Prob/Stat/Discrete **Name**_____
10.1 Worksheet

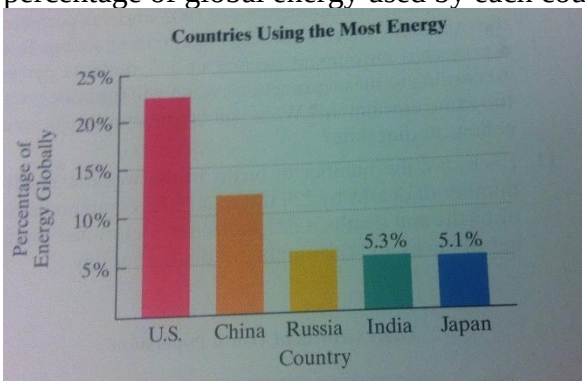
1. One number exceeds another by 26. The sum of the numbers is 64. What are the numbers?

2. In 2000, the population of Greece was 10,600,000, with projections of a population decreases of 28,000 people per year. In the same year, the population of Belgium was 10,200,000, with the projections of a population decreases of 12,000 people per year. According to these projections, when will the two countries have the same population? What will be the population at that time?

3. In 2007, there were 13,300 students at college A, with a projected enrollment increase of 1000 students per year. In the same year, there were 26,800 students at college B, with a projected enrollment decline of 500 students per year. According to these projections, when will the colleges have the same enrollment? What will be the enrollment in each college at that time?

4. Each day, the number of births in the world exceeds the number of deaths by 229 thousand. The combined number of births and deaths is 521 thousand. Determine the number of births and the number of deaths per day.

5. The bar graph shows the percentage of global energy used by the countries consuming the most energy. The percentage of global energy used by China exceeds Russia by 6% and the percentage of global energy used by the United States exceeds Russia by 16.4%. Combined, the United States, China, and Russia consume 40.4% of the world's energy. Determine the percentage of global energy used by each country.



6. The bus fare in a city is $1.25. People who use the bus have the option of purchasing a monthly coupon book for $15.00. With the coupon book, the fare is reduced to $0.75. Determine the number of times in a month the bus must be used so that the total monthly cost without the coupon book is the same as the total monthly cost with the coupon book.

7. Suppose that we agree to pay you 8¢ for every problem in this chapter that you solve correctly and fine you 5¢ for every problem done incorrectly. If at the end of 26 problems we do not owe each other any money, how many problems did you solve correctly?

8. It was wartime when the Ricardos found out Mrs. Ricardo was pregnant. Ricky Ricardo was drafted and made out a will, deciding that $14,000 in a savings account was to be divided between his wife and his child-to-be. Rather strangely, and certainly with gender bias, Ricky stipulated that if the child were a boy, he would get twice the amount of the mother's portion. If it were a girl, the mother would get twice the amount the girl was to receive. We'll never know what Ricky was thinking of, for (as fate would have it) he did not return from war. Mrs. Ricardo gave birth to twins—a boy and a girl. How was the money divided?

Prob/Stat/Discrete **Name**_____

10.2 Worksheet

In Exercises 1-6, solve each proportion.

1. $\frac{56}{x} = \frac{8}{7}$
2. $\frac{x}{32} = \frac{3}{24}$
3. $\frac{x}{2} = -\frac{1}{5}$
4. $\frac{-3}{8} = \frac{6}{x}$
5. $\frac{x+4}{8} = \frac{3}{16}$
6. $\frac{2}{y-5} = \frac{3}{y+6}$

In Exercises 7 and 8, use a proportion to solve each variation problem.

7. y varies directly as x, y = 45 when x = 5. Find y when x = 13.

8. y varies inversely as x, y = 6 when x = 3. Find y when x = 9.

In Exercises 9-11, solve each proportion for x.

9. $\frac{a}{x} = \frac{b}{c}$
10. $\frac{a-b}{c} = \frac{x}{d}$
11. $\frac{ax-b}{b} = \frac{c-d}{d}$

Use a proportion to solve Exercises 12-14.

