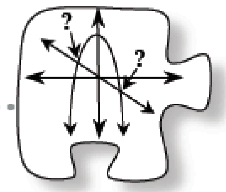

SOLVING AND INTERSECTIONS
5

Chapter 5 Teacher Guide

Section	Lesson	Days	Lesson Title	Materials	Homework
5.1	5.1.1	1	Strategies for Solving Equations	• Lesson 5.1.1 Res. Pg. • Transparency and overhead pens OR poster paper and markers. • Team Roles transparency (Lesson 1.1.2A or E Res. Pg.) (optional)	5-6 to 5-12
	5.1.2	2	Solving Equations and Systems Graphically	None	5-18 to 5-24 and 5-25 to 5-32
	5.1.3	1	Finding Multiple Solutions to Systems of Equations	None	5-37 to 5-43
	5.1.4	1	Using Systems of Equations to Solve Problems	None	5-48 to 5-53
5.2	5.2.1	2	Solving Inequalities with One or Two Variables	• Lesson 5.2.1A Res. Pg • Lesson 5.2.1B Res. Pg • Lesson 5.2.1C Res. Pg • Colored pencils or markers	5-62 to 5-67 and 5-68 to 5-74
	5.2.2	1	Using Systems to Solve a Problem	• Manipulatives, dry spaghetti noodles (optional)	5-79 to 5-86
	5.2.3	1	Application of Systems of Linear Inequalities	• Poster paper (optional)	5-89 to 5-95
	5.2.4	1	Using Graphs to Find Solutions	• Lesson 5.2.4 Res. Pg. • Sticky notes • Poster of graph (optional)	5-97 to 5-102
Chapter Closure		Varied Format Options			

Total: **10 days plus optional time for Chapter Closure**

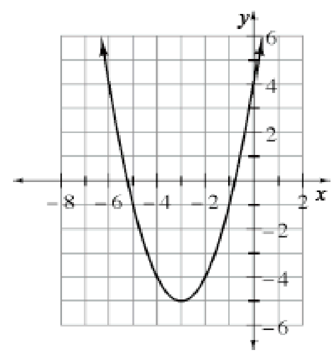
5.1.1 How can I solve?



Strategies for Solving Equations

Today you will have the opportunity to solve challenging equations. As you work with your team, you will be challenged to solve equations using multiple approaches and to write clear explanations to show your understanding. The goal today is for you to examine all of the ways you already know to solve equations and to learn how to use these methods to solve other types of equations.

5-1. SOLVING GRAPHICALLY



One of the big questions of Chapter 4 was how to find special points of a function. For example, you now have the skills to look at an equation of a parabola in graphing form and name its vertex quickly. But what about the locations of other points on the parabola? Consider the graph of $y = (x + 3)^2 - 5$ at right.

a. Use the graph to solve the equation $(x + 3)^2 - 5 = 4$. How did the graph help you solve the equation?

b. How can you use the equation $y = (x + 3)^2 - 5$ to verify that your solutions from part (a) are correct? Discuss this with your team.

5-2. ALGEBRAIC STRATEGIES

The graph in problem 5-1 was useful to solve an equation like $(x+3)^2 - 5 = 4$. But what if you do not have an accurate graph? And what can you do when the solution is not on a grid point or is off your graph?

Your task: Solve the equation below algebraically (that is, using the equation without a graph) at least three different ways. The "Discussion Points" below are provided to help you get started. Be ready to share your **strategies** with the class.

$$(x+3)^2 - 5 = 4$$

Discussion Points

What algebraic **strategies** might be useful?

What makes this equation look challenging? How can we make the equation simpler?

How can we be sure that our **strategy** helps us find *all* possible solutions?

5-3. Three **strategies** you may have used in problem 5-2 are **rewriting** (using algebra to write a new equivalent equation that is easier to solve), **looking inside** (reasoning out the value of the expression inside the function or parentheses), and **undoing** (**reversing** or doing the opposite of an operation; for example, taking the square root to eliminate the squaring). These **strategies** and others will be useful throughout the rest of this course. Examine how these **strategies** can be used to solve the equation below.

$$\frac{x-5}{4}+\frac{1}{3}=\frac{5}{6}$$

a. Ernie decided to multiply both sides of the equation by 24 so that his equation becomes $6(x-5)+8=20$. Which **strategy** did Ernie use? How can you tell?

b. Elle took Ernie's equation and decided to subtract 8 from both sides to get $6(x-5)=12$. Which **strategy** did Elle use?

c. Eric looked at Elle's equation and said, "I can tell that $(x-5)$ must equal 2 because $6\cdot 2=12$. Therefore, if $x-5=2$, then x must be 7." What **strategy** did Eric use?

d. Verify that Eric's solution in part (c) is correct. Then use the **strategies** from parts (a) through (c) in a different way to solve $\frac{x-5}{4}+\frac{1}{3}=\frac{5}{6}$. Did you get the same result?

5-4. Solve each equation below, if possible, using any **strategy**. Check with your teammates to see what strategies they chose. Be sure to check your solutions.

a. $4|8x-2|=8$

b. $3\sqrt{4x-8}+9=15$

c. $(x-3)^2-2=-5$

d. $(2y-3)(y-2)=-12y+18$

e. $\frac{5}{x}+\frac{1}{3x}=\frac{4x}{3}$

f. $|3-7x|=-6$

g. $\frac{6w-1}{5}-3w=\frac{12w-16}{15}$

h. $(x+2)^2+4(x+2)-5=0$

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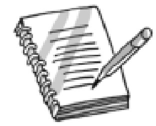
5-5. Create a Learning Log entry about all of the solving **strategies** you saw today. For each **strategy**, show an **ex**ample and **ex**plain which types of equations work best with that **strategy**. Title this entry "**Strategies** for Solving Equations" and label it with today's date.



Review & Preview

5-6. Solve $(x-2)^2-3=1$ graphically. That is, graph $y=(x-2)^2-3$ and $y=1$ on the same set of axes and find the x-value(s) of any points of intersection. Then use algebraic **strategies** to solve the equation and verify that your graphical solutions are correct.

5-7. Solve each equation below. Think about rewriting, looking inside, or undoing to simplify the process.

a. $2(x-1)^2+7=39$

b. $7(\sqrt{m+1}-3)=21$

c. $\frac{x}{2}+\frac{x}{3}=\frac{5x+2}{6}$

d. $-7+(\frac{4x+2}{2})=8$

5-8. Describe the graphs of the equations given in parts (a) and (b) below. What are their domains and ranges?

a. $y=3$

b. $x=-2$

c. Where do the two graphs cross?

5-9. Find the equation of the line that passes through (0, 2) and (5, 2). Then complete parts (a) and (b) below.

a. What would be the equation of the x-axis?

b. What would be the equation of the y-axis?

5-10. Solve the system of equations shown at right.

$$2x+6y=10$$
$$x=8-3y$$

a. Describe what happened when you tried to solve the system.

b. Draw the graph of the system.

c. How does the graph of the system explain what happened with the equations? Make your answer as clear and thorough as possible.

5-11. Rewrite each radical below as an equivalent expression using fractional exponents.

a. $\sqrt[2]{5}$

b. $\sqrt[3]{9}$

c. $\sqrt[8]{17^x}$

d. $7\sqrt[4]{x^3}$

5-12. The graph of a line and an exponential can intersect twice, once, or not at all. Describe the possible number of intersections for each of the following pairs of graphs. Your solution to each part should include all of the possibilities and a quickly sketched example of each one.

