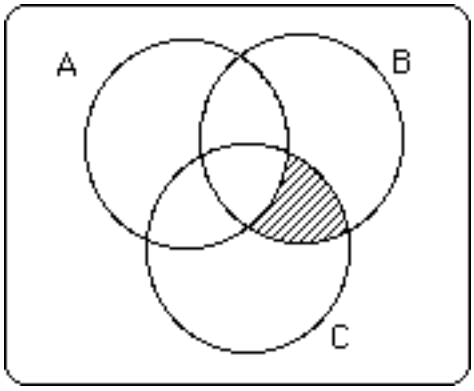
1. Identify the following shaded region:



a. $A' \cup B \cap C$ b. $A' \cap B \cap C$ c. $(A' \leftrightarrow B) \cup (A' \leftrightarrow C)$

d. $A' \cup B \cup C$ e. $A' \cap B \cup C$

2. Out of 25 people surveyed, 15 like football, 11 like basketball and 4 like neither. How many people like basketball but not football?

a. 4 b. 11 c. 5 d. 10 e. 6

3. Suppose a jar contains 3 red marbles and 4 green marbles. Three marbles are selected at random without replacement. How many different selections contain exactly two green marbles?

a. 48 b. 36 c. 6 d. 18 e. 11

4. The craft store has 25 different shades of red thread. How many different selections of three distinct shades are possible?

a. P(25,3) b. C(25,3) c. 3^{25} d. 25^3 e. 3x25

5. A knick-knack rack has 7 slots. A lady has a thimble, a small statue, and a piece of costume jewelry to put in three different slots. How many ways can this be done?

a. 7 b. 35 c. 210 d. 21 e. 27

6. To celebrate the end of summer school, Alex and Julie go out for pizza. If the pizza restaurant offers 8 different toppings and 4 different crusts, how many different pizzas can be ordered? (A pizza has any number of toppings and one type of crust).

a. 1024 b. 256 c. 260 d. 12 e. 32

7. What is the coefficient of $x^2\, y^{119}$ in the binomial expansion of $(x+y)^{121}$?

a. 7021 b. C(119,2) c. 7260 d. P(123,2) e. 121

For problems 8, 9 and 10 suppose that a fair die is rolled. Let E be the event {2, 4, 5, 6} and let F be the event {1, 2, 3, 4}.

8. What is the probability of event F?

a. $\frac{10}{6}$ b. $\frac{1}{6}$ c. $\frac{2}{6}$ d. $\frac{3}{6}$ e. $\frac{4}{6}$

9. What is the probability of event E′ (i.e. - E-complement)?

a. $\frac{2}{6}$ b. $\frac{1}{6}$ c. $\frac{4}{6}$ d. $\frac{3}{6}$ e. $\frac{17}{6}$

10. What is the probability that E occurs given that F has occurred?

a. $\frac{2}{6}$ b. 1 c. $\frac{3}{4}$ d. $\frac{2}{4}$ e. $\frac{4}{6}$

11. Suppose E and F are independent events, Pr(E) = 0.2 and Pr(F) = 0.3. What is Pr(E $\cup$ F)?

a. 0.4 b. 0.44 c. 0.06 d. 0.56 e. 0.94

12. Suppose E and F are mutually exclusive events, Pr(E) = 0.3 and Pr(F) = 0.4. What is Pr(E|F)?

a. 0.4 b. 0.3 c. 0 d. 0.12 e. 0.1

13. Suppose an expert beanbag thrower plays a beanbag game at the annual county fair. If she has two throws to win and for each throw she has a $\frac{3}{4}$ probability of throwing the beanbag through the hole, what is her probability of winning?

a. $\frac{3}{16}$ b. $\frac{12}{16}$ c. $\frac{9}{16}$ d. $\frac{1}{16}$ e. $\frac{15}{16}$

14. If the odds in favor of the Notre Dame football team winning their first game are 12 to 8, then what is the probability of Notre Dame winning?

a. 0.60 b. 0.40 c. 1.5 d. 0.67 e. 0.33

15. Suppose we flip a fair coin 6 times. What is the probability of getting exactly two heads?

a. $\frac{6}{64}$ b. $\frac{8}{64}$ c. $\frac{15}{64}$ d. $\frac{39}{64}$ e. $\frac{30}{64}$

