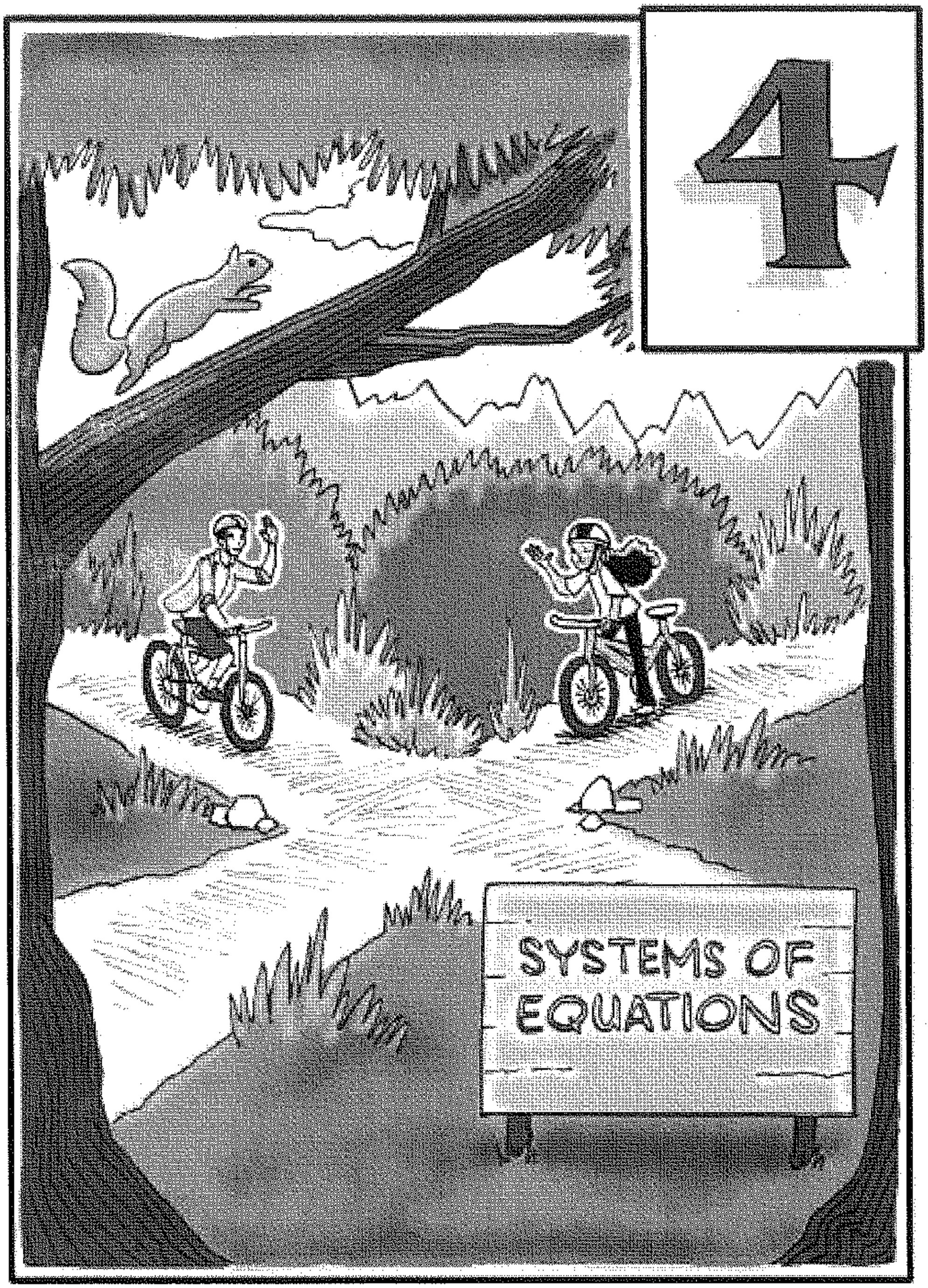
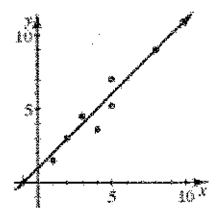

4
SYSTEMS OF
EQUATIONS

MATH NOTES

METHODS AND MEANINGS

Line of Best Fit

A **line of best fit** is a straight line that represents, in general, data on a scatterplot, as shown in the diagram. This line does not need to touch any of the actual data points, nor does it need to go through the origin. The line of best fit is a model of numerical two-variable data that helps describe the data in order to make predictions for other data.



