

The semester A examination for Bridge to Algebra 2 will consist of two parts. Part 1 will be selected response. Part 2 will be short answer.

- Students may use a calculator.
- If a calculator is used to find points on a graph, the appropriate calculator function (i.e. zero, intersect, minimum or maximum) should be used. The trace function should not be used.
- Decimal approximations must be accurate to three places after the decimal point.

The formulas below will be provided in the examination booklet.

Equations of a Line
Standard Form: $Ax + By = C$
Slope-Intercept Form: $y = mx + b$ or $y = b + mx$

Probability
Experimental probability: $P(\text{event}) = \frac{\text{Number of observed occurrences of event}}{\text{Total number of observations}}$
Theoretical probability: $P(\text{event}) = \frac{\text{Number of outcomes in event}}{\text{Total number of equally likely possible outcomes}}$

1. A recipe calls for 2 cups of juice concentrate and 3 cups of water. Sal has 5 cups of juice concentrate and will use all of it. How much water will he use to follow the recipe?
2. A recipe that serves 8 people calls for 5 pounds of apples and 2 cups of flour. You want to prepare the recipe for 24 people.
 - a. How many pounds of apples will you need?
 - b. How many cups of flour will you need?
 - c. If a 5 pound bag of apples costs \$6.49, how much money will it cost to buy apples for the recipe for 24 people?
3. About $\frac{1}{90}$ of all human births are twins. If a nurse has attended 6,000 births, about how many of them resulted in twins?

4. A certain car gets 25 miles per gallon on the highway.
 - a. How many gallons of gas are used for that car to be driven 125 miles on the highway?
 - b. If gas costs \$2.79 per gallon, what is the cost, per mile, for gas when the car drives on the highway?

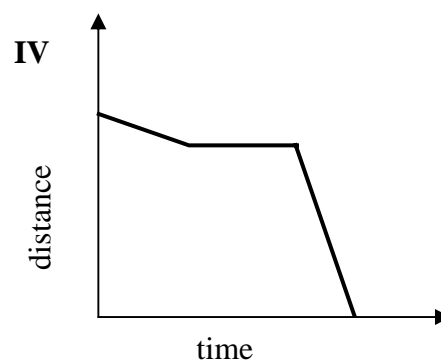
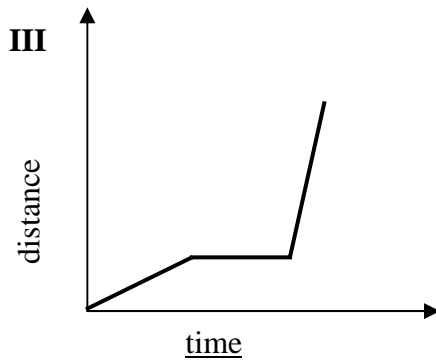
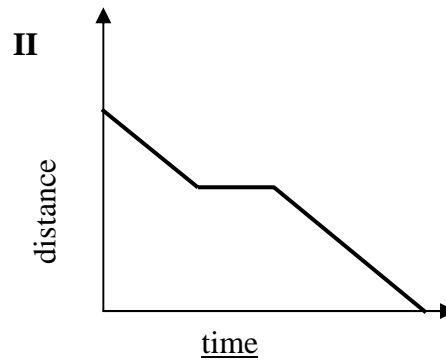
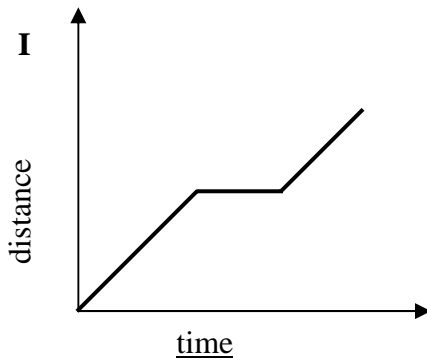
5. A ship has a leak and takes on water at a rate of 5 gallons every 6 hours.
 - a. How many gallons of water would the ship take on in 24 hours?
 - b. How many gallons of water would the ship take on each hour (this is the hourly rate of change in gallons per hour)?

6. Cara’s car uses 5 gallons of gas to travel 132 miles on the highway. Max’s car used 3 gallons of gas to travel 84 miles on the highway. Whose car has better gas mileage?