Use the following probability distribution for problems 16 and 17.

k	Pr(X = k)
– 2	0.1
0	0.3
1	0.2
2	0.2
3	0.2

16. What is $Pr(X^2 = 4)$?

a. 0.1 b. 0.3 c. 0.2 d. 0 e. 0.4

17. What is E(X)?

a. 2.5 b. 2.0 c. 1.5 d. 1.0 e. 0

18. Suppose that a random variable X has a probability distribution with mean $\mu = E(X) = 144$ and standard deviation $\sigma = 2$. Using the Chebychov Inequality, the probability that is between 138 and 150 inclusive is greater than or equal to:

a. $\frac{5}{9}$ b. $\frac{1}{9}$ c. $\frac{8}{9}$ d. $\frac{6}{9}$ e. $\frac{3}{9}$

19. Suppose the number of M&M's placed into a one pound bag is normally distributed. If the average number of M&M's in a bag is 300 and the standard deviation is 6, what is the probability of a bag containing 308 M&M's or more?

a. $A\left(\frac{4}{3}\right)$ b. $1 - A\left(\frac{4}{3}\right)$ c. $A\left(\frac{4}{3}\right) - 1$

d. $1 + A\left(\frac{4}{3}\right)$ e. $1 - A\left(-\frac{4}{3}\right)$

20. A jar contains 3 colored marbles: red, blue, and green. A single marble is selected, its color noted and then the marble is replaced in the jar. If we do this 10 times, when is the probability of drawing a red marble 7 or 8 times?

a. $\binom{10}{7}\left(\frac{1}{3}\right)^7\left(\frac{2}{3}\right)^3 + \binom{10}{8}\left(\frac{1}{3}\right)^8\left(\frac{2}{3}\right)^2$

b. $\left[\binom{10}{7} + \binom{10}{8}\right]\left(\frac{1}{3}\right)^7\left(\frac{2}{3}\right)^3$

c. $\binom{10}{7}\left(\frac{1}{3}\right)^3\left(\frac{2}{3}\right)^7 + \binom{10}{8}\left(\frac{1}{3}\right)^2\left(\frac{2}{3}\right)^8$

d. $\binom{10}{7}\left(\frac{1}{3}\right)^7\left(\frac{2}{3}\right)^3 \times \binom{10}{8}\left(\frac{1}{3}\right)^8\left(\frac{2}{3}\right)^{72}$

e. $\frac{2^2 + 2^3}{2^{10}}$

21. What is the 42nd percentile of a normal distribution with mean $\mu = 1000$ and standard deviation $\sigma = 100$?

a. – 20 b. 420 c. 1020 d. 1420 e. 980

22. Use the normal approximation to the binomial distribution to estimate the probability of obtaining exactly 200 heads when a fair coin is tossed 400 times.

a. 0.2 b. 0.03 c. 0.5 d. 0.04 e. 0.05

23. What is the x-intercept of the line $3x - 4_y = 2$?

a. $\left(\frac{3}{2}, 0\right)$ b. $\left(\frac{2}{3}, 0\right)$ c. $\left(0, \frac{2}{3}\right)$

d. $\left(0, \frac{-1}{2}\right)$ e. $\left(\frac{-1}{2}, 0\right)$

24. What is the equation for the line passing through the point (6,4) and perpendicular to the line $3x - 4y = 2$?

a. $-3x + 4y = 2$ b. $-4x + 3y = 36$ c. $4x + 3y = 36$

d. $3x + 4y = 34$ e. $-3x + 4y = 34$

25. Let $A = \begin{bmatrix} 1 & 0 \\ 3 & 2 \end{bmatrix}$. What is A^{-1} ?

a. $\begin{bmatrix} 1 & 0 \\ -\frac{3}{2} & \frac{1}{2} \end{bmatrix}$ b. $\begin{bmatrix} 1 & 0 \\ \frac{3}{2} & \frac{1}{2} \end{bmatrix}$ c. $\begin{bmatrix} \frac{1}{2} & 0 \\ -\frac{3}{2} & 1 \end{bmatrix}$

d. $\begin{bmatrix} \frac{1}{2} & 0 \\ \frac{3}{2} & 1 \end{bmatrix}$ e. $\begin{bmatrix} 2 & 0 \\ -3 & 2 \end{bmatrix}$