12. The maintenance bill for a shopping center containing 180,000 square feet is $45,000. What is the bill for a store in the center that is 4800 square feet?

13. To estimate the number of bass in a lake, wildlife biologists tagged 50 bass and released them in the lake. Later they netted 108 bass and found 27 of them tagged. Approximately how many bass are in the lake?

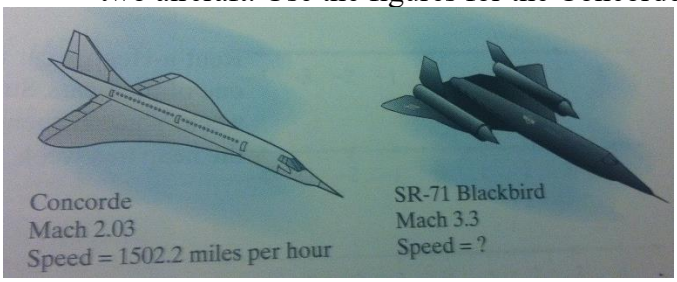
14. Many areas of Northern California depend on the snow-pack of the Sierra Nevada mountain range for their water supply. Meteorologists have determined that 250 cubic centimeters of snow will melt to 28 cubic centimeters of water. How much water does 1200 cubic centimeters of melting snow produce?

Exercises 15-21 involve direct and inverse variation. Use a proportion to solve each exercise.

15. The height that a ball bounces varies directly as the height from which it was dropped. A tennis ball dropped from 12 inches bounces 8.4 inches. From what height was the tennis ball dropped if it bounces 56 inches.

16. A person's hair length varies directly as the number of years it has been growing. After 2 years, a person's hair length is 8 inches. The longest moustache on record was grown by Kalyan Sain of India. Sain grew his moustache for 17 years. How long was it?

17. The Mach number is a measurement of speed named after the man who suggested it, Ernest Mach (1838-1916). The speed of an aircraft varies directly as its Mach number. Shown here are two aircraft. Use the figures for the Concorde to determine the Blackbird's speed.



18. The distance that an object falls varies directly as the square of the time it has been falling. An object falls 144 feet in 3 seconds. Find how far it will fall in 7 seconds.

19. The time that it takes you to get to campus varies inversely as your driving rate. Averaging 20 miles per hour in terrible traffic, it takes you 1.5 hours to get to campus. How long would the trip take averaging 60 miles per hour?

20. The current in a circuit varies inversely as the resistance. The current is 20 amperes when the resistance is 5 ohms. Find the current for a resistance of 16 ohms.

21. Radiation machines, used to treat tumors, produce an intensity of radiation that varies inversely as the square of the distance from the machine. At 3 meters, the radiation intensity is 62.5 milliroentgens per hour. What is the intensity at a distance of 2.5 meters?

Prob/Stat/Discrete **Name**_____
10.3 Worksheet

In Exercises 1-9, solve each inequality and graph the solution set on a number line.

1. $3x + 3 < 18$

2. $\frac{x}{4} < -1$

3. $3x + 4 \leq 2x + 7$

4. $14 - 3x > 5$

5. $5 - x \leq 1$

6. $4x - 7 > 9x - 2$

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

8. $7 < x + 5 < 11$

9. $-3 \leq \frac{2}{3}x - 5 < -1$

10. A car can be rented from Basic Rental for $60 per week plus 50 cents for each mile driven. How many miles can you travel if you can spend at most $600 for the week?

11. An elevator at a construction site has a maximum capacity of 3000 pounds. If the elevator operator weighs 245 pounds and each cement bag weighs 95 pounds, up to how many bags of cement can be safely lifted on the elevator in one trip?

12. A car can be rented from Basic Rental for $260 per week with no extra charge for mileage. Continental charges $80 per week plus 25 cents for each mile driven to rent the same car. How many miles must be driven in a week to make the rental cost for Basic Rental a better deal than Continental's?

