Graph the linear inequality.

1) \(x + 2y \geq 6\)
A toy making company has at least 300 squares of felt, 700 oz of stuffing, and 230 ft of trim to make dogs and dinosaurs. A dog uses 1 square of felt, 4 oz of stuffing, and 1 ft of trim. A dinosaur uses 2 squares of felt, 3 oz of stuffing, and 1 ft of trim.

3) It costs the company $1.05 to make each dog and $1.22 for each dinosaur. The company wants to minimize its costs. What are the coefficients of the dual objective function?

A) 300, 700, 230  
B) 1, 2, 1.05  
C) 1, 4, 1  
D) 1.05, 1.22
Four accounting majors, two economics majors, and three marketing majors have interviewed for five different positions with a large company. Find the number of different ways that five of these could be hired.

4) The four accounting majors must be hired first, and then the final position would be chosen from the remaining majors.
   A) 2880 ways  B) 480 ways  C) 100 ways  D) 120 ways

Find the effective rate corresponding to the given nominal rate. Round to the nearest hundredth.

5) 6% compounded semiannually
   A) 6.09%  B) 6.17%  C) 6.14%  D) 6.00%

Find the number of subsets of the set.

6) \{x \mid x \text{ is a day of the week}\}
   A) 128  B) 127  C) 124  D) 256

Use the rule of total probability to find the indicated probability.

7) A company is conducting a sweepstakes, and ships two boxes of game pieces to a particular store. Box A has 2% of its contents being winners, while 5% of the contents of box B are winners. Box A contains 32% of the total tickets. If the contents of both boxes are mixed in a drawer and a ticket is chosen at random, what is the probability it is a winner?
   A) 0.035  B) 0.07  C) 0.04  D) 0.006

Find the slope of the line passing through the given pair of points.

8) (17, -7) and (-10, -15)
   A) \frac{8}{27}  B) -\frac{22}{7}  C) \frac{27}{8}  D) -\frac{8}{27}

Find the periodic payment that will amount to the given sum under the given conditions.

9) \$48,000, interest is 4% compounded annually, payments made at the end of each year for 5 years
   A) \$2883.66  B) \$4512.71  C) \$8862.11  D) \$3902.54

Solve the problem using Bayes’ Theorem. Round the answer to the nearest hundredth, if necessary.

10) For mutually exclusive events X_1, X_2, and X_3, let P(X_1) = 0.54, P(X_2) = 0.15, and P(X_3) = 0.31. Also, P(Y|X_1) = 0.40, P(Y|X_2) = 0.30, and P(Y|X_3) = 0.60. Find P(X_2|Y).
    A) 0.42  B) 0.20  C) 0.48  D) 0.10
Use graphical methods to solve the linear programming problem.

11) Minimize \( z = 0.18x + 0.12y \)
subject to:
\[ 2x + 6y \geq 30 \]
\[ 4x + 2y \geq 20 \]
\[ x \geq 0 \]
\[ y \geq 0 \]

A) Minimum of 1.02 when \( x = 3 \) and \( y = 4 \)  
B) Minimum of 1.2 when \( x = 4 \) and \( y = 4 \)  
C) Minimum of 1.86 when \( x = 9 \) and \( y = 2 \)  
D) Minimum of 1.08 when \( x = 4 \) and \( y = 3 \)

Find the odds.

12) Find the odds in favor of rolling an odd number when a fair die is rolled.
A) 2 to 1  
B) 1 to 2  
C) 3 to 2  
D) 1 to 1

Find the lump sum deposited today that will yield the same total amount as this yearly payment made at the end of each year for 20 years at the given interest rate, compounded annually.

13) \$55,000 at 5%  
A) \$685,421.57  
B) \$685,201.00  
C) \$705,166.00  
D) \$664,691.50

Find the correlation coefficient.

14) The test scores of 6 randomly picked students and the number of hours they prepared are as follows:

<table>
<thead>
<tr>
<th>Hours</th>
<th>5</th>
<th>10</th>
<th>4</th>
<th>6</th>
<th>10</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Score</td>
<td>64</td>
<td>86</td>
<td>69</td>
<td>86</td>
<td>59</td>
<td>87</td>
</tr>
</tbody>
</table>

A) 0.2242  
B) 0.6781  
C) -0.2242  
D) -0.6781

For the following amount at the given interest rate compounded continuously, find (a) the future value after 9 years, (b) the effective rate, and (c) the time to reach $10,000. Round all values to the nearest hundredth.

15) \$5400 at 4.3%  
A) (a) \$7951.81  
(b) 54.39%  
(c) 11.33 years  
B) (a) \$7951.81  
(b) 4.39%  
(c) 14.33 years  
C) (a) \$7951.62  
(b) 204.39%  
(c) 15.33 years  
D) (a) \$5400.00  
(b) 104.39%  
(c) 13.33 years
Find the probability.

16) A bag contains 17 balls numbered 1 through 17. What is the probability that a randomly selected ball has an even number?
   A) \( \frac{17}{8} \)  B) 8  C) \( \frac{8}{17} \)  D) \( \frac{1}{2} \)

17) If 80% of scheduled flights actually take place and cancellations are independent events, what is the probability that 3 separate flights will all take place?
   A) 0.51  B) 0.01  C) 0.64  D) 0.80

18) Assuming that boy and girl babies are equally likely, find the probability that a family with four children has all boys given that the first two are boys.
   A) 1  B) \( \frac{1}{8} \)  C) \( \frac{1}{4} \)  D) \( \frac{1}{2} \)

For the following systems of equations in echelon form, tell how many solutions there are in nonnegative integers.

19) \( 3x + 2y + 2z = 180 \)
    \( y - 4z = 10 \)
   A) 7  B) 16  C) 5  D) 6

Find the present value of the ordinary annuity.

20) Payments of $52 made quarterly for 10 years at 4% compounded quarterly
   A) $1691.85  B) $1707.40  C) $510.54  D) $1398.94

Use Bayes' rule to find the indicated probability.

21) A person must select one of three boxes, each filled with clocks. The probability of box A being selected is 0.32, of box B being selected is 0.26, and of box C being selected is 0.42. The probability of finding a red clock in box A is 0.2, in box B is 0.4, and in box C is 0.9. A box is selected. Given that the box contains a red clock, what is the probability that box A was chosen?
   A) 0.064  B) 0.133  C) 0.32  D) 0.117

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

22) Find \( x_1 \geq 0 \) and \( x_2 \geq 0 \) such that

\[
\begin{aligned}
2x_1 + 5x_2 \leq 12 \\
3x_1 + 3x_2 \leq 8 \\
z = 4x_1 + x_2 \text{ is maximized.}
\end{aligned}
\]

A) \[
\begin{bmatrix}
x_1 & x_2 & s_1 & s_2 & z \\
2 & 5 & 1 & 0 & 0 & 12 \\
3 & 3 & 0 & 1 & 0 & 8 \\
4 & 1 & 0 & 0 & 1 & 0
\end{bmatrix}
\]

B) \[
\begin{bmatrix}
x_1 & x_2 & s_1 & s_2 & z \\
2 & 5 & 1 & 0 & 0 & 8 \\
3 & 3 & 0 & 1 & 0 & 12 \\
-4 & -1 & 0 & 0 & 1 & 0
\end{bmatrix}
\]

C) \[
\begin{bmatrix}
x_1 & x_2 & s_1 & s_2 & z \\
2 & 5 & 1 & 0 & 0 & 12 \\
3 & 3 & 0 & 1 & 0 & 8 \\
-4 & -1 & 0 & 0 & 1 & 0
\end{bmatrix}
\]

D) \[
\begin{bmatrix}
x_1 & x_2 & s_1 & s_2 & z \\
2 & 5 & 1 & 0 & 0 & 8 \\
3 & 3 & 0 & 1 & 0 & 12 \\
4 & 1 & 0 & 0 & 1 & 0
\end{bmatrix}
\]
Find the expected value for the random variable.