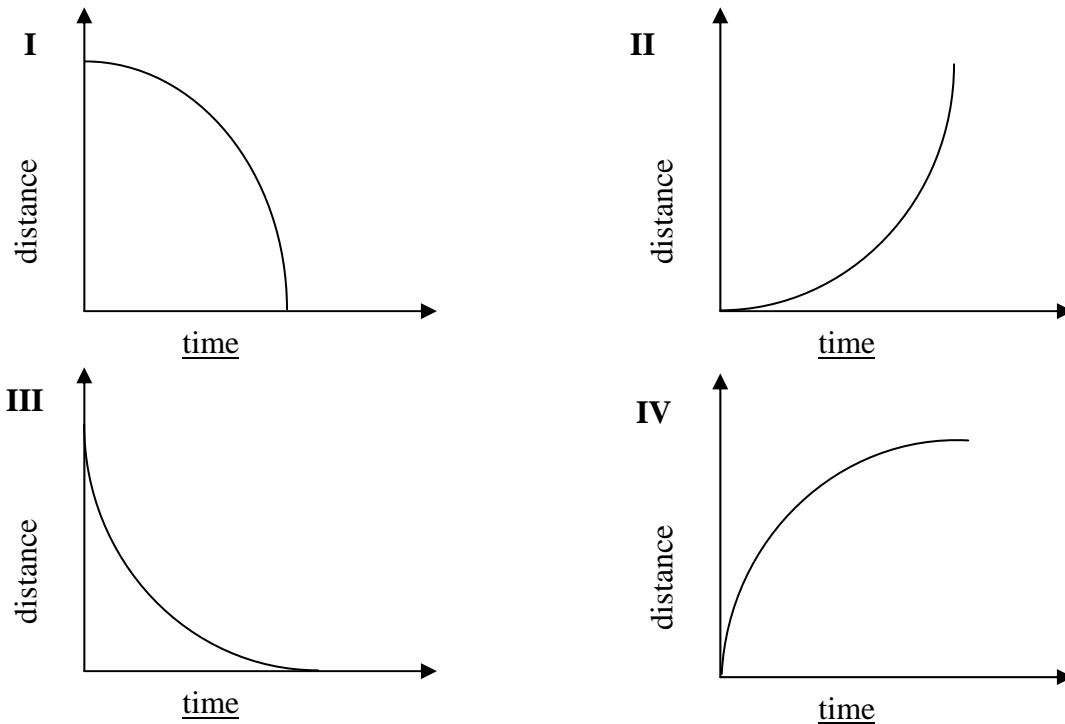
7. Stewart’s puppy gained 8 pounds in 3 months. Crystal’s puppy gained 14 pounds in 5 months. Whose puppy gained weight at a faster rate?

Match each story to the appropriate graph below.

8. Daniel gets up from his beach chair and begins to walk at a steady pace to the ice cream stand. After a while, he stops and talks to some friends. Then he continues to walk to the ice cream stand at his original steady pace.
 - a. Which graph (I, II, III, or IV) below could represent Daniel’s distance from his beach chair as a function of time?
 - b. Which graph (I, II, III, or IV) below could represent Daniel’s distance from the ice cream stand as a function of time?



9. A ball is at the top of a ramp. It rolls down the ramp with increasing speed and then falls into a hole in the ground.
- Which graph (I, II, III, or IV) below could represent the ball's distance from the top of the ramp as a function of time?
 - Which graph (I, II, III, or IV) below could represent the ball's distance from the hole as a function of time?



In problems 10 through 12, solve each equation twice, once for each of the two variables on the right-hand side of the equation.

10. $P = 2l + 2w$

11. $y = \frac{1}{2}x + r$

12. $v = \frac{2}{3}t + m$

13. Circle the equations that are mathematically equivalent to $P = 2l + 2w$.

$$w = \frac{P - 2l}{2}$$

$$l = \frac{P}{2} - w$$

$$w = \frac{P}{2} - l$$

$$P = 2(l + w)$$

$$\frac{P}{2} = l + w$$

$$l = \frac{P - 2w}{2}$$

14. Circle the equations that are mathematically equivalent to $y = \frac{1}{2}x + r$.

$$r = y - \frac{1}{2}x$$

$$x = 2y - 2r$$

$$x = \frac{1}{2}y - r$$

$$2y = x + 2r$$

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

$$r = 2y - x$$

15. Circle the equations that are mathematically equivalent to $m = v - \frac{2}{3}t$.

$$t = \frac{2}{3}(v - m)$$

$$t = \frac{3}{2}v - m$$

$$v = \frac{2}{3}t + m$$

$$t = \frac{3}{2}(v - m)$$

$$t = \frac{2}{3}v - m$$

$$t = \frac{3}{2}v - \frac{3}{2}m$$

In problems 16 through 19, solve for x .

