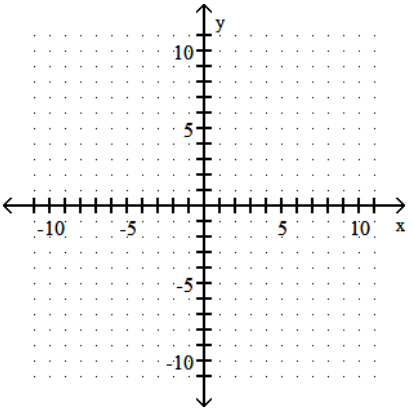
MATH FOR LIBERAL ARTS
REVIEW 3

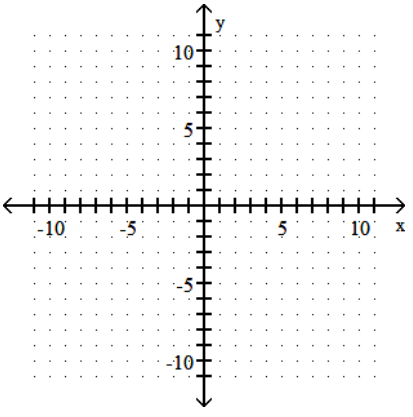
SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

Graph the linear inequality.

1) $5x + y \le -1$

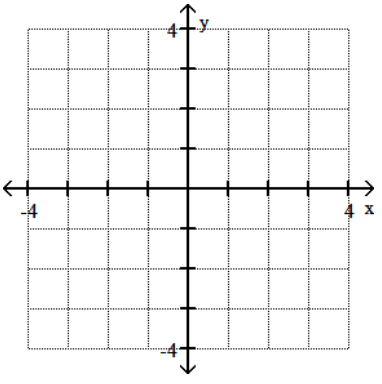


2) $2x + 4y \ge -8$

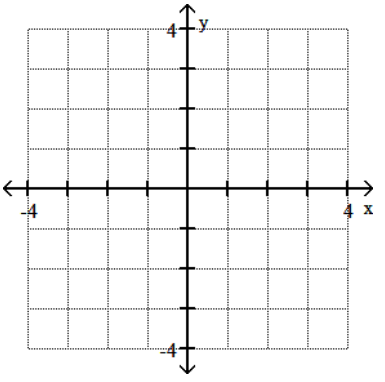


Graph the feasible region for the system of inequalities.

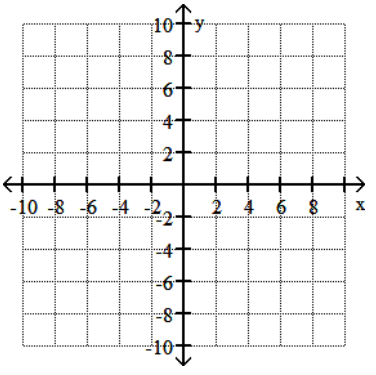
3) $2x + y \le 4$
$x - 1 \ge 0$



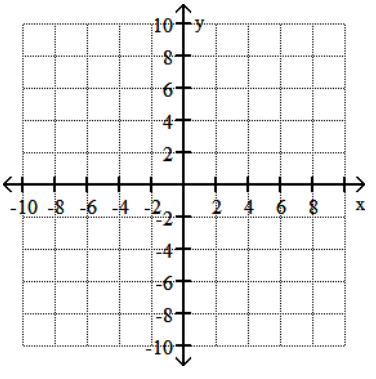
4) $2x + y \le 4$
$y - 1 \le 0$



5) $2y + x \ge -2$
$y + 3x \le 9$
$y \le 0$
$x \ge 0$



6) $4y + x \ge -2$
$y + 2x \le 10$
$4y \le 10x + 40$
$y \ge 0$



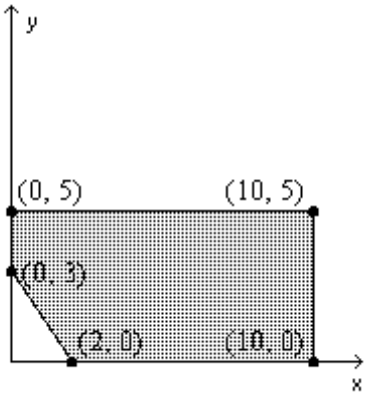
A manufacturer of wooden chairs and tables must decide in advance how many of each item will be made in a given week. Use the table to find the system of inequalities that describes the manufacturer's weekly production.