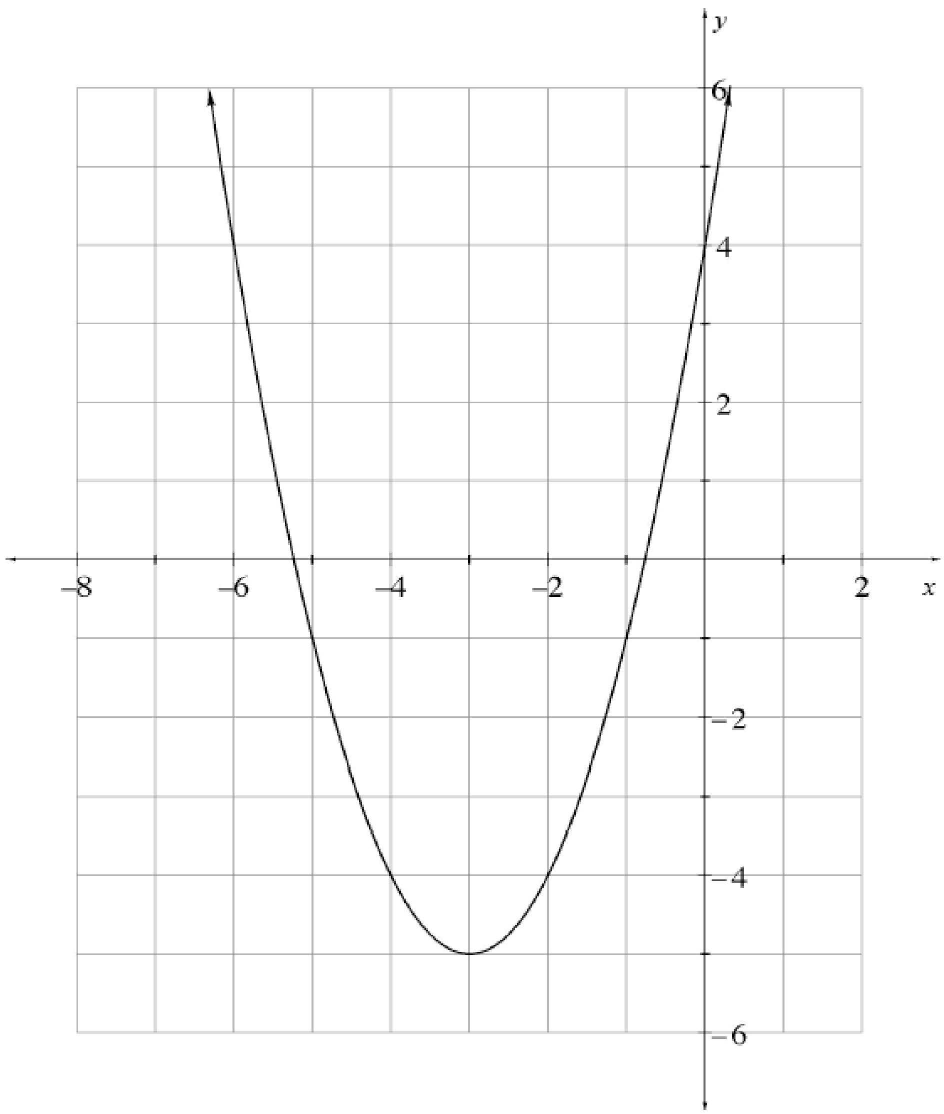
a. A line and a parabola

b. Two different parabolas

c. A parabola and a circle

d. A parabola and the hyperbola $y=\frac{1}{x}$

Lesson 5.1.1 Resource Page



5.1.2 How can I use a graph to solve?

Solving Equations and Systems Graphically

In the previous lesson, you used and named three algebraic methods to solve different kinds of equations. In today's lesson, you will solve different equations again, but this time you will use your understanding of graphs, as well as your algebra skills, to solve the equations and to verify your algebraic results.

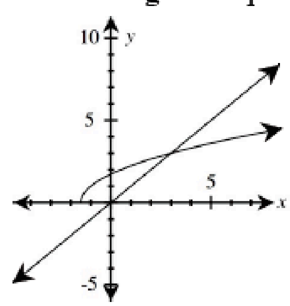
5-13. In problem 5-1, you used a graph to solve an equation. In what other ways can a graph be a useful solution tool? Consider this question as you solve the equation $\sqrt{2x+3}=x$.

a. Use algebraic **strategies** to solve $\sqrt{2x+3}=x$. How many solutions did you find? Which **strategies** did you use?

b. Miranda graphed the functions $y=\sqrt{2x+3}$ and $y=x$ to test the solutions from part (a). *"I think something is wrong,"* she said. Graph the system on your graphing calculator and find the intersection(s) of the functions. What happened? How many solutions must there be to this equation?

c. When a result from a solution process does not make the original equation true, it is called an **extraneous solution**. It is not a solution of the equation, even though it is a result from solving algebraically. For example, since $\sqrt{2(-1)+3}\neq -1$, then $x=-1$ is not a solution of the equation $\sqrt{2x+3}=x$. The fact that extraneous solutions can arise after following straightforward solving techniques makes it especially important to check your solutions!

But why did the extraneous solution appear in this problem? Examine the graph of the system of equations $y=\sqrt{2x+3}$ and $y=x$, shown at right. Where would an extraneous solution $x=-1$ appear on the graph? And why do the graphs not intersect there? Explain.



5-14. **After solving the equation $2x^2 + 5x - 3 = x^2 + 4x + 3$, Gustav got called to the office and left his team. When his teammates examined his graphing calculator to try to find out how he found his solution, they only saw the graph of $y = x^2 + x - 6$. Consider this situation as you answer the questions below.**

a. **Solve $2x^2 + 5x - 3 = x^2 + 4x + 3$ algebraically.**

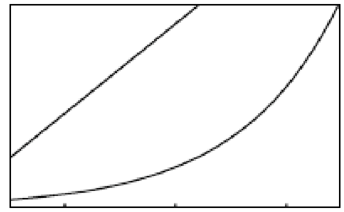
b. **Where did Gustav get the equation $y = x^2 + x - 6$?**

5-14. *Problem continued from previous page.*

c. How can you see the solutions to $2x^2 + 5x - 3 = x^2 + 4x + 3$ in the grah of $y = x^2 + x - 6$? Explain why this makes sense.

d. Grieta solved $2x^2 + 5x - 3 = x^2 + 4x + 3$ by graphing a system of equations and looking for the points of intersection. What equations do you think she used? Graph these equations on your graphing calculator and explain where the solutions to the equation exist on the graph.

5-15. Karen could not figure out how to solve $20x + 1 = 3^x$ algebraically, so she decided to use her graphing calculator. However, after she finished entering the equations $y = 20x + 1$ and $y = 3^x$, she got the graph shown at right. After studying the graph, Karen suspects there are no solutions to $20x + 1 = 3^x$.



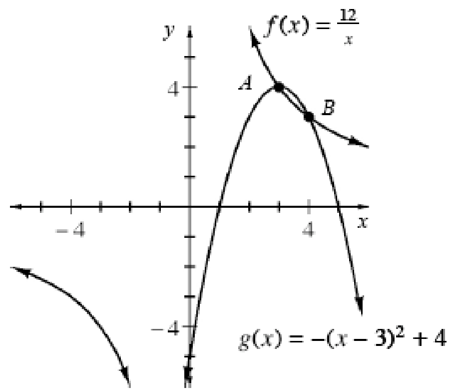
a. What do you think? If there are solutions, find them and prove that they are solutions. If there are no solutions, demonstrate that there cannot be a solution.

b. What should solutions to the equation, $20x + 1 = 3^x$, look like? In other words, will solutions be a single number, or should they be the coordinates of a point? Explain.

c. Elana started to solve first by subtracting 1 from both sides of her equation. So when she graphed her system later, she used the equations $y = 20x$ and $y = 3^x - 1$. Should she get the same solutions? Test your conclusion with your graphing calculator.

d. Discuss with your team why Karen could not solve the system algebraically. What do you think?

5-16. Jack was working on solving an equation and he graphed the functions $f(x) = \frac{12}{x}$ and $g(x) = -(x-3)^2 + 4$, as shown at right.



a. What equation was Jack solving?

b. Use points A and B to solve the equation you wrote in part (a).

c. Are there any other solutions to this same equation that are represented by neither point A nor point B? If so, show that these other solutions make your equation true.

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5-17. What does the solution to an equation mean? Do you have any new ideas about solutions that you did not have before? Create a Learning Log entry that explains the meaning of a solution in as many ways as possible. Title this entry "The Meaning of Solution, Part 1" (Parts 2 and 3 will be coming later) and label it with today's date.

Review & Preview

5-18. Solve $(x-3)^2 - 2 = x + 1$ graphically. Is there more than one way to do this? Explain.

5-19. Graph a system of equations to solve $2|x-4| - 3 = \frac{2}{3}x - 3$. Show your solutions clearly on your graph.

5-20. Solve each of the following equations using any method. Be sure to check your solutions.

a. $-3\sqrt{2x-5} + 7 = -8$

b. $2|3x+4| - 10 = 12$

5-21. Ted needs to find the point of intersection for the lines $y = 18x - 30$ and $y = -22x + 50$. He takes out a piece of graph paper and then realizes that he can solve this problem without graphing. Explain how Ted is going to accomplish this, and then find the point of intersection.

5-22. Your family plans to buy a new air conditioner. They can buy the Super Cool X1400 for $800, or they can buy the Efficient Energy X2000 for $1200. Both models will cool your home equally well, but the Efficient Energy model is less expensive to operate. The Super Cool X1400 will cost $60 a month to operate, while the Efficient Energy X2000 costs only $40 a month to operate.

a. Write an equation to represent the cost of buying and operating the Super Cool X1400 where C = cost and m = months.

b. Write an equation to represent the cost of buying and operating the Efficient Energy X2000.

c. How many months would your family have to use the Efficient Energy model to compensate for the additional cost of the original purchase?

d. Figuring your family will only use the air conditioner for 4 months each year, how many years will you have to wait to start saving money overall?

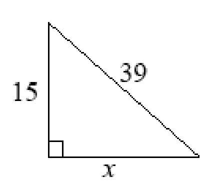
5-23. Find the x- and y-intercepts.

a. $2x - 3y = 9$

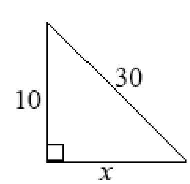
b. $3y = 2x + 12$

5-24. Find the value of x.

a.



b.



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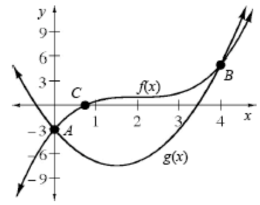
5-25. Solve $3x-1=2^x$ graphically. Could you solve this equation algebraically? Explain.