16. $3x = x + 10$

17. $2 - 4(x - 3) = -9(10 - x)$

18. $11 - 8x = 3\left(x + \frac{11}{8}\right)$

19. $5x + 10 = -3x - 14$

In problems 20 through 24, solve and graph the solutions to the following inequalities.

20. $3x \geq x + 10$

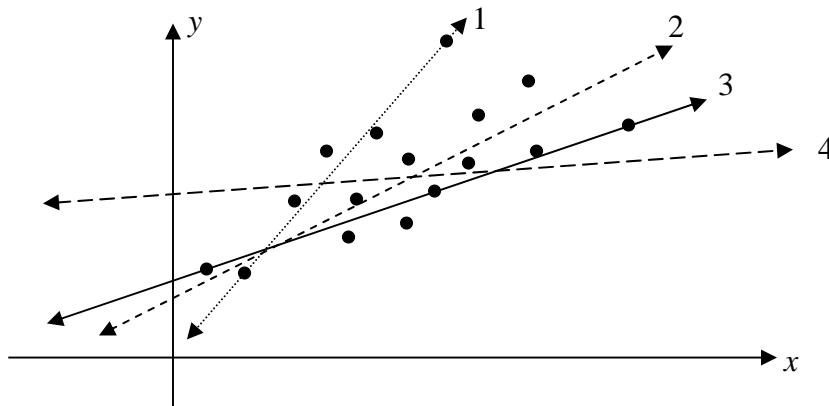
21. $3x \leq x + 10$

22. $2 - 4(x - 3) < -9(10 - x)$

23. $11 - 8x \geq 3\left(x + \frac{11}{8}\right)$

24. $5x + 10 > -3x - 14$

25. Jose will order a pizza. Pete’s Pizza charges \$18 for a large pizza including any toppings. Paolo’s Pizza charges \$15 for a large pizza plus \$0.75 per topping. For what number of toppings is Paolo’s large pizza less expensive than Pete’s large pizza?
- Write a linear inequality that can be solved to answer this question.
 - Solve the linear inequality.
 - What is the practical meaning of your solution?
26. Victor is offered two jobs. Computer Industries will pay Victor a \$3,000 sign-on bonus plus \$1,250 per week. Ideal Imaging will pay Victor \$1,600 per week. How many weeks of work would it take for Victor to earn more at Ideal Imaging?
- Write a linear inequality that can be solved to answer this question.
 - Solve the linear inequality.
 - What is the practical meaning of your solution?
27. How many solutions are there to each of the following linear equations in 2 variables?
- $y = 15 + .75x$ $y = 3000 + 1250x$ $y = 1600x$ $y = \frac{2}{3}x$ $3y = 2x$ $2x + 3y = 8$
- 0
 - 1
 - 2
 - There are an infinite number of solutions
28. What does the graphical representation of a two-variable linear equation look like? Where are the solutions?
29. Graph the solutions to the equations in item 27 above.
30. Sophi graphed some data and drew some lines through it. Which line (1, 2, 3, or 4) is the most reasonable estimate for a line of best fit?



31. Look for connections between the context, table, equation, and graph below.

Context:

Marina is driving on a highway.
 At noon, she was already 80 miles from home.
 Between noon and 5 P.M., she traveled at a constant rate of 65 miles per hour. Model Marina's distance from home as a function of time since noon.

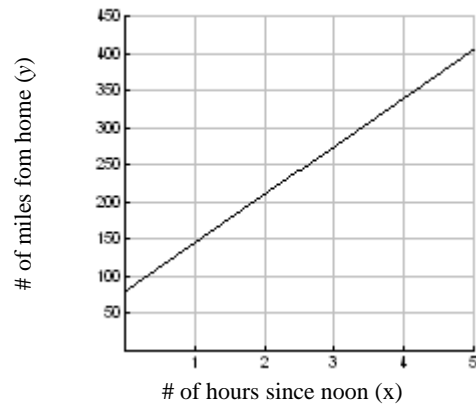
Equation:

$$y = 80 + 65x$$

Table:

# of hours since noon	# of miles from home
0	80
1	145
2	210
3	275
4	340
5	405

Graph:



- Where is the y-intercept in each of these representations?
- Where is the slope (rate of change) in each of these representations?