To write the equation of a line of best fit, find the coordinates of any two convenient points on the line (they could be lattice points where the gridlines intersect, or they could be data points, or the origin, or a combination). Then write the equation of the line that goes through these two points.

Review & Preview

4-8. Smallville High School Principal is concerned about his school's Advanced Placement (AP) test scores. He wonders if there is a relationship between the students' performance in class and their AP test scores so he randomly selects a sample of ten students who took AP examinations and compares their final exam scores to their AP test scores.

AP Score	5	1	4	2	1	4	2	1	3	5
Final%	97	70	84	66	62	79	73	63	82	90

Create a scatterplot on graph paper. Draw a line of best fit that represents the data. Refer to the Math Notes box in this lesson. Use the equation of your line of best fit to predict the final exam score of another Smallville HS student who scored a 3 on their AP test.

4-9. Solve for x. Check your solutions, if possible.

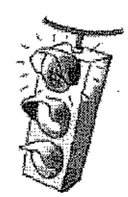
a. $-2(4-3x)-6x=10$

b. $\frac{x-5}{-2}=\frac{x-1}{-3}$

4-10. On the same set of axes, use slope and y-intercept to graph each line in the system shown at right. Then find the point(s) of intersection, if one (or more) exists.

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

4-11. A team of students is trying to answer the scientific notation problem $2\times10^3\cdot4\times10^7$.



Jorge thinks they should use a generic rectangle because there are two terms multiplied by two terms.

Cadel thinks the answer is 8×10^{10} but he cannot explain why.

Lauren thinks they should multiply the like parts. Her answer is 8×100^{21}.

Who is correct? Explain why each student is correct or incorrect.

4-12. For each of the following generic rectangles, find the dimensions (length and width) and write the area as the product of the dimensions and as a sum.

a.

$3y^2$	$-12y$

b.

$3y^2$	$-12y$
$5y$	-20

4-13. A **prime number** is defined as a number with exactly two integer factors: itself and 1. Jeannie thinks that all prime numbers are odd. Is she correct? If so, state how you know. If not, provide a counterexample.

4-14. Solve this problem by writing and solving an equation. Be sure to define your variable.

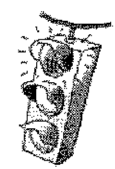
A rectangle has a perimeter of 30 inches. Its length is one less than three times its width. What are the length and width of the rectangle?

4-15. The basketball coach at Washington High School normally starts each game with the following five players:

Melinda, Samantha, Carly, Allison, and Kendra

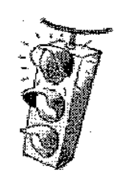
However, due to illness, she needs to substitute Barbara for Allison and Lakeisha for Melinda at this week's game. What will be the starting roster for this upcoming game?

4-16. When Ms. Shreve solved an equation in class, she checked her solution and it did not make the equation true! Examine her work below and find her mistake. Then find the correct solution.



$$5(2x-1)-3x=5x+9$$
$$10x-5-3x=5x+9$$
$$7x-5=5x+9$$
$$12x=4$$
$$x=\frac{1}{3}$$

4-17. Determine if the statement below is always, sometimes, or never true. Justify your conclusion.



$$2(3+5x)=6+5x$$

4-18. Find an equation for the line passing through the points $(-3,1)$ and $(9,7)$.

4-19. Multiply each polynomial. That is, change each product to a sum.

a. $(2x+1)(3x-2)$

b. $(2x+1)(3x^2-2x-5)$

MATH NOTES

METHODS AND MEANINGS

The Equal Values Method

The **Equal Values Method** is a method to find the solution to a system of equations. For example, solve the system of equations below:

$$2x+y=5$$
$$y=x-1$$

Put both equations into $y=mx+b$ form. The two equations are now $y=-2x+5$ and $y=x-1$.

$$\begin{array}{r|l} 2x+y=5 & y=x-1 \\ y=-2x+5 & \end{array}$$

Take the two expressions that equal y and set them equal to each other. Then solve this new equation to find x. See the example at right.

$$-2x+5=x-1$$
$$-3x=-6$$
$$x=2$$

Once you know x, substitute your solution for x into *either* original equation to find y. In this example, the second equation is used.

$$y=x-1$$
$$y=(2)-1$$
$$y=1$$

Check your solution by evaluating for x and y in *both* of the *original* equations.

$$\begin{array}{r|l} 2x+y=5 & y=x-1 \\ 2(2)+1=5 & 1=2-1 \\ 5=5 & 1=1 \\ \checkmark & \checkmark \end{array}$$

Review & Preview

4-25. Write expressions to represent the quantities described below.

a. Geraldine is 4 years younger than Tom. If Tom is t years old, how old is Geraldine? Also, if Steven is twice as old as Geraldine, how old is he?

b. 150 people went to see "Ode to Algebra" performed in the school auditorium. If the number of children that attended the performance was c, how many adults attended?