5-26. Consider the graphs of $f(x)=\frac{1}{2}(x-2)^3+1$ and $g(x)=2x^2-6x-3$ at right.



a. Write an equation that you could solve using points A and B. What are the solutions to your equation? Substitute them into your equation to show that they work.

b. Are there any solutions to the equation in part (a) that do not appear on the graph? Explain.

c. Write an equation that you could solve using point C. What does the solution to your equation appear to be? Again, substitute your solution into the equation. How close was your estimate?

d. What are the domains and ranges of $f(x)$ and $g(x)$?

5-27. Solve each of the following equations using any method.

a. $2(x+3)^2-5=-5$

b. $3(x-2)^2+6=9$

c. $|2x-5|-6=15$

d. $3\sqrt{5x-2}+1=7$

5-28. Given the parabola $f(x)=x^2-2x-3$, complete parts (a) through (c) below.

a. Find the vertex by averaging the x-intercepts.

b. Find the vertex by completing the square.

c. Find the vertex of $f(x)=x^2+5x+2$ using your method of choice.

d. What are the domain and range for $f(x)=x^2+5x+2$?

5-29. Solve each of the following equations for the indicated variable.

a. $5x-3y=12$ for y

b. $F=\frac{Gm_1m_2}{r^2}$ for m_2

c. $E=\frac{1}{2}mv^2$ for m

d. $(x-4)^2+(y-1)^2=10$ for y

5-30. Paul states that $(a+b)^2$ is equivalent to a^2+b^2. Joyce thinks that something is missing. Help Joyce show Paul that the two expressions are not equivalent. Explain using at least two different approaches: diagrams, algebra, numbers, or words.

5-31. Graph each of the following equations. (Keep the graphs handy, because you will need them later.)

a. $y=|x|$

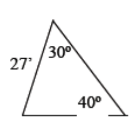
b. $|y|=x$

c. How are the two graphs similar? How are they different?

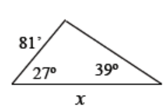
d. What are the domain and range of each relation?

5-32. Find the value of x.

a.

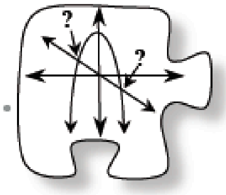


b.



5.1.3 How many solutions are there?

Finding Multiple Solutions to Systems of Equations



You have used many different solving **strategies** to find solutions of equations with one variable both algebraically and graphically. You have also worked with systems of two equations with two variables. In this lesson, you will use your algebraic and graphing tools to determine the number of solutions that various systems have and to determine the meaning of those solutions.

5-33. Solve each system of equations below without graphing. For each one, explain what the solution (or lack thereof) tells you about the graph of the system.

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

b. $y = \frac{1}{2}x^2 + 1$
$y = 2x - 1$

c. $y^2 = x$
$y = x - 2$

d. $4x - 2y = 10$
$y = 2x - 5$

5-34. Now consider the system shown at right.

$$x^2 + y^2 = 25$$
$$y = x^2 - 13$$

a. How many solutions do you expect this system to have? Explain how you made your prediction.

b. Solve this system by graphing. How many solutions did you find? Was your prediction in part (a) correct?

c. Find a way to combine these equations to create a new equation so that the only variable is x. Then find another way to combine $x^2 + y^2 = 25$ and $y = x^2 - 13$ to form a different equation that contains only the variable y. Which of these equations would be easier to solve? Why?

d. If you have not already done so, solve one of the combined equations from part (c). If solving becomes too difficult, you may want to switch to the other combined equation.

When you have solutions for one variable, solve for the other variable by substituting each solution into one of the original equations and solving for the remaining variable. Then locate each solution on the graph from part (b).

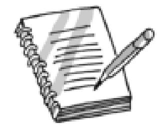
5-35. In problem 5-34, you analyzed the system shown at right.

$$x^2 + y^2 = 25$$
$$y = x^2 - 13$$

a. What minor adjustments can you make to an equation (or both equations) in this system so that the new system has no solutions? Have each member of your team find a different way to alter the system. **Justify** that your system has no solution algebraically. Also, be ready to share your **strategies** for changing the system along with your **justification** with the class.

b. Now work with your team to alter the system three more times so that the new systems have 3, 2, or 1 solution. For each new system that your team creates, solve the system algebraically to study how the algebraic solution helps indicate how many solutions will be possible. Be prepared to explain what different situations occur during solving that result in a different number of solutions.

5-36. Look over your work from today. Name all of the **strategies** you used to solve systems of equations. Which **strategies** were most useful for solving linear systems? What about non-linear systems? Write a Learning Log entry describing your ideas you about solving systems. Title this entry "Finding Solutions to Systems" and label it with today's date.



Review & Preview

5-37. Solve each of the following systems algebraically. What do the solutions tell you about each system? Visualizing the graphs may help with your description.

a. $y = 3x - 5$
$y = -2x - 15$

b. $y - 7 = -2x$
$4x + 2y = 14$

c. $y = 2(x+3)^2 - 5$
$y = 14x + 17$

d. $y = 3(x-2)^2 + 3$
$y = 6x - 12$

5-38. Solve each equation below. Think about rewriting, looking inside, or undoing to simplify the process.

a. $3(y+1)^2 - 5 = 43$

b. $\sqrt{1-4x} = 10$

c. $\frac{6y-1}{y} - 3 = 2$

d. $\sqrt[3]{1-2x} = 3$

5-39. This is a Checkpoint for use of function notation and describing domains and ranges.

Find the domain and range of $g(x) = 2(x+3)^2$. Then answer the questions below.

a. Find $g(-5)$.

b. Find $g(a+1)$.

c. If $g(x) = 32$, figure out what number x can be.

d. If $g(x) = 0$, figure out what number x can be.

e. Check your answers by referring to the Checkpoint 9 materials located at the back of your book.

If you needed help to solve these problems correctly, then you need more practice using function notation and describing domains and ranges. Review the Checkpoint 9 materials and try the practice problems. Also, consider getting help outside of class time. From this point on, you will be expected to solve problems like these easily and accurately.

5-40. Wet World has an 18-foot-long water slide. The angle of elevation of the slide (the angle it forms with a horizontal line) is 50°. At the end of the slide, there is a 6-foot drop into a pool. After you climb the ladder to the top of the slide, how many feet above the water level are you? Draw a diagram.

5-41. Describe how the graph of $y + 3 = -2(x+1)^2$ is different from $y = x^2$.

5-42. Solve the system of equations at right.

$$2^{(x+y)} = 16$$
$$2^{(2x+y)} = \frac{1}{8}$$

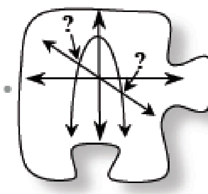
5-43. The price of a movie ticket averages \$10.25 and is increasing by 3% per year. Use that information to complete parts (a) through (c) below.

a. What is the multiplier in this situation?

b. Write a function that represents the cost of a movie ticket n years from now.

c. If tickets continue to increase at the same rate, what will they cost 10 years from now?

5.1.4 How can I use systems?



Using Systems of Equations to Solve Problems

You have developed several **strategies** for solving equations and systems of equations. You have also focused on the meaning of a solution. In this lesson, you will have the opportunity to see how your **strategies** can be used in real-life contexts. You will expand your understanding of solutions by applying them to these situations. As you work today, use the questions below to help stimulate mathematical conversations:

How can we make this situation into equations?

What does this solution tell us?

How can we solve it?

Are there any other **strategies** that could be useful?

5-44. HOW TALL IS HAROLD?

Jamal and Dinah were still eating as they came into Algebra 2 class from lunch. Someone had left a book on the floor and they tripped. As they each hit the floor, the food they were carrying went flying across the room directly toward Harold, who was showing off his latest dance moves.

As Jamal and Dinah watched in horror, Jamal's cupcake and Dinah's sandwich splattered Harold right on the top of his head! Jamal's cupcake flew on a path that would have landed on the floor 20 feet away from him if it had not hit Harold. Dinah's sandwich flew on a path that would have landed on the floor 24 feet away from her if it had not hit Harold. Jamal's cupcake got up to 9 feet high, and Dinah's sandwich reached a height of 6 feet, before hitting Harold.

How tall is Harold? Show your solution in as many ways as you can.

5-45. Write a system of equations to fit the situation below. Then solve the system using as many **strategies** as you can. How many solutions are possible?

Your math class wants to collect money for a field trip, so it decides to sell two kinds of candy bags. The Chocolate Lovers Bag costs $4.25 for five chocolate truffles and two caramel turtle candies. The Combusting Caramel Bag costs $3.50 for eight caramel turtle candies and two chocolate truffles. How much does each chocolate truffle and caramel turtle candy cost?

5-46. Lucky you! You are a new college graduate and have already been offered two jobs. Each job involves exactly the same tasks, but the salary plans differ, as shown below.

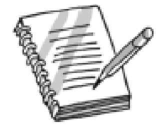
Job A offers a starting salary of $52,000 per year with an annual increase of $3,000.

