AP Statistics   Name _____
Review Ch. 6

1. The. number of sweatshirts a vendor sells daily has the following probability distribution.

Number of Sweatshirts x	0	1	2	3	4	5
$P(x)$	0.3	0.2	0.3	0.1	0.08	0.02

If each sweatshirt sells for $25, what is the expected daily total dollar amount taken in by the vendor from the sale of sweatshirts?

(A) $5.00   (B) S7.60   (C) $35.50   (D) $38.00   (E) $75.00

2. An urn contains exactly three balls numbered 1, 2, and 3, respectively. Random samples of two balls are drawn from the urn with replacement. The average, $\overline{X} = \dfrac{X_1 + X_2}{2}$, where X_1 and X_2 are the numbers on the selected balls, is recorded after each drawing. Which of the following describes the sampling distribution of $\overline{X}$?

(A)

$\overline{X}$	1	1.5	2	2.5	3
Probability	$\dfrac{1}{5}$	$\dfrac{1}{5}$	$\dfrac{1}{5}$	$\dfrac{1}{5}$	$\dfrac{1}{5}$

(B)

$\overline{X}$	1	1.5	2	2.5	3
Probability	$\dfrac{1}{9}$	$\dfrac{2}{9}$	$\dfrac{1}{3}$	$\dfrac{2}{9}$	$\dfrac{1}{9}$

(C)

$\overline{X}$	1	1.5	2	2.5	3
Probability	0	0	1	0	0

(D)

| $\overline{X}$	1	1.5	2	2.5	3
Probability	$\dfrac{1}{10}$	$\dfrac{1}{10}$	$\dfrac{1}{10}$	$\dfrac{1}{10}$	$\dfrac{1}{10}$

(E) It cannot be determined from the information given.

3. Random variable X is normally distributed with mean 10 and standard deviation 3, and random variable Y is normally distributed with mean 9 and standard deviation 4. If X and Y are independent, which of the following describes the distribution of $Y - X$?

(A) Normal with mean 1 and standard deviation -1
(B) Normal with mean -1 and standard deviation -1
(C) Normal with mean -1 and standard deviation 5
(D) Normal with mean 1 and standard deviation 7
(E) Normal with mean -1 and standard deviation 7
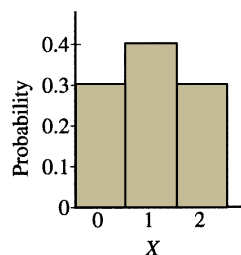
4. A game of chance is played in which X, the number of points scored in each game, has the distribution shown above. Which of the following is true for the sampling distribution of the sum, Y, of the scores when the game is played twice?

(A) Y takes on values 0, 1, 2 with respective probabilities 0.3, 0.4, and 0.3.
(B) Y takes on values 0, 2, 4 according to a binomial distribution with mean equal to 2.
(C) Y takes on values 0, 2, 4 with respective probabilities 0.3, 0.4, and 0.3.
(D) Y takes on values 0, 1, 2, 3, 4 according to a binomial distribution with mean equal to 2.
(E) Y takes on values 0, 1, 2, 3, 4 with respective probabilities 0.09, 0.24, 0.34, 0.24, and 0.09.

5. The probability of obtaining a head when a certain coin is flipped is about 0.65. Which of the following is closest to the probability that heads would be obtained 15 or fewer times when this coin is flipped 25 times?

(A) 0.14   (B) 0.37   (C) 0.39   (D) 0.60   (E) 0.65

6. The number of points, X, scored in a game has the probability distribution below.
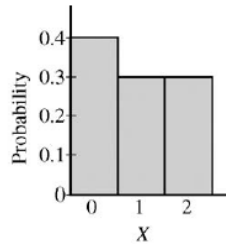
The number of points obtained in one game is independent of the number of points obtained in second game. when the game is played twice, the sum of the number of points for both times could be 0, 1, 2, 3, or 4. If Y represents the sampling distribution of the sum of the scores when the game is played twice, for which value of Y will the probability be greatest?

(A) 0   (B) 1   (C) 2   (D) 3   (E) 4

7. A company sells concrete in batches of 5 cubic yards. The probability distribution of X, the number of cubic yards sold in a single order for concrete from this company, is shown in the table below.

X = the number of cubic yards	10	15	20	25	30
Probability	0.15	0.25	0.25	0.30	0.05

The expected value of the probability distribution of X is 19.25 and the standard deviation is 5.76. There is a fixed cost to deliver the concrete. The profit Y, in dollars, for a particular order can be described by Y = 75X - 100. What is the standard deviation of Y?

(A) $332.00   (B) $432.00   (C) $532.00   (D) $1,343.75   (E) $1,400.00

8. A nonprofit organization plans to hold a raffle to raise funds for its operations. A total of 1,000 raffle tickets will be sold for $1.00 each. After all the tickets are sold, one ticket will be selected at random and its owner will receive $50.00. The expected value for the net gain for each ticket is -$0.95. What is the meaning of the expected value in this context?