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10.4 Worksheet

In Exercise 1, determine whether the given ordered pair is a solution of the system.

1. (8,5)

$5x - 4y = 20$
$3y = 2x + 1$

In Exercise 2, solve each system by graphing. Check the coordinates of the intersection point in both equations.

2. $x + y = 6$

$x - y = 2$

In Exercise 3 and 4, solve each system by the substitution method. Be sure to check all proposed solutions.

3. $2x - 3y = -13$

$y = 2x + 7$

4. $2x + 3y = 11$

$x - 4y = 0$

In Exercises 5 and 6, solve by the method of your choice. Identify systems with no solution and systems with infinitely many solutions, using set notation to express their solution sets.

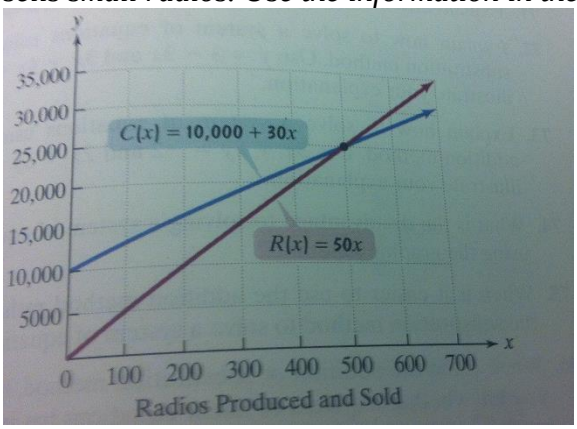
5. $6x + 2y = 7$

$y = 2 - 3x$

6. $y = 3x - 5$

$21x - 35 = 7y$

The figure shows the graphs of the cost and revenue functions for a company that manufactures and sells small radios. Use the information in the figure to solve Exercises 7-9.



7. How many radios must be produced and sold for the company to break even?

8. More than how many radios must be produced and sold for the company to have a profit?

9. Use the formulas shown in the small radios graph to find R(200) – C(200). Describe what this means for the company.

Exercises 10-11, describe a number of business ventures. For each exercise,

a) Write the cost function, C.
b) Write the revenue function, R.
c) Determine the break-even point. Describe what this means.

10. You invest in a new play. The cost includes an overhead of $30,000, plus production costs of $2500 per performance. A sold-out performance brings in $3125. (In solving this exercise, let x represent the number of sold-out performances.)

11. You invested $30,000 and started a business writing greeting cards. Supplies cost 2¢ per card and you are selling each card for 50¢. (In solving this exercises, let x represent the number of cards produced and sold.)

12. Two medium eggs and three cups of ice cream contain 701 milligrams of cholesterol. One medium egg and one cup of ice cream exceed the suggested daily cholesterol intake of 300 milligrams by 25 milligrams. Determine the cholesterol content in each item.

Prob/Stat/Discrete **Name**_____
10.5 Worksheet

In Exercises 1-4, graph each linear inequality.

1. $2x + 3y > 12$
2. $2y - x > 4$
3. $y < -\frac{1}{4}x$
4. $y > -2$

In Exercise 5-7, graph the solution set of each system of inequalities.