Job B starts at $36,000 per year with a raise of 11% each year.

a. Under what conditions would Job A be a better choice? When would Job B be a better choice? Use graphs, tables, and equations to help you **justify** your answer.

b. How could you change this problem slightly so that Job B is always a better choice? How could you change it so that Job A is always better? If it is not possible for Job A or Job B always to be a better choice, explain why not.

5-47. What does the solution to a system of equations mean? Can you find more than one way to answer that question? Create a Learning Log entry that expands on your thinking about the meaning of a solution. Title this entry "The Meaning of Solution, Part 2" and label it with today's date.



Review & Preview

5-48. Gloria is weighing combinations of geometric solids. She found that 4 cylinders and 5 prisms weigh 32 ounces and that 1 cylinder and 8 prisms weigh 35 ounces. Write and solve a system of equations to determine the weight of each cylinder and prism.

5-49. Is $x=-1$ a solution to the inequality $2x^2+5x-3 \le x^2+4x+3$? What about $x=5$? Show how you know. Then find three more solutions.

5-50. Solve each equation below algebraically. Think about rewriting, looking inside, or undoing to simplify the process.

a. $5-3(\frac{1}{2}x+2)=-7$

b. $5(\sqrt{x-2}+1)=15$

c. $12-(\frac{2x}{3}+x)=2$

d. $-3(2x+1)^3=-192$

5-51. Given the parabola $y=x^2-8x+10$, complete parts (a) through (c) below.

a. Find the vertex by averaging the x-intercepts.

b. Find the vertex by completing the square.

c. Find the vertex of $y=x^2-3x$ using your method of choice.

5-52. Refer back to the graphs you made for problem 5-31. (It was a homework problem from Lesson 5.1.2.) Use those graphs to help you to graph each of the following inequalities.

a. $y \le |x|$

b. $|y| \ge x$

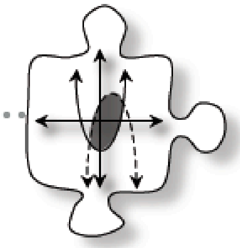
5-53. For the equation $y=-(x+1)^3+2$:

a. Draw a graph.

b. Use your graph to estimate the solution to $-3=-(x+1)^3+2$.

5.2.1 How can I solve inequalities?

Solving Inequalities with One or Two Variables



In Section 5.1, you developed many **strategies** for solving equations with one variable and systems of equations with two variables. But what if you want to solve an inequality or system of inequalities instead? Today you will explore how to use familiar **strategies** to find solutions for an inequality.

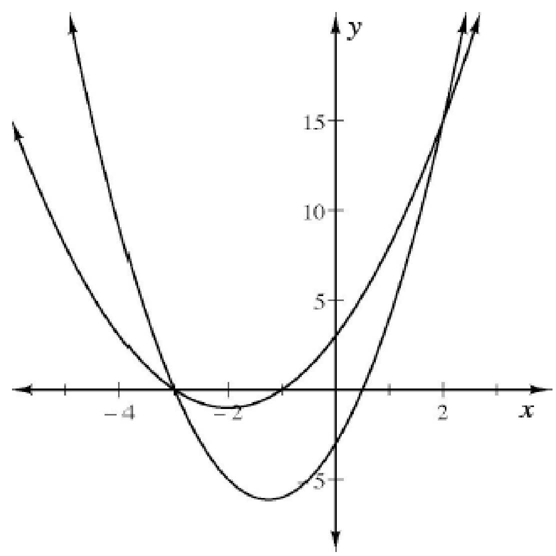
As you work, the questions below can help focus team discussions:

What **strategy** should we use?

How can we know if this solution is correct?

How can we be sure we found all solutions?

5-54. In Lessons 5.1.1 and 5.1.2, you learned how to use the graph of a system to solve an equation. How can the graphs of $y = 2x^2 + 5x - 3$ and $y = x^2 + 4x + 3$ (shown at right) help you solve an *inequality*? Consider this as you answer the questions below.



a. How are the solutions of $2x^2 + 5x - 3 = x^2 + 4x + 3$ represented on this graph? What are the solutions?

b. Obtain a Lesson 5.2.1 Resource Page from your teacher. On the resource page, label each graph with its equation and highlight each function with a different color. How did you decide which graph matches which function?

c. On the graph, identify the x-values for which $2x^2 + 5x - 3 \le x^2 + 4x + 3$. How did you locate the solutions? How many solutions are there? Find a way to describe all of the solutions.

d. How can these solutions be represented on a number line? Locate the number line labeled with $2x^2 + 5x - 3 \le x^2 + 4x + 3$ below the graph on your resource page. Use a colored marker to highlight the solutions to the inequality on the number line.

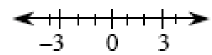
e. What about the inequality $2x^2 + 5x - 3 > x^2 + 4x + 3$? What are the solutions to this inequality? Represent your solutions algebraically and on a number line.

5-55. Now consider the inequality $2x - 5 > 1$.

a. List at least three solutions of this inequality.

b. What is the smallest number that will make this inequality true? If you cannot find the smallest number, which number is the largest that makes it *not* true? This number is a **boundary**.

c. Draw a number line like the one at right on your paper and mark the boundary point for $2x - 5 > 1$. Is the point part of the solution of the inequality? If yes, fill in a point on the line; if not draw an open circle. On which side of the boundary do the solutions lie? Indicate the solutions by "bolding" the appropriate portion of the number line and representing the graph algebraically.



5-56. Consider the inequality $4|x+1|-2>6$.

a. How many boundary points are there? What are they? Should they be marked with filled or unfilled circles? Make the appropriate markings on a number line.

b. Which portions of the number line contain the solutions? How many regions do you need to test? Represent the solutions algebraically and on a number line.

5-57. Burt and Ernie were solving the inequality $2x^2 + 5x - 3 < x^2 + 4x + 3$. They were looking at the graph in problem 5-54 when Burt had an idea. *"Can't we change this into one parabola and solve our inequality that way?"* he said.

Ernie asked, *"What do you mean?"*

"Can't we find the solutions by looking at the graph of $f(x) = x^2 + x - 6$?" Burt replied.

a. Where did Burt get the equation $y = x^2 + x - 6$?

b. Try Burt's idea. Graph the parabola and show how it can be used to solve the original inequality.

c. *"Just a minute!"* mumbled Ernie, *"I think I have a short cut. Instead of graphing the parabola, can't we just rewrite the original inequality as $x^2 + x - 6 > 0$ and then solve the equation $x^2 + x - 6 = 0$? This would give us the boundary points and then we could test numbers to find the regions that contain the solutions."* Check Ernie's short cut. Does it give the same solution?

d. Use any method to solve the inequality $x^2 - 3x - 10 \geq 0$.

5-58. Next, Burt and Ernie were working on solving the inequality $4|x+1|-2>6$ from problem 5-56. This time, Ernie had an idea. *"Why don't we find the solutions to this by graphing a system of equations like we did in problem 5-54?"*

a. What system of equations should they graph?

b. Graph the system and explain how you can use it to find the solutions to $4|x+1|-2>6$.

5-59. In problem 5-54 you looked at solutions to an inequality with one variable (x). Now consider the system of inequalities with two variables (x and y) below.

$$y \geq 2x^2 + 5x - 3$$
$$y < x^2 + 4x + 3$$

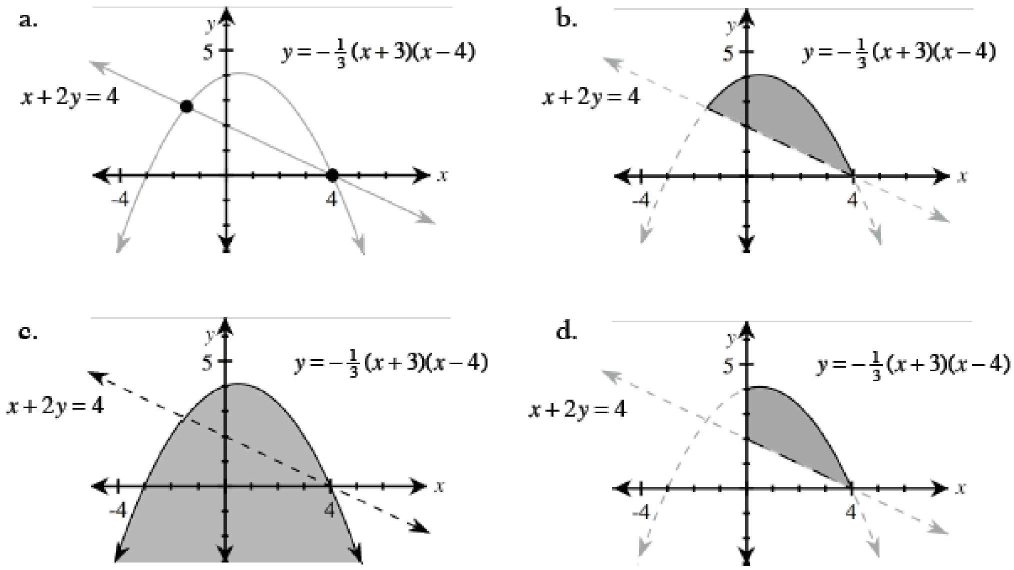
a. Which points make both inequalities true? For example, does the point $(-3, 0)$ make both inequalities true? What about $(-1, 1)$? $(1, 5)$? Refer back to your Lesson 5.2.1A Resource Page to help you think about these questions.

b. What is the difference between a solution to the *system* of inequalities above and a solution to the inequality found in problem 5-54?