32. Look for connections between the context, table, equation, and graph below.

Context:

A 500 gallon underground water storage tank has a leak. The tank is full and then water leaves the tank at a constant rate of 5 gallons every 6 hours. Model the amount of water left in the tank as a function of time since the leak began when the tank was full.

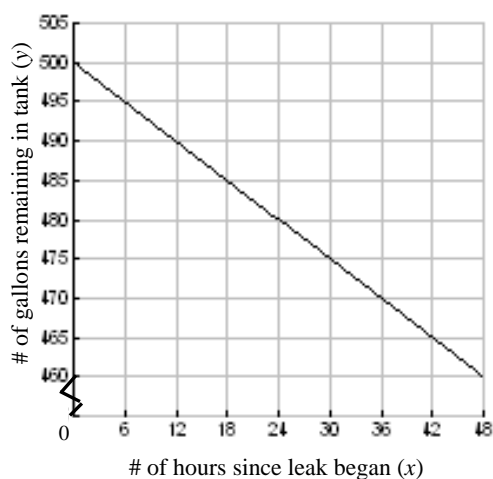
Equation:

$$y = 500 - \frac{5}{6}x$$

Table:

# of hours since leak began	# of gallons remaining in tank
0	500
1	$499\frac{1}{6}$
6	495
12	490
18	485
24	480

Graph:



- Where is the y-intercept in each of these representations?
- Where is the slope (rate of change) in each of these representations?

For problems 33 through 36 determine if each is a function.

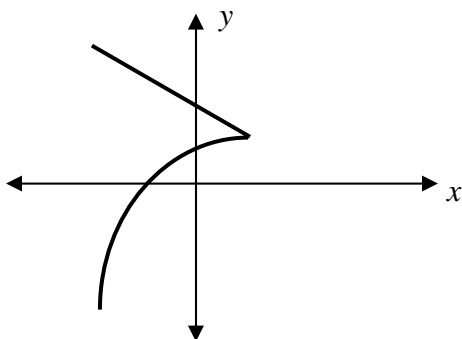
33.

x	y
-2	-1
-1	0
-1	3
0	7
3	2
5	6
5	4

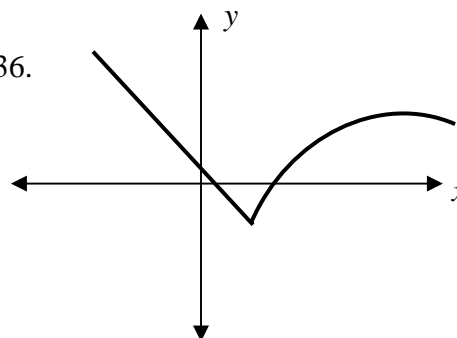
34.

x	y
-2	-1
-1	0
0	3
1	7
3	2
5	6
9	4

35.



36.



For problems 37 through 39, complete the tables so that the functions are linear.

37.

x	y
-3	5
-2	3
-1	
0	
1	
2	
3	

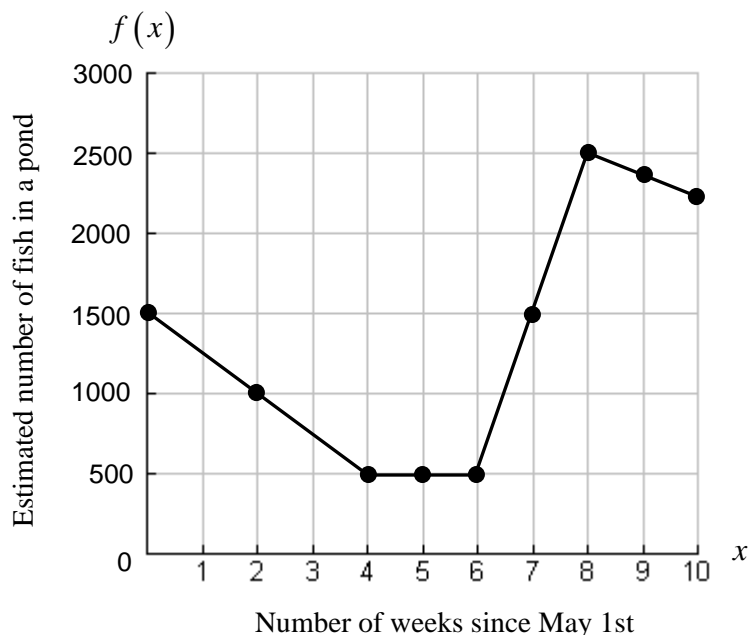
38.