23) A business bureau gets complaints as shown in the following table. Find the expected number of complaints per day.

<table>
<thead>
<tr>
<th>Complaints per Day</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Probability</td>
<td>0.04</td>
<td>0.11</td>
<td>0.26</td>
<td>0.33</td>
<td>0.19</td>
<td>0.12</td>
</tr>
</tbody>
</table>

A) 3.01  
B) 2.85  
C) 2.73  
D) 2.98

Solve the problem.

24) Let the demand and supply functions be represented by D(p) and S(p), where p is the price in dollars. Find the equilibrium price and equilibrium quantity for the given functions.

\[ D(p) = 3840 - 50p \]
\[ S(p) = 250p - 960 \]

A) $19; 2890  
B) $16; 3040  
C) $24; 2640  
D) $19; 3040

25) How many ways can a committee of 2 be selected from a club with 12 members?

A) 33 ways  
B) 132 ways  
C) 2 ways  
D) 66 ways

26) Midtown Delivery Service delivers packages which cost $1.70 per package to deliver. The fixed cost to run the delivery truck is $84 per day. If the company charges $3.70 per package, how many packages must be delivered daily to make a profit of $22?

A) 53 packages  
B) 49 packages  
C) 42 packages  
D) 15 packages

27) Tasha borrowed $14,000 to purchase a new car at an annual interest rate of 8.9%. She is to pay it back in equal monthly payments over a 4 year period. What is her monthly payment?

A) $103.83  
B) $347.73  
C) $25.96  
D) $405.77

28) If $22,000 earned simple interest of $1283.33 in 10 months, what was the simple interest rate?

A) 6.2%  
B) 7.6%  
C) 7%  
D) 6%

29) Carole's car averages 15.2 miles per gallon in city driving and 25.5 miles per gallon in highway driving. If she drove a total of 554.1 miles on 29 gallons of gas, then how many of the gallons were used for city driving?

A) 11 gallons  
B) 16 gallons  
C) 20 gallons  
D) 18 gallons

30) A simplified economy has only two industries, the electric company and the gas company. Each dollar's worth of the electric company's output requires 0.20 of its own output and 0.4 of the gas company's output. Each dollar's worth of the gas company's output requires 0.50 of its own output and 0.7 of the electric company's output. Construct the input-output matrix.

\[
\begin{bmatrix}
0.20 & 0.70 \\
0.40 & 0.50 \\
\end{bmatrix}
\]

31) If you toss five fair coins, in how many ways can you obtain at least one head?

A) 16 ways  
B) 15 ways  
C) 31 ways  
D) 32 ways
32) How many three-digit counting numbers do not contain any of the digits 1, 5, 7, 8, or 9?  
A) 48 numbers  
B) 125 numbers  
C) 100 numbers  
D) 64 numbers

33) The information in the chart gives the salary of a person for the stated years. Model the data with a linear function using the points (1, 24,700) and (3, 26,500).

<table>
<thead>
<tr>
<th>Year, x</th>
<th>Salary, y</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990, 0</td>
<td>$23,500</td>
</tr>
<tr>
<td>1991, 1</td>
<td>$24,700</td>
</tr>
<tr>
<td>1992, 2</td>
<td>$25,200</td>
</tr>
<tr>
<td>1993, 3</td>
<td>$26,500</td>
</tr>
<tr>
<td>1994, 4</td>
<td>$27,200</td>
</tr>
</tbody>
</table>

A) \( y = 900x + 23,800 \)  
B) \( y = -1147x + 23,800 \)  
C) \( y = 900x \)  
D) \( y = 28.3x + 23,800 \)

34) A poll is conducted in a U.S. city to determine voting preferences prior to a presidential election. The following probabilities were obtained from the relative frequencies:

\[ P(D) = 0.51, P(M \cap D) = 0.22, P(M \cup D) = 0.77 \]

where \( M \) represents male and \( D \) represents a person who plans to vote Democrat.
Find \( P(M \cap D') \).
A) 0.49  
B) 0.78  
C) 0.26  
D) 0.71

35) Which of the following investments is larger after 10 years?
A) An initial amount of $16,800 is deposited with $8400 deposited annually, with interest earned at 3.75% compounded annually.  
B) An initial amount of $14,000 is deposited with $700 deposited monthly, with interest earned at 3.75% compounded monthly.

36) Wally’s Warehouse sells trash compactors and microwaves. Wally has space for no more than 90 trash compactors and microwaves together. Trash compactors weigh 26 pounds and microwaves weigh 55 pounds. Wally is limited to a total of 8100 pounds for these items. The profit on a microwave is $43 and on a compactor $27. How many of each should Wally stock to maximize profit potential?
A) 0 trash compactors, 89 microwaves  
B) 90 trash compactors, 1 microwave  
C) 0 trash compactors, 90 microwaves  
D) 1 trash compactor, 89 microwaves

37) The State Employees’ Credit Union offers a 1-year certificate of deposit with an APR (or effective rate) of 5.3%. If interest is compounded quarterly, find the actual interest rate. Round to the nearest tenth of a percent.
A) 5.2%  
B) 5.4%  
C) 6.2%  
D) 5.0%

38) Suppose that you are to cut a piece of ribbon for a wreath that is 252 inches long into two pieces so that one piece is 6 times as long as the other. How long is each piece of ribbon?
A) 42 in., 180 in.  
B) 42 in., 252 in.  
C) 36 in., 252 in.  
D) 36 in., 216 in.
39) Below is a table of data from a survey given to 1600 teenagers asking them to estimate what percentage of their classmates are using drugs. If a girl is selected at random, find the probability that her estimate of the percentage using drugs is 50% or higher. Round to the nearest hundredth.

<table>
<thead>
<tr>
<th></th>
<th>None</th>
<th>1% - 24%</th>
<th>25% - 49%</th>
<th>50% - 74%</th>
<th>75% or more</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boys</td>
<td>26</td>
<td>182</td>
<td>450</td>
<td>114</td>
<td>28</td>
</tr>
<tr>
<td>Girls</td>
<td>46</td>
<td>232</td>
<td>350</td>
<td>164</td>
<td>8</td>
</tr>
</tbody>
</table>

A) 0.09    B) 0.11    C) 0.18    D) 0.22

40) For the following table of data,
   a. Draw a scatterplot.
   b. Calculate the correlation coefficient.
   c. Calculate the least squares line and graph it on the scatterplot.
   d. Predict the y-value when x is 27.

<table>
<thead>
<tr>
<th>x</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>y</td>
<td>5</td>
<td>4.5</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>3.5</td>
<td>2.5</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

A) a.  