7) Use x for the number of chairs and y for the number of tables made per week. The number of work-hours available for construction and finishing is fixed.

	Hours per chair	Hours per table	Total hours available
Construction	1	3	27
Finishing	1	2	20

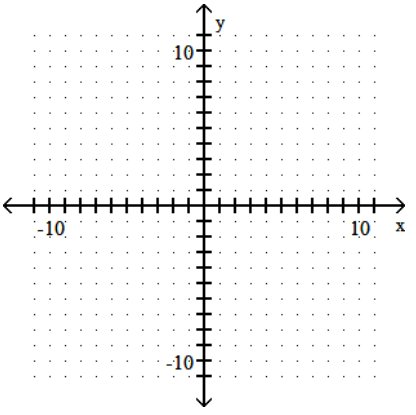
Find the value(s) of the function on the given feasible region.

8) Find the maximum and minimum of $z = 20x + 4y$.

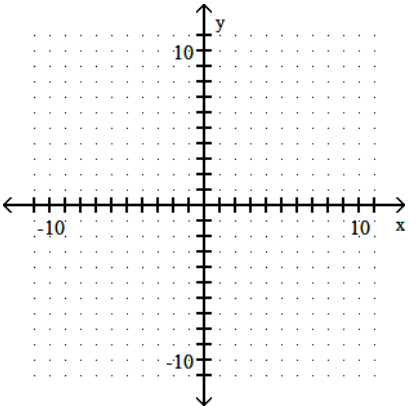


Use graphical methods to solve the linear programming problem.

9) Maximize $z = 6x + 7y$
subject to: $2x + 3y \le 12$
$2x + y \le 8$
$x \ge 0$
$y \ge 0$



10) Maximize $z = 2x + 5y$
subject to: $3x + 2y \le 6$
$-2x + 4y \le 8$
$x \ge 0$
$y \ge 0$



Find the value(s) of the function, subject to the system of inequalities.

11) Find the maximum and minimum of $P = 19x + 3y$ subject to:
$0 \le x \le 10,\ 0 \le y \le 5,\ 3x + 2y \ge 6$.

12) Find the minimum of $P = 23x + 18y + 23$ subject to:
$x \ge 0,\ y \ge 0,\ x + y \ge 1$.

State the linear programming problem in mathematical terms, identifying the objective function and the constraints.

13) A firm makes products A and B. Product A takes 2 hours each on machine L and machine M; product B takes 4 hours on L and 2 hours on M. Machine L can be used for 8 hours and M for 7 hours. Profit on product A is \$6 and \$7 on B. Maximize profit.

14) A car repair shop blends oil from two suppliers.
Supplier I can supply at most 49 gal with 3.8% detergent. Supplier II can supply at most 69 gal with 3.1% detergent. How much can be ordered from each to get at most 100 gal of oil with maximum detergent?

The Acme Class Ring Company designs and sells two types of rings: the VIP and the SST. They can produce up to 24 rings each day using up to 60 total man-hours of labor. It takes 3 man-hours to make one VIP ring, versus 2 man-hours to make one SST ring.

15) How many of each type of ring should be made daily to maximize the company's profit, if the profit on a VIP ring is \$30 and on an SST ring is \$40?

Convert the constraints into linear equations by using slack variables.

16) Maximize $z = 2x_1 + 8x_2$
Subject to: $x_1 + 6x_2 \le 15$
$7x_1 + 5x_2 \le 25$
$x_1 \ge 0, x_2 \ge 0$

Introduce slack variables as necessary and write the initial simplex tableau for the problem.