Number of cups of juice concentrate, x	Number of cups of water, y
0	0
1	
2	3
3	
4	
5	
6	

39.

Number of pounds of apples, x	Number of cups of flour, y
0	0
1	
	1
3	
5	2
9	
	4

40. Look at the graph below.



- What are the units of measurement for the rate of change?
- Over what intervals does there appear to be a constant rate of change?
- Write a piecewise function, $f(x)$ that represents the estimated number of fish in the pond each week since May 1st.

$$f(x) = \left\{ \begin{array}{l} \\ \\ \\ \\ \end{array} \right.$$

d. Fill in the blanks to explain the practical meaning of the slope of the piecewise function.

During the weeks _____, the fish population changed at a rate of _____ fish per week.
 During the weeks _____, the fish population changed at a rate of _____ fish per week.
 During the weeks _____, the fish population changed at a rate of _____ fish per week.
 During the weeks _____, the fish population changed at a rate of _____ fish per week.

- What is the average rate of change over the interval $x = 2$ to $x = 7$?
- What is the practical meaning of the value you obtained in (e)?
- How could you show (e) and (f) on the graph?

For problems 41 and 42, match appropriate parts of the contexts and questions below with the corresponding equation from the equation bank. If a statement or question does not correspond with any equation in the bank, write “no equation.” Cross out any equations in the equation bank that do not correctly relate to any of the contexts or questions below.

41. a. Lisa sells x computers for \$2300 each and y printers for \$400 each.
 b. Altogether, Lisa sold computers and printers for a total of \$5800.
 c. Lisa sold 5 items.
42. a. Cheri had \$2300 in her savings account at the beginning of the year. Each month, she deposits \$400. Let y = the amount of money Cheri has saved in x months since the beginning of the year.
 b. When will Cheri have \$5800?
 c. How much money, y , will Cheri have after 5 months?

Equation Bank for problems 41 and 42:		
I. $x + y = 5$	II. $y = 2300 + 400x$	III. $y = 400 + 2300x$
IV. $2300x + 400y = 5800$	V. $y = 2300 + 400(5)$	VI. $5800 = 2300 + 400x$

43. Write a matrix equation for Lisa’s situation in #41.
44. The edge of a historic house is near a steep cliff. The local historical society is concerned about erosion and keeps track of the distance from the house to the edge of the cliff. The following is a table of information.

Calendar Year	1975	1980	1985	1990	1995	2000	2005
Number of years, x , since 1975	0	5	10	15	20	25	30
Distance, y , from house to edge of cliff, in feet.	26.00	24.60	23.25	21.90	20.70	19.60	18.25

You have been hired by the historical society to model the data and predict when the cliff will erode to the edge of the house.

- a. Determine the equation of the regression line. Round your numbers to three places after the decimal point.
- b. What is the value of the slope in your regression line?
- c. What is the practical meaning of slope in this context?
- d. What is the value of the y-intercept in your regression line?
- e. What is the practical meaning of the y-intercept in this context?
- f. How does the y-intercept compare to information given in the data table? Why?
- g. According to your regression equation, how many feet will the edge of the cliff be from the house in the year 2015?
- h. According to your regression equation, when will the cliff have eroded to the edge of the house?

