The random variable Y has the probability distribution shown. Problems 1-2 refer to Y.

$Y = k$	-1	0	1
$\Pr(Y = k)$	.1	.3	.6

1. What is the expected value of Y ?

a) 0 b) .3 c) .5 d) 1 e) .25

2. Find the probability distribution of Y^2.

a)

$Y^2 = k$	0	1
$\Pr(Y^2 = k)$	.09	.370

b)

$Y^2 = k$	0	1
$\Pr(Y^2 = k)$	.3	.7

c)

$Y^2 = k$	-1	0	1
$\Pr(Y^2 = k)$	.01	.09	.36

d)

$Y^2 = k$	0	1	2
$\Pr(Y^2 = k)$	.4	.9	.6

e)

$Y^2 = k$	0	1
$\Pr(Y^2 = k)$	.5	.5

3. The random variable Z has the probability distribution shown

k	0	2	4
Pr (Z = k)	$\frac{2}{3}$	$\frac{1}{6}$	$\frac{1}{6}$

What is the variance, σ^2, of Z? Hint: The expected value of Z is 1.

a) 0 b) 1 c) $\frac{5}{3}$ d) $\frac{7}{3}$ e) $\frac{1}{6}$

4. Suppose the variance of a random variable is .25. What is the standard deviation of this random variable?

a) .0625 b) .5 c) .75 d) .9375 e) not enough information

5. An experiment consists of rolling a six sided die either 3 times or until a toss shows a "one", whichever comes first. Let X count the number of rolls in a trial. What is the expected value of the random variable X?

a) $1 \cdot \frac{1}{6} + 2 \cdot \frac{1}{6} + 3 \cdot \frac{4}{6}$

b) $1 \cdot \frac{1}{6} + 2 \cdot \frac{5}{36} + 3 \cdot \frac{25}{36}$

c) $1 \cdot \frac{1}{6} + 2 \cdot \frac{1}{6} + 3 \cdot \frac{1}{6}$

d) $5 \cdot \frac{1}{6} + 5 \cdot \frac{1}{6} + 1 \cdot \frac{4}{6}$

e) $1 \cdot \frac{1}{6} + 2 \cdot \frac{1}{36} + 3 \cdot \frac{29}{36}$

6. An experiment consists of flipping a coin 8 times and counting the number of heads. What is the probability of getting either 3 or 4 heads?

a) $\binom{8}{3} + \binom{8}{4}$

b) $\binom{8}{3} \binom{8}{4} \left(\frac{1}{2}\right)^3 \left(\frac{1}{2}\right)^5$

c) $\binom{8}{3} \cdot \left(\frac{1}{2}\right)^3 + \binom{8}{4} \left(\frac{1}{2}\right)^4$

d) $\binom{8}{3} \cdot \left(\frac{1}{8}\right) + \binom{8}{4} \left(\frac{1}{8}\right)$

e) $\binom{8}{3} \left(\frac{1}{2}\right)^3 \left(\frac{1}{2}\right)^5 + \binom{8}{4} \left(\frac{1}{2}\right)^4 \left(\frac{1}{2}\right)^4$

Problems 7 - 8 refer to the following:

A famous basketball player decides to switch careers and take up baseball. Each time at bat the probability of him getting a hit is .195. An experiment consists of counting the number of hits he gets in 20 times at bat.

7. What is the variance of this experiment?

a) 20(.195)   b) 20(.805)   c) 20(.195)(.805)

d) $(.195)^{20}$ e) .195

8. What is the expected number of hits?

a) 20(.195)   b) 20(.805)   c) 20(.195)(.805)

d) $(.195)^{20}$ e) .195

9. Suppose that the life span of the Madagascar hissing cockroach is normally distributed with $\mu = 3$ years and $\sigma = 2$. What is the probability of a Madagascar hissing cockroach having a life span of 4 or more years?

a) .3085 b) .7088 c) .1587 d) .5199 e) .9938

10. Find the area of the shaded region under the given normal curve where $\mu = 30$, and $\sigma = 4$.

a) .6915 b) .5000 c. .9772 d. .3085 e. .0228

11. Suppose that in a particular town people are asked to pick their favorite animal. 45% pick dogs, 40% pick cats, 15% pick Madagascar hissing cockroaches. What is the probability that exactly 3 out of 5 randomly chosen people from this town picked cats as their favorite animal?

a) $(.4)^4 (.6)^5$

b) $\binom{5}{3} (.4)^3$

c) $\binom{5}{3} (.4)^3 (.6)^2$

d) $\binom{5}{3} \binom{1}{2}^5$

e) $\binom{5}{3}$

Problems 12 - 14 refer to the following 2 matrices.

