1. 60% of the students at a certain university are female. 20% of the female students are vegetarians, and 10% of the male students are vegetarians. Your friend tells you she has a relative who is a student at the university and is a vegetarian. What is the probability that your friend's relative is female?

a. $\frac{5}{6}$ b. .6 c. $\frac{2}{3}$ d. .75 e. .8

2. An urn contains 5 red balls and 2 white balls. A person has been instructed to select balls at random from the urn, one at a time, without replacement, until a white ball is drawn. What is the probability that the person has to stop after exactly four draws?

a. $4 \cdot \left(\frac{5}{7}\right)^3 \cdot \frac{2}{7}$ b. $\left(\frac{5}{7}\right)^3 \cdot \frac{2}{7}$ c. $\frac{5 \cdot 4 \cdot 3 \cdot 2}{7 \cdot 6 \cdot 5 \cdot 4}$

d. $\frac{\binom{5}{3} \cdot \binom{2}{1}}{\binom{7}{4}}$ e. $\binom{5}{3}\binom{2}{1}$

3. Let E and F be two events associated with the same experiment. Suppose that E and F are independent, and that $\Pr(E) = \frac{1}{2}$ and $\Pr(F) = \frac{1}{2}$. Then $\Pr(E \cup F) =$

a. $\frac{3}{4}$ b. 1 c. 0 d. $\frac{1}{2}$ e. $\frac{1}{4}$

4. In tossing a fair die, we observe the uppermost face. Let E be the event "odd number occurs" and let F be the event "number greater than 3 occurs". What is Pr(E|F)?

a. $\frac{2}{3}$ b. $\frac{1}{2}$ c. $\frac{1}{3}$ d. 0 e. $\frac{3}{4}$

5. A random variable X has the following probability distribution:

k	Pr(X = k)
–1	1/2
0	1/4
1	1/8
2	1/8

Then the random variable X^2 has the following probability distribution:

a.

k	$Pr(X^2 = k)$
–1	1/2
0	1/4
1	1/8
2	1/8

b.

k	$Pr(X^2 = k)$
–1	1/4
0	1/16
1	1/64
2	1/64

c.

k	$Pr(X^2 = k)$
–1	1/2
0	1/4
1	1/8
4	1/8

d.

k	$Pr(X^2 = k)$
0	1/64
1	17/64
4	1/64

e.

k	$Pr(X^2 = k)$
0	1/4
1	5/8
4	1/8

6. The expected value (mean) of the random variable X in problem 6) is:

a. 1 b. $\frac{-1}{8}$ c. $\frac{1}{4}$ d. $\frac{1}{2}$ e. 0

7. A certain basketball player has a free-throw success rate of 2/3. An experiment consists in letting him try three times, and counting the number X of successes. The probability distribution of the random variable X is:

a.

k	Pr(X = k)
1	1/3
2	1/3
3	1/3

b.

k	Pr(X = k)
0	0
1	0
2	1
3	0

c.

k	Pr(X = k)
0	1/8
1	3/8
2	3/8
3	1/8

d.

k	Pr(X = k)
0	1/4
1	1/4
2	1/4
3	1/4

e.

k	Pr(X = k)
0	1/27
1	6/27
2	12/27
3	8/27

8. An experiment consists in rolling a fair die nine times and observing the uppermost face each time. What is the probability that the 6 occurs at least seven times?

a. $\left(\frac{1}{6}\right)^7$

b. $36\left(\frac{1}{6}\right)^7\left(\frac{5}{6}\right)^2$

c. $\left(\frac{1}{6}\right)^9 + \left(\frac{1}{6}\right)^8 \left(\frac{5}{6}\right) + \left(\frac{1}{6}\right)^7 \left(\frac{5}{6}\right)^2$

d. $\left(\frac{1}{6}\right)^9 + 9\left(\frac{1}{6}\right)^8 \left(\frac{5}{6}\right) + 36\left(\frac{1}{6}\right)^7 \cdot \left(\frac{5}{6}\right)^2$

e. 0

9. Two distinct numbers are selected at random from among the four numbers 1, 2, 3, 4 and largest of them is recorded. Call the result X. What is the expected value E(X)?

a. $\frac{1}{2}$

b. $\frac{50}{16}$

c. 2.5

d. 3

e. $\frac{20}{6}$

10. A person searching for a missing relative decides to hire a private investigator (PI) for a period of two months. On the basis of her experience with similar cases, the PI estimates that the probability of her finding the missing relative within the allotted time is .18, and that her expenses including labor costs will be around \$20,000. Payment is to be made in advance, and will be kept by the PI if the relative is found by her (dead or alive); otherwise it will be returned in full to the client. How much should the PI charge?

a. \$360,000 b. \$20,000 c. $\$\frac{20{,}000}{.18}$

d. \$20,000 (.18) e. $\$\frac{20{,}000 \cdot (.92)}{.18}$

11. Alfred, Bruce and Clint are three boys who are a little tired of their toy cars. Alfred's is worth \$1, Bruce's is worth \$2, and Clint's is worth \$3. They decide to run a 1000 m race; the loser must give his toy car to the winner (but the runner-up must keep his). Assume that the boys have equally good running records. What is the expected gain in toy car value for Alfred?

a. $\$\frac{1}{2}$ b. \$3 c. \$2 d. \$1 e. \$0

12. An experiment consists in selecting 600 people at random from the U.S. population and recording the number X of those who were born on a Sunday. What is the standard deviation of the random variable X?

a. $\sqrt{\frac{6}{7}}$ b. $\frac{3600}{49}$ c. $\frac{6}{7}$ d. $\frac{60}{7}$ e. $\frac{600}{7}$

13. A person who regularly uses a morning bus from A-town to B-town determines that the expected time of arrival of the bus at the B-town station is 8:30 a.m. with a standard deviation of 2 minutes. She is aware of the Chebychev inequality and concludes therefore that on any particular day the bus will arrive at B-town between 8:25 a.m. and 8:35 a.m. with a probability which is at least

a. $\frac{2}{3}$ b. $\frac{3}{5}$ c. $\frac{1}{3}$ d. $\frac{24}{25}$ e. $\frac{21}{25}$

14. Miriam's monthly living expenses are normally distributed with a mean of \$1000 and a standard deviation of \$150. A balance inquiry made on the first of January tells her that her money supply for all of January is \$1250. What is the probability that Miriam will run out of money before the end of January?

a. .9505 b. .0495 c. $\frac{3}{5}$ d. $\frac{2}{5}$ e. .2

15. Scores in a final exam given to students at Chancy High School are normally distributed, with a mean of 220 and a standard deviation of 56. The graders decide that everybody whose score is at or above the 60th percentile should have a letter grade of B– or better. What is the minimum score for getting a B–?

a. 206 b. 260 c. 234 d. 180 e. 264

16. A fair die is rolled 720 times and the uppermost face observed each time. Using the normal approximation to a binomial distribution, estimate the probability of getting at least 100 sixes.

a. .9772 b. .35 c. 1 d. .5793 e. .8159

17. Tom, who owns an unusual coin, suggests to his friend Martha that they should gamble according to the following rules. Each time the coin is tossed and shows "heads", Martha must pay a dime to Tom, and each time it shows "tails", Tom must pay a dime to Martha. After 100 tosses of the coin Martha finds that she is poorer by
$3 = 30 dimes. She begins to suspect that the coin is unfair. She points out, correctly, that if the coin were fair, the probability of a loss of $3 or more on her side after 100 tosses would only be about

a. .2 b. .35 c. .2743

d. less than .0002 e. .0013