17) Maximize $z = 2x_1 + x_2$
subject to: $x_1 + x_2 \le 52$
$3x_1 + x_2 \le 180$
$x_1 \ge 0,\ x_2 \ge 0$

$$\left[\begin{array}{c|c} & \\ \hline & \end{array}\right]$$

18) Maximize $z = 2x_1 + 5x_2$
subject to: $5x_1 + 10x_2 \le 110$
$10x_1 + 15x_2 \le 150$
$x_1 \ge 0,\ x_2 \ge 0$

$$\left[\begin{array}{c|c} & \\ \hline & \end{array}\right]$$

Find the pivot in the tableau.

19)

x_1	x_2	x_3	x_4	x_5	z	
2	1	4	1	0	0	48
2	4	1	0	1	0	32
-1	-3	-2	0	0	1	0

20)

x_1	x_2	x_3	x_4	x_5	x_6	z	
1	2	1	1	0	0	0	14
2	2	3	0	1	0	0	36
4	1	1	0	0	1	0	18
-2	-1	-3	0	0	0	1	0

Use the indicated entry as the pivot and perform the pivoting once.

21)

x_1	x_2	x_3	x_4	x_5	z	
②	1	4	1	0	0	32
2	4	1	0	1	0	48
-4	-3	-2	0	0	1	0

22)

x_1	x_2	x_3	x_4	x_5	x_6	z	
1	2	①	1	0	0	0	10
2	2	3	0	1	0	0	36
4	1	1	0	0	1	0	18
-2	-1	-3	0	0	0	1	0

Write the basic solution for the simplex tableau determined by setting the nonbasic variables equal to 0.

23)

x_1	x_2	x_3	x_4	x_5	z	
3	4	0	3	1	0	18
1	5	1	7	0	0	25
-3	4	0	1	0	1	19

Use the simplex method to solve the linear programming problem.

24) Maximize $z = 5x_1 + 3x_2$
subject to: $2x_1 + 4x_2 \le 13$
$x_1 + 2x_2 \le 6$
with $x_1 \ge 0, x_2 \ge 0$

25) Maximize $z = 3x_1 + 2x_2$
subject to: $2x_1 + 3x_2 \le 4$
$4x_1 + 2x_2 \le 12$
with $x_1 \ge 0, x_2 \ge 0$

A bakery makes sweet rolls and donuts. A batch of sweet rolls requires 3 lb of flour, 1 dozen eggs, and 2 lb of sugar. A batch of donuts requires 5 lb of flour, 3 dozen eggs, and 2 lb of sugar. Set up an initial simplex tableau to maximize profit.

26) The bakery has 580 lb of flour, 660 dozen eggs, 700 lb of sugar. The profit on a batch of sweet rolls is $93.00 and on a batch of donuts is $ 62.00.

Let U = {q, r, s, t, u, v, w, x, y, z}; A = {q, s, u, w, y}; B = {q, s, y, z}; and C = {v, w, x, y, z}. List the members of the indicated set, using set braces.

27) A'

28) $A \cap B'$

29) $(A \cup B)'$

30) $(A \cap B)'$

31) $A' \cup B$

32) $C' \cap A'$

The lists below show five agricultural crops in Alabama, Arkansas, and Louisiana.

Alabama	Arkansas	Louisiana
soybeans (s)	soybeans (s)	soybeans (s)
peanuts (p)	rice (r)	sugarcane (n)
corn (c)	cotton (t)	rice (r)
hay (h)	hay (h)	corn (c)
wheat (w)	wheat (w)	cotton (t)

Let U be the smallest possible universal set that includes all of the crops listed; and let A, K, and L be the sets of five crops in Alabama, Arkansas, and Louisiana, respectively. Find the indicated set.

33) $A \cap K$

34) $K' \cap L$

35) $A \cup L$

Write the sample space for the given experiment.

36) An 8-sided die is rolled. (The sides contain the numbers 1, 2, 3, 4, 5, 6, 7, and 8.)

For the experiment described, write the indicated event in set notation.

37) A die is tossed twice with the tosses recorded as an ordered pair. Represent the following event as a subset of the sample space: The first toss shows a six.