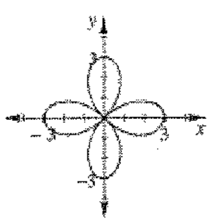
c. The cost of a new CD is \$14.95, and the cost of a video game is \$39.99. How much would c CDs and v video games cost?

4-26. Nina has some nickels and 9 pennies in her pocket. Her friend, Maurice, has twice as many nickels as Nina. Together, these coins are worth 84¢. How many nickels does Nina have? Show all of your work and label your answers.

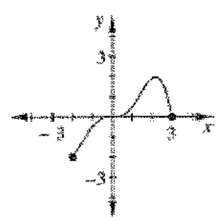
4-27. Create a table and graph the equation $y = 10 - x^2 + 3x$. Label its x- and y-intercepts.

4-28. Examine the graphs of each relation below. Decide if each is a function. Then describe the domain and range of each one.

a.



b.



4-29. What number is not part of the domain of the function $g(x) = \frac{x+2}{x-1}$? How can you tell?

4-30. If $f(x) = 3x - 9$ and $g(x) = -x^2$, find:

a. $f(-2)$ b. $g(-2)$ c. x if $f(x) = 0$ d. $g(m)$

MATH NOTES

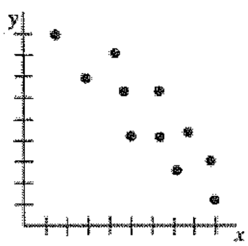
METHODS AND MEANINGS

Describing Association

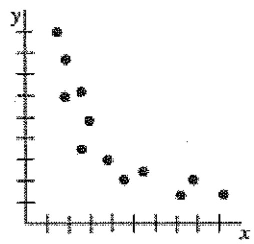
An association (relationship) between two numerical variables can be described by its form, direction, strength, and outliers.

The shape of the pattern is called the **form** of the association: **linear** or **non-linear**. The form can be made of **clusters** of data.

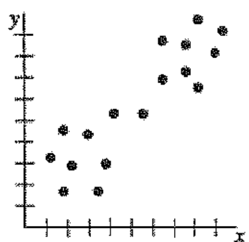
If one variable increases as the other variable increases, the **direction** is said to be a **positive association**. If one variable increases as the other variable decreases, there is said to be a **negative association**. If there is no apparent pattern in the scatterplot, then the variables have **no association.**



Negative **linear** association

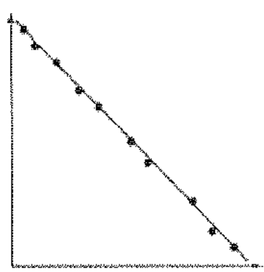


Negative **non-linear** association

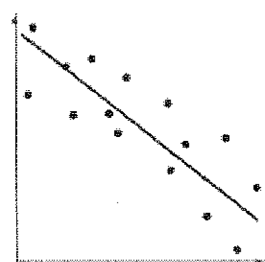


Positive **linear** association with **clusters**

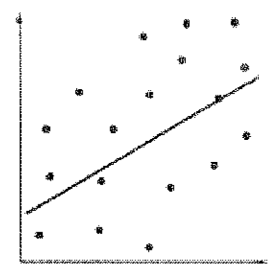
Strength is a description of how much scatter there is in the data away from the line of best fit. See some examples below.



strong negative association

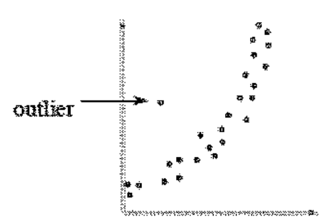


moderate negative association



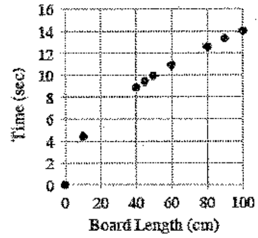
weak positive association

An **outlier** is a piece of data that does not seem to fit into the overall pattern. There is one obvious outlier in the association graphed at right.



Review & Preview

4-36. Ms. Hoang's class conducted an experiment by rolling a marble down different lengths of slanted boards and timing how long it took. The results are shown below. Describe the association. Refer to the Math Notes box in this lesson if you need help remembering how to describe an association.



4-37. Solve each equation for the variable. Check your solutions, if possible.