B) a.  

b. -0.965 
   c. \( Y = -0.45x + 5.53 \) 
   d. -6.62 

b. 0.965 
   c. \( Y = 0.45x - 5.53 \) 
   d. 6.62
41) The odds in favor of a horse winning a race are posted as 4 : 3. Find the probability that the horse will lose the race.
   A) \( \frac{3}{4} \)  
   B) \( \frac{3}{7} \)  
   C) \( \frac{4}{7} \)  
   D) \( \frac{1}{3} \)

42) The outdoor temperature rises to 20° Fahrenheit. What is this temperature in Celsius?
   A) 11.1°  
   B) -12°  
   C) 20°  
   D) -6.7°

43) Suppose you pay $1.00 to roll a fair die with the understanding that you will get back $3.00 for rolling 4 or 5. What is your expected payback?
   A) $0  
   B) $3.00  
   C) $1.00  
   D) -$2.00

44) A restaurant offers 9 possible appetizers, 15 possible main courses, and 4 possible desserts. How many different meals are possible at this restaurant? (Two meals are considered different unless all three courses are the same).
   A) 540 meals  
   B) 530 meals  
   C) 729 meals  
   D) 28 meals

45) Bill has 6 friends over for dinner. After dinner, the seven of them are thinking about going out dancing. Not everyone is sure that they want to go. How many subsets of the seven are possible if at least two people go dancing?
   A) 6  
   B) 56  
   C) 120  
   D) 121

46) 38% of a store's computers come from factory A and the remainder come from factory B. 1% of computers from factory A are defective while 4% of computers from factory B are defective. If one of the store's computers is selected at random, what is the probability that it is defective and from factory B?
   A) 0.66  
   B) 0.015  
   C) 0.025  
   D) 0.04
47) Ten students in a graduate program were randomly selected. Their grade point averages (GPAs) when they entered the program were between 3.5 and 4.0. The following data were obtained regarding their GPAs on entering the program versus their current GPAs. Use the equation of the least squares line to predict the current GPA of a student whose entering GPA is 3.7.

<table>
<thead>
<tr>
<th>Entering GPA (x)</th>
<th>Current GPA(y)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.5</td>
<td>3.6</td>
</tr>
<tr>
<td>3.8</td>
<td>3.7</td>
</tr>
<tr>
<td>3.6</td>
<td>3.9</td>
</tr>
<tr>
<td>3.6</td>
<td>3.6</td>
</tr>
<tr>
<td>3.5</td>
<td>3.9</td>
</tr>
<tr>
<td>3.9</td>
<td>3.8</td>
</tr>
<tr>
<td>4.0</td>
<td>3.7</td>
</tr>
<tr>
<td>3.9</td>
<td>3.9</td>
</tr>
<tr>
<td>3.5</td>
<td>3.8</td>
</tr>
<tr>
<td>3.7</td>
<td>4.0</td>
</tr>
</tbody>
</table>

A) 3.41  B) 3.30  C) 3.79  D) 3.59

48) If 5 apples in a barrel of 25 apples are rotten, what is the expected number of rotten apples in a sample of 2 apples?

A) 1  B) 0.63  C) 0.4  D) 0.33

49) A summer camp wants to hire counselors and aides to fill its staffing needs at minimum cost. The average monthly salary of a counselor is $2400 and the average monthly salary of an aide is $1100. The camp can accommodate up to 45 staff members and needs at least 30 to run properly. They must have at least 10 aides, and may have up to 3 aides for every 2 counselors. How many counselors and how many aides should the camp hire to minimize cost?

A) 27 counselors and 18 aides  B) 35 counselors and 10 aides  
C) 12 counselors and 18 aides  D) 18 counselors and 12 aides

50) What is the probability that at least 2 students in a class of 36 have the same birthday?

A) 0.832  B) 0.799  C) 0.849  D) 0.814

51) Find the expected number of girls in a family of 4.

A) 2.5  B) 1.75  C) 2  D) 1.5

52) Barbara knows that she will need to buy a new car in 3 years. The car will cost $15,000 by then. How much should she invest now at 5%, compounded quarterly, so that she will have enough to buy a new car?

A) $12,340.54  B) $13,605.44  C) $13,928.99  D) $12,922.63

53) In order to receive a B in a course, it is necessary to get an average of 80% correct on two one-hour exams of 100 points each, on one midterm exam of 200 points, and on one final exam of 500 points. If a student scores 92, and 85 on the one-hour exams, and 146 on the midterm exam, what is the minimum score on the final exam that the person can get and still earn a B?

A) 397  B) 577  C) 307  D) 442
54) Jill Sharp, a fitness trainer, has an exercise regimen that includes running, swimming, and walking. She has no more than 12 hours per week to devote to exercise, including at most 4 hours running. She wants to walk at least three times as many hours as she swims. Jill will burn on average 528 calories per hour running, 492 calories per hour swimming, and 348 calories per hour walking.

How many hours per week should Jill spend on each exercise to maximize the number of calories she burns? What is the maximum number of calories she will burn? (Hint: Write the constraint involving walking and swimming in the form \( \leq 0 \).)

- A) 4 hr running, 2 hr swimming, and 6 hr walking; 5184 calories burned
- B) 4 hr running, 6 hr swimming, and 2 hr walking; 5760 calories burned
- C) 4 hr running, 1 hr swimming, and 7 hr walking; 5040 calories burned
- D) 3 hr running, 3 hr swimming, and 6 hr walking; 5148 calories burned

55) You have money in an account at 5% interest, compounded weekly. To the nearest year, how long will it take for your money to double?

- A) 8 years
- B) 19 years
- C) 14 years
- D) 11 years

56) Midtown Delivery Service delivers packages which cost $1.70 per package to deliver. The fixed cost to run the delivery truck is $44 per day. If the company charges $5.70 per package, how many packages must be delivered daily to break even?

- A) 5 packages
- B) 11 packages
- C) 7 packages
- D) 25 packages

Determine whether the given events are mutually exclusive.

57) Being a teenager and being a United States Senator

- A) Yes
- B) No

Find the number of elements in the indicated set by referring to the given table.

58) The table below shows the results of a poll taken in a U.S. city in which people are asked which candidate they intend to vote for in an upcoming presidential election.

<table>
<thead>
<tr>
<th></th>
<th>NonHispanic White (A)</th>
<th>Hispanic American (B)</th>
<th>African-American (C)</th>
<th>Asian-American (D)</th>
<th>American Indian (E)</th>
<th>Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Democrat (D)</td>
<td>237</td>
<td>112</td>
<td>86</td>
<td>140</td>
<td>16</td>
<td>519</td>
</tr>
<tr>
<td>Republican (R)</td>
<td>241</td>
<td>64</td>
<td>32</td>
<td>175</td>
<td>5</td>
<td>517</td>
</tr>
<tr>
<td>Other (O)</td>
<td>25</td>
<td>23</td>
<td>12</td>
<td>15</td>
<td>17</td>
<td>92</td>
</tr>
<tr>
<td>Totals</td>
<td>503</td>
<td>199</td>
<td>130</td>
<td>330</td>
<td>38</td>
<td>1200</td>
</tr>
</tbody>
</table>

Find the number of people in the set \( R' \cup (A \cup F) \)

- A) 929
- B) 812
- C) 1224
- D) 295

The sizes of two matrices \( A \) and \( B \) are given. Find the sizes of the product \( AB \) and the product \( BA \), whenever these products exist.

59) \( A \) is \( 2 \times 1 \), and \( B \) is \( 1 \times 1 \).

- A) \( AB \) does not exist; \( 1 \times 2 \)
- B) \( 2 \times 2; 1 \times 1 \)
- C) \( 1 \times 2; 1 \times 1 \)
- D) \( 2 \times 1; BA \) does not exist.
Find the equation of the least squares line.

60) Ten students in a graduate program were randomly selected. Their grade point averages (GPAs) when they entered the program were between 3.5 and 4.0. The following data were obtained regarding their GPAs on entering the program versus their current GPAs.

<table>
<thead>
<tr>
<th>Entering GPA (x)</th>
<th>Current GPA (y)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.5</td>
<td>3.6</td>
</tr>
<tr>
<td>3.8</td>
<td>3.7</td>
</tr>
<tr>
<td>3.6</td>
<td>3.9</td>
</tr>
<tr>
<td>3.6</td>
<td>3.6</td>
</tr>
<tr>
<td>3.5</td>
<td>3.9</td>
</tr>
<tr>
<td>3.9</td>
<td>3.8</td>
</tr>
<tr>
<td>4.0</td>
<td>3.7</td>
</tr>
<tr>
<td>3.9</td>
<td>3.9</td>
</tr>
<tr>
<td>3.5</td>
<td>3.8</td>
</tr>
<tr>
<td>3.7</td>
<td>4.0</td>
</tr>
</tbody>
</table>

A) \( y = 3.67 + 0.0313x \)  
B) \( y = 4.91 + 0.0212x \)  
C) \( y = 2.51 + 0.329x \)  
D) \( y = 5.81 + 0.497x \)

Find the future value of the ordinary annuity. Interest is compounded annually, unless otherwise indicated.