Find the probability of the given event.

38) A card drawn from a well-shuffled deck of 52 cards is a red ace.

39) A card drawn from a well-shuffled deck of 52 cards is an ace or a 9.

40) A card drawn from a well-shuffled deck of 52 cards is an ace or a 6.

41) A card drawn from a well-shuffled deck of 52 cards is an ace or a 7.

Use the given table to find the probability of the indicated event. Round your answer to the nearest thousandth.

42) College students were given three choices of pizza toppings and asked to choose one favorite. The following table shows the results.

toppings	freshman	sophomore	junior	se
cheese	13	16	19	
meat	19	22	16	
veggie	16	13	19	

A randomly selected student prefers a meat topping.

Solve the problem.

43) One card is selected from a deck of cards. Find the probability of selecting a red card or a queen.

44) A single die is rolled one time. Find the probability of rolling an odd number or a number less than 5.

Convert the odds that the given event will occur to the probability that the event will occur.

45) The odds in favor of becoming the President are 1 to 5,000,000.

Solve the problem.

46) A survey revealed that 50% of people are entertained by reading books, 33% are entertained by watching TV, and 17% are entertained by both books and TV. What is the probability that a person will be entertained by either books or TV? Express the answer as a percentage.

47) Of the coffee makers sold in an appliance store, 3.0% have either a faulty switch or a defective cord, 1.8% have a faulty switch, and 0.2% have both defects. What is the probability that a coffee maker will have a defective cord? Express the answer as a percentage.

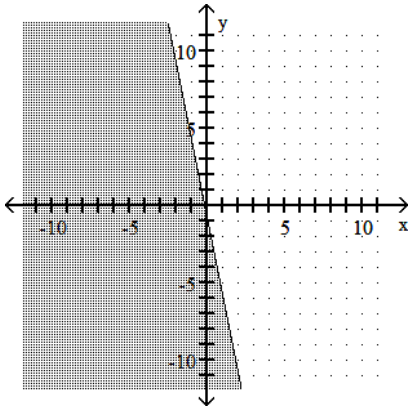
48) If a single fair die is rolled, find the probability of a 4 given that the number rolled is odd.

49) If two cards are drawn without replacement from an ordinary deck, find the probability that the second card is red, given that the first card was a heart.

Assume that two marbles are drawn without replacement from a box with 1 blue, 3 white, 2 green, and 2 red marbles. Find the probability of the indicated result.

50) The second marble is red, given that the first marble is white.

1)



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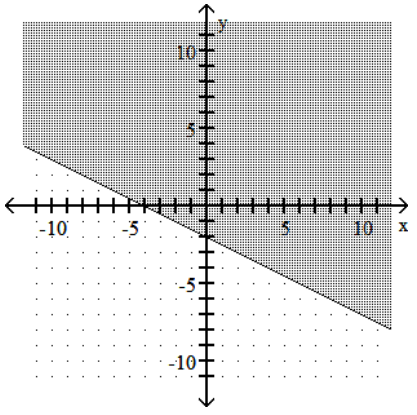

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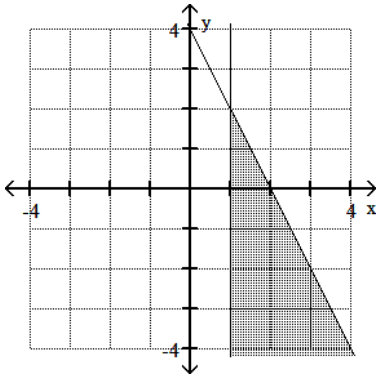

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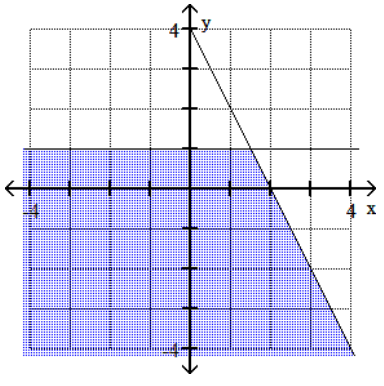

