MATH 90 – CHAPTER 4 Name: .

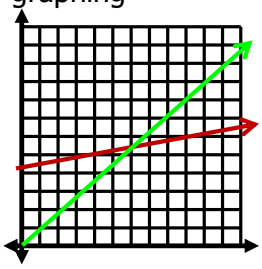
4.1 Solving Linear Systems

Need To Know

- Idea of a system
- Types of systems
- Review of Graphing Lines
- How to solve systems by graphing

Business:

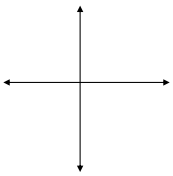
Cost = equation #1
Income = equation #2



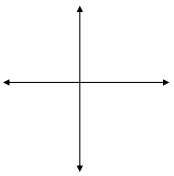
Solutions & Types of Systems

A solution to a system of linear equations is the set of points that make BOTH equations true at the same time.

Inconsistent



Consistent



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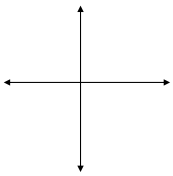


Review Graphing Lines

Types of Linear Equations

Slope-Intercept From

_____

Vertical Line _____

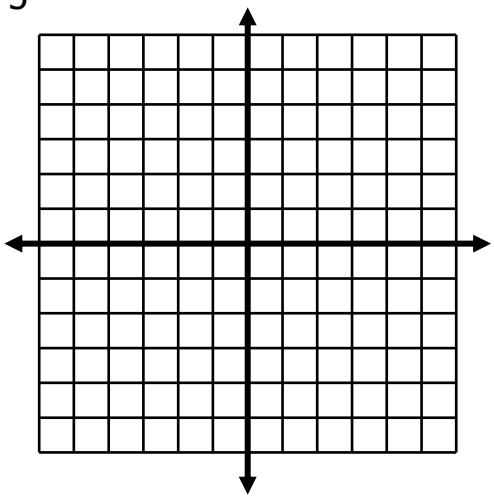
Horizontal Line _____

Ways to Graph Lines

1. **Use y = mx + b**
   a. Graph the y-intercept point.
   b. Use the slope = rise/run
2. **Make a table of 3 points**
   a. Pick an easy x value
   b. Plug it in
   c. Solve for the y value