61) \( R = \$900, i = 10\% \) interest compounded semiannually for 11 years  
A) \$52,654.69 \)  
B) \$34,654.69 \)  
C) \$23,343.68 \)  
D) \$32,147.33 \)

Let \( A = \{ 6, 4, 1, \{3, 0, 8\}, \{9\} \} \). Determine whether the statement is true or false.

62) \( \{9\} \subseteq A \)  
A) True  
B) False

Perform the indicated operation, where possible.

63) \( \begin{bmatrix} 5 & 4 \\ 6 & 9 \end{bmatrix} + \begin{bmatrix} 1 \\ 5 \end{bmatrix} \)  
A) \( \begin{bmatrix} 6 \\ 9 \end{bmatrix} \)  
B) \( \begin{bmatrix} 6 & 9 \end{bmatrix} \)  
C) \( \begin{bmatrix} 5 & 1 \\ 4 & 5 \end{bmatrix} \)  
D) Not possible

Write the augmented matrix for the system. Do not solve.

64) \( 7x + 4y + 8z = 75 \)  
\( 8x + 4y - 2z = -4 \)  
\( 4x + 9y + 5z = 53 \)

A) \( \begin{bmatrix} 7 & 8 & 4 & 75 \\ 4 & 4 & 9 & -4 \\ 8 & 2 & 5 & 53 \end{bmatrix} \)  
B) \( \begin{bmatrix} 7 & 4 & 8 & 75 \\ 8 & 4 & -2 & 4 \\ 4 & 9 & 5 & 53 \end{bmatrix} \)  
C) \( \begin{bmatrix} 7 & 4 & 8 \\ 8 & 4 & -2 \\ 4 & 9 & 5 \end{bmatrix} \)  
D) \( \begin{bmatrix} 75 & 8 & 4 & 75 \\ -4 & 2 & 4 & 8 \\ 53 & 5 & 9 & 4 \end{bmatrix} \)
Graph the feasible region for the system of inequalities.

65) \( x - 2y \leq 2 \)
\( x + y \leq 0 \)
66) \[3y + x \geq -6\]
\[y + 2x \leq 8\]
\[y \leq 0\]
\[x \geq 0\]

Use the echelon method to solve the system of two equations in two unknowns.

67) \[x + 2y = -6\]
\[8x + 3y = -48\]
A) (6, -1)
B) (-6, 0)
C) (-5, -6)
D) No solution

Find the payment necessary to amortize the loan.

68) $14,400; 8.25\%$ compounded monthly; 48 monthly payments
A) $1735.53$
B) $351.67$
C) $373.17$
D) $353.24$
State the dual problem. Use \( y_1, y_2, y_3 \) and \( y_4 \) as the variables. Given: \( y_1 \geq 0, y_2 \geq 0, y_3 \geq 0, \) and \( y_4 \geq 0. \)

69) Minimize \( w = 2x_1 + 3x_2 + x_3 \) subject to: \( x_1 + 3x_2 + 2x_3 \geq 41 \)
\( 2x_1 + 4x_2 + 3x_3 \geq 54 \)
\( x_1 \geq 0, x_2 \geq 0, x_3 \geq 0 \)

A) Maximize \( z = 41y_1 + 54y_2 \) subject to: \( y_1 + 2y_2 \geq 2 \)
\( 3y_1 + 4y_2 \geq 3 \)
\( 2y_1 + 3y_2 \geq 1 \)

B) Maximize \( z = 54y_1 + 41y_2 \) subject to: \( 2y_1 + y_2 \geq 2 \)
\( 4y_1 + 3y_2 \geq 3 \)
\( 3y_1 + 2y_2 \geq 1 \)

C) Maximize \( z = 54y_1 + 41y_2 \) subject to: \( 2y_1 + y_2 \leq 2 \)
\( 4y_1 + 3y_2 \leq 3 \)
\( 3y_1 + 2y_2 \leq 1 \)

D) Maximize \( z = 41y_1 + 54y_2 \) subject to: \( y_1 + 2y_2 \leq 2 \)
\( 3y_1 + 4y_2 \leq 3 \)
\( 2y_1 + 3y_2 \leq 1 \)

Use an amortization table to solve the problem. Round to the nearest cent.

70) The monthly payments on a $90,000 loan at 11% annual interest are $1023.30. How much of the first monthly payment will go toward the principal?

A) $198.30
B) $112.56
C) $825.00
D) $910.74

Decide whether the situation involves permutations or combinations.

71) A selection of a chairman and a secretary from a committee of 17 people.

A) Permutation
B) Combination

Given a group of students: \( G = \{ \text{Allen, Brenda, Chad, Dorothy, Eric} \} \) or \( G = \{ A, B, C, D, E \} \), count the different ways of choosing the following officers or representatives for student congress. Assume that no one can hold more than one office.

72) A treasurer and a secretary if the two must not be the same sex

A) 3
B) 10
C) 6
D) 12

Find an equation in slope-intercept form (where possible) for the line.

73) Through (2, -1), \( m = -1.5 \)

A) \( y = 1.5x - 4 \)
B) \( y = -1.5x + 2 \)
C) \( y = 1.5x + 2 \)
D) \( y = -1.5x - 4 \)

74) Through (-4, 8), perpendicular to \( 3x + 7y = -68 \)

A) \( y = \frac{3}{7}x + \frac{3}{7} \)
B) \( y = -\frac{7}{3}x + \frac{52}{3} \)
C) \( y = \frac{7}{3}x + \frac{52}{3} \)
D) \( y = -\frac{4}{7}x + \frac{68}{7} \)

75) Through (-9, -4) and (5, 7)

A) \( y = \frac{11}{14}x + \frac{43}{14} \)
B) \( y = -\frac{5}{2}x - \frac{11}{2} \)
C) \( y = \frac{11}{14}x + \frac{43}{14} \)
D) \( y = \frac{5}{2}x - \frac{11}{2} \)
Prepare a probability distribution for the experiment. Let $x$ represent the random variable, and let $P$ represent the probability.

76) Three balls are drawn from a bag containing 5 red and 3 green balls. The number of green balls is counted.

<table>
<thead>
<tr>
<th>$x$</th>
<th>$P(x)$</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1/3</td>
</tr>
<tr>
<td>1</td>
<td>1/6</td>
</tr>
<tr>
<td>2</td>
<td>1/6</td>
</tr>
<tr>
<td>3</td>
<td>1/3</td>
</tr>
</tbody>
</table>

Use the Gauss-Jordan method to solve the system of equations.