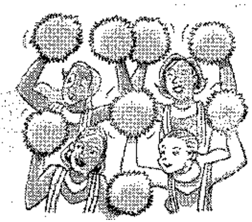
a. $8a+a-3=6a-2a-3$

b. $(m+2)(m+3)=(m+2)(m-2)$

c. $\frac{x}{2}+1=6$

d. $4t-2+t^2=6+t^2$

4-38. The Fabulous Footballers scored an incredible 55 points at last night's game. Interestingly, the number of field goals was 1 more than twice the number of touchdowns. The Fabulous Footballers earned 7 points for each touchdown and 3 points for each field goal.



a. **Multiple Choice:** Which system of equations below best represents this situation? Explain your reasoning. Assume that t represents the number of touchdowns and f represents the number of field goals.

i. $t=2f+1$
$7t+3f=55$

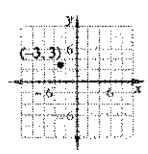
ii. $f=2t+1$
$7t+3f=55$

iii. $t=2f+1$
$3t+7f=55$

iv. $f=2t+1$
$3t+7f=55$

b. Solve the system you selected in part (a) and determine how many touchdowns and field goals the Fabulous Footballers earned last night.

4-39. Yesterday Mica was given some information and was asked to find a linear equation. But last night her cat destroyed most of the information! At right is all she has left:

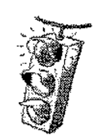


x	y
–3	
–2	1
–1	
0	
1	
2	
3	

a. Complete the table and graph the line that represents Mica's equation.

b. Mica thinks the equation for this graph could be $2x+y=-3$. Is she correct? Explain why or why not. If not, find your own algebraic equation to match the graph and $x \rightarrow y$ table.

4-40. Kevin and his little sister, Katy, are trying to solve the system of equations shown below. Kevin thinks the new equation should be $3(6x-1)+2y=43$, while Katy thinks it should be $3x+2(6x-1)=43$. Who is correct and why?



$$y=6x-1$$
$$3x+2y=43$$

4-41. Simplify each expression. In parts (c) and (d) write your answers using scientific notation.

a. $5^0 \cdot 2^{-3}$

b. $\frac{a^3}{b^{-2}} \cdot \frac{ab^2}{a^4}$

c. $2.3\times10^{-3} \cdot 4.2\times10^{2}$

d. $(3.5\times10^{3})^2$

MATH NOTES

METHODS AND MEANINGS

The Substitution Method

The **Substitution Method** is a way to change two equations with two variables into one equation with one variable. It is convenient to use when only one equation is solved for a variable.

For example, to solve the system: $x=-3y+1$
$4x-3y=-11$

Use substitution to rewrite the two equations as one. In other words, replace x in the second equation with $(-3y+1)$ from the first equation to get $4(-3y+1)-3y=-11$. This equation can then be solved to find y. In this case, $y=1$.

$$x=-3y+1$$
$$4(\quad)-3y=-11$$
$$4(-3y+1)-3y=-11$$
$$-12y+4-3y=-11$$
$$-15y+4=-11$$
$$-15y=-15$$
$$y=1$$

To find the point of intersection, substitute the value you found into either original equation to find the other value.

In the example, substitute $y=1$ into $x=-3y+1$ and write the answer for x and y as an ordered pair.

$$x=-3(1)+1$$
$$x=-2$$
$$(-2,1)$$

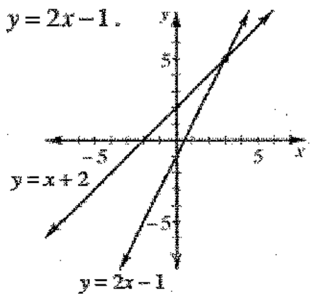
To check the solution, substitute $x=-2$ and $y=1$ into *both* of the *original* equations.

$$-2=-3(1)+1 \qquad 4(-2)-3(1)=-11$$
$$-2=-2 \qquad -11=-11$$

Review & Preview

4-49. Camila is trying to find the equation of a line that passes through the points $(-1, 16)$ and $(5, 88)$. Does the equation $y = 12x + 28$ work? Justify your answer.

4-50. The graph at right contains the lines for $y = x + 2$ and $y = 2x - 1$.



a. Using the graph, what is the solution to this system?

b. Solve the system algebraically to confirm your answer to part (a).

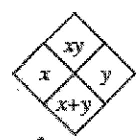
4-51. Hotdogs and corndogs were sold at last night's football game. Use the information below to write mathematical sentences to help you determine how many corndogs were sold.