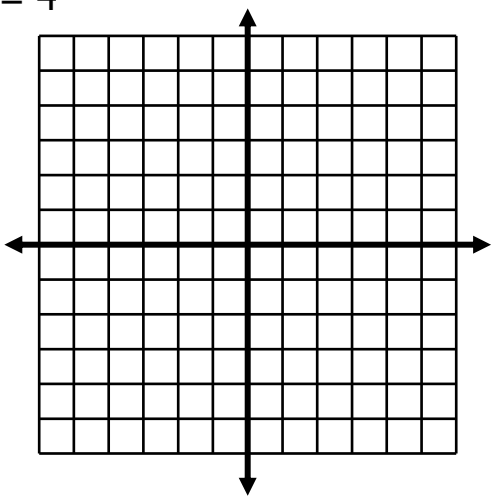
Solve the System by Graphing

$x + y = 3$ and $x - y = 5$



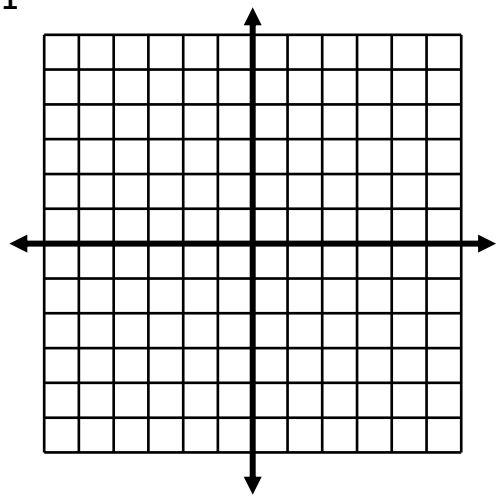
Solve the System by Graphing

$x + 2y = 6$ and $3x - y = 4$



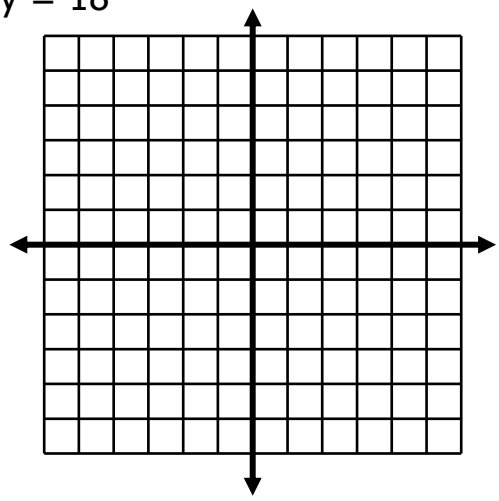
Solve the System by Graphing

$x = 2$ and $y = 3x - 1$



Solve the System by Graphing

$x + 2y = 8$ and $3x + 6y = 18$



4.1 Conclusion

Solve a System by Graphing

- Graph both lines
- Find the point(s) of intersection
- Explain your solution
- Use graph paper or a ruler to graph carefully. Messy graphs will not reveal the correct solution.

4.2 The Substitution Method

Need To Know

- The idea of the substitution method
- The steps for the substitution method
- Apply

Idea of the Substitution Method

$x + y = 3$

$y = x + 5$

Goal

1. Turn two equations with two variables into one equation with one variable.
2. Solve to get one answer.

Steps for Substitution

1. _____(i.e. get *x* or *y* by itself).
2. _____the expression for the variable _____ _____and solve it.
3. _____this answer _____
4. Check your ordered pair in both equations.

Solve by Substitution Method

$-5x + y = -1$

$-2x + 3y = 10$

Steps for Substitution
1. Get *x* or *y* by itself
2. Plug into the other equation and solve it.
3. Solve for other variable.
4. Check

Solve by Substitution Method

$x - 4y = -5$

$3x - 2y = 5$

Steps for Substitution
1. Get *x* or *y* by itself
2. Plug into the other equation and solve it.
3. Solve for other variable.
4. Check

Solve by Substitution Method

$4x + 2y = 3$

$x = 4y - 3$

Steps for Substitution
1. Get *x* or *y* by itself
2. Plug into the other equation and solve it.
3. Solve for other variable.
4. Check

Solve Two Variable Word Problems

The perimeter of a Lacrosse field is 340 yards. The length is 10 yd. less than twice the width. Find the length and the width.

4.3 The Elimination Method

Need To Know

- Review of the substitution method
- The idea of the elimination method
- The steps for the elimination method
- Apply

Review Substitution - disadvantages

$3x + 5y = 4$

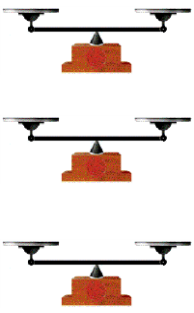
$-7x + 3y = 10$

Solve the System by Elimination

$x + y = 6$

$2x - y = 3$

Why it works



Solve the System by Elimination

$3x - y = 7$

$x + 2y = 7$

Steps for Elimination

1. Put equations in standard form and pick one variable to eliminate.
2. _____in one variable.
3. _____ and solve.
4. Plug in the first answer to find solution for the other variable.
5. Check your ordered pair in both equations.

Solve the System by Elimination

$3x + 2y - 3 = 0$

$2x = -5y + 13$

Steps for Elimination

1. Put in standard form
2. Set up opposites
3. Add equation & solve
4. Solve for other variable
5. Check

Solve the System by Elimination

$$\frac{1}{3}x+\frac{1}{2}y=1$$

$$x+\frac{3}{4}y=0$$

Steps for Elimination
1. Put in standard form
2. Set up opposites
3. Add equation & solve
4. Solve for other variable
5. Check

Solve the System by Elimination

$$a - 3b = 2$$

$$-3a + 9b = 2$$

Steps for Elimination
1. Put in standard form
2. Set up opposites
3. Add equation & solve
4. Solve for other variable
5. Check

4.4 Applications of Systems

Need To Know

- Overview of systems
- Recall guide lines to solve word problems
- Recall tools to solve problems
- Apply