77) $x + y + z = -5$
$$x - y + 3z = 11$$
$$3x + y + z = -11$$

A) (3, -3, -5)  
B) (3, -5, -3)  
C) (-3, -5, 3)  
D) No solution

78) $3x + y + z = 5$
$$4x + 5y - z = -8$$
$$10x + 7y + 2z = 2$$

A) $\left\{\frac{6z + 33}{11}, \frac{7z - 44}{11}, z\right\}$  
B) $\left\{-\frac{6z + 33}{11}, -\frac{7z - 44}{11}, z\right\}$

79) $5x + 2y + z = -11$
$$2x - 3y - z = 17$$
$$7x - y = 12$$

A) (0, -6, 1)  
B) (-2, 0, -1)  
C) (1, -5, 0)  
D) No solution

80) $-5x - 4y = -38$
$$-15x - 12y = -114$$

A) (6, 2)  
B) $\left\{\frac{38}{5} - \frac{4}{5}y, y\right\}$  
C) $\left\{\frac{38}{5} + \frac{4}{5}y, y\right\}$

D) No solution

A manufacturing company wants to maximize profits on products A, B, and C. The profit margin is $3 for A, $6 for B, and $15 for C. The production requirements and departmental capacities are as follows:

<table>
<thead>
<tr>
<th>Department</th>
<th>Production requirement by product (hours)</th>
<th>Departmental capacity (Total hours)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assembling</td>
<td>A 2 B 3 C 2</td>
<td>30,000</td>
</tr>
<tr>
<td>Painting</td>
<td>1 2 2</td>
<td>38,000</td>
</tr>
<tr>
<td>Finishing</td>
<td>2 3 1</td>
<td>28,000</td>
</tr>
</tbody>
</table>

81) What is the maximum profit if the profit margin on C changes to $10.00?

A) $60,000  
B) $42,000  
C) $280,000  
D) $150,000
Use the echelon method to solve the system.

\[
\begin{align*}
82) \quad \frac{x}{5} + \frac{y}{5} &= 2 \\
& \quad x - y = 4
\end{align*}
\]

82) ________

A) (6, 4) \hspace{1cm} B) (-7, 4) \hspace{1cm} C) (7, 3) \hspace{1cm} D) No solution

Find the compound amount for the deposit. Round to the nearest cent.

83) $15,000 at 6\% compounded semiannually for 6 years

A) $17,910.78 \hspace{1cm} B) $21,386.41 \hspace{1cm} C) $20,400.00 \hspace{1cm} D) $21,277.79

Each day Larry needs at least 10 units of vitamin A, 12 units of vitamin B, and 20 units of vitamin C. Pill #1 contains 4 units of A and 3 of B. Pill #2 contains 1 unit of A, 2 of B, and 4 of C. Pill #3 contains 10 units of A, 1 of B, and 5 of C.

84) Pill #1 costs 6 cents, pill #2 costs 2 cents, and pill #3 costs 14 cents. Larry wants to minimize cost.

What is the constraint inequality for vitamin B?

A) 3P_1 + 2P_2 + P_3 \geq 12
B) 4P_1 + P_2 + 10P_3 \geq 10
C) 6P_2 + 2P_3 + 14P_3 \geq 12
D) 3P_1 + 2P_2 + P_3 \leq 2

Find the ratios of products A, B, and C using a closed model.

85) \[
\begin{array}{ccc}
A & B & C \\
0.1 & 0.5 & 0.5 \\
0.8 & 0.3 & 0.4 \\
0.1 & 0.2 & 0.1
\end{array}
\]

A) 2: 3: 3 \hspace{1cm} B) 33: 24: 10 \hspace{1cm} C) 8: 11: 10 \hspace{1cm} D) 55: 76: 23

A bag contains 6 cherry, 3 orange, and 2 lemon candies. You reach in and take 3 pieces of candy at random. Find the probability.

86) All lemon

A) 1 \hspace{1cm} B) 0 \hspace{1cm} C) 0.061 \hspace{1cm} D) 0.1212

Find the amount that should be invested now to accumulate the following amount, if the money is compounded as indicated.

87) $4600 at 5.8\% compounded quarterly for 6 years

A) $1343.82 \hspace{1cm} B) $6498.41 \hspace{1cm} C) $3256.18 \hspace{1cm} D) $3279.77

Decide whether the statement is true or false.

88) \{5, 7, 9\} \cap \{6, 8, 10\} = \{5, 7, 9, 6, 8, 10\}

A) True \hspace{1cm} B) False

Find the transpose of the matrix.

89) \[
\begin{bmatrix}
3 & 9 & 6 & 0 \\
1 & 7 & 8 & 6
\end{bmatrix}
\]

A) \[
\begin{bmatrix}
1 & 3 \\
7 & 9 \\
8 & 6 \\
6 & 0
\end{bmatrix}
\]
B) \[
\begin{bmatrix}
1 & 7 & 8 & 6 \\
3 & 9 & 6 & 0
\end{bmatrix}
\]
C) \[
\begin{bmatrix}
3 & 1 \\
9 & 7 \\
6 & 8 \\
0 & 6
\end{bmatrix}
\]
D) \[
\begin{bmatrix}
3 & 9 \\
9 & 1 \\
0 & 6 \\
6 & 8
\end{bmatrix}
\]
Suppose that in the loan described, the borrower made a larger payment, as indicated. Calculate (a) the time needed to pay off the loan, (b) the total amount of the payments, and (c) the amount of interest saved, compared with the original loan and payments.

90) $7400; 6.2% compounded semiannually; 18 semiannual payments; with larger payment of $910.

- A) (a) 9 semiannual periods
  (b) $8190
  (c) $1150.15
- B) (a) 9 semiannual periods
  (b) $7556.50
  (c) $1097.15
- C) (a) 10 semiannual periods
  (b) $8661.65
  (c) $1105.15
- D) (a) 10 semiannual periods
  (b) $9100
  (c) $1176.15

Shade the Venn diagram to represent the set.

91) \((A \cap B \cap C)'\)
Use slack variables to convert the constraints into linear equations.

Maximize \[ z = 3x_1 + 5x_2 \]
subject to:
\[ 7x_1 + 3x_2 \leq 30 \]
\[ x_1 + 3x_2 \leq 40 \]
with:
\[ x_1 \geq 0, \ x_2 \geq 0 \]

A) \[ 7x_1 + 3x_2 + s_1 \leq 30 \]
\[ x_1 + 3x_2 + s_2 \leq 40 \]
B) \[ 7x_1 + 3x_2 = s_1 + 30 \]
\[ x_1 + 3x_2 = s_2 + 40 \]
C) \[ 7x_1 + 3x_2 + s_1 = 30 \]
\[ x_1 + 3x_2 + s_2 = 40 \]
D) \[ 7x_1 + 3x_2 + s_1 = 30 \]
\[ x_1 + 3x_2 + s_2 = 40 \]

The initial tableau of a linear programming problem is given. Use the simplex method to solve the problem.

\[
\begin{array}{cccccc}
 x_1 & x_2 & x_3 & s_1 & s_2 & z \\
\hline
 4 & 2 & 2 & 1 & 0 & 0 & 30 \\
 3 & 1 & 1 & 0 & 1 & 0 & 25 \\
-2 & -3 & -1 & 0 & 0 & 1 & 0 \\
\end{array}
\]

A) Maximum at 25 for \( x_2 = 15, \ s_1 = 10 \) 
B) Maximum at 12.5 for \( x_2 = 7.5, \ s_2 = 5 \) 
C) Maximum at 30 for \( x_2 = 10, \ s_1 = 15 \) 
D) Maximum at 45 for \( x_2 = 15, \ s_2 = 10 \)
Solve the system of equations by using the inverse of the coefficient matrix if it exists and by the echelon method if the inverse doesn’t exist.

95) \(-3x - 6y = -3\)
\[6x + 12y = 5\]

A) \((-3, 5)\)  
B) No inverse, no solution for system  
C) No inverse, \(1 + \frac{1}{2}y, y\)  
D) \((-2, -2)\)

Tell whether the statement is true or false.

96) \{all odd integers greater than -3 and less than 5\} = \{-1, 1, 3\}

A) True  
B) False

Find the expected value for the random variable \(x\) having this probability function.

97) \[\begin{array}{cccc}
2 & .1 & & \\
& \uparrow_p & & \\
a & b & c & d & e \\
\end{array}\]

\[a = 20 \quad b = 21 \quad c = 22 \quad d = 23 \quad e = 24\]

A) 18  
B) 22  
C) 17.2  
D) 17.8

Express the given situation as a linear inequality.