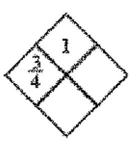
a. The number of hotdogs sold was three fewer than twice the number of corndogs. Write a mathematical sentence that relates the number of hotdogs and corndogs. Let h represent the number of hotdogs and c represent the number of corndogs.

b. A hotdog costs \$3 and a corndog costs \$1.50. If \$201 was collected, write a mathematical sentence to represent this information.

c. How many corndogs were sold? Show how you found your answer.

4-52. Copy and complete each of the Diamond Problems below. The pattern used in the Diamond Problems is shown at right.



a.


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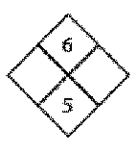
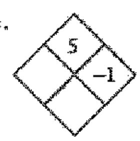
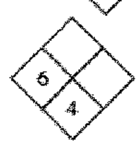


c.


d.


4-53. Rianna thinks that if $a = b$ and if $c = d$, then $a + c = b + d$. Is she correct?

4-54. Solve the following equations for x, if possible. Check your solutions.

a. $-(2 - 3x) + x = 9 - x$

b. $\frac{6}{x+2} = \frac{3}{4}$

c. $5 - 2(x + 6) = 14$

d. $\frac{1}{2}x - 4 + 1 = -3 - \frac{1}{2}x$

MATH NOTES

METHODS AND MEANINGS

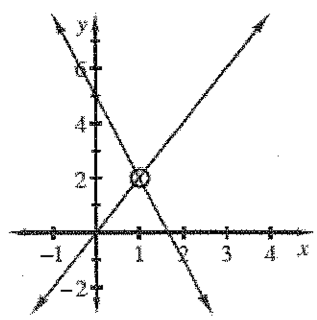
Systems of Linear Equations

A **system of linear equations** is a set of two or more linear equations that are given together, such as the example at right:

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

If the equations come from a real-world situation, then each variable will represent some type of quantity in both equations. For example, in the system of equations above, y could stand for a number of dollars in *both* equations and x could stand for the number of weeks.

To represent a system of equations graphically, you can simply graph each equation on the same set of axes. The graph may or may not have a **point of intersection**, as shown circled at right.



Also notice that the point of intersection lies on *both* graphs in the system of equations. This means that the point of intersection is a **solution** to *both* equations in the system. For example, the point of intersection of the two lines graphed above is $(1, 2)$. This point of intersection makes both equations true, as shown at right.

$$y = 2x \qquad (2) = 2(1) \qquad 2 = 2$$

$$y = -3x + 5 \qquad (2) = -3(1) + 5 \qquad 2 = -3 + 5 \qquad 2 = 2$$

The point of intersection makes both equations true; therefore the point of intersection is a solution to both equations. For this reason, the point of intersection is sometimes called a **solution to the system of equations.**

4-60. Find the point of intersection of each pair of lines, if one exists. If you use an Equation Mat, be sure to record your process on paper. Check each solution, if possible.

a. $x = -2y - 3$
$4y - x = 9$

b. $x + 5y = 8$
$-x + 2y = -1$

c. $4x - 2y = 5$
$y = 2x + 10$

4-61. Jai was solving the system of equations below when something strange happened.

$$y = -2x + 5$$
$$2y + 4x = 10$$

a. Solve the system. Explain to Jai what the solution should be.

b. Graph the two lines on the same set of axes. What happened?

c. Explain how the graph helps to explain your answer in part (a).

4-62. On Tuesday the cafeteria sold pizza slices and burritos. The number of pizza slices sold was 20 less than twice the number of burritos sold. Pizza sold for $2.50 a slice and burritos for $3.00 each. The cafeteria collected a total of $358 for selling these two items.

a. Write two equations with two variables to represent the information in this problem. Be sure to define your variables.

b. Solve the system from part (a). Then determine how many pizza slices were sold.

4-63. A local deli sells 4-inch sub sandwiches for $2.95. It has decided to sell a "family sub" that is 50 inches long. How much should it charge? Show all work.

4-64. Use generic rectangles to multiply each of the following expressions.

a. $(x+2)(x-5)$

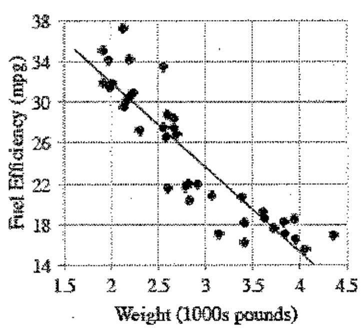
b. $(y+2x)(y+3x)$

c. $(3y-8)(-x+y)$

d. $(x-3y)(x+3y)$

4-65. A consumer magazine collected the following data for the fuel efficiency of cars (miles per gallon) compared to weight (thousands of pounds).

