

1. The length of a certain species of fish is normally distributed with mean 62.8cm and a standard deviation of 8.4cm. A local fisherman catches one and measures it at 73.3cm. Thinking it might be the biggest ever caught on the lake, he has it mounted on his wall. Find the probability of a longer fish than his being caught in this lake.

- a) 0.8944 b) 0.5000 c) 0.1587 d) 0.1056

2. A survey of people working in downtown Chicago were asked about their usage of public transportation. Of those asked, seventy-four said they take the bus, one hundred and twelve said they took the trains, thirty-eight said they took both, and sixty-seven said they took neither. How many people were in the survey?

- a) 291 b) 157 c) 215 d) 224

3.

Maximize : $-2x + 5y$ subject to :

$$-x + y \geq 40$$

$$x \leq 60$$

$$3x + 4y \leq 300$$

$$x \geq 0, y \geq 0$$

- a) There is no Maximum
 b) Max is 270 at (60,30)
 c) Max is 200 at (0,40)
 d) Max is 260 at (20,60)

4. Which pairs of matrices are inverses of each other? Assume P and K are not 0.

$$A = \begin{bmatrix} 4 & -1 \\ 2 & 0.5 \end{bmatrix} \quad B = \begin{bmatrix} 1 & 0.25 \\ -0.5 & .125 \end{bmatrix} \quad C = \begin{bmatrix} 2P & 0 \\ 4P & -1 \end{bmatrix} \quad D = \begin{bmatrix} \frac{1}{2P} & 0 \\ 2 & -1 \end{bmatrix} \quad E = \begin{bmatrix} K & -2 \\ -1 & \frac{1}{K} \end{bmatrix} \quad F = \begin{bmatrix} \frac{-1}{K} & 2 \\ -1 & -K \end{bmatrix}$$

- a) A and B only
 b) A and B, C and D
 c) C and D only
 d) All 3 pairs; A and B, C and D, E and F

5. The BriteLite™ lighting company has factories in Detroit and Memphis and warehouses in Cincinnati and Knoxville. There are 640 MagnaLite fixtures in Detroit and 420 in Memphis, while there are orders placed from Cincinnati for 560 and from Knoxville for 350. The cost of shipping each fixture is \$8 from Detroit to Cincinnati, \$10 from Detroit to Knoxville, \$7 from Memphis to Cincinnati, and \$12 from Memphis to Knoxville. The regional manager needs to fill the orders at least cost. Let x = Memphis to Cincinnati and y = Memphis to Knoxville.

Which is the correct Objective function for this Linear Programming problem?

- a) Minimize $15x + 19y$
 b) Minimize $9320 - x + 2y$
 c) Minimize $8400 - 3x + 4y$
 d) Minimize $7980 - x + 2y$

6. There are eight Republicans and twelve Democrats among the twenty City Council members. The mayor, who is a Republican, selects a committee of seven for an issue very important to his agenda. If he were to select the committee randomly, what is the probability there will be more Republicans than Democrats?

- a) 0.251 b) 0.002 c) 0.500 d) 0.749

7.

A sociologist finds that of women who attend college, 70% of their daughters attended college, while for women who did not attend college, 25% of their daughters attended college. Should this trend continue, what percentage of the granddaughters (daughters of daughters) of today's college women will attend college?

- a) 0.49 b) 0.464 c) 0.565
d) Cannot tell without this generation's proportions

8. An expert rifle shooter hits a target on $\frac{2}{3}$ of his attempts. During a weekend long competition he will fire at the target 450 times. Use normal approximation techniques to find the probability that he hits the target more than 285 times, but not more than 328 times.

- a) 0.9235 b) 0.9243 c) 0.9372 d) 0.9364

9. An island north of Europe has an economy based on only Fish and Chips. To produce \$1, the fish industry needs \$0.08 from itself and \$0.12 from the chips industry, while to produce \$1, the chips industry needs \$0.15 from itself and \$0.04 from the fish industry. The government's commerce office projects a demand from the public for \$34567 in fish and \$23456 in chips next year. Find the combined amount of fish and chips that needs to be produced in order to satisfy this demand, to the nearest \$1.

- a) \$72157 b) \$72115 c) \$58023 d) \$46653

10. Given the following: $P(A) = 0.40$, $P(B') = 0.48$, $P(A \cup B) = 0.64$, find $P(A' | B')$

- a) 0.75 b) 0.60 c) 0.48 d) 0.65

11.

$$2x + 3y = -29$$

Solve the system of equations: $x + y - z = -12$

$$2x - 3y - 12z = 1$$

- a) $(x = 3z - 7, y = -2z - 5, z = \text{Any Real})$
b) $(x = -3z - 7, y = 2z - 5, z = \text{Any Real})$
c) $(-7, -5, 0)$
d) No Solution

12.

The Acme Furniture company builds tables and chairs. Each table needs 4 hours of carpentry, 2 hours of sanding, and 3 hours of finishing, while each chair needs 2 hours of carpentry, 1 hour of sanding, and 1 hour of finishing. There are 360 hours of carpentry, 120 hours of sanding, and 180 hours of finishing available each week. The profits are \$40 on each table and \$24 on each chair. The shop manager wants at most three times as many chairs made as tables each week. If $X = \#$ tables and $Y = \#$ chairs, which of the following is a correct constraint for this Linear Programming Problem?