98) Phil Leitz needs at least 35 units of a nutritional supplement per day. Red pills provide 5 units and blue pills provide 7. Let \(x\) be the number of red pills and \(y\) be the number of blue pills.

A) \(35(x + y) \geq 35\)  
B) \(5x + 7y \geq 35\)  
C) \(x + y \geq 35\)  
D) \(12(x + y) \geq 35\)

Solve the problem. Round to the nearest cent.

99) $765.13 is deposited at the end of each month for 2 years in an account paying 2% interest compounded monthly. Find the final amount of the account.

A) $19,484.55  
B) $17,954.29  
C) $18,719.42  
D) $17,159.29

100) Joan wants to start an IRA that will have $250,000 in it when she retires in 30 years. How much should she invest annually in her IRA to do this if the interest is 6% compounded annually?

A) $7829.33  
B) $2663.69  
C) $3162.23  
D) $5814.74

Graph the feasible region of the system.
A summer camp wants to hire counselors and aides to fill its staffing needs at minimum cost. The camp can accommodate up to 45 staff members and needs at least 30 to run properly. They must have at least 10 aides, and may have up to 3 aides for every 2 counselors. Let $x$ represent the number of counselors and $y$ the number of aides.

\[
\begin{align*}
A) & \quad 30 \leq x + y \leq 45, \quad y \geq 10, \quad y \leq \frac{3}{2}x, \quad x \geq 0 \\
B) & \quad x + y \leq 45, \quad y \geq 10, \quad y \leq \frac{2}{3}x, \quad x \geq 0 \\
C) & \quad 30 \leq x + y \leq 45, \quad y \geq 10, \quad y \geq \frac{3}{2}x, \quad x \geq 0 \\
D) & \quad 30 \leq x + y \leq 45, \quad y \geq 10, \quad x \leq \frac{3}{2}y, \quad x \geq 10
\end{align*}
\]
Prepare an amortization schedule showing the first four payments for the loan.

102) Mary finances $150,000 towards the purchase of a new home through a 20-year mortgage. The interest rate applied to the monthly unpaid balance is 7%.

<table>
<thead>
<tr>
<th>Payment Number</th>
<th>Amount of Payment</th>
<th>Interest for Period</th>
<th>Portion to Principal</th>
<th>Principal at End of Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Find the expected value of the random variable in the experiment.

105) Three cards are drawn from a deck without replacement. The number of aces is counted.
A) 1
B) 0.2308
C) 0.2174
D) 1.0134

Find the maturity value and the amount of simple interest earned. Round to the nearest cent.

106) $8397 at 3.9% for 4 months
A) $8478.87; $81.87
B) $8533.45; $136.45
C) $8506.16; $109.16
D) $8507.08; $110.08
Use the given table to find the indicated probability.

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

<table>
<thead>
<tr>
<th>Toppings</th>
<th>Freshman</th>
<th>Sophomore</th>
<th>Junior</th>
<th>Senior</th>
<th>Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cheese</td>
<td>13</td>
<td>14</td>
<td>19</td>
<td>22</td>
<td>68</td>
</tr>
<tr>
<td>Meat</td>
<td>28</td>
<td>22</td>
<td>14</td>
<td>13</td>
<td>77</td>
</tr>
<tr>
<td>Veggie</td>
<td>14</td>
<td>13</td>
<td>28</td>
<td>22</td>
<td>77</td>
</tr>
</tbody>
</table>

A student is selected at random. Find the probability that the student's favorite topping is meat given that the student is a junior.
A) 0.063  B) 0.182  C) 0.230  D) 0.378

Find the requested probability.
108) A fair coin is tossed 5 times. What is the probability of exactly 4 heads?
A) 0.0313  B) 0.1250  C) 0.1563  D) 0.0625

109) A family has five children. The probability of having a girl is 1/2. What is the probability of having at least 3 boys?
A) 0.5000  B) 0.1563  C) 0.4688  D) 0.3125

Use the simplex method to solve the linear programming problem.

110) Minimize \( w = 5y_1 + 3y_2 \)
subject to:
\[ 2y_1 + 3y_2 \geq 9 \]
\[ 2y_1 + y_2 \geq 11 \]
y_1 \geq 0, y_2 \geq 0
A) 33 when y_1 = 11 and y_2 = 0  B) 27 when y_1 = 5 and y_2 = 1
C) 25 when y_1 = 2 and y_2 = 55  D) 27.5 when y_1 = 5.5 and y_2 = 0

111) Maximize \( z = 5x_1 + 3x_2 \)
subject to:
\[ 2x_1 + 4x_2 \leq 13 \]
x_1 + 2x_2 \leq 6
with \( x_1 \geq 0, x_2 \geq 0 \)
A) Maximum is 18 when x_1 = 0, x_2 = 6  B) Maximum is 9 when x_1 = 0, x_2 = 3
C) Maximum is 30 when x_1 = 6, x_2 = 0  D) Maximum is 32.5 when x_1 = 6.5, x_2 = 0

Find the indicated probability.

112) 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 that the first marble is white and the second marble is blue.
A) \( \frac{3}{28} \)  B) \( \frac{3}{56} \)  C) \( \frac{3}{64} \)  D) \( \frac{29}{56} \)
113) The table below describes the smoking habits of a group of asthma sufferers.

<table>
<thead>
<tr>
<th></th>
<th>Nonsmoker</th>
<th>Light smoker</th>
<th>Heavy smoker</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Men</td>
<td>361</td>
<td>86</td>
<td>85</td>
<td>532</td>
</tr>
<tr>
<td>Women</td>
<td>361</td>
<td>65</td>
<td>61</td>
<td>487</td>
</tr>
<tr>
<td>Total</td>
<td>722</td>
<td>151</td>
<td>146</td>
<td>1019</td>
</tr>
</tbody>
</table>

If one of the 1019 subjects is randomly selected, find the probability that the person chosen is a woman given that the person is a light smoker.

A) 0.133 B) 0.430 C) 0.248 D) 0.064

114) The age distribution of students at a community college is given below.

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>Number of students (f)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under 21</td>
<td>414</td>
</tr>
<tr>
<td>21 - 25</td>
<td>412</td>
</tr>
<tr>
<td>26 - 30</td>
<td>216</td>
</tr>
<tr>
<td>31 - 35</td>
<td>52</td>
</tr>
<tr>
<td>Over 35</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>1116</td>
</tr>
</tbody>
</table>

A student from the community college is selected at random. Find the probability that the student is at least 31. Round your answer to three decimal places.

A) 0.934 B) 74 C) 0.047 D) 0.066

115) The following contingency table shows the popular votes cast in the 1984 presidential election by region and political party. Round your answer to three decimal places.

<table>
<thead>
<tr>
<th>Region</th>
<th>Democratic</th>
<th>Republican</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northeast</td>
<td>9046</td>
<td>11,336</td>
<td>101</td>
</tr>
<tr>
<td>Midwest</td>
<td>10,511</td>
<td>14,761</td>
<td>169</td>
</tr>
<tr>
<td>South</td>
<td>10,998</td>
<td>17,699</td>
<td>136</td>
</tr>
<tr>
<td>West</td>
<td>7022</td>
<td>10,659</td>
<td>214</td>
</tr>
<tr>
<td>Totals</td>
<td>37,577</td>
<td>54,455</td>
<td>620</td>
</tr>
</tbody>
</table>

A person who voted Democratic in the 1984 presidential election is selected at random. Find the probability that the person was from the West.