5. $2x + y < 3$

$x - y > 2$

6. $x \geq 4$

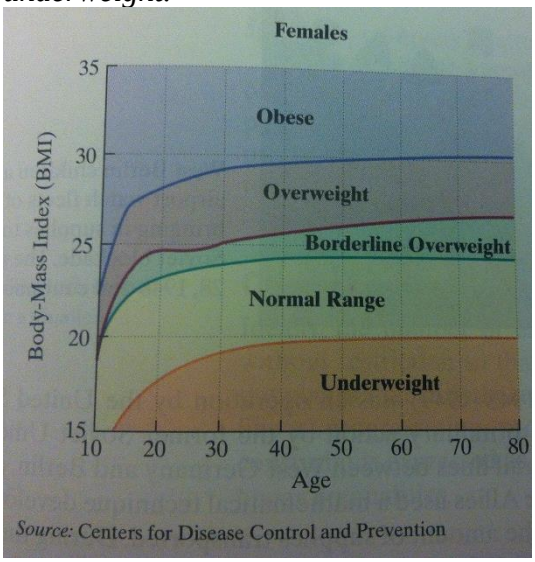
$y \leq 2$

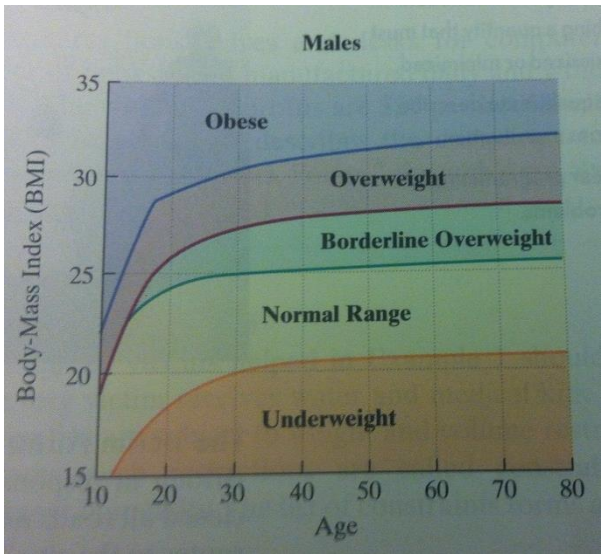
7. $y > 2x - 3$

$y < -x + 6$

8. A patient is not allowed to have more than 330 milligrams of cholesterol per day from a diet of eggs and meat. Each egg provides 165 milligrams of cholesterol. Each ounce of meat provides 110 milligrams.
   a) Write an inequality that describes the patient's dietary restrictions for x eggs and y ounces of meat.
   b) Graph the inequality. Because x and y must be positive, limit the graph to quadrant I only.
   c) Select an ordered pair satisfying the inequality. What are its coordinates and what do they represent in this situation?

The graph of an inequality in two variables is a region in the rectangular coordinates system. Regions in coordinate systems have numerous applications. For example, the regions in the following two graphs indicate whether a person is obese, overweight, borderline overweight, normal weight, or underweight.





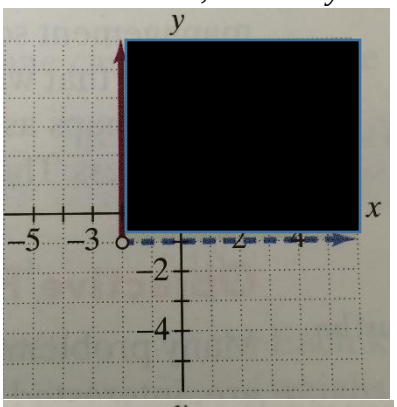
The horizontal axis shoes a person's age. The vertical axis shows that a person's body-mass index (BMI), computed using the following formula:

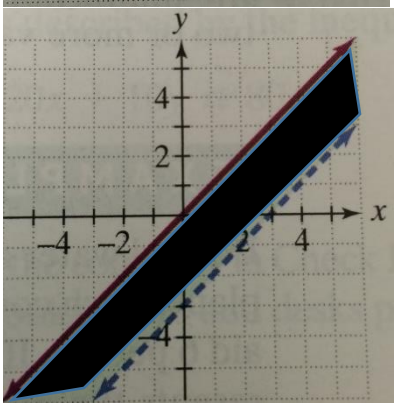
$$\text{BMI} = \frac{703W}{H^2}$$

The variable W represents weight, in pounds. The variable H represents height, in inches. Use this information to solve Exercises 9 and 10.

9. A man is 20 years old, 72 inches (6 feet) tall, and weighs 200 pounds.
   a) Compute the man's BMI. Round to the nearest tenth.
   b) Use the man's age and his BMI to locate this information as a point in the coordinate system for males. In this person obese, overweight, borderline overweight, normal weight, or underweight?
10. A woman is 25 years old, 66 inches (5 feet, 6 inches) tall, and weighs 105 pounds.
   a) Compute the woman's BMI. Round to the nearest tenth.
   b) Use the woman's age and her BMI to locate this information as a point in the coordinate system for females. Is this person obese, overweight, borderline overweight, normal weight, or underweight?