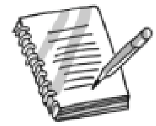
c. How are the graphs of the equations $y = 2x^2 + 5x - 3$ and $y = x^2 + 4x + 3$ related to the graph of the system of inequalities?

d. With your team, find a way to represent all of the solutions to the system of inequalities on the Lesson 5.2.1A Resource Page graph.

5-60. For each of the following graphs, find an equation, inequality, or system that could have the solution shown. Note that the equations for the line and the parabola are given.



5-61. What does the solution to an inequality or a system of inequalities mean? Does it matter if the inequality has one variable or two? Create a Learning Log entry that expands on your thinking about the meaning of a solution. Title this entry "The Meaning of Solution, Part 3" and label it with today's date.



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Review & Preview

5-62. Find boundary points for each of the following inequalities. Draw the boundaries on a number line and shade the solution regions.

a. $3x+2 \geq x-6$ b. $2x^2-5x<12$

5-63. Solve the following inequalities and draw a number line graph to represent each solution.

a. $|2x+3|<5$ b. $|2x+3| \geq 5$

c. $|2x-3|<5$ d. $|2x-3| \geq 5$

e. $|3-2x|<5$ f. $|3-2x| \geq 5$

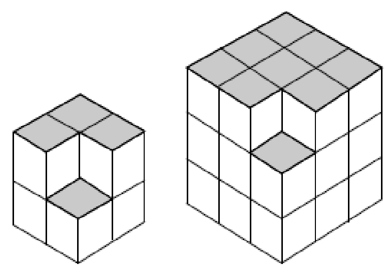
g. Describe any relationships you see among these six problems.

5-64. Examine the figures at right, and then visualize the figure for $n = 4$.

a. How many cubes are in the figure for $n=4$?

b. How many cubes are in the figure for $n=1$?

c. Find the general equation for the number of cubes for any n. Verify your formula with the cases of $n=1$ and $n=5$.



$n=2$ $n=3$

d. Is the sequence arithmetic, geometric or neither? Explain your reasoning.

5-65. Lexington High School has an annual growth rate of 4.7%. Three years ago there were 1500 students at the school.

a. How many students are there now?

b. How many students were there 5 years ago?

c. How many students will there be n years from now?

5-66. Complete the square to rewrite the equation below, changing it to graphing form. Then graph it.

$x^2+y^2-2y-8=0$

5-67. Factor each expression in parts (a) and (b). Then, in parts (c) and (d), factor *and reduce* each expression.

a. $bx+ax$ b. $x+ax$ c. $\frac{ax+a}{x^2+2x+1}$ d. $\frac{x^2-b^2}{ax+ab}$

5-68. Graph the four inequalities below on the same set of axes.

i. $2y \geq x-3$ *ii.* $x-2y \geq -7$

iii. $y \leq -2x+6$ *iv.* $-9 \leq 2x+y$

a. What type of polygon is formed by the solution of this set of inequalities? Write a convincing argument to **justify** your answer.

b. Find the vertices of the polygon. If your graph is very accurately drawn you will be able to determine the points from the graph. If it is not, you will need to solve the systems (pairs) of equations that represent the corners of your graphs.

5-69. Solve the following absolute value inequalities.

a. $|x-4|<9$ b. $\left|\frac{1}{2}x-45\right| \geq 80$

c. $|2x-5| \leq 2$

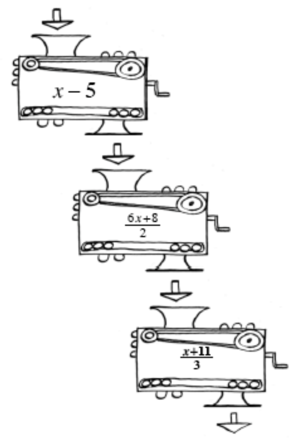
5-70. Consider the arithmetic sequence $2,\ a-b,\ a+b,\ 35,\ \ldots$. Find a and b.

5-71. MARVELOUS MARK'S FUNCTION MACHINES

Mark has set up a series of three function machines that he claims will surprise you.

a. Try a few numbers. Are you surprised by your results?

b. Carrie claims that she was not surprised by her results. She also says that she can show why the sequence of machines does what it does by simply dropping in a variable and writing out step-by-step what happens inside each machine. Try it. (Use something like *c* or *m*.) Be sure to show all of the steps.



5-72. Give the equation of each circle below in graphing form.

a. A circle with center (0, 0) and radius 6.

b. A circle with center (2, –3) and radius 6.

c. A circle with equation $x^2+y^2-8x+10y+5=0$.

5-73. Find the equation (in $y=mx+b$ form) of each line described below.

a. A line with slope $\frac{1}{2}$ passing through the point (6, 1).

b. The line $y=2x+b$ passing through the point (1, 4).

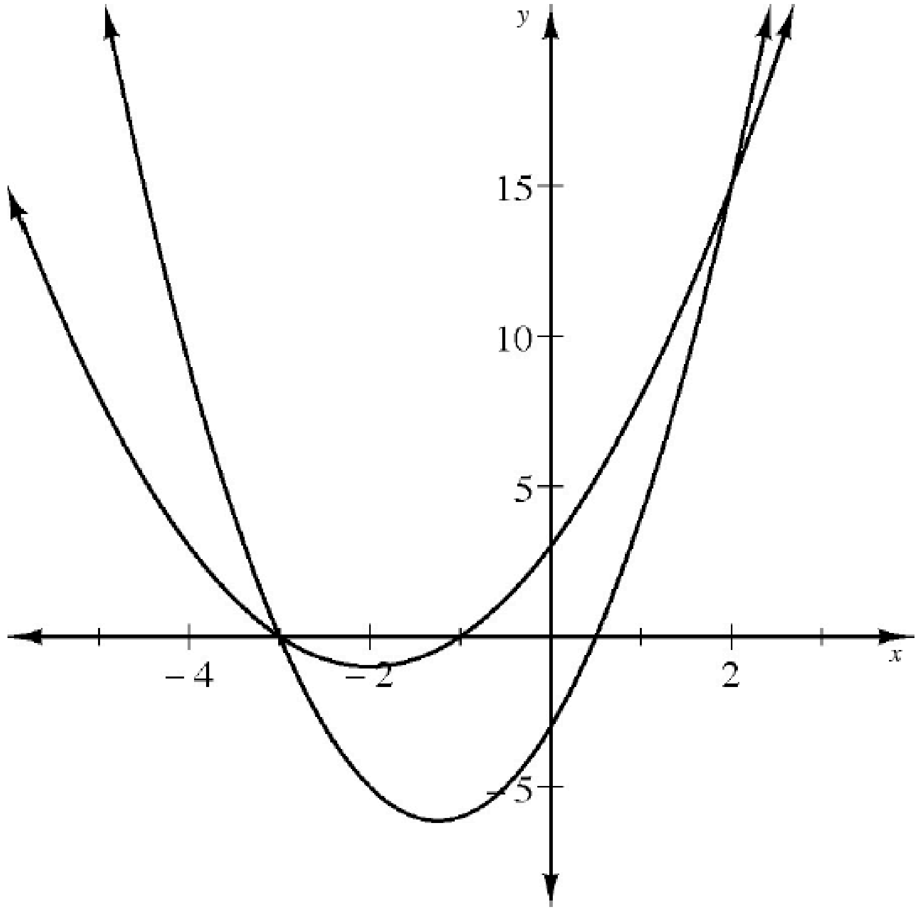
5-74. Sketch the graph of the function $f(x)=3\cdot5^x$.

a. What is the domain of $f(x)$?

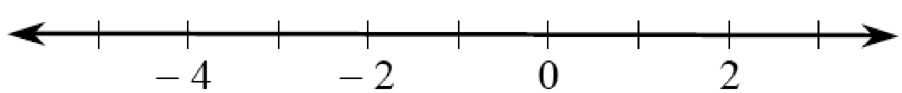
b. Sketch the graph of the geometric sequence $t(n)=3\cdot5^n$.

c. What is the difference between $f(x)$ and $t(n)$? Explain completely.