A) 0.345 B) 0.076 C) 0.187 D) 0.196

Decide whether the matrices are inverses of each other. (Check to see if their product is the identity matrix I.)

\[
\begin{bmatrix}
9 & -2 \\
7 & -2
\end{bmatrix}
\begin{bmatrix}
\frac{1}{2} & \frac{1}{2} \\
-\frac{7}{4} & -\frac{9}{4}
\end{bmatrix}
\]

A) Yes B) No

Find the probability of the event.

117) A 10-question multiple choice test has 4 possible answers for each question. A student selects at least 6 correct answers.

A) 0.118 B) 0.989 C) 0.020 D) 0.995
Find the amount of each payment to be made into a sinking fund so that enough will be present to accumulate the following amount. Payments are made at the end of each period. The interest rate given is per period.

118) $77,000; money earns 4.8% compounded monthly for \(1\frac{1}{12}\) years

A) $1658.34  
B) $1550.52  
C) $5782.25  
D) $1917.23

Write the solutions that can be read from the simplex tableau.

119) \[
\begin{bmatrix}
2 & 0 & 3 & 1 & 1 & 0 & 10 \\
1 & 1 & 2 & 4 & 0 & 0 & 16 \\
4 & 0 & 1 & 8 & 0 & 1 & 23
\end{bmatrix}
\]

A) \(s_1 = 10, x_2 = 16, z = 23; x_1, x_3, s_2 = 0\)  
B) \(s_2 = 10, x_2 = 16, z = 23; x_1, x_3, s_1 = 0\)  
C) \(s_2 = 10, x_2 = 16, z = 23; x_1, x_3, s_2 = 0\)  
D) \(s_1 = 10, x_2 = 16, z = 23; x_1, x_3, s_1 = 0\)

Evaluate the function as indicated.

120) Find \(f(-4.9)\) when \(f(x) = 9x - 6.3\).

A) -50.4  
B) -37.8  
C) -44.73  
D) 37.8

Of the 2,598,960 different five-card hands possible from a deck of 52 playing cards, how many would contain the following cards?

121) Two black cards and three red cards

A) 845,000 hands  
B) 1,690,000 hands  
C) 1,267,500 hands  
D) 422,500 hands

Find the matrix product, if possible.

122) \[
\begin{bmatrix}
0 & -2 \\
4 & 3
\end{bmatrix}
\begin{bmatrix}
-1 & 3 & 2 \\
0 & -1 & 1
\end{bmatrix}
\]

A) \[
\begin{bmatrix}
0 & -6 & -4 \\
0 & -3 & 3
\end{bmatrix}
\]

B) \[
\begin{bmatrix}
0 & 2 & -2 \\
-4 & 9 & 11
\end{bmatrix}
\]

C) \[
\begin{bmatrix}
0 & -4 & 2 \\
9 & -2 & 11
\end{bmatrix}
\]

D) Does not exist

Use the union rule to answer the question.

123) If \(n(B) = 24\), \(n(A \cap B) = 5\), and \(n(A \cup B) = 42\); what is \(n(A)\)?

A) 18  
B) 23  
C) 25  
D) 21

Find the inverse, if it exists, for the matrix.

124) \[
\begin{bmatrix}
2 & -7 \\
-2 & 2
\end{bmatrix}
\]

A) \[
\begin{bmatrix}
2 & 7 \\
2 & 2
\end{bmatrix}
\]

B) \[
\begin{bmatrix}
\frac{1}{5} & \frac{7}{10} \\
\frac{1}{5} & \frac{1}{5}
\end{bmatrix}
\]

C) \[
\begin{bmatrix}
\frac{1}{5} & -\frac{7}{10} \\
\frac{1}{5} & -\frac{1}{5}
\end{bmatrix}
\]

D) No inverse
The lists below show five agricultural crops in Alabama, Arkansas, and Louisiana.

<table>
<thead>
<tr>
<th>Alabama</th>
<th>Arkansas</th>
<th>Louisiana</th>
</tr>
</thead>
<tbody>
<tr>
<td>soybeans (s)</td>
<td>soybeans (s)</td>
<td>soybeans (s)</td>
</tr>
<tr>
<td>peanuts (p)</td>
<td>rice (r)</td>
<td>sugarcane (n)</td>
</tr>
<tr>
<td>corn (c)</td>
<td>cotton (t)</td>
<td>rice (r)</td>
</tr>
<tr>
<td>hay (h)</td>
<td>hay (h)</td>
<td>corn (c)</td>
</tr>
<tr>
<td>wheat (w)</td>
<td>wheat (w)</td>
<td>cotton (t)</td>
</tr>
</tbody>
</table>

Let \( U \) be the smallest possible 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.

125) \( A \cap K \)

A) \{c, p, r, t\}  
B) \{c, h, s, t, w\}  
C) \{c, h, p, r, s, t, w\}  
D) \{h, s, w\}

Using either logarithms or a graphing calculator, find the time required for the initial amount to be at least equal to the final amount.

126) $6000 deposited at 4% compounded quarterly, to reach at least $12,300.

A) 17 years  
B) 19 years, 3 months  
C) 18 years, 9 months  
D) 18 years

Let \( U =\{\text{all soda pops}\}; A =\{\text{all diet soda pops}\}; B =\{\text{all cola soda pops}\}; C =\{\text{all soda pops in cans}\}; \) and \( D =\{\text{all caffeine-free soda pops}\}. \) Describe the given set in words.

127) \((A \cap B) \cap C'\)

A) All non- diet, non- cola soda pops not in cans  
B) All soda pops that are diet colas or not in cans  
C) All cola soda pops not in cans  
D) All diet- cola soda pops not in cans

How many distinguishable permutations of letters are possible in the word?

128) COLORADO

A) 40,320  
B) 13,440  
C) 6720  
D) 4480

Determine the interest rate needed to accumulate the following amounts in a sinking fund, with monthly payments as given.

129) Accumulate $191,000, monthly payments of $600 over 18 years.

A) 2.57%  
B) 4.07%  
C) 3.27%  
D) 4.77%

Find the monthly house payment necessary to amortize the following loan.

130) $60,000 at 6.69% for 15 years

A) $334.50  
B) $22.30  
C) $591.34  
D) $528.95

Pivot once about the circled element in the simplex tableau, and read the solution from the result.

131) \[
\begin{array}{cccccc|c}
\text{x}_1 & \text{x}_2 & \text{x}_3 & s_1 & s_2 & z \\
\hline
3 & 1 & 4 & 0 & 2 & 0 & 9 \\
6 & 0 & 2 & 1 & 5 & 0 & 3 \\
3 & 0 & 0 & 0 & 3 & 1 & 2 \\
\end{array}
\]

A) \( x_1 = 9, x_2 = -15, z = -7; x_2, x_3, s_2 = 0 \)  
B) \( x_1 = 3, x_2 = 21, z = -7; x_3, s_1, s_2 = 0 \)  
C) \( x_1 = 3, s_1 = -15, z = -7; x_2, x_3, s_1 = 0 \)  
D) \( x_1 = 3, x_2 = -15, z = 11; x_3, s_1, s_2 = 0 \)
Use a Venn diagram to decide if the statement is true or false.

132) \((A' \cap B') = A \cap B'\)  

\[
\begin{array}{c}
\text{A} \\
\text{B}
\end{array}
\]

A) True  
B) False

Solve the system of equations. Let \(z\) be the parameter.

133) \[
\begin{align*}
7x + 3y + 5z &= 0 \\
3x + y + 2z &= 0
\end{align*}
\]

\[
\begin{array}{l}
A) \left[-\frac{1}{2}z, 2z, z\right] \\
B) (z, z, z) \\
C) \left[-\frac{1}{2}z, -\frac{1}{2}z, z\right] \\
D) \left[-\frac{1}{2}z, -2z, z\right]
\end{array}
\]

An order of award presentations has been devised for seven people: Jeff, Karen, Lyle, Maria, Norm, Olivia, and Paul.