In Exercises 11 and 12, write a system of inequalities for each graph.

11. 

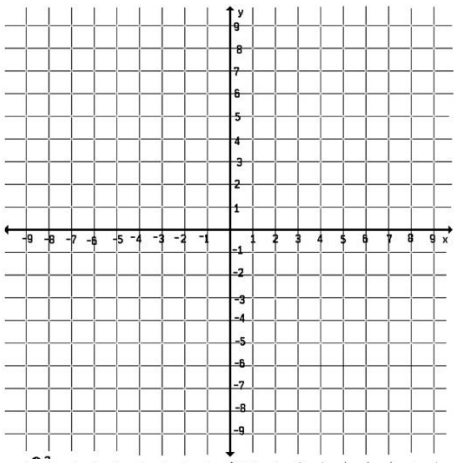
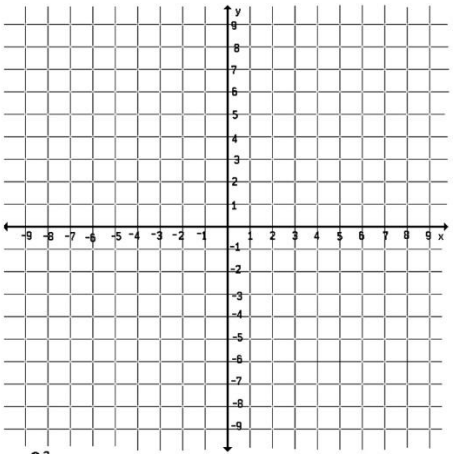
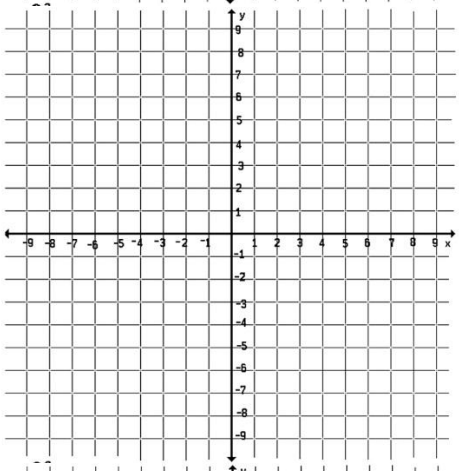
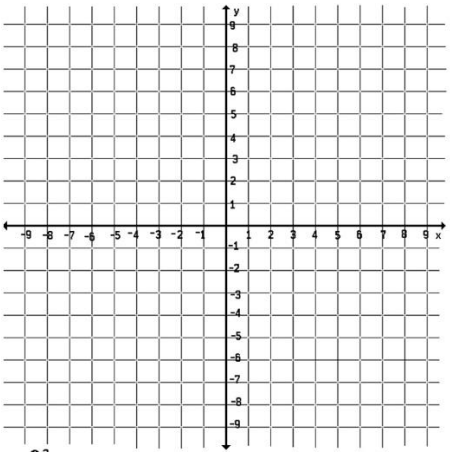
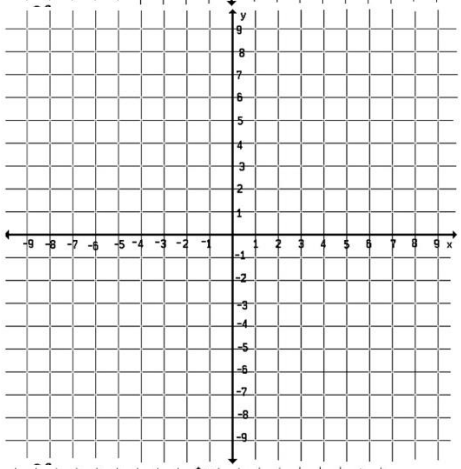
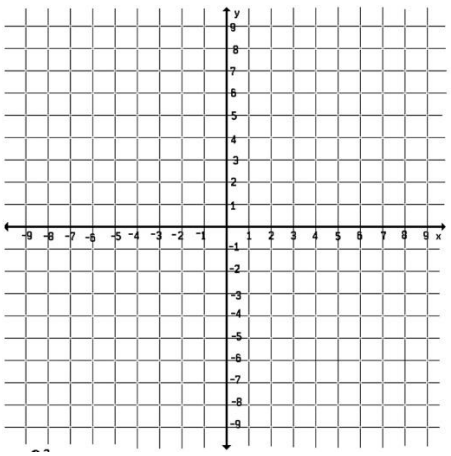
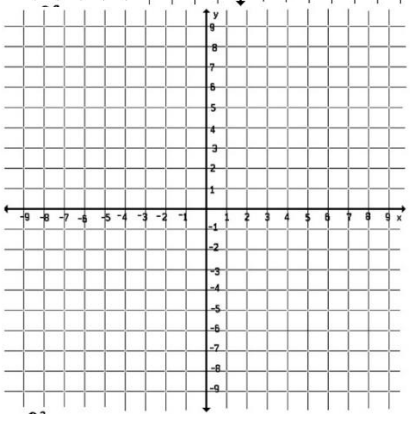
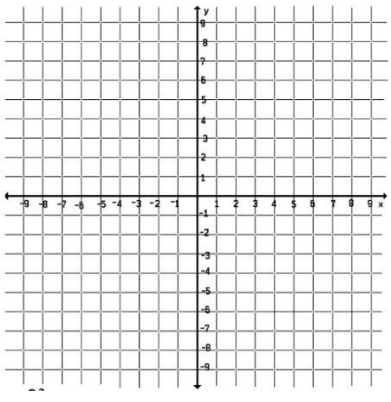
12. 