$e = 49 - 8.4w$
w is the weight (1000s of pounds) and e is the fuel efficiency (mpg).



a. Describe the association between fuel efficiency and weight.

b. Cheetah Motors has come out with a super lightweight sports utility vehicle (SUV) that weighs only 2800 pounds. What does the model predict the fuel efficiency will be?

METHODS AND MEANINGS

Forms of a Linear Function

MATH NOTES

There are three main forms of a linear function: slope-intercept form, standard form, and point-slope form. Study the examples below.

Slope-Intercept form: $y = mx + b$. The slope is m, and the y-intercept is $(0, b)$.

Standard form: $ax + by = c$

Point-Slope form: $y - k = m(x - h)$. The slope is m, and (h, k) is a point on the line. For example, if the slope is −7 and the point (10, 20) is on the line, the equation of the line can be written $y - (-10) = -7(x - 20)$ or $y + 10 = -7(x - 20)$.

Review & Preview

4-71. Solve these systems of equations using any method. Check each solution, if possible.

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

b. $x=8-2y$
$y-x=4$

c. $y=-\frac{1}{2}x+7$
$y=x-8$

d. $9x+10y=14$
$7x+5y=-3$

4-72. For each line below, make a table and a graph. What do you notice?

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

b. $2x-3y=3$

4-73. Find all possible values for x in each equation.

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

b. $|x-3.2|=4.7$

c. $|9+6x|=4$

c. $|-7x-7|=1$

4-74. Aimee thinks the solution to the system below is $(-4,-6)$. Eric thinks the solution is $(8, 2)$. Who is correct? Explain your reasoning.

$$2x-3y=10$$
$$6y=4x-20$$

4-75. Figure 3 of a tile pattern has 11 tiles, while Figure 4 has 13 tiles. If the tile pattern grows at a constant rate, how many tiles will Figure 50 have?

4-76. Solve each equation for the indicated variable.

a. $y=mx+b$ (for b)

b. $y=mx+b$ (for x)

c. $I=prt$ (for t)

d. $A=p+prt$ (for t)

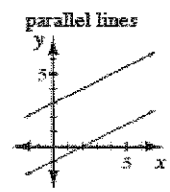
MATH NOTES

METHODS AND MEANINGS

Intersection, Parallel, and Coincide

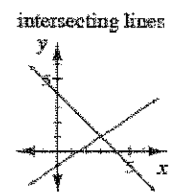
When two lines lie on the same flat surface (called a plane), they may **intersect** (cross each other) once, an infinite number of times, or never.

For example, if the two lines are **parallel**, then they never intersect. The system of these two lines does not have a solution. Examine the graph of two parallel lines at right. Notice that the distance between the two lines is constant and that they have the same slope but different y-intercepts.



However, what if the two lines lie exactly on top of each other? When this happens, we say that the two lines **coincide**. When you look at two lines that coincide, they appear to be one line. Since these two lines intersect each other at all points along the line, coinciding lines have an infinite number of intersections. The system has an infinite number of solutions. Both lines have the same slope and y-intercept.

While some systems contain lines that are parallel and others coincide, the most common case for a system of equations is when the two lines intersect once, as shown at right. The system has one solution, namely, the point where the lines intersect, (x, y).



4-81. Solve the following systems of equations using any method. Check each solution, if possible.

a. $-2x+3y=1$
$2x+6y=2$

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

c. $3x-y=7$
$y=3x-2$

d. $x+2y=1$
$3x+5y=8$

4-82. The Math Club is baking pies for a bake sale. The fruit-pie recipe calls for twice as many peaches as nectarines. If it takes a total of 168 pieces of fruit for all of the pies, how many nectarines are needed?

4-83. Candice is solving this system:

$$2x-1=3y$$
$$5(2x-1)+y=32$$

a. She notices that each equation contains the expression $2x-1$. Can she substitute $3y$ for $2x-1$? Why or why not?

b. Substitute $3y$ for $2x-1$ in the second equation to create one equation with one variable. Then solve for x and y.

4-84. Find $g(-5)$ for each function below.

a. $g(x)=x^3-2$

b. $g(x)=7+\sqrt{4-x}$

c. $g(x)=\sqrt[3]{x+(-59)}$

d. $g(x)=-4|x-1|$

4-85. Tim is buying snacks for the Mathletes who love microwave popcorn. When Tim looks at the popcorn selection he notices many brands and different prices. He wonders if the cost is related to the quality of the popcorn. To answer his question he purchases a random sample of popcorn bags and records their price. When it is time for the Mathletes meeting he pops each bag in the same microwave, opens each bag and counts the number of unpopped kernels.

