# MATH 104 - EXAM III

1. The probability distribution for a random variable X is given below. What is the variance of X?

| k | Pr(X=k) |
|---|---|
| 1 | .1 |
| 2 | .1 |
| 3 | .5 |
| 4 | .3 |

(a) .8 (b) $\sqrt{.8}$ (c) 0 (d) 9.8 (e) $\sqrt{9.8}$

2. The population of scores, for a class of 10 students, on a 5 question quiz is given by the table below. The mean for the scores is 3. What is the population variance for the scores?

| Score | Frequency |
|---|---|
| 0 | 0 |
| 1 | 1 |
| 2 | 2 |
| 3 | 4 |
| 4 | 2 |
| 5 | 1 |

(a) 1.2 (b) $\sqrt{1.2}$ (c) 10.2 (d) $\sqrt{10.2}$ (e) 0

3. Let Z be a random variable with standard normal distribution. Find the value of z so

that $\Pr(-z \le Z \le z) = .994$.

(a) 2.75 (b) 2.5 (c) 2.6 (d) .006 (e) -2.6

4. The amount of Guinness sold weekly by McGuires Irish pub is normally distributed with $\mu$ = 2,000 pints and $\sigma$ = 500 pints. How many pints of Guinness should Mr. McGuire have on hand at the beginning of the week to be 99.9% sure that he will not run out before the end of the week?

(a) 3,550 (b) 3,175 (c) 3,650 (d) 2,650 (e) 2,000

5. If a random variable X has a normal distribution with mean $\mu = 5$ and standard deviation $\sigma = 2$, how many standard deviations <u>below</u> the mean is $x = 0$?

(a) $\frac{5}{2}$ (b) 5 (c) $\sqrt{\frac{5}{2}}$ (d) $\sqrt{5}$ (e) 0

6. Each time a soccer player takes a penalty, her chances of scoring a goal are .7. Let X be the number of goals she scores out of 5 penalties. What is the standard deviation of X?

(a) $\sqrt{1.05}$ (b) 1.05 (c) 3.5 (d) $\sqrt{3.5}$ (e) $\sqrt{1.5}$

7. If 10% of all pistachios in a barrel are defective, use the normal approximation to the binomial to estimate the probability of getting 20 or less defective pistachios in a bag of 400, chosen at random from the barrel.

(a) .0006 (b) .2 (c) .9994 (d) .0548 (e) .9452

8. The number of boxes of sugar coated frosty bombs sold in a certain shop is linearly related to the price. When the price is $2.00 per box, sales are 100 boxes per week. However, if the price is raised to $3.00 per box the demand drops to 75 boxes per week. How many boxes will be sold if the price is raised to $4.00 per box?

(a) 50 (b) 0 (c) 25 (d) 45 (e) 30

9. The number of points of intersection of two particular lines in the xy plane is determined. Which of the following numbers cannot describe the exact number of points of intersection?

(a) 3 (b) 0 (c) 1 (d) infinitely many

10. Which of the following statements is true about the solution of the following system of equations:

$$\begin{cases} 2x + y = 6 \\ x + 3y = 8 \end{cases}$$

(a) The value of x is 2 (b) The value of x is 1 (c) There are infinitely many solutions
(d) There is no solution (e) The value of x is -2.

11. Which of the following statements is true about the solution to the following system of equations?

$$\begin{cases} 2x + 5y = 1 \\ x + y = -1 \\ x - y = 1 \end{cases}$$

(a) There is no solution (b) There are infinitely many solutions
(c) The value of x is 1 (d) The value of x is 2. (e) x may have any value.

12. An athlete wishes to restrict his calorie intake to 3,000 calories per day. He wishes to limit his fat intake to 10 grams per day and he also wants his carbohydrate consumption to be twice that of his protein consumption. A gram of fat yields 7 calories and a gram of either carbohydrates or proteins is equivalent to 4 calories. Which of the following systems of equations must he solve to find the number of grams of fat, denoted F, the number of grams of carbohydrates, denoted C, and the number of grams of protein, denoted P, that he should consume each day.