45. Select the graph that matches each equation.

Equations

a. $y = 10 + \frac{10}{3}x$

b. $-3x + 10y = 0$

c. $3y = 10x$

d. $3y = 30 - 10x$

e. $10x - 3y = 0$

f. $3y = 30 + 10x$

g. $y = 10 - \frac{10}{3}x$

h. $10y = 3x$

i. $10x - 3y = -30$

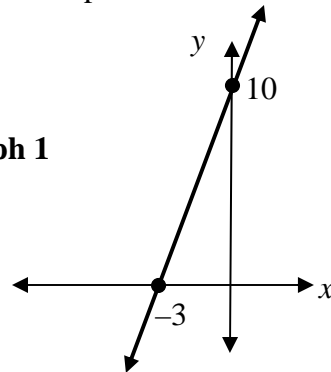
j. $y = \frac{3}{10}x$

k. $10x + 3y = 30$

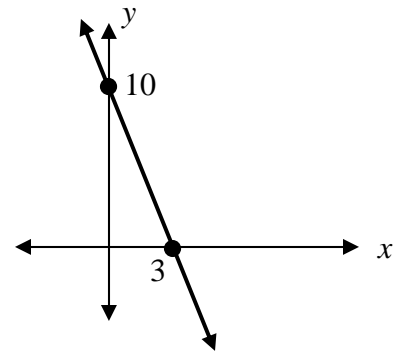
l. $y = \frac{10}{3}x$

Graphs

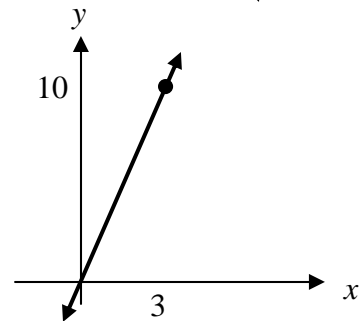
Graph 1



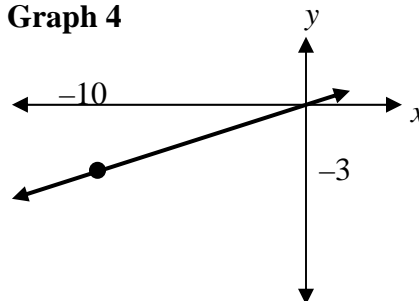
Graph 2



Graph 3



Graph 4



53. Let's look back at Victor's situation in #26. Victor is offered two jobs. Computer Industries will pay Victor a \$3,000 sign-on bonus plus \$1,250 per week. Ideal Imaging will pay Victor \$1,600 per week.
- Model Victor's situation with Computer Industries using a linear equation.
 - What is the y-intercept and what is its practical meaning in this context?
 - What is the slope and what is its practical meaning in this context?
 - Model Victor's situation with Ideal Imaging using a linear equation.
 - What is the y-intercept and what is its practical meaning in this context?
 - What is the slope and what is its practical meaning in this context?
 - Write the equations for Victor's situation with Computer Industries and with Ideal Imaging as a system of equations.
 - Solve the system of equations.
 - What is the practical meaning of the solution to the system of equations?
54. Victor decides to move closer to his work. He looks at apartments to rent with some of his friends. In Manor Park Apartments, he must contribute \$800 to the deposit, and then pay \$700 rent per month. In Sunnyside View Apartments, he must contribute \$450 to the deposit, and then pay \$750 rent per month.
- Write a system of linear equations that represents Victor's rental situation.
 - Solve the system of equations.
 - What is the practical meaning of the solution to the system of equations?

55. Let's look back at Lisa's situation in #41. Lisa sells x computers for \$2300 each and y printers for \$400 each. Altogether, Lisa sold computers and printers for a total of \$5800. Lisa sold 5 items. How many computers did she sell? How many printers did she sell?
- What is the practical meaning of the expression $2300x$ in Lisa's context?
 - What is the practical meaning of the expression $400y$ in Lisa's context?
 - What is the practical meaning of the expression $2300x + 400y$ in Lisa's context?
 - What is the relationship between $2300x + 400y$ and \$5800 in Lisa's context?
 - What equation can be written that utilizes what you noted in (d)?
 - How many items did Lisa sell altogether?
 - How can (f) be used to make an equation involving x and y ?
 - Write a system of equations that represents Lisa's situation.
 - Solve the system of equations.
 - What is the practical meaning of the solution to the system of equations?
56. In the morning, Lisa exercised for 6 miles along a 6-mile trail. Lisa knows that she jogs at a steady pace of 15 minutes per mile, and walks at a steady pace of 25 minutes per mile. Lisa completed the 6-mile trail in 110 minutes. She wants to figure out the distance she ran, x , and the distance she walked, y .
- Write a system of linear equations that represents Lisa's exercise situation.
 - Solve the system of equations.
 - What is the practical meaning of the solution to the system of equations?
 - Write a matrix equation to represent Lisa's exercise situation.