Price ($)	2.30	0.60	1.30	1.50	1.70	1.00
# Unpopped	4	30	17	21	15	20

a. Make a scatterplot on graph paper and draw the line of best fit. Determine the equation of the line of best fit.

b. Estimate the number of unpopped kernels (after cooking) in a bag that costs $1.19.

4-86. This problem is part 2 of the checkpoint for solving linear equations (fractional coefficients). It will be referred to as Checkpoint 4.

Solve each equation.

a. $\frac{1}{6}m-3=-5$

b. $\frac{2}{3}x-3=\frac{1}{2}x-7$

c. $x+\frac{x}{2}-4=\frac{x}{4}$

If you needed help solving these problems correctly, then you need more practice. Review the Checkpoint 4 materials and try the practice problems. Also, consider getting help outside of class time. From this point on, you will be expected to do problems like these quickly and easily.

4-98. Find the point of intersection for each set of equations below using any method. Check your solutions, if possible.

a. $6x - 2y = 10$
$3x - 5 = y$

b. $6x - 2y = 5$
$3x + 2y = -2$

c. $5 - y = 3x$
$y = 2x$

d. $y = \frac{1}{4}x + 5$
$y = 2x - 9$

4-99. Consider the equation $-6x = 4 - 2y$.

a. If you graphed this equation, what shape would the graph have? How can you tell?

b. Without changing the form of the equation, find the coordinates of three points that must be on the graph of this equation. Then graph the equation on graph paper.

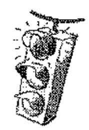
c. Solve the equation for y. Does your answer agree with your graph? If so, how do they agree? If not, check your work to find the error.

4-100. A tile pattern has 10 tiles in Figure 2 and increases by 2 tiles for each figure. Find a rule for this pattern and then determine how many tiles are in Figure 100.

4-101. Make a table and graph the rule $y = -x^2 + x + 2$ on graph paper. Label the x-intercepts.

4-102. Mr. Greer solved the equation below. However, when he checked his solution, it did not make the original equation true. Find his error and then find the correct solution.

$$4x = 8(2x - 3)$$
$$4x = 16x - 3$$
$$-12x = -3$$
$$x = \frac{-3}{-12}$$
$$x = \frac{1}{4}$$



4-103. Mr. Saksunn is concerned with his students' scores on the last math test and also concerned about the number of students looking tired in class. He decides to see if there is a relationship between the number of tired or sleepy behaviors (yawns, nodding-off, head on desk) a student exhibits and their test score. He has his assistant observe 10 students and count the number of tired behaviors during one week of class.

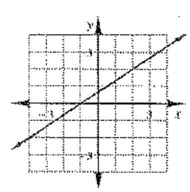
Tired Behaviors	2	4	0	2	1	7	0	1	3	6
Test Score	73	63	89	85	90	58	97	90	79	41

a. Make a scatterplot on graph paper and draw the line of best fit. Determine the equation of the line of best fit.

b. Using your equation from part (a), estimate the test score of a student who exhibits 5 tired behaviors during Professor Saksunn's math class in a week.

4-104. Thirty coins, all dimes and nickels, are worth \$2.60. How many nickels are there?

4-105. **Multiple Choice:** Martha's equation has the graph shown at right. Which of these are solutions to Martha's equation? (Remember that more than one answer may be correct.)



a. $(-4, -2)$

b. $(-1, 0)$

c. $x = 0$ and $y = 1$

d. $x = 2$ and $y = 2$

4-106. Copy and complete the table below. Then write the corresponding rule.

IN (x)	2	10	6	7	-3	0	-10	100	x
OUT (y)	-7				18	3			

4-107. Simplify each expression. In parts (c) and (d) write your answers using scientific notation.

a. $2^3 \cdot 5^{-2}$

b. $(xy^2)^3 \cdot (x^{-2})$

c. $3 \times 10^3 \cdot 4 \times 10^5$

d. $\frac{4 \times 10^2}{5 \times 10^{-2}}$

4-108. Using the variable x, write an equation that has no solution. Explain how you know it has no solution.