Without graphing, in Exercises 13-15, determine if each system has no solution or infinitely many solutions.

13. $3x + y < 9$
$3x + y > 9$

14. $6x - y \leq 24$
$6x - y > 24$

15. $3x + y \leq 9$
$3x + y \geq 9$

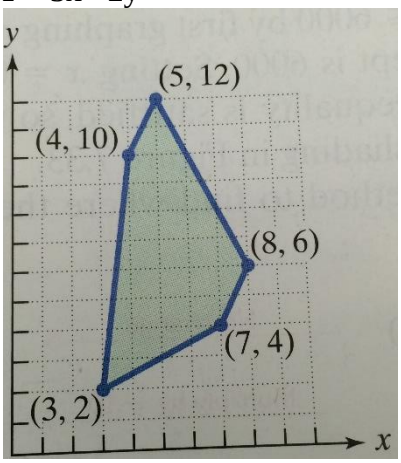
Prob/Stat/Discrete **Name**_____

10.6 Worksheet

In Exercise 1, find the value of the object function at each corner of the graph region. What is the maximum value of the objective function? What is the minimum value of the objective function?

1. Objective Function

$z = 3x + 2y$



In Exercises 2 and 3, an objective function and a system of linear inequalities representing constraints are given.

a) *Graph the system of inequalities representing the constraints.*
b) *Find the value of the objective function at each corner of the graphed region.*
c) *Use the values in part (b) to determine the maximum value of the objective function and the values of x and y for which the maximum occurs.*

2. Objective Function

$z = x + y$

Constraints

$x \leq 6$

$y \geq 1$

$2x - y \geq -1$

3. Objective Function

$z = x + 3y$

Constraints

$x + y \geq 2$

$x \leq 6$

$y \leq 5$

$x \geq 0$

$y \geq 0$

Use the directions for Exercises 2 and 3 to solve Exercise 4.