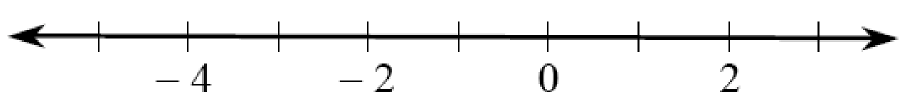
Lesson 5.2.1A Resource Page



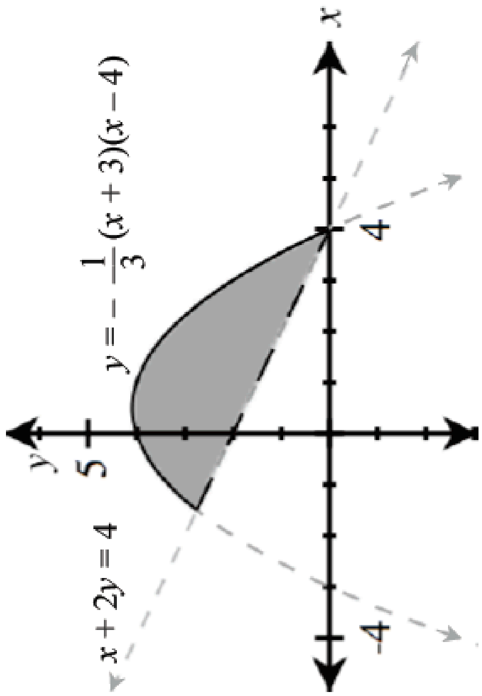
$2x^2+5x-3 \le x^2+4x+3$

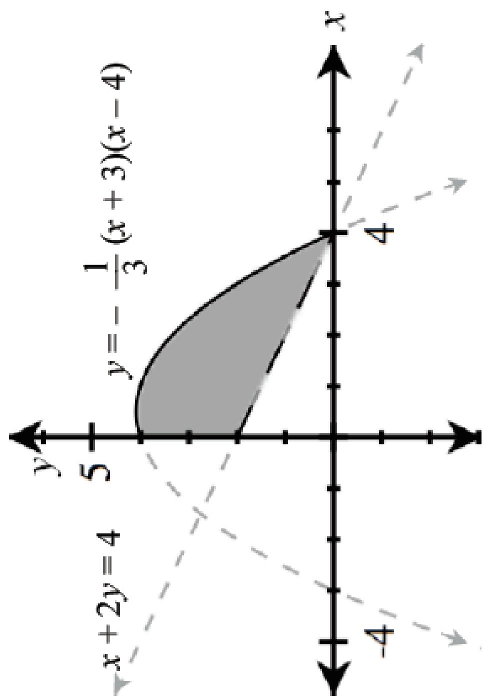


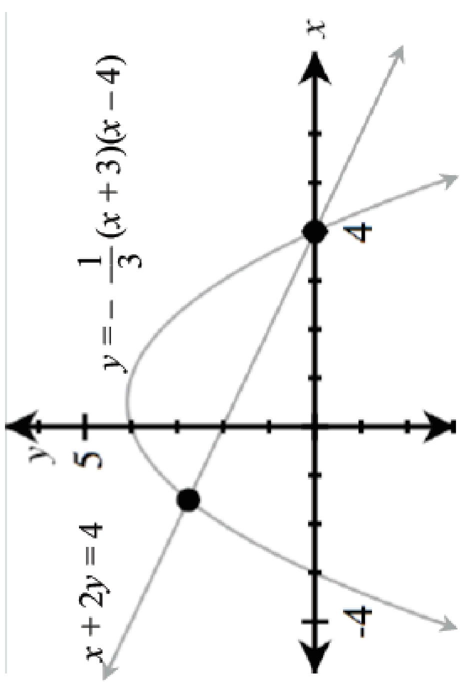
$2x^2+5x-3 > x^2+4x+3$

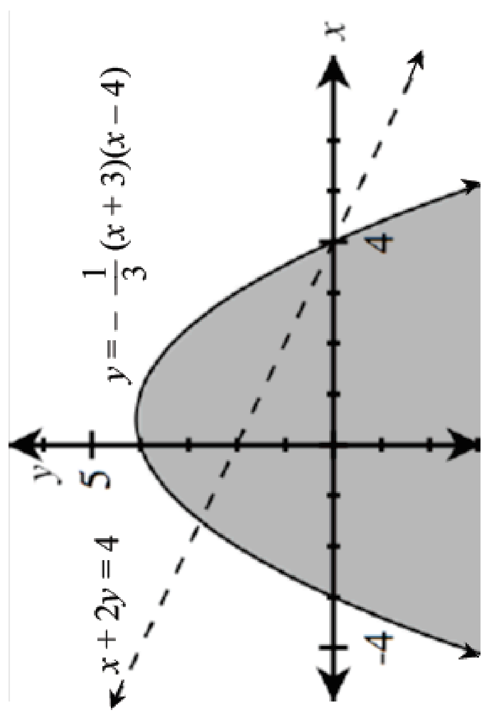


Lesson 5.2.1B Resource Page





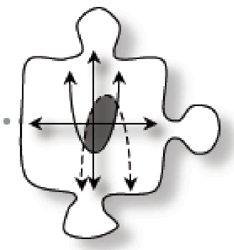




Solving Methods

	Equation	Inequality
1 Variable		
System with 2 Variables		

5.2.2 How can I organize the possibilities?



Using Systems to Solve a Problem

The system of linear equalities and inequalities are used by businesses and manufacturers to make service and production decisions. They use linear programming for this application. Today you will get to sample this technique.

5-75. THE TOY FACTORY

Otto Toyom builds toy cars and trucks. To make each car, he needs 4 wheels, 2 seats, and 1 gas tank. To make each truck, he needs 6 wheels, 1 seat, and 3 gas tanks. His storeroom has 36 wheels, 14 seats, and 15 gas tanks. He is trying to decide how many cars and trucks to build so he can make the largest possible amount of money when he sells them. Help Otto figure out what his options are. What are all of the choices he could make about how many cars and how many trucks he will build? Make a list of all possible combinations. Then plot the number of possible cars and trucks in the first quadrant of a graph.

5-76. Otto wants to make as much profit as possible. Use your list to find which combination of cars and trucks will make the most profit based on the information below.

a. Which of Otto's options gives him the greatest profit if he makes \$1 on each car and \$1 on each truck he sells? How do you know?

b. The market has just changed, and Otto can now make \$2 for each truck but only \$1 for each car. What is his best choice for the number of cars and the number of trucks to make now? How can you be sure? Explain.

5-77. In problem 5-76, you probably had to show many calculations to convince Otto that your recommendation was a good one. Now you will take another look at Otto's business using algebra and graphing tools.

a. Write three inequalities to represent the relationship between the number of cars (x), the number of trucks (y), and the number of:

i. wheels *ii.* seats *iii.* gas tanks

b. Graph this system of inequalities on the same set of axes you used for problem 5-75. Shade the solution region lightly. Why is it okay to assume that $x \geq 0$ and $y \geq 0$?

c. What are the vertices of the pentagon that outlines your region? Explain how you could find the exact coordinates of those points if you could not read them easily from the graph.

d. Are there any points in the solution region that represent choices that seem more likely to give Otto the maximum profit? Where are they? Why do you think they show the best choices?

e. Write an equation to represent Otto's total profit (P) if he makes \$1 on each car and \$2 on each truck. What if Otto ended up with a profit of only \$8? Show how to use the graph of the profit equation when $P = 8$ to figure out how many cars and trucks he made.

f. Which points do you need to test in the profit equation to get the maximum profit? Is it necessary to try all of the points? Why or why not?

g. What if Otto got greedy and wanted to make a profit of \$14? How could you use a profit line to show Otto that this would be impossible based on his current pricing?

5-78. Find Otto's highest possible profit if he gets \$3 per car and \$2 per truck. Find the profit expression and find the best combinations of cars and trucks to maximize the profit.

MATH NOTES

METHODS AND MEANINGS

Inequalities with Absolute Value

If k is any positive number, an inequality of the form $|f(x)| > k$ is equivalent to the statement $f(x) > k$ **or** $f(x) < -k$.

For example, $|2x-17| > 9$ is equivalent to $2x-17 > 9$ or $2x-17 < -9$. Solving yields $x > 13$ or $x < 4$.

$|f(x)| < k$ is equivalent to the statement $-k < f(x) < k$. Another way to write this is $f(x) > -k$ and $f(x) < k$. For example, $|x+4| < 9$ is equivalent to $-9 < x+4 < 9$. Solving yields $-13 < x < 5$, that is, $x > -13$ and $x < 5$.

Review & Preview

5-79. Solve the system of equations at right. What subproblems did you need to solve?

$$x+2y=4$$
$$2x-y=-7$$
$$x+y+z=-4$$

5-80. Solve each of the following inequalities. Express the solutions algebraically and on a number line.

a. $3x-5\le 7$

b. $x^2+6>42$

5-81. Three red rods are 2 cm longer than two blue rods. Three blue rods are 2 cm longer than four red rods. How long is each rod?

5-82. Simone has been absent and does not know the difference between the graph of $y\le 2x-2$ and the graph of $y<2x-2$. Explain thoroughly so that she completely understands what points are excluded from the second graph and why.

5-83. Graph the solutions to each of the following inequalities on a different set of axes (but you should be able to fit all four on one side of the graph paper). Label each graph with the inequality as given and with its *y*-form. Choose a test point and show that it gives the same result in both forms of your inequality.

a. $3x-3<y$

b. $3>y$

c. $3x-2y\le 6$

d. $x^2-y\le 9$

5-84. This is a Checkpoint for solving for one variable in an equation with two or more variables.

Rewrite the following equations so that you could enter them into the graphing calculator. In other words, solve for *y*.

a. $x-3(y+2)=6$

b. $\frac{6x-1}{y}-3=2$

c. $\sqrt{y-4}=x+1$

d. $\sqrt{y+4}=x+2$

e. Check your answers by referring to the Checkpoint 10 materials located at the back of your book.