26. Solve the following system of linear equations.

$$4x + 2y = 10$$
$$3x + y = 13$$

a. no solution

b. $x = -8$, $y = 21$

c. $x = -8$, $y = 37$

d. $x = 8$, $y = 21$

e. $x = 8$, $y = -11$

27. What is the solution of the system of linear equations represented by the following matrix?

$$\begin{array}{c} x\ \ y\ \ z\ \ w \\ \left[\begin{array}{cccc|c} 1 & 0 & -4 & 0 & 5 \\ 0 & 2 & 0 & -8 & 20 \end{array}\right] \end{array}$$

a. $x = -4z + 5$, $y = 4w + 10$, $z =$ any value, $w =$ any value

b. $x = -4z + 5$, $y = -8w + 20$, $z =$ any value, $w =$ any value

c. $x = 4z + 5$, $y = -8w + 20$, $z =$ any value, $w =$ any value

d. $x = 4z + 5$, $y = 4w + 10$, $z =$ any value, $w =$ any value

e. $x = 4z + 5$, $y = 4w + 10$, $z = \frac{1}{4}(5 - x)$, $w = \frac{1}{4}(10 - y)$

28. What is $\begin{bmatrix} 0 & 1 \\ 4 & 2 \end{bmatrix} \times \begin{bmatrix} 3 & 4 \\ 1 & 5 \end{bmatrix}$?

a. $\begin{bmatrix} 1 & 5 \\ 5 & 7 \end{bmatrix}$ b. $\begin{bmatrix} 1 & 14 \\ 5 & 26 \end{bmatrix}$ c. $\begin{bmatrix} 1 & 5 \\ 14 & 26 \end{bmatrix}$ d. $\begin{bmatrix} 16 & 11 \\ 20 & 11 \end{bmatrix}$ e. $\begin{bmatrix} 16 & 20 \\ 11 & 11 \end{bmatrix}$

29. What is the inverse of A = $\begin{bmatrix} 1 & 0 & 4 \\ 0 & 2 & 4 \\ 0 & 2 & 6 \end{bmatrix}$?

a. $\begin{bmatrix} 1 & 2 & -2 \\ 0 & \frac{3}{2} & -1 \\ 0 & -\frac{1}{2} & \frac{1}{2} \end{bmatrix}$ b. $\begin{bmatrix} 1 & -2 & 2 \\ 0 & \frac{3}{2} & -1 \\ 0 & -\frac{1}{2} & \frac{1}{2} \end{bmatrix}$ c. $\begin{bmatrix} 1 & 0 & 0 \\ 0 & \frac{1}{2} & 0 \\ 0 & -\frac{1}{2} & \frac{1}{2} \end{bmatrix}$

d. $\begin{bmatrix} 1 & 0 & -2 \\ 0 & \frac{1}{2} & -1 \\ 0 & -\frac{1}{2} & 1 \end{bmatrix}$ e. $\begin{bmatrix} 1 & 0 & 2 \\ 0 & \frac{1}{2} & -1 \\ 0 & -\frac{1}{2} & \frac{1}{2} \end{bmatrix}$

30. Which of the following matrices are stochastic matrices?

I. $\begin{bmatrix} \frac{1}{6} & \frac{5}{3} \\ \frac{5}{6} & -\frac{2}{3} \end{bmatrix}$

II. $\begin{bmatrix} 1 & 0.7 \\ 0 & 0.3 \end{bmatrix}$

III. $\begin{bmatrix} 0.3 & 0.7 \\ 0.1 & 0.9 \end{bmatrix}$

IV. $\begin{bmatrix} 0.4 & 0 & 1 \\ 0.6 & 0.2 & 0 \\ 0 & 0.8 & 0 \end{bmatrix}$

V. $\begin{bmatrix} 0.2 & 0.5 \\ 0.1 & 0.1 \\ 0.7 & 0.4 \end{bmatrix}$

a. II, IV only

b. all except I

c. II, IV, V only

d. all except V

e. III only