57. Choose the correct graph for each system of inequalities.

a. $y \geq \frac{2}{3}x$

b. $y \leq \frac{2}{3}x$

c. $y \geq \frac{2}{3}x$

d. $y \leq \frac{2}{3}x$

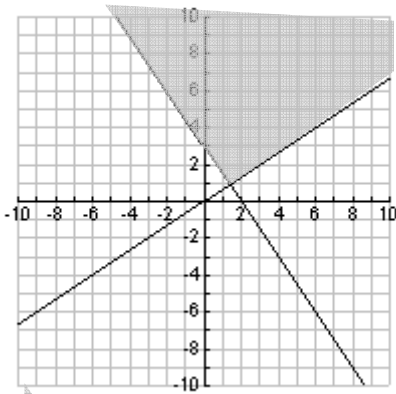
$y \geq -\frac{3}{2}x + 3$

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

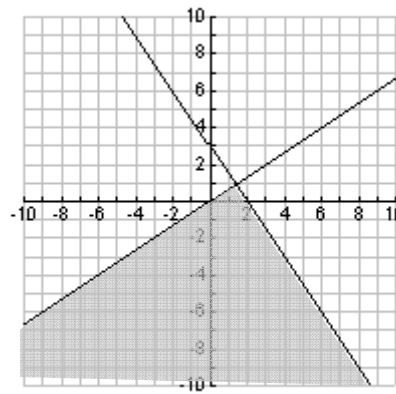
$y \leq -\frac{3}{2}x + 3$

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

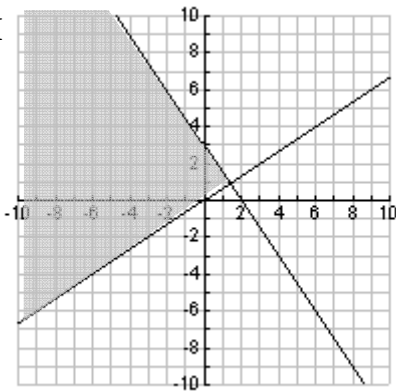
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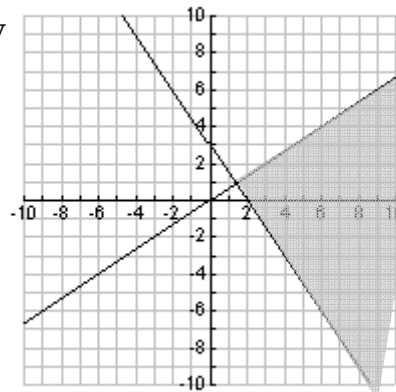
II



III



IV



58. A school club can spend no more than \$200 to buy t-shirts and hats for a fundraiser. T-shirts cost the club \$5 each and hats cost the club \$2 each. The club will then sell them to students to raise money. Students can buy t-shirts for \$12 each and hats for \$6 each. The club must net a profit of at least \$220 from this fundraiser.

Let x = number of t-shirts

Let y = number of hats

- a. Complete the chart to help organize the information.

	Amount of money each item costs the club	Amount of money for which the club will sell each item to students	Profit per item
t-shirt			
Hat			

- b. Write a system of linear inequalities to represent the club's situation.
 Hint:
 Let one inequality represent the number of t-shirts and hats that the club can purchase.
 Let the other inequality represent the profit gained for x t-shirts and y hats.
- c. Graph the solution to the system of inequalities.
- d. Write 5 combinations of the number of t-shirts and hats that can be bought and then sold to students for the club to raise at least \$220.

59. Lisa must sell at least 20 items this month. Computers now cost \$2400 and printers still cost \$400. Lisa also must sell a total of at least \$20,000 worth of merchandise this month.

Let x represent the number of computers.

Let y represent the number of printers.

- a. Write a system of linear inequalities to represent Lisa's situation.
- b. Graph the solution to the system of inequalities.
- c. Write 5 combinations of selling computers and printers that will work for Lisa's situation.
60. Victor is buying picture frames to hang in his new apartment. He can spend no more than \$120 on the frames. Victor found small frames that cost \$6 each and large frames that cost \$12 each. Victor needs at least 10 frames.

Let x represent the number of small frames.

Let y represent the number of large frames.

- a. Write a system of inequalities to model this situation.
- b. Graph the solution
- c. Write 6 combinations for the number of large and small frames Victor can buy.

61. Daniel saw the following sign at the ice cream stand on the beach.

<p style="text-align: center;"><u>ICE CREAM SANDWICHES</u> \$2 each</p> <p style="text-align: center;">But 5 for \$2 each and get more for only \$1 each!</p>

Let x = number of ice cream sandwiches
Let y = total cost for x ice cream sandwiches

Write an appropriate piecewise function that represents the situation.

62. Victor decided to take the job at Creative Imaging where he would earn \$1600 per week. Victor has done such a good job that, after his 6-month review (26 weeks), his boss recommended him for a raise beginning with his 28th weekly paycheck. Victor's weekly salary will increase by 3% to \$1648.

Let x = number of weekly paychecks earned since Victor began working at Creative Imaging.
Let y = total dollars earned since Victor began working at Creative Imaging.

Write an appropriate piecewise function that represents the situation.