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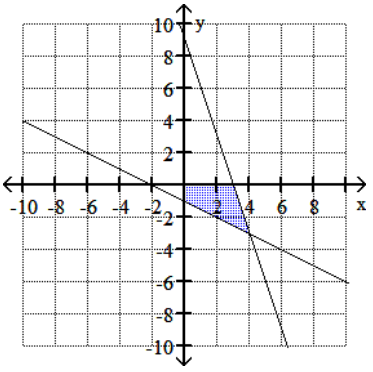

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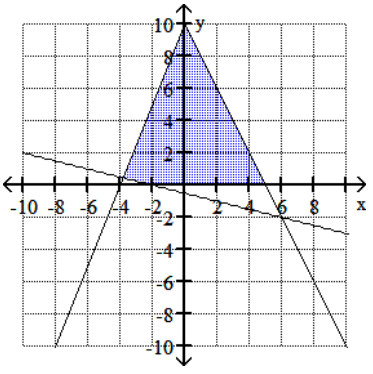

7) $x + 3y \le 27$
$x + 2y \le 20$
$x \ge 0$
$y \ge 0$

8) 220, 12

9) Maximum of 32 when $x = 3$ and $y = 2$

10) Maximum of $\frac{49}{4}$ when $x = \frac{1}{2}$ and $y = \frac{9}{4}$

11) 205, 9

12) 41

13) Maximize $6A + 7B$
Subject to: $2A + 4B \le 8$
$2A + 2B \le 7$
$A, B \ge 0.$

14) Maximize $0.038x + 0.031y$
Subject to: $0 \le x \le 49$
$0 \le y \le 69$
$x + y \le 100.$

15) 0 VIP and 24 SST

16) $x_1 + 6x_2 + s_1 = 15$
$7x_1 + 5x_2 + s_2 = 25$

17)

x_1	x_2	s_1	s_2	z	
1	1	1	0	0	52
3	1	0	1	0	180
-2	-1	0	0	1	0

18)

x_1	x_2	s_1	s_2	z	
5	10	1	0	0	110
10	15	0	1	0	150
-2	-5	0	0	1	0

19) 4 in row 2, column 2

20) 3 in row 2, column 3

21)

x_1	x_2	x_3	x_4	x_5	z	
1	$\frac{1}{2}$	2	$\frac{1}{2}$	0	0	16
0	3	-3	-1	1	0	16
0	-1	6	2	0	1	64

22)

x_1	x_2	x_3	x_4	x_5	x_6	z	
1	2	1	1	0	0	0	10
-1	-4	0	-3	1	0	0	6
3	-1	0	-1	0	1	0	8
1	5	0	3	0	0	1	30

23) $x_1 = 0$, $x_2 = 0$, $x_3 = 25$, $x_4 = 0$, $x_5 = 18$, $z = 19$

24) Maximum is 30 when $x_1 = 6$, $x_2 = 0$

25) Maximum is 6 when $x_1 = 2$, $x_2 = 0$

26)

x_1	x_2	s_1	s_2	s_3	s_4	
3	5	1	0	0	0	580
1	3	0	1	0	0	660
2	2	0	0	1	0	700
-93	-62	0	0	0	1	0

27) {r, t, v, x, z}

28) {u, w}

29) {r, t, v, x}

30) {r, t, u, v, w, x, z}

31) {q, r, s, t, v, x, y, z}

32) {r, t}

33) {h, s, w}

34) {c, n}

35) {c, h, n, p, r, s, t, w}

36) {1, 2, 3, 4, 5, 6, 7, 8}

37) {(6, 1), (6, 2), (6, 3), (6, 4), (6, 5), (6, 6)}

38) $\frac{1}{26}$

39) $\frac{2}{13}$

40) $\frac{2}{13}$

41) $\frac{2}{13}$

42) .333

43) $\frac{7}{13}$

44) $\frac{5}{6}$

45) $\frac{1}{5{,}000{,}001}$

46) 66%

47) 1.4%

48) 0

49) $\frac{25}{51}$

50) $\frac{2}{7}$