If you needed help to solve these equations correctly, then you need more practice in solving for one variable in an equation involving two or more variables. Review Checkpoint 10 materials and try the practice problems. Also, consider getting help outside of class time. From this point on, you will be expected to solve equations such as these easily and accurately.

5-85. Think about the axis system in the two-dimensional coordinate plane. What is the equation of the *x*-axis? What is the equation of the *y*-axis?

5-86. Samy has a 10-foot wooden ladder, which he needs to climb to reach the roof of his house. The roof is 12 feet above the ground. The base of the ladder must be at least 1.5 feet from the base of the house. How far is it from the top step of the ladder to the edge of the roof? Draw a sketch.

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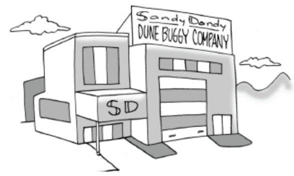
5.2.3 How can I find the best combination?

Application of Systems of Linear Inequalities

The process of using linear systems to find the optimal solution to a problem with multiple constraints is called **linear programming**. You used this process while solving "The Toy Factory." Now you will work on a problem using this technique, only this time you can use a system of inequalities and do not need to list all of the possible outcomes.

5-87. SANDY DANDY DUNE BUGGIES

Jacklyn Toyom, CEO of the Sandy Dandy Dune Buggy Company and sister of Otto, has discovered that your team has found a way to optimize the profit for the Toy Factory. She would like to hire your team to help her company. Here is her letter:



Dear Study Team,

I was so impressed to hear about how you helped Otto maximize his profits at his Toy Factory! I think your team could help my company as well.

Here at the Sandy Dandy Dune Buggy Company we make two popular models of off-road vehicles: the Crawler and the Rover. Each week, we receive enough parts to build at most 15 Crawlers and 12 Rovers. The only exceptions to the supply of parts are the colored night lamps and high-definition speakers, which have to be specially manufactured for our off-road vehicles. Each of the Crawlers requires 5 of the lamps and 2 of the speakers. The Rover requires 3 lamps and 6 speakers. Our supplier is a small company and can only manufacture 81 of the lamps and 78 of the speakers for us each week.

Since we are also a small company, we have only 12 employees. By contract, the maximum number of hours each employee can work is 37.5 hours per week. It takes our employees 20 hours to assemble one Crawler and 30 hours to assemble one Rover.

Each Crawler sold brings in a profit of $500. The Rover is less expensive to manufacture than the Crawler but is very popular and can be sold at a profit of $1000 each.

I need a detailed proposal of how to maximize our profit that I can submit to our Board of Trustees. I look forward to a profitable business relationship!

Sincerely,
Ms. Jacklyn Toyom
CEO, Sandy Dandy Dune Buggy Company

5-87. *Problem continued from previous page.*

Your task: Find the best combination of Crawlers and Rovers to produce each week to maximize the company's profit. Create a detailed proposal to submit to Ms. Toyom that includes:

- The number of Crawlers and Rovers to manufacture each week.
- The maximum profit the company can expect to make.
- Calculations and graphs to **justify** your recommendation.

Constraints to keep in mind are the number of:

(1) speakers available
(2) lamps available
(3) total employee hours each week

Discussion Points

How does this problem compare to "The Toy Factory" from the previous lesson?

What is the maximum number of hours for all of the employees that can be worked in one week?

How can we **justify** that we have found the most profitable combination of each vehicle to manufacture?

Further Guidance

5-88. After emailing a few questions to Ms. Toyom, your team received the following email:

From: "Ms. Toyom" <toyom@welovemath.com>
To: <studyteam@thinkingisgood.net>
Subject: Clarifications to your Questions

Dear Study Team,

Thank you for your questions. I am happy to clarify them. Our Board of Trustees requires the following information in your proposal:

1. A list of all of the constraints (to make sure you took them into consideration).
2. An inequality for each of the constraints.
3. A full-page graph showing all inequalities and the resulting solution region (use a different color for each inequality).
4. Calculations for each of the vertices on your solution region. List these points at their vertex.
5. Profit calculations, with maximum profit included on your graph.

Please make sure to include a cover letter summarizing your proposal. Also include a brief explanation for each of the items listed above.

Sincerely, Ms. Toyom

Further Guidance section ends here.

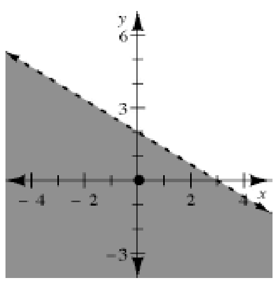
MATH NOTES

METHODS AND MEANINGS

Graphing Inequalities with Two Variables

To graph an inequality with two variables, first graph the boundary line or curve. If the inequality does not include equality (that is, if it is $>$ or $<$ rather than $\geq$ or $\leq$), then the graph of the boundary is dashed to indicate that it is not included in the solution. Otherwise, the boundary is a solid line or curve.

Once the boundary is graphed, choose a point that does not lie on the boundary to test in the inequality. If that point makes the inequality true, then the entire region in which that point lies is a solution. If that point makes the inequality false, then the entire region in which the point lies is not a solution. Examine the two examples below.



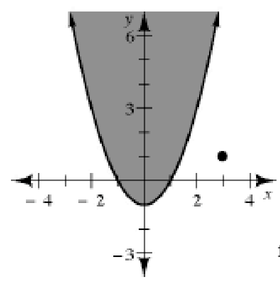
$y < -\frac{2}{3}x + 2$

Test $(0, 0)$:

$$0 \overset{?}{<} -\tfrac{2}{3}(0) + 2$$

$$0 \overset{?}{<} 2$$

True, so shade below the line.



$y \geq x^2 - 1$

Test $(3, 1)$:

$$1 \overset{?}{\geq} 3^2 - 1$$

$$1 \overset{?}{\geq} 8$$

False, so shade the region that does not contain the test point, that is, shade above the parabola.

October 24, 2010

Review & Preview

5-89. Solve the system of equations at right algebraically and explain what the solution tells you about the graphs of the two equations.

$$3x+2=y$$
$$-9x+3y=11$$

5-90. Draw the graph of the system of inequalities at right.

$$y \ge |x|-3$$
$$y \le -|x|+5$$

a. What polygon does the intersection form? **Justify** your answer.

b. What are its vertices?

c. Find the area of the intersection.

5-91. Solve each of the following inequalities. Express the solutions algebraically and on a number line.

a. $3(x+2) > 4x-7$

b. $3x^2-4x+2 \le x^2+x-6$

5-92. Solve each equation for y so that it could be entered into a graphing calculator.

a. $5-(y-3)=3x$

b. $4(x+y)=-2$

5-93. Janelle conducted an experiment by mistake by leaving her bologna sandwich at school over winter break. When she got back, her sandwich was much larger than it was when she left it. Her science teacher explained that the sandwich had produced large quantities of a rare bacterium, bolognicus sandwichae. Based on a sample taken from the sandwich, Janelle determined that there were approximately 72 million bacteria present. Her science teacher explained that this is not very surprising, since the number of this bacteria triples every 24 hours. Since the sandwich had been made only 15 days ago, Janelle is sure that she can sue the meat company; the food-industry standard for the most bacteria a sandwich-sized portion can have at the time of production is 100. Find out how many of the bacteria were present when the sandwich was made to determine if Janelle has a case.

5-94. Solve the system of equations at right.

$$x+3y=16$$
$$x-2y=31$$

a. Now rewrite the system and replace x with x^2.

b. What effect will this have on the solution to the system? Solve the new system.

5-95. A line intersects the graph of $y=x^2$ twice. One point has an x-coordinate of -4, and the other point has an x-coordinate of 2.

a. Draw a sketch of both graphs, and find the equation of the line.

b. Find the measure of the angle that the line makes with the x-axis.

5.2.4 What can I learn from a graph?

Using Graphs to Find Solutions

You have seen that you can find solutions to problems, equations, inequalities and systems using graphs. In this lesson, you will apply this knowledge to a math competition challenge.

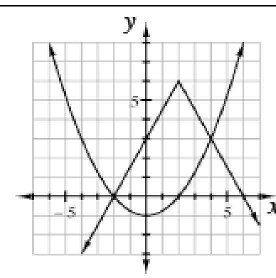
5-96. MATH TEAM CHALLENGE

At the annual two-day Math Challenge, teams from various high schools get together for a sometimes not-too-friendly math competition. Your school's biggest rival, Silicon Mountain High School, has won the competition the last five years and is already bragging that they will take first place again. However, your team has worked exceptionally hard this year to understand the Algebra 2 curriculum and its challenging concepts. Everyone on your team feels confident that they can beat Silicon Mountain High.

At the end of the first day of competition, scores for each school are posted and WOW! Your team and Silicon Mountain's team are tied for first place! Before the teams leave for the day, they are handed a copy of the final problem in the competition (shown below). At first your team is excited, but when your team reads the "Final Challenge," you all realize that everyone has a lot of work to do before tomorrow's event.

Final Challenge

The three math judges will ask your team five questions that can be answered by looking at the graph of the functions at right. Your score for each answer will depend on its accuracy and completeness.