134) In how many ways can the first award be presented to Karen and the last to Lyle?  
A) 120  
B) 24  
C) 360  
D) 840

Convert the inequality into a linear equation by adding a slack variable.

135) \[
\begin{align*}
9x_1 + 5x_2 + s_1 &\leq 57 \\
9x_1 + 5x_2 + s_1 &\geq 57
\end{align*}
\]

\[
\begin{array}{l}
A) 9x_1 + 5x_2 + s_1 < 57 \\
B) 9x_1 + 5x_2 + s_1 = 57 \\
C) 9x_1 + 5x_2 + s_1 \leq 57 \\
D) 9x_1 + 5x_2 + s_1 \geq 57
\end{array}
\]

Suppose that in the loan described, the borrower paid off the loan after the time indicated. Calculate the amount needed to pay off the loan.

136) \$120,000; 9\% compounded quarterly; 15 quarterly payments; paid off after 12 quarters.  
A) \$12.61  
B) \$27,305.98  
C) \$99,092.66  
D) \$190,972.73

Find the amount of compound interest earned.

137) \$10,000 at 6\% compounded semiannually for 4 years  
A) \$2624.77  
B) \$1255.09  
C) \$2667.70  
D) \$5938.48

Insert \(\leq\) or \(\geq\) in the blank to make the statement true.

138) \([4, 5, 6, 7, 9] \_ [5, 7, 9]\)  
A) \(\leq\)  
B) \(\geq\)
Write the system of inequalities that describes the possible solutions to the problem.

139) 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.

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.

<table>
<thead>
<tr>
<th></th>
<th>Hours per chair</th>
<th>Hours per table</th>
<th>Total hours available</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction</td>
<td>1</td>
<td>3</td>
<td>27</td>
</tr>
<tr>
<td>Finishing</td>
<td>1</td>
<td>2</td>
<td>20</td>
</tr>
</tbody>
</table>

A) \( x + 3y \leq 27 \)
B) \( x + y \geq 36 \)
C) \( x + 3y \geq 27 \)
D) \( x + 3y \geq 0 \)

Write a cost function for the problem. Assume that the relationship is linear.

140) A cable TV company charges $25 for the basic service plus $8 for each movie channel. Let \( C(x) \) be the total cost in dollars of subscribing to cable TV, using \( x \) movie channels.

A) \( C(x) = 8x - 25 \)
B) \( C(x) = 8x + 25 \)
C) \( C(x) = 25x - 8 \)
D) \( C(x) = 25x + 8 \)

Find the future value of the annuity due. Assume that interest is compounded annually, unless otherwise indicated.

141) \( R = 3300; \ i = 0.06; \ n = 15 \)

A) \( \$81,419.34 \)
B) \( \$84,719.34 \)
C) \( \$76,810.70 \)
D) \( \$69,349.72 \)

Find the values of the variables in the equation.

142) \[
\begin{bmatrix}
  t - 3 & 3 & - 3 \\
  - 6 & 3 & - 3 \\
  - 6 & 1 & - 7 \\
\end{bmatrix}
= \begin{bmatrix}
  - 6 & 3 & - 3 \\
  - 6 & x + 6 & - 7 \\
\end{bmatrix}
\]

A) \( t = - 3, \ x = 7 \)
B) \( t = - 9, \ x = 7 \)
C) \( t = - 3, \ x = - 5 \)
D) \( t = - 6, \ x = 1 \)

Give the probability distribution and sketch the histogram.

143) At a safety program for hunters, each member of a class of 25 took 5 shots at a target. The number of bullseyes is shown in the table.

<table>
<thead>
<tr>
<th>Number of Bull's-eyes</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Total: 25</td>
<td></td>
</tr>
</tbody>
</table>
An experiment is conducted for which the sample space is \( S = \{a, b, c, d\} \). Decide if the given probability assignment is possible for this experiment. If the assignment is not possible, tell why.

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>Probabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>1.05</td>
</tr>
<tr>
<td>b</td>
<td>0.15</td>
</tr>
<tr>
<td>c</td>
<td>-0.25</td>
</tr>
<tr>
<td>d</td>
<td>0.05</td>
</tr>
</tbody>
</table>

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Use a Venn Diagram and the given information to determine the number of elements in the indicated region.

\[ n(U) = 83, n(A) = 41, n(B) = 34, n(C) = 23, n(A \cap B) = 9, n(A \cap C) = 6, n(B \cap C) = 6, \text{ and } n(A \cap (B \cap C)) = 5. \]

Find \( n((A \cup B) \cup C)' \).

A) 31     B) 1     C) 5     D) 32
Use the indicated region of feasible solutions to find the maximum and minimum values of the given objective function.

146) \( z = 9x - 12y \)

A) Maximum of 45; minimum of -72
B) Maximum of -72; minimum of 0
C) Maximum of 45; minimum of 0
D) Maximum of -48.75; minimum of -72

Use a Venn diagram to find the indicated probability.

147) If \( P(A \cup B) = 0.63 \), \( P(A) = 0.35 \), and \( P(A \cap B) = 0.19 \), find \( P(B) \).

A) 0.54
B) 0.47
C) 0.39
D) 0.6

Find the production matrix for the input-output and demand matrices using the open model.

148) \( A = \begin{bmatrix} 0.25 & 0.08 \\ 0.33 & 0.11 \end{bmatrix} \), \( D = \begin{bmatrix} 600 \\ 900 \end{bmatrix} \)

A) \( \begin{bmatrix} 945 \\ 1362 \end{bmatrix} \)
B) \( \begin{bmatrix} 1181 \\ 1703 \end{bmatrix} \)
C) \( \begin{bmatrix} 1293 \\ 1131 \end{bmatrix} \)
D) \( \begin{bmatrix} 900 \\ 1245 \end{bmatrix} \)

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

149) \( C' \cap A' \)

A) \( \{q, s, u, v, w, x, y, z\} \)
B) \( \{q, r, s, t, u, v, x, y, z\} \)
C) \( \{w, y\} \)
D) \( \{s, t\} \)

Let \( A = \{1, 3, 5, 7\} \); \( B = \{5, 6, 7, 8\} \); \( C = \{5, 8\} \); \( D = \{2, 5, 8\} \); and \( U = \{1, 2, 3, 4, 5, 6, 7, 8\} \). Determine whether the given statement is true or false.

150) \( A \subseteq A \)

A) True
B) False

In a certain college, 33% of the physics majors belong to ethnic minorities. Find the probability of the event from a random sample of 10 students who are physics majors.

151) No more than 6 belong to an ethnic minority.

A) 0.9846
B) 0.0547
C) 0.913
D) 0.9815

Solve.

152) A lottery game contains 26 balls numbered 1 through 26. What is the probability of choosing a ball numbered 27?

A) 1
B) \( \frac{1}{26} \)
C) 0
D) 26
Use a Venn diagram to answer the question.

153) A survey of 220 families showed that
   83 had a dog;
   64 had a cat;
   28 had a dog and a cat;
   84 had neither a cat nor a dog, and in addition did not have a parakeet;
   6 had a cat, a dog, and a parakeet.
   How many had a parakeet only?
   A) 22  B) 32  C) 27  D) 17

Identify the probability statement as empirical or not.

154) The probability of rolling an even number on a fair die is 0.50.
    A) Not empirical  B) Empirical

Find the interest rate for each deposit and compound amount.

155) $6000 accumulating to $8414.58, compounded quarterly for 8 years.
    A) 4.25%  B) 4.5%  C) 4.75%  D) 3.75%

Find the simple interest. Assume a 360-day year. Round results to the nearest cent.

156) $52,799 at 3.7% for 18 months
    A) $2954.97  B) $3093.14  C) $2767.55  D) $2930.34