1. A fair coin is tossed 100 times. Estimate the probability of observing at least 60 heads.

a) .0287 b) .40 c) .3632 d) .0495 e) .0606

2. An experiment consists of 18 binomial trials, each having probability of success equal to 2/3. Estimate the probability of having exactly 12 successes.

a) .5987 b) .5596 c) .1974 d) .6666 e) .4013

3. Which of the following points satisfies the system of linear inequalities?

$$\begin{cases} x + y \geq 3 \\ 3x - y \geq -1 \\ x \leq 3 \end{cases}$$

a) (0,0) b) (2,4) c) (–1,2) d) (1,6)
e) none of the above

4. The point of intersection of the lines $x - y = 1$ and $x + 2y = 2$ is

a) (4/3, 1/3) b) (2,1) c) (4/3, 0) d) (1, 1/2)

e) none of the above.

5. The equation of the line passing through the point $(1,3)$ and parallel to the line $y = -5x + 2$ is

a) $y - 3 = x - 1$

b) $y = (1/5)x + (14/5)$

c) $y = -5x + 8$

c) $y = -5x + 3$

d) none of the above

6. Use Gaussian elimination to solve the following system of equations:

$$\begin{cases} x - 5y = -4 \\ 6x + 8y = 33 \end{cases}$$

a) $(x,y) = (1,1)$

b) $(x,y) = (7/2, 3/2)$

c) $(x,y) = (11, 3)$

d) $(x,y) = (-14, -2)$

e) There is no solution.

7. Use Gaussian elimination to find the point of intersection of the lines $2x + y = 5$ and $y = x - 1$.

a) $(8,7)$

b) $(6,5)$

c) $(4,3)$

d) $(2,1)$

e) $(0, -1)$

8. Use Gaussian elimination to solve the following system of equations:

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

a) $(x,y,z) = (2, -3, -1)$ b) $(x,y,z) = (0,1,1)$

c) $(x,y,z) = (-2,5,3)$ d) $(x,y,z) = \left(\frac{1}{2}, 0, -2\right)$

e) There is no solution.

9. The result of pivoting the matrix $\begin{bmatrix} 1 & 3 & 5 \\ 5 & 6 & 2 \end{bmatrix}$ about the 2 – 2 entry is

a) $\begin{bmatrix} -3/2 & 0 & 4 \\ 5/6 & 1 & 1/3 \end{bmatrix}$ b) $\begin{bmatrix} 1 & 3 & 5 \\ 5/6 & 1 & 1/3 \end{bmatrix}$

c) $\begin{bmatrix} 1 & 3 & 5 \\ 3 & 0 & -8 \end{bmatrix}$ d) $\begin{bmatrix} 1 & 0 & -8/3 \\ 0 & 1 & 23/9 \end{bmatrix}$

e) none of the above

10. Find the general solution of the following system if possible.

$$\begin{cases} x + y + z = 1 \\ x + y + 2z = -1 \\ 2x + 2y + 3z = 0 \end{cases}$$

a) $(x,y,z) = (0,3,-2)$ b) $x + y = 3, \quad z = -2$

c) $(x,y,z) = (-4,7,-2)$ d) $y + 2z = -1, \quad x = 0$

e) There is no solution

11. The two lines $-2x + y = 3$ and $-3x + y = 2$

a) are parallel
b) are perpendicular
c) intersect in exactly one point
d) coincide
e) none of the above

12. Let

$$A = \begin{bmatrix} 3 & 2 & 7 \\ 1 & 0 & 3 \\ 1 & 4 & 2 \end{bmatrix} \quad \text{and} \quad B = \begin{bmatrix} 0 & 1 & 2 \\ 1 & 5 & 2 \\ 7 & 1 & 3 \end{bmatrix}$$

The third row of AB is

a) $\begin{bmatrix} 31 & 11 & 16 \end{bmatrix}$

b) $\begin{bmatrix} 25 & 18 & 58 \end{bmatrix}$

c) $\begin{bmatrix} 18 & 23 & 16 \end{bmatrix}$

d) $\begin{bmatrix} 7 & 4 & 6 \end{bmatrix}$

e) none of the above

13. If A is a 3×4 matrix and B is a 4×2 matrix, then the size of AB is

a) 2×3
b) 3×2
c) 3×4
d) 4×4
e) none of the above

14. Suppose one hour's output in a brewery (measured in bottles) is described by the following matrix

	Production line 1	Production line 2
Regular beer	300	200
Light beer	400	100
Malt beer	100	50

$$\begin{bmatrix} 300 & 200 \\ 400 & 100 \\ 100 & 50 \end{bmatrix} = A$$

Production line 1 operates x hours per day and production line 2 operates y hours per day. The 2–1 entry of $A\begin{bmatrix} x \\ y \end{bmatrix}$ represents

a) the number of bottles of light beer produced in a day
b) the number of bottles of regular beer produced in a day
c) the number of hours in a day spent producing light beer
d) the number of hours in a day spent producing regular beer
e) none of the above

15. The inverse of the matrix $\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ is

a) $\begin{bmatrix} \frac{1}{2} & -\frac{3}{2} \\ -1 & 2 \end{bmatrix}$

b) $\begin{bmatrix} -2 & 1 \\ \frac{3}{2} & -\frac{1}{2} \end{bmatrix}$

c) $\begin{bmatrix} 1 & 1/2 \\ 1/3 & 1/4 \end{bmatrix}$

d) not defined

e) none of the above

16. The matrix $\begin{bmatrix} 3 & x \\ 4 & 36 \end{bmatrix}$ has no inverse if x equals

a) 0 b) $\frac{1}{3}$ c) 3 d) 27 e) 48

17. Solve the system $\begin{cases} 2x + 3y = 4 \\ -2x - y = 8 \end{cases}$

by computing the inverse of $\begin{bmatrix} 2 & 3 \\ -2 & -1 \end{bmatrix}$.

a) (x,y) = (2,0)   b) (x,y) = (2,–12)   c) (x,y) = (–1,2)

d) (x,y) = (–3,–2)   e) (x,y) = (–7,6)

18. Use the Gauss-Jordan method to compute the inverse of the matrix

$$\begin{bmatrix} 3 & 1 \\ 2 & 1 \end{bmatrix}.$$

a. $\begin{bmatrix} -3 & -1 \\ 2 & 1 \end{bmatrix}$

b. $\begin{bmatrix} \frac{1}{3} & 1 \\ \frac{1}{2} & 1 \end{bmatrix}$

c. $\begin{bmatrix} 1 & -1 \\ -2 & 3 \end{bmatrix}$

d. $\begin{bmatrix} 1 & 1 \\ 2 & 3 \end{bmatrix}$

e. There are infinitely many inverses.

19. Use the Gauss-Jordan method to compute the inverse of the matrix

$$\begin{bmatrix} 1 & 0 & 1 \\ 2 & 1 & 0 \\ 0 & 1 & -1 \end{bmatrix}$$

a. $\begin{bmatrix} -1 & -2 & 0 \\ 0 & 1 & -1 \\ 0 & 1 & 1 \end{bmatrix}$

b. $\begin{bmatrix} 1 & 2 & 0 \\ 0 & 1 & 1 \\ 1 & 0 & 1 \end{bmatrix}$

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

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

e. There is no inverse.

20. Use your answer in Problem 19 to solve the following system of equations:

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

a. $(x, y, z) = (2, -3, -1)$

b. $(x, y, z) = (0, 1, 1)$

c. $(x, y, z) = (-2, 5, 3)$

d. $(x, y, z) = (\frac{1}{2}, 0, -2)$

e. There is no solution.