(a) $4C + 4P + 7F = 3{,}000$
$F = 10$
$C = 2P$

(b) $4C + 4P + 7F = 3{,}000$
$7F = 10$
$C = 2P$

(c) $C + P + F = 3{,}000$
$F = 10$
$C = 2P$

(d) $4C + 4P + 7F = 3{,}000$
$\frac{F}{7} = 10$
$4C = 8P$

(e) $\frac{C}{4} + \frac{P}{4} + \frac{F}{7} = 3{,}000$
$F = 10$
$C = 2P$

13. The matrix corresponding to a system of equations is given by

$$\begin{array}{c} x \quad y \quad z \\ \left[\begin{array}{ccc|c} 1 & 1 & 1 & 3 \\ 0 & 0 & 2 & 4 \end{array}\right] \end{array}$$

The general solution of the system is

(a) $z = 2$
$x = 1 - y$
$y =$ any value

(b) $z =$ any value
$y = 2$
$x = 1 - z$

(c) $z =$ any value
$y = z - 2$
$x = -y + 1$

(d) $z = 2$
$x =$ any value
$x = 1 - y$

(e) $z = 2$
$y = 1$
$x = 0$

14. The matrix $\begin{bmatrix} 1 & 2 & 1 \\ 2 & 0 & 1 \\ 1 & 1 & \textcircled{-1} \end{bmatrix}$ is pivoted around the circled element. What is the entry in the 2nd row and 2nd column of the resulting matrix?

(a) 1 (b) 0 (c) 2 (d) -1 (e) -2

15. Let $A = \begin{bmatrix} 2 & -1 \\ 0 & 1 \\ 1 & 0 \end{bmatrix}$ and $B = \begin{bmatrix} -1 & 1 \\ 2 & 1 \\ 1 & 1 \end{bmatrix}$

Then 2A + B is given by

(a) $\begin{bmatrix} 3 & -1 \\ 2 & 3 \\ 3 & 1 \end{bmatrix}$ (b) $\begin{bmatrix} 1 & 0 \\ 2 & 2 \\ 2 & 1 \end{bmatrix}$ (c) $\begin{bmatrix} 0 & 1 \\ 4 & 3 \\ 3 & 2 \end{bmatrix}$ (d) $\begin{bmatrix} 5 & -1 \\ 2 & 2 \\ 2 & 1 \end{bmatrix}$ (e) $\begin{bmatrix} 1 & 0 \\ 2 & 3 \\ 2 & 1 \end{bmatrix}$

16. Let $X = \begin{bmatrix} 1 & 5 & 1 \\ 2 & 1 & 1 \\ 3 & 1 & 0 \end{bmatrix}$ $Y = \begin{bmatrix} 2 & 5 & 0 \\ 0 & 1 & 1 \\ 1 & 1 & 0 \end{bmatrix}$

Find the entry in the $2^{nd}$ row and $2^{nd}$ column of XY.

(a) 12 (b) 5 (c) 1 (d) 11 (e) 16

17. Let $A = \begin{bmatrix} 1 & 1 \\ 2 & 0 \end{bmatrix}$. Find $A^{-1}$.

(a) $\begin{bmatrix} 0 & 1/2 \\ 1 & -1/2 \end{bmatrix}$ (b) $\begin{bmatrix} 0 & -1 \\ -2 & 1 \end{bmatrix}$ (c) $\begin{bmatrix} 1 & -1 \\ -2 & 0 \end{bmatrix}$ (d) $\begin{bmatrix} -1/2 & 1/2 \\ 1 & 0 \end{bmatrix}$

(e) $\begin{bmatrix} -1/2 & -1/2 \\ -1 & 0 \end{bmatrix}$

18. If $A\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 1 \\ 2 \\ 1 \end{bmatrix}$ and $A^{-1} = \begin{bmatrix} 1 & 2 & 1 \\ 0 & 1 & 1 \\ 3 & 1 & 1 \end{bmatrix}$. Find the value of y.

(a) 3 (b) 5 (c) 6 (d) 2 (e) 1

19. The matrix corresponding to a system of linear equations is given by

$$\begin{array}{c} x \quad y \quad z \\ \left[\begin{array}{ccc|c} 1 & 0 & 1 & 1 \\ 1 & 1 & 1 & 2 \\ 0 & 1 & 1 & 3 \end{array}\right] \end{array}$$

Which of the following statements is true about the solution of the system.

(a) $z = 2$ (b) $z = -1$ (c) $z =$ any value (d) no solution (e) $z = 0$

20. Use the Gauss-Jordan method to find the entry in the 3rd row and 2nd column of matrix $A^{-1}$ where A is the matrix:

$$A = \begin{bmatrix} 1 & 1 & 0 \\ 0 & 1 & 0 \\ 0 & 1 & 1 \end{bmatrix}$$

(a) -1 (b) 2 (c) 1 (d) 0 (e) $-\frac{1}{2}$