Let M = $\begin{bmatrix} 3 & 4 \\ 1 & 2 \end{bmatrix}$, N = $\begin{bmatrix} 1 & -1 \\ 1 & 1 \end{bmatrix}$.

12 Find M · N.

a) $\begin{bmatrix} 7 & 1 \\ 3 & 1 \end{bmatrix}$ b) $\begin{bmatrix} 3 & -4 \\ 1 & 2 \end{bmatrix}$ c) $\begin{bmatrix} 1 & 3 \\ -4 & 2 \end{bmatrix}$ d) [12] e) $\begin{bmatrix} 4 & 1 \\ 8 & 7 \end{bmatrix}$

13. Find M + N.

a) [12] b) $\begin{bmatrix} 7 & 3 \\ 1 & 1 \end{bmatrix}$ c) $\begin{bmatrix} 4 & 3 \\ 2 & 3 \end{bmatrix}$ d) $\begin{bmatrix} 7 \\ 1 \end{bmatrix}$ e) [4 −2]

14. Find the first row of M^{-1}. Hint: If A = $\begin{bmatrix} a & b \\ c & d \end{bmatrix}$ then $A^{-1} = \begin{bmatrix} d/\Delta & -b/\Delta \\ -c/\Delta & a/\Delta \end{bmatrix}$ where $\Delta = ad - bc$.

a) $\begin{bmatrix} \frac{3}{2} & \frac{4}{2} \end{bmatrix}$ b) $\begin{bmatrix} \frac{3}{2} & 1 \end{bmatrix}$ c) [7] d) [1 −2] e) $\begin{bmatrix} -\frac{1}{2} & \frac{3}{2} \end{bmatrix}$

15. Suppose a and b satisfy the two equations

$$3a + 4b = 1$$
$$a + 2b = 2$$

What is a + b? Hint: Find a and b then add then together.

a) $-\frac{1}{2}$ b) 5 c) 2 d) $\frac{2}{3}$ e) $\frac{7}{2}$

16. Let X denote the normal random variable with $\mu = 8$ and $\sigma = 2$. Find $\Pr(x \leq 12)$.

a) .0228 b) .2500 c) .7881 d) .9992 e) .9772

17. Let y denote the normal random variable with $\mu = 5$ and $\sigma = 2$. Find $\Pr(6 \leq y \leq 7)$.

a) – .8502 b) .8502 c) .1359 d) .8641 e) .1498

18. Which one of the following systems is equivalent to the system

$$\begin{cases} x + 2y + 5z = 7 \\ \quad\; y + 3z = 9 \end{cases}$$

a) $\begin{cases} x \quad + 2z = 12 \\ \quad y + 3z = 9 \end{cases}$

b) $\begin{cases} x \quad + -z = -11 \\ \quad y + z = 9 \end{cases}$

c) $\begin{cases} x \quad + 5z = 7 \\ \quad y + 3z = 9 \end{cases}$

d) $\begin{cases} x \quad - z = -11 \\ \quad y + 3z = 9 \end{cases}$

e) $\begin{cases} x = -11 \\ y = 9 \end{cases}$

19. Let M = [3 2 1] , N = $\begin{bmatrix} 4 \\ 5 \\ 6 \end{bmatrix}$. Find M · N.

a) [28]

b) $\begin{bmatrix} 12 & 15 & 18 \\ 8 & 10 & 12 \\ 4 & 5 & 6 \end{bmatrix}$

c) $\begin{bmatrix} 12 \\ 10 \\ 6 \end{bmatrix}$

d) [12 10 6]

e) they can't be multiplied.

20. Use the normal approximation to the binomial distribution to estimate the probability of getting exactly 50 heads in 100 flips of a coin.

a) .5000 b) .8413 c) .0796 d) .5398 e) .3085