Guide Lines to Solve Systems

Method	Strengths	Weaknesses
Graphing	•Solutions are visual	•Imprecise if answers are fraction •Hard to graph big numbers
Substitution	•Solutions are always exact •Easy to use if x or y is by itself.	•Hard if equations yield fraction •You can't visualize answer
Elimination	•Solutions are always exact •Easy to use if decimals or fractions appear in system	•You can't visualize answer

Guide Lines to Solve Problems

Blueprint for Solving

1. Read and understand the problem (# of unknowns)
2. Assign variables and write down the meaning of the variable
3. Write an equation
4. Solve the equation
5. Write down your answer using a complete sentence
6. Reread and check your solution

Tools to Reveal the Equation

1. Use keywords
2. Draw a picture
3. Make up a simpler problem
4. Make tables of numbers and look for patterns
5. Use charts to organize your information
6. Make a guess
7. Use a verbal model

Apply

In winning the 2000 conference finals, the Lakers scored 69 of their points on a combination of 31 two- and three-pointers How many of each type did they make.

Steps
1. Familiarize
2. Translate
3. Carry out
4. Check
5. State answer

Tools
1. Keywords
2. Drawing
3. Simpler problem
4. Tables/Patterns
5. Charts
6. Guess
7. Verbal Model

Apply

Zoo prices are $6 for adults and $3 for children. On a cold day they collected $1554 from 394 admissions. How many were adults and how many children?

Steps
1. Familiarize
2. Translate
3. Carry out
4. Check
5. State answer

Tools
1. Keywords
2. Drawing
3. Simpler problem
4. Tables/Patterns
5. Charts
6. Guess
7. Verbal Model

Apply

Steps
1. Familiarize
2. Translate
3. Carry out
4. Check
5. State answer

Café Europa mixes Brazilian coffee worth $19 per kg and Turkish coffee worth $22 per kg.
The new batch needs to be 300-kg costing $20 per kg.
How much of each type must be mixed?

	Brazilian	Turkish	Europa's
Num of kg of Beans			
Price			
Cost of Beans			

Tools
1. Keywords
2. Drawing
3. Simpler problem
4. Tables/Patterns
5. Charts
6. Guess
7. Verbal Model

Apply

Steps
1. Familiarize
2. Translate
3. Carry out
4. Check
5. State answer

An experiment requires 200 ml of a 68% acid solution. The only solutions available are 50% acid and 80% acid. How much of each do we mix?

	50%	80%	68%
Amount of Solution			
% Strength			
Amount of Acid			

Tools
1. Keywords
2. Drawing
3. Simpler problem
4. Tables/Patterns
5. Charts
6. Guess
7. Verbal Model

4.5 Solving Equations by Graphing

Need To Know

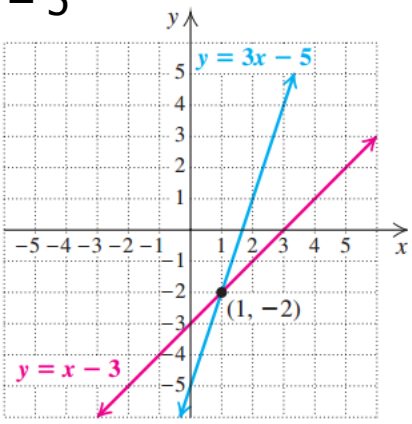
- Contrast Between Graphing: a System and a Linear Equation.
- Solving Linear Equations from Graphs.
- Making Graphs to Solve Linear Equations.

Solve by Graphing: System vs Linear Eq

Solve the system by graphing.

$y = x - 3$

$y = 3x - 5$



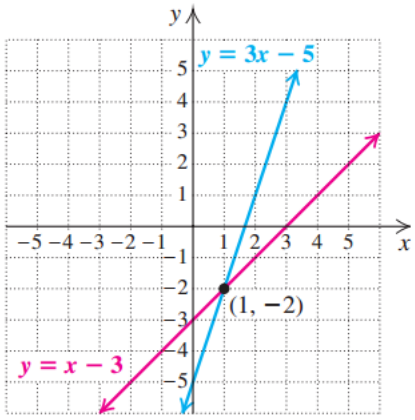
The solutions _____

Solve the equation by graphing.