(A) The ticket owners lose an average of $0.05 per raffle ticket.
(B) The ticket owners lose an average of $0.95 per raffle ticket.
(C) Each ticket owner will lose $0.95 per raffle ticket.
(D) A ticket owner would have to purchase 19 more tickets for the expected value of his or her net gain to increase to $0.00.
(E) A ticket owner has a 95 percent chance of having a ticket that is not selected.

Free Response

9. A shopping mall has three automated teller machines (ATMs). Because the machines receive heavy use, they sometimes stop working and need to be repaired. Let the random variable X represent the number of ATMs that are working when the mall opens on a randomly selected day. The table shows the probability distribution of X.

Number of ATMs working when the mall opens	0	1	2	3
Probability	0.15	0.21	0.40	0.24

(a) What is the probability that at least one ATM is working when the mall opens?

(b) What is the expected value of the number of ATMs that are working when the mall opens?

(c) What is the probability that all three ATMs are working when the mall opens, given that at least one ATM is working?

(d) Given that at least one ATM is working when the mall opens, would the expected value of the number of ATMs that are working be less than, equal to, or greater than the expected value from part (b) ? Explain

10. The graph below displays the relative frequency distribution of X, the total number of dogs and cats owned per household, for the households in a large suburban area. For instance, 14 percent of the households own 2 of these pets.
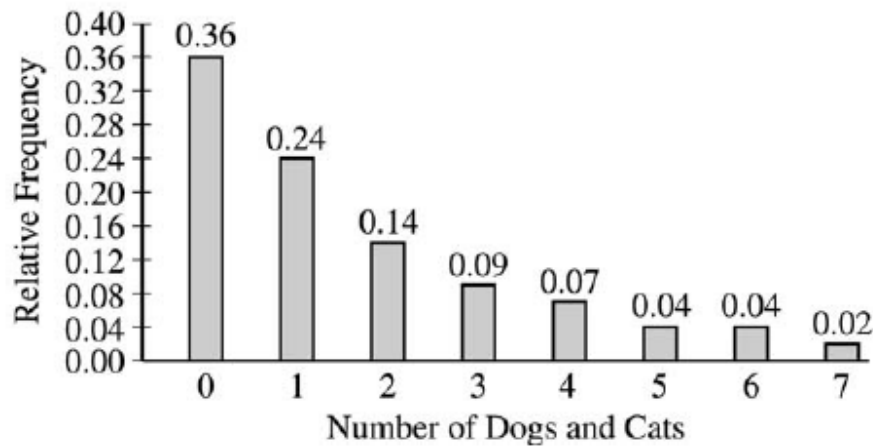
a. According to a local law, each household in this area is prohibited from owning more than 3 of these pets. If a household in this area is selected at random, what is the probability that the selected household will be in violation of this law? Show your work.

b. If 10 households in this area are selected at random, what is the probability that exactly 2 of them will be in violation of this law? Show your work.

Answers
Multiple Choice

1. D   7. B
2. B   8. B
3. C
4. E
5. B
6. C

Free Response

9. **Part (a):**

The probability that at least one ATM is working when the mall opens is:

$$P(X \geq 1) = 0.21 + 0.40 + 0.24 = 0.85.$$

Part (b):

The expected value of the number of ATMs that are working when the mall opens is:

$$E(X) = 0(0.15) + 1(0.21) + 2(0.40) + 3(0.24) = 1.73 \text{ machines.}$$

Part (c):

The probability that all three ATMs are working when the mall opens, given that at least one ATM is working is:

$$P(X = 3 \mid X \geq 1) = \frac{P(X = 3 \text{ and } X \geq 1)}{P(X \geq 1)} = \frac{P(X = 3)}{P(X \geq 1)} = \frac{0.24}{0.85} \approx 0.282$$

Part (d):

Given that at least one ATM is working when the mall opens, the expected value of the number of working ATMs would be greater than the expected value calculated in part (b). By eliminating the possibility of 0 working ATMs, the probabilities for 1, 2, and 3 working ATMs all increase proportionally, so the expected value must increase.

10. **Part (a):**

$$P(X>3) = 0.07 + 0.04 + 0.04 + 0.02 = 0.17.$$

Part (b):

Y = number of households in violation.

Y has a binomial distribution with $n = 10$ and $p = 0.17$.

$$P(Y = 2) = \binom{10}{2}(0.17)^2(0.83)^8 = 0.2929.$$

Part (c):

The distribution of $\bar{X}$ will:
1. be approximately normal;
2. have mean $\mu_{\bar{x}} = 1.65$;

3. have standard deviation $\sigma_{\bar{x}} = \dfrac{\sigma}{\sqrt{n}} = \dfrac{1.851}{\sqrt{150}} = 0.1511.$