4-109. If $f(x) = 3 - |x|$ and $g(x) = \sqrt[3]{x} + 5$, then find:

a. $f(-5)$

b. $g(64)$

c. $f(0)$

d. $f(2)$

e. $g(-8)$

f. $g(0)$

4-110. **Multiple Choice:** Which equation below could represent a tile pattern that grows by 3 and has 9 tiles in Figure 2?

a. $3x + y = 3$

b. $-3x + y = 9$

c. $-3x + y = 3$

d. $2x + 3y = 9$

4-111. Solve the systems of equations below using the method of your choice. Check your solutions, if possible.

a. $y = 7 - 2x$
$2x + y = 10$

b. $3y - 1 = x$
$4x - 2y = 16$

4-112. Decide if the statement below is true or false. Justify your response.

"The expression $(x+3)(x-1)$ is equivalent to $(x-1)(3+x)$."

4-113. Find each of the following products by drawing and labeling a generic rectangle or by using the Distributive Property.

a. $(x+5)(x+4)$

b. $2y(y+3)$

4-114. Solve each equation below for the indicated variable, if possible. Show all steps.

a. Solve for x: $2x + 22 = 12$

b. Solve for y: $2x - y = 3$

c. Solve for x: $2x + 15 = 2x - 15$

d. Solve for y: $6x + 2y = 10$

4-115. **Consecutive integers** are integers that are in order without skipping, such as 3, 4, and 5. Find three consecutive numbers with a sum of 54.

CL 4-116. Solve the system of equations shown at right.

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

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

b. Graph the system of equations. How does the graph of the system explain what happened with the equations?

CL 4-117. Solve the system of equations shown at right.

$$18x - 3y = 9$$
$$y = 6x - 3$$

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

b. Graph the system of equations. How does the graph of the system explain what happened with the equations?

CL 4-118. Solve these systems of equations using any method.

a. $y = 3x + 7$, $y = -4x + 21$

b. $3x - y = 17$, $-x + y = -7$

c. $x = 3y - 5$, $2x + 12y = -4$

CL 4-119. Bob climbed down a ladder from his roof, while Roy climbed up another ladder next to him. Each ladder had 30 rungs. Their friend Jill recorded the following information about Bob and Roy:

Bob went down 2 rungs every second.

Roy went up 1 rung every second.

At some point, Bob and Roy were at the same height. Which rung were they on?

CL 4-120. Solve for x.

a. $6x - 11 = 4x + 12$

b. $2(3x - 5) = 6x - 4$

c. $(x - 3)(x + 4) = x^2 + 4$

d. $\frac{x}{25} = \frac{7}{10}$

e. $\frac{2}{3}x + 3 = \frac{1}{4}x - 7$

f. $x + \frac{x}{3} = 4$

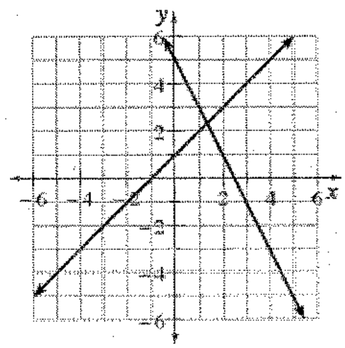
CL 4-121. Solve the equations in parts (a) and (b) for y. Then state the slope and the y-intercept of each equation in part (c).

a. $-6x-2y=8$

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

c. For each of the two solved equations, find the y-intercept and slope. Justify your answers.

CL 4-122. Leo solved a system of equations by graphing and the graph is shown at right.



a. Estimate the solution from the graph.

b. What is the equation of each line in the system?

c. Solve the system algebraically. How accurate was your estimate?

CL 4-123. As treasurer of his school's FFA club, Kenny wants to buy gifts for all 18 members. He can buy t-shirts for \$9 and sweatshirts for \$15. The club has only \$180 to spend. If Kenny wants to spend all of the club's money, how many of each type of gift can he buy?

a. Write a system of equations representing this problem.

b. Solve your system of equations and figure out how many of each type of gift Kenny should buy.

CL 4-124. Simplify each expression to one without zero or negative exponents. In part (d), write the answer in scientific notation.

a. 3^{-2}

b. $a^3b^2(b^{-1})^3$

c. $\frac{x^2y^3}{x^2y^{-1}}$

d. $\frac{4\times10^5}{8\times10^7}$

CL 4-125. Rewrite each expression below as a product and as a sum.

a. $(x+7)(2x-5)$

b. $5x(y-7)$

c. $(3x-7)(x^2-2x+11)$

CL 4-126. Check your answers using the table at the end of the closure section. Which problems do you feel confident about? Which problems were hard? Use the table to make a list of topics you need help on and a list of topics you need to practice more.