$x - 3 = 3x - 5$

y_1

y_2



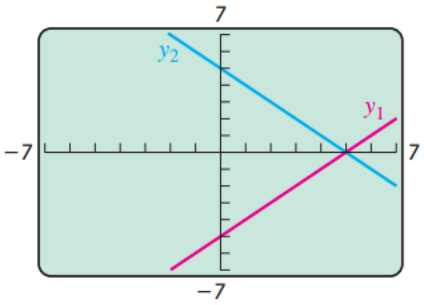
The solutions _____

Compare and Contrast – What is different about the 2nd problem?

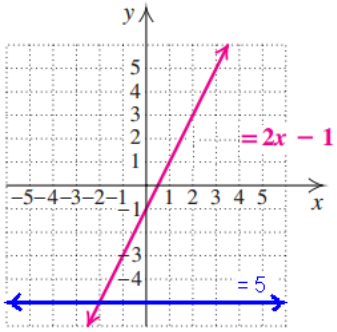
Solve by Graphing

Estimate the solution of each from the graph.

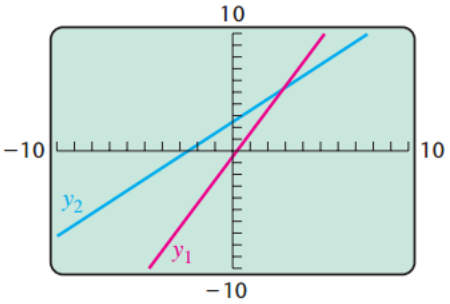
1) Find x for $y_1 = y_2$



2) $2x - 1 = 5$



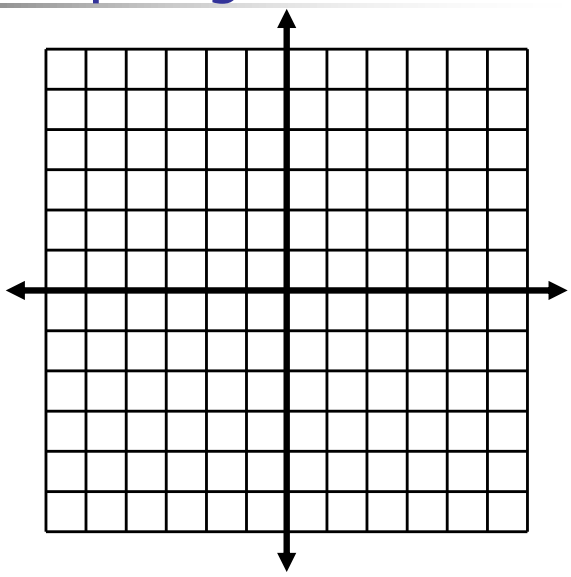
3) $2x - \frac{1}{2} = x + \frac{5}{2}$



Solve By Graphing

Solve Graphically

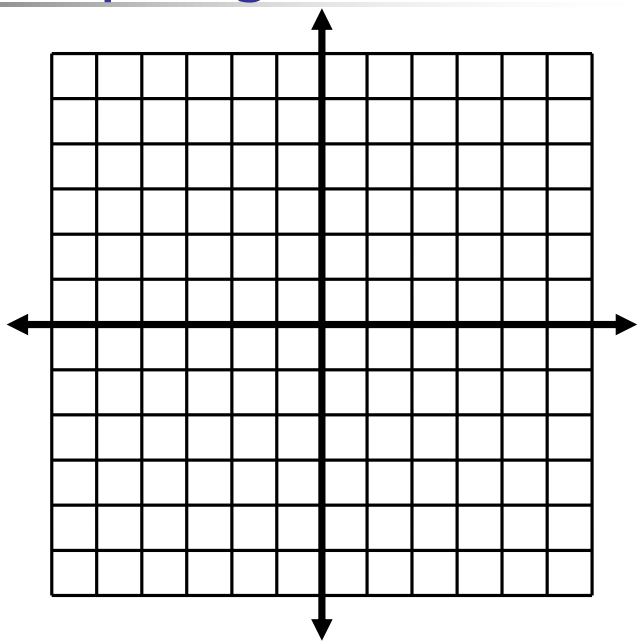
x + 4 = 6



Solve By Graphing

Solve Graphically

$x - 5 = 3x - 1$



Solve By Graphing

Solve Graphically

$3 - x = \frac{1}{2}x - 3$