Your task: Obtain a Lesson 5.2.4 Resource page from your teacher, which contains the graph in the "Final Challenge." With your team, discuss the graph and decide what questions the judges might ask about it. For each question, form a complete response so that your team is prepared for the "Final Challenge."

Discussion Points

What can a graph tell us about equations? About inequalities?

Can we use the graph to get information about equations and inequalities in one variable and in two variables?

MATH NOTES

METHODS AND MEANINGS

Solutions to One-Variable and Two-Variable Equations

When an equation has one variable, solutions are single numbers. When an equation contains two variables, solutions are ordered pairs.

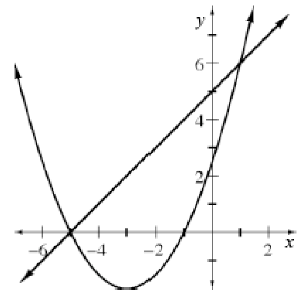
For example, the solutions for the system of equations shown at right are the ordered pairs of numbers (4, 44) and (–1, –11) because these are the (x, y) pairs that make both equations true. They are also the points at which the graphs of the two equations intersect.

$$y = x^2 + 8x - 4$$
$$y = 2x^2 + 5x - 8$$

The solutions for the equation $2x^2 + 5x - 8 = x^2 + 8x - 4$ (notice that it has only one variable) are the numbers 4 and –1, because they are the two x-values that make the equation true.

Review & Preview

5-97. Consider the graph at right as you answer the following questions.



a. Find the equation of the parabola.

b. Find the equation of the line.

c. Use your graph to solve $x+5=\frac{1}{2}(x+3)^2-2$.

d. Use your graph to solve the system:

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

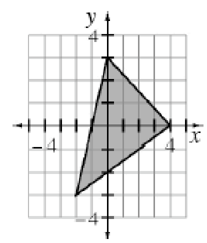
e. Use your graph to solve the inequality $x+5<\frac{1}{2}(x+3)^2-2$.

f. Use your graph to solve $\frac{1}{2}(x+3)^2-2=0$.

g. Use your graph to solve $x+5=4$.

h. How could you change the equation of the parabola so that the parabola and the line do not intersect? Is there more than one way?

5-98. Write the three inequalities that form the triangle shown at right.



5-99. Solve eqach of the following inequalities. Represent the solutions algebraically and on a number line.

a. $2|3x-5|\geq 4$

b. $\frac{1}{3}(3x-6)^3+4<13$

5-100. On separate pairs of axes, sketch the graph of each equation or inequality below.

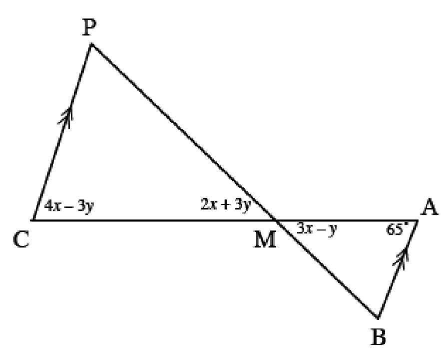
a. $y+5=(x-2)^2$

b. $y\leq(x+3)^3$

c. $y=4+\frac{1}{x-3}$

5-101. Find the measure of $\angle$CPM in the diagram at right.

List any subproblems that were necessary to solve this problem.



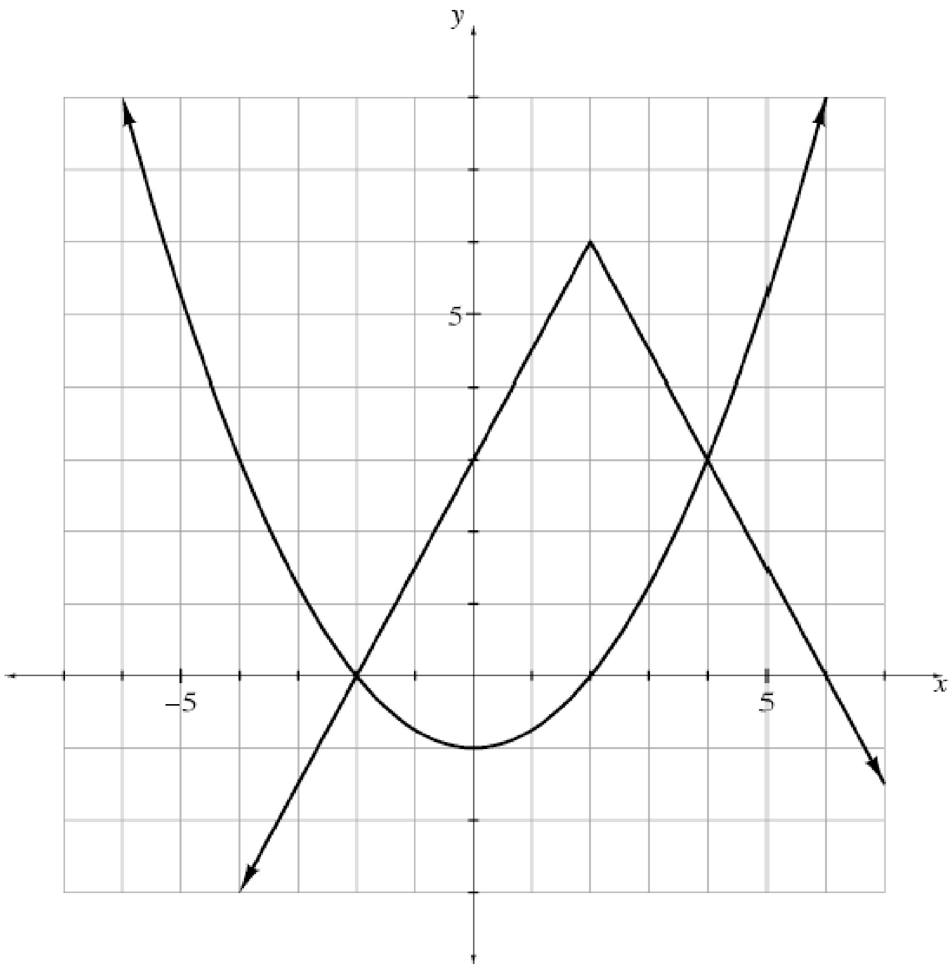
5-102. Solve for w in each equation below.

a. $w^2+4w=0$

b. $5w^2-2w=0$

c. $w^2=6w$

Lesson 5.2.4 Resource Page



CL 5-104. Solve each system of equations without graphing. For each case, explain what the solution tells you about the graph of the system.

a. $y = \frac{1}{3}x^2 + 1$
$y = 2x - 2$

b. $x = y^2$
$x - y = 6$

c. $6x - 2y = -4$
$y = 3x + 2$

CL 5-105. Estelle and Carlos will be hosting a party and will buy 6 pies for their guests. Two lemon meringue pies cost \$3 less than 4 blueberry pies. Three lemon meringue pies cost \$9 more than 3 blueberry pies. How much does each type of pie cost?

CL 5-106. Graph the following inequality or systems of inequalities.

a. $y \le 4x + 16$
$y > -\frac{4}{3}x - 4$

b. $y < x^2 - 2x - 3$
$y \le \frac{3}{4}x + 2$

c. $y \ge |x + 2| - 3$

d. $y \le \frac{1}{2}x + 3$
$y \ge (x+1)^2 - 2$

CL 5-107. Solve each inequality and graph the solution on a number line.

a. $x^2 - 2x - 15 < 0$

b. $|3x - 2| \ge 10$

CL 5-108. Find the equation of each of the lines described below.

a. The line that passes through (6, 1) and $(-10, -7)$.

b. The line that is perpendicular to $y = \frac{2}{3}x + 1$ and passes through (0, 5).

CL 5-109. Solve each equation for y.

a. $2y^2 + 3y = 7$

b. $3(2x - y) + 12 = 4x - 3$

c. $y(2y+1) + 3(2y+1) = 0$

d. $-4y - 1 = 4y(y - 2)$

CL 5-110. Complete the square and state the center and radius of the circle.

$$x^2 + y^2 - 4x + 6y - 3 = 0$$

CL 5-111. Evan spent the summer earning money so he could buy the classic car of his dreams. He purchased the car for \$2,295 from Fast Deal Freddie, the local used car salesman. Freddie told Evan that the car would increase by half its value after five years. Evan knows that this model appreciates 8% annually. Did Freddie try to trick Evan, or was his claim accurate?

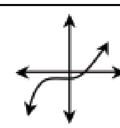
CL 5-112. Check your answers using the table at the end of this section. Which problems do you feel confident about? Which problems were hard? Have you worked on problems like these in math classes you have taken before? Use the table to make a list of topics you need help on and a list of topics you need to practice more.

What does it mean to solve?
What is a solution?

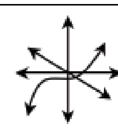
For each type of equation or inequality, provide an example and then show and explain the solution using as many representations as you can.

An equation with 1 variable

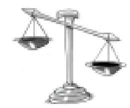
An equation with 2 variables (a function or relation)



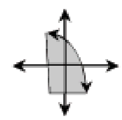
A system of equations in 2 variables (2 functions or relations)



An inequality in 1 variable (usually x)



An Inequality in 2 variables (usually x and y)



A system of inequalities in 2 variables