- a) $4X + 2Y \geq 360$ b) $3X - Y \geq 0$ c) $4X + 2Y \geq 360$ d) $X - 3Y \leq 0$

13. The Perfect Pie pizza parlor offers the following toppings: sausage, pepperoni, onion, green pepper, garlic, tomato, anchovies, bacon, olives, basil, and spinach. They offer a “perfect party pizza” which allows the customer to put up to eight toppings on the pizza. In how many ways can this be done?

- a) 165 b) 1816 c) 40320 d) 1981

14. A student at a college where every class is the same number of hours wishes to confirm the GPA listed in his student records. The college uses a point system of $A = 4, B = 3, C = 2, D = 1, F = 0$. So far in his college career, the student has earned 7 A's, 6 B's, 8 C's, 5 D's, and 2 F's. Calculate this student's mean grade point average.

- a) 2.00 b) 2.50 c) 2.58 d) 2.39

15. Use the matrices and their given dimensions (sizes) to determine which of the Matrix Expressions below are possible mathematically.

$$\begin{matrix} [A] & [B] & [C] & [D] & [E] \\ 2 \times 3 & 2 \times 3 & 3 \times 2 & 3 \times 3 & 2 \times 2 \end{matrix}$$

- I. $BDC + E$
 II. $CAB + CD$
 III. $A + B + C$
 IV. $EA + BCB$

- a) All of them b) I and IV only c) I, II, and IV d) II and IV only

16. The Absorbing Stochastic Matrix, A , has been rearranged into $\begin{bmatrix} I & S \\ 0 & R \end{bmatrix}$ form. Find $\begin{bmatrix} I & S(I - R)^{-1} \\ 0 & 0 \end{bmatrix}$

and determine what proportion of the population that started in P will eventually end in the absorbing state R .

$$A = \begin{matrix} & P & Q & R & S \\ P & \begin{bmatrix} .2 & 0 & 0 & .4 \end{bmatrix} \\ Q & \begin{bmatrix} .5 & 1 & 0 & .3 \end{bmatrix} \\ R & \begin{bmatrix} .2 & 0 & 1 & .2 \end{bmatrix} \\ S & \begin{bmatrix} .1 & 0 & 0 & .1 \end{bmatrix} \end{matrix} \Rightarrow \begin{matrix} & Q & R & P & S \\ Q & \begin{bmatrix} 1 & 0 & .5 & .3 \end{bmatrix} \\ R & \begin{bmatrix} 0 & 1 & .2 & .2 \end{bmatrix} \\ P & \begin{bmatrix} 0 & 0 & .2 & .4 \end{bmatrix} \\ S & \begin{bmatrix} 0 & 0 & .1 & .1 \end{bmatrix} \end{matrix}$$

- a) 0.706 b) 0.647 c) 0.294 d) 0.353

17. The medical test for a certain disease has 3% False Positives and 6% False Negatives. If 20% of the population which gets tested actually has this disease, find the probability of (i) a negative test result and (ii) that a person has the disease given that their test result was negative.

- a) (i) 0.788 and (ii) 0.0152
- b) (i) 0.212 and (ii) 0.0152
- c) (i) 0.242 and (ii) 0.8017
- d) (i) 0.788 and (ii) 0.8017

18. A teacher with a class of 16 students is going to give a group project assignment to the class. If they break up into groups of size 5,4,3,2, and two other students decide to each do the whole project alone, in how many ways can these groups have been chosen, each doing a different version of the project?

- a) 63063000
- b) 5.02×10^{13}
- c) 302702400
- d) 605404800

19. The tables below show two investment opportunities, with their potential return values and the associated probabilities of each return listed. Find the Expected Value and Variance of each opportunity, and then select the statement which best describes what these values tell you about the investment choices.

Investment A

| Return | Prob |
|---------|------|
| -\$3000 | 0.2 |
| \$0 | 0.15 |
| \$1500 | 0.2 |
| \$4000 | 0.45 |

Investment B

| Return | Prob |
|--------|------|
| \$0 | 0.05 |
| \$1000 | 0.15 |
| \$1500 | 0.5 |
| \$2000 | 0.3 |

- a) The mean of A is greater than B, and the standard deviations are equal
- b) The means are equal, and the standard deviation of B is greater than that of A
- c) The means are equal, and the standard deviation of A is greater than that of B
- d) The mean of B is greater, and the standard deviations are equal

20. Study habits of the students at a certain public university are as follows: of those who study heavily one day, 30% will study heavily the next day, 50% will study lightly, and the rest not at all; of those who study lightly one day, 40% will study lightly again, 35% heavily, and the rest not at all; of those who do not study one day, all will study heavily the next day (apparently guilty feelings run strong at this school). In the long run, what percentage of students will study heavily on any given day?

- a) The transition matrix A is Absorbing, so it is not possible to say
- b) 0.3717
- c) 0.4461
- d) 0.4626