4. Objective Function

$z = 5x - 2y$

Constraints

$0 \leq x \leq 5$

$0 \leq y \leq 3$

$x + y \geq 2$

5. a) A student earns $10 per hour for tutoring and $7 per hour as a teacher's aid. Let x = the number of hours each week spent tutoring and y = the number of hours each week spent as a teachers aid. Write the objective function that describes total weekly earnings.

b) The student is bound by the following constraints:

- To have enough time for studies, the student can work no more 20 hours per week.
- The tutoring center requires that each tutor spend at least three hours per week tutoring.
- The tutoring center requires that each tutor spend no more than eight hours per week tutoring.

Write a system of three inequalities that describes these constraints.

c) Graph the system of inequalities from part b. Use only the first quadrant and its boundary.

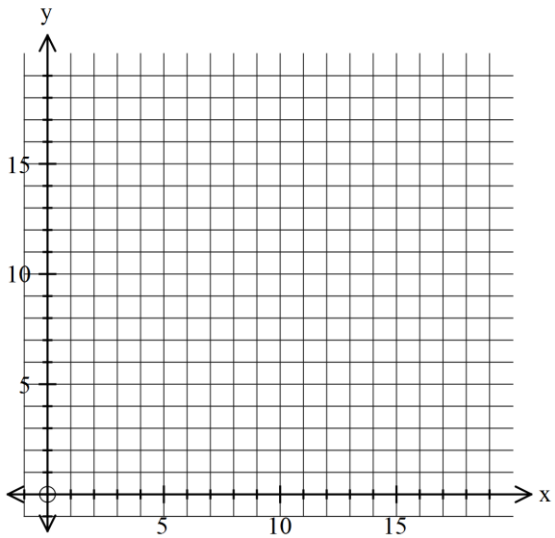
d) Evaluate the objective function for the total weekly earnings at each of the four vertices.

Use the two steps for solving a linear programming problem, given in your notes, to solve the problems in Exercises 6 and 7.

6. You are about to take a test that contains computation problems worth 6 point each and word problems worth 10 points each. You can do a computation problem in 2 minutes and a word problem in 4 minutes. You have 40 minutes to take a test the test and may answer no more than 12 problems. Assuming you answer all the problems attempted correctly, how many of each type of problem must you answer to maximize your score? What is the maximum score?

7. A theater is presenting a program on drinking and driving for students and their parents. The proceeds will be donated to a local alcohol information center. Admission is $2.00 for parents and $1.00 for students. However, the situation has two constraints: The Theater can hold no more than 150 people and every two parents must bring at least one student. How many parents and students should attend to raise the maximum amount of money?

