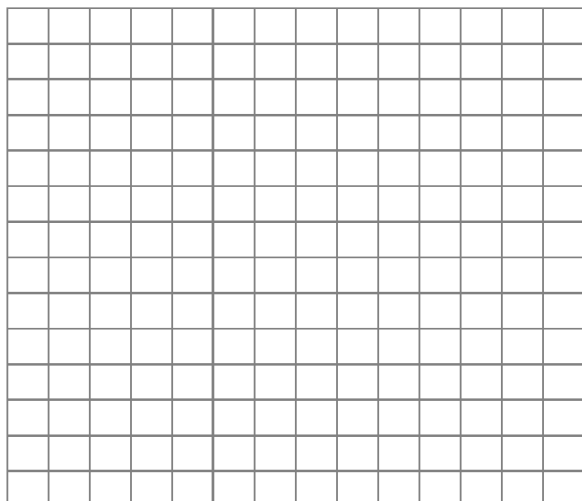
The solution of a system of inequalities with two variables is the set of ordered pairs that satisfy all of the inequalities in the system. The solution set is represented by the overlap, or intersection, of the graphs of the inequalities.

Example 1 Solve by Graphing

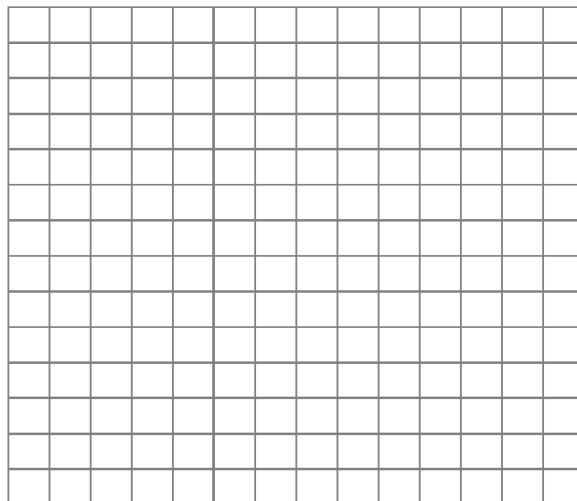
Solve the system of inequalities by graphing.

Guided Practice

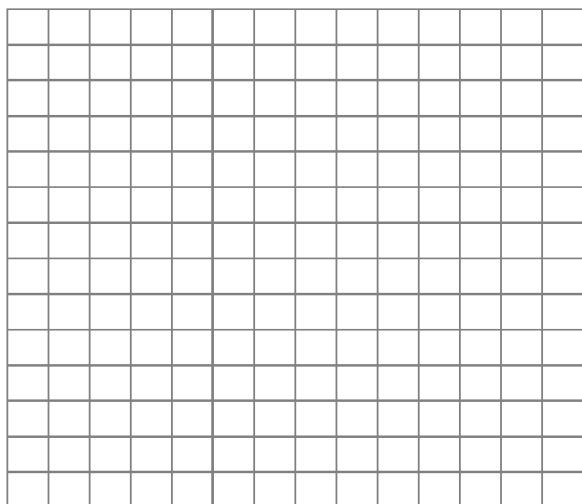
1A. $y \leq 3$
 $x + y \geq 1$



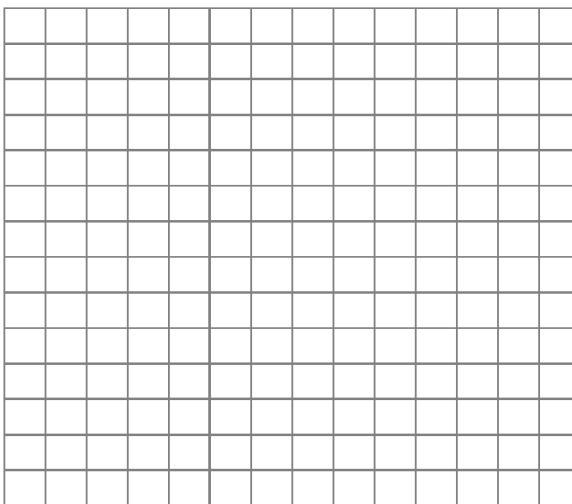
1B. $2x + y \geq 2$
 $2x + y < 4$



1C. $y \geq -4$
 $3x + y \leq 2$



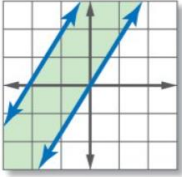
1D. $x + y > 2$
 $-4x + 2y < 8$



StudyTip

Parallel Boundaries

A system of equations represented by parallel lines does not have a solution. However, a system of inequalities with parallel boundaries can have a solution. For example:



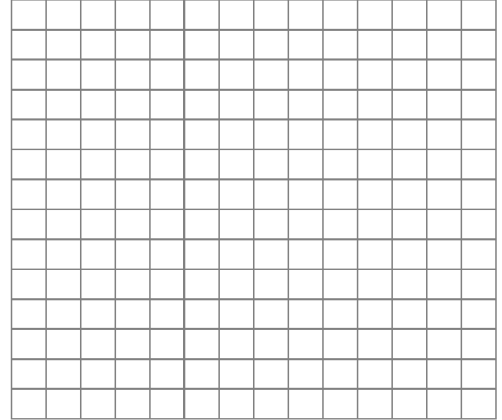
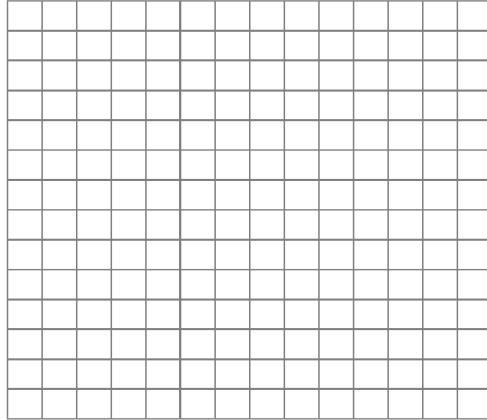
Example 2 No Solution

Solve the system of inequalities by graphing.

GuidedPractice

2A. $y > 3$
 $y < 1$

2B. $x + 6y \leq 2$
 $y \geq -\frac{1}{6}x + 7$



2 Apply Systems of Inequalities When using a system of inequalities to describe constraints on the possible combinations in a real-world problem, sometimes only whole-number solutions will make sense.

Real-World Example 3 Whole-Number Solutions

GuidedPractice

- 3. FUNDRAISING** The Theater Club is selling shirts. They have only enough supplies to print 120 shirts. They will sell sweatshirts for AED 22 and T-shirts for AED 15, with a goal of at least AED 2000 in sales.
- A.** Define the variables, and write a system of inequalities to represent this situation.
 - B.** Then graph the system.
 - C.** Name one possible solution.
 - D.** Is (45, 30) a solution? Explain.

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