For problems 63 through 67 use the following matrices:

$$A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix} \quad B = \begin{bmatrix} 5 & 6 \\ 7 & 8 \end{bmatrix}$$

63. a. $A + B$
b. $B + A$
c. What do you notice about (a) and (b) above?
64. a. $A - B$
b. $B - A$
c. What do you notice about (a) and (b) above?
65. a. AB
b. BA
c. What do you notice about (a) and (b) above?
66. a. Write the 2×2 identity matrix, $I_{2 \times 2}$.
b. $A \cdot I_{2 \times 2}$
c. $I_{2 \times 2} \cdot A$
d. What do you notice about (b) and (c)?
67. a. Find $\det A$
b. Use $\det A$ to find A^{-1}
c. $A \cdot A^{-1}$
d. $A^{-1} \cdot A$
e. What do you notice about (c) and (d) above?
68. Think back to Lisa's situation in #41 and the matrix equation you wrote in #43.
a. Solve the matrix equation using inverse matrices.
b. How many computers did Lisa sell? How many printers did Lisa sell?
c. Is this the same answer you obtained in #55(j)?
69. Think back to Lisa's situation in #56 and the matrix equation you wrote in #56(d).
a. Solve the matrix equation using inverse matrices.
b. How far did Lisa run? How far did Lisa walk?
c. Is this the same answer you obtained in #56(c)?

70. Trish, Tony and Val are on an archery team. During each practice round, Trish, Tony and Val each shoot ten arrows toward the target. The target has 5 concentric rings of color. From the outer edge, the colors are white, black, blue, red, yellow. Yellow is the center area and is the bull's-eye. Results of four practice rounds are shown in the tables below.

Name	Round 1				
	White	Black	Blue	Red	Yellow
Trish	5	3	2	0	0
Tony	5	2	3	0	0
Val	3	7	0	0	0

Round 2				
White	Black	Blue	Red	Yellow
4	3	3	0	0
4	2	2	2	0
3	4	2	1	0

Name	Round 3				
	White	Black	Blue	Red	Yellow
Trish	3	2	3	2	0
Tony	3	2	3	1	1
Val	2	2	2	2	2

Round 4				
White	Black	Blue	Red	Yellow
0	3	2	3	2
1	2	2	2	3
0	1	2	4	3

- Represent each round using a matrix. Label the matrices A, B, C, D .
- Let matrix $T = A + B + C + D$. Write T .
- What is the practical meaning of T in this context?
- Each colored part of the target is worth a certain number of points as follows:

White = 1 point
 Black = 3 points
 Blue = 5 points
 Red = 7 points
 Yellow = 9 points

- Create a 5×1 matrix P to represent the information in (d).
- How could you use matrices T and P to determine each person's total number of points earned in the four rounds?
 - How many points did Trish get? How many points did Tony get? How many points did Val get?

71. At the beginning of each football game, a coin is tossed and lands either heads or tails up. Of the first 70 coin tosses, 38 were heads up, and 32 were tails up. What is the probability that the next time the coin is tossed it will land heads up?
72. Victor's company is designing a new keyboard for computers. The placement of keys will be based on the frequency of their usage. The company samples documents in English and counts the number of times each letter appears. The following table shows the frequency of letters in one small sample of 90 letters.

Letter	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	Total
Freq.	8	1	3	4	12	2	2	6	7	0	1	4	2	7	8	2	0	6	6	9	3	1	2	0	2	0	90

Consider vowels as including the letters a, e, i, o, u, and y.

Use the data above to determine the following in (a) through (d).

- The probability that a letter selected from the sample is "x"
 - The probability that a letter selected from the sample is "e"
 - The probability that a letter selected from the sample is a vowel
 - The probability that a letter selected from the sample is "e" given that a vowel is selected.
- e. Victor's research group decided which keys on the keyboard will be used for the 26 letters. How many different ways are there to arrange the letters on the 26 keys?
73. Trish, Tony, and Val each enter one ticket into a drawing to win prizes at Lisa's computer store. 175 tickets have been entered. When a ticket is drawn from the box, it will not be put back into the box. What is the probability that Trish's ticket will be drawn first, and Tony's ticket will be drawn second, and Val's ticket will be drawn third?
74. Victor exercises on the same 6-mile trail as Lisa. Victor plans to go to the trail 5 days in the month of April. Lisa plans to go to the trail 6 days in the month of April. What is the probability that Victor and Lisa will go to the trail on the same day in April?