8. Suppose that you inherit $10,000. The will states how you must invest the money. Some (or all) of the money must be invested in stocks and bonds. The requirements are that at least $3000 be invested in bonds, with expected returns of $0.08 per dollar, at least $2000 be invested in stocks, with expected returns of $0.12 per dollar. Because the stocks are medium risk, the final stipulation requires that the investment in bonds should never be less than the investment in stocks. How should the money be invested so as to maximize your expected returns?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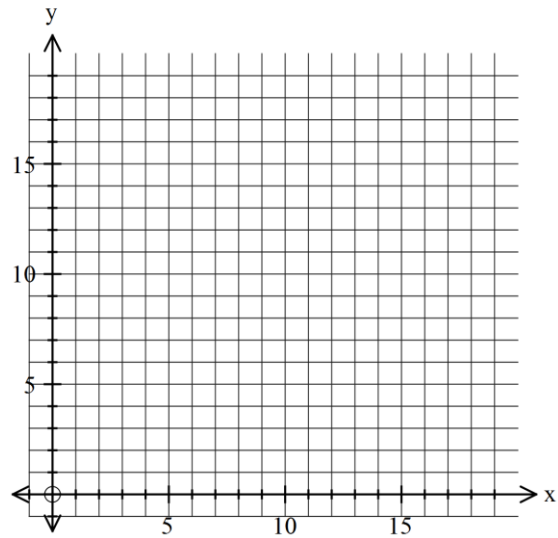
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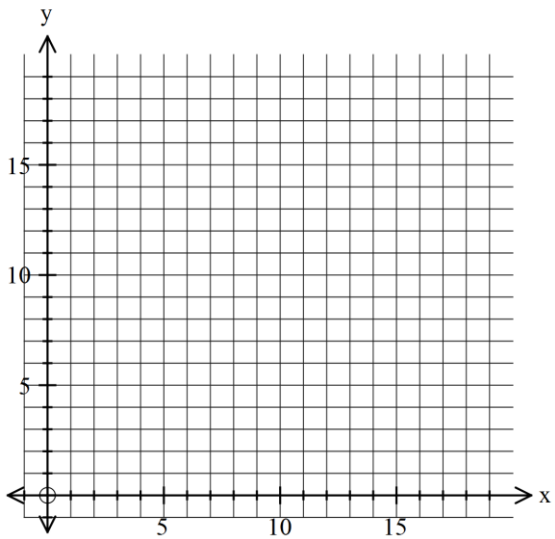
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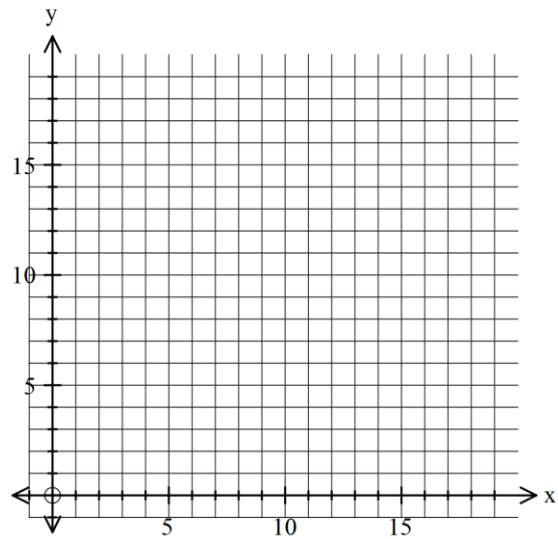
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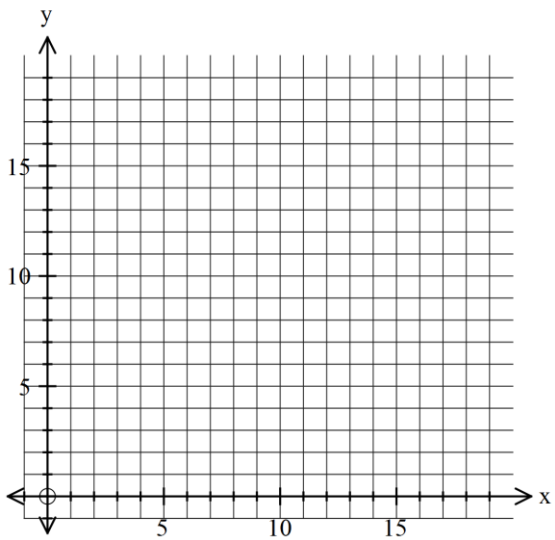
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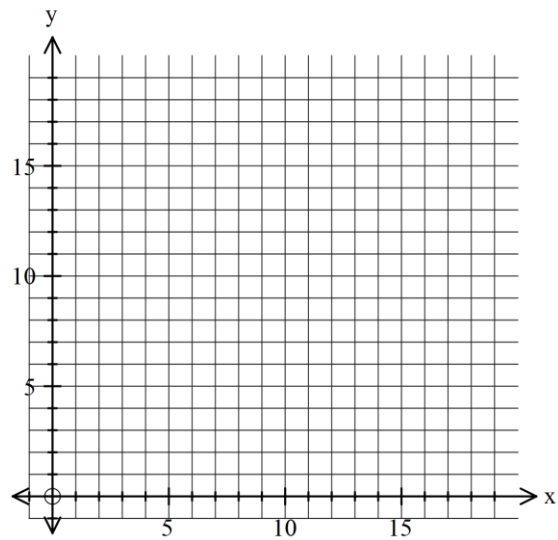
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