1. Consider the following five sets of outcomes from random phenomena:

I. The total number of points scored in a randomly selected college football game.

II. Lifespan in hours of a randomly selected halogen light bulb.

III. The number of passengers in a randomly selected city bus.

IV. The airline of the next plane to land at O'Hare International Airport.

V. Length in inches of the next rattlesnake caught in a trap.

Which of the above are <u>continuous</u> random variables?

A. II and III only

B. II and V only

C. None of these are continuous random variables.

2. Which of the following probability distributions of a discrete random variable X is a legitimate probability distribution

A.

x	1	2	3
$p(x)$	0.3	0.4	0.4

B.

x	-1	0	1
$p(x)$	0.2	0.2	0.5

C.

x	-1	0	1
$p(x)$	0.3	0.4	0.3

3. In a particular game, a six-sided die is rolled once. If an odd number (1, 3, 6) is rolled, you lose $1. If a six (6) is rolled, you win $6. If a two (2) or four (4) is rolled, you win $2. Let *X* be the amount that you win. The expected value of *X* is:

A. About $2.33.

B. About $1.17

C. About $3.33

HINT: Make a table to represent the probability distribution of *X.*

4. Let Z = the number students in Mr. Rooney's English class who arrive late on a randomly selected day. The expected value of Z is 2. Which one of the following is the best interpretation of what this means?

A. We can be confident that at least 2 students will be late to Mr. Rooney's class on a randomly selected day.

B. On average, the number of students who are late to Mr. Rooney's class on a randomly selected day is 2.

C. There are 2 students in Mr. Rooney's class who almost always arrive late.

5. Let X = the number of times that a randomly selected customer visits a grocery store during a one-week period. Suppose that the probability distribution of X is as follows:

X	0	1	2	3
$P(X)$	0.1	0.4	0.4	0.1

Which of the following calculations yield the standard deviation of X, σ_X?

A. $(0.1)(0-1.5)+(0.4)(1-1.5)+(0.4)(2-1.5)+(0.1)(3-1.5)$

B. $\sqrt{(0)(0.1-0.25)^2+(1)(0.4-0.25)^2+(2)(0.4-0.25)^2+(3)(0.1-0.25)^2}$

C. $\sqrt{(0.1)(0-0.25)^2+(0.4)(1-0.25)^2+(0.4)(2-0.25)^2+(0.1)(3-0.25)^2}$

6. If *X* and *Y* are random variables, and $Z = X + Y$ which of the following is a condition for calculating $\sigma_z{}^2$ by using $\sigma_x{}^2 + \sigma_y{}^2$?

A. *X* and *Y* are both normally distributed.

B. *X* and *Y* are independent.

C. *X* and *Y* are mutually exclusive.

7. The daily total sales (excluding Saturday) at a small restaurant has a probability distribution that is approximately Normal with a mean of $\mu = \$530$ and a standard deviation of $\sigma = \$120$ The probability the sales will exceed $700 on a given day is approximately:

A. 0.9222.

B. 0.5778.

C. 0.0778.

8. A set of 10 playing cards consists of 5 red cards and 5 black cards. The cards are shuffled thoroughly, and we draw 4 cards one at a time and with replacement. Let X = the number of red cards drawn. The random variable X has which of the following probability distributions?

A. binomial distribution with parameters $n = 10$ and $p = 0.5$

B. binomial distribution with parameters $n = 4$ and $p = 0.5$

C. neither (A) nor (B)

9. At a high school with 800 students, 80% of the students ride the school bus. If 20 students are selected randomly (without replacement) and we let X = the number of students in the sample who ride the bus, what is the probability that at least one of the students doesn't ride the bus?

A. 0.0115

B. 0.0576

C. 0.9885

10. In a certain large population, 70% are right-handed. You need a left-handed pitcher for your softball team and decide to find one by asking people chosen from the population at random. (We assume that once you do find a left-hander, he or she will be happy to join your team and will say yes.) Which of the following is closest to the probability that you will have to ask four or more people before finding your first left-hander?

A. 0.103

B. 0.147

C. 0.343

Problem #1
Correct Response: B. II and V only
Explanation:These variables take on real-numbered values. I, II take values on only a discrete set of numbers (the counting numbers), and IV takes on categorical values.

A is Incorrect. Recall that a continuous random variable must take values on an interval of real numbers. The precision of those values is limited only by how they are measured.

C is Incorrect. Recall that a continuous random variable must take values on an interval of real numbers. The precision of those values is limited only by how they are measured.

Problem #2
Correct Response: C
Explanation: It is possible for a random variable to take a negative value, and the sum of all the probabilities is 1.

A is Incorrect. The probabilities for all possible values must add up to 1.

B is Incorrect. The probabilities for all possible values must add up to 1.

Problem #3
Correct Response: B
Explanation: The amount X takes the value -$1 with probability 3/6, the value $2 with probability 2/6, and the value $6 with probability 1/6. The expected value (mean) of X is then given by μX = Σ xp(x) = (-$1)(3/6) + ($2)(2/6) + ($6)(1/6) = –3/6 + 4/6 + 6/6 = 7/6 = About$1.17.

A is Inorrect. Incorrect. You probably forgot to consider the chances of losing $1.
C is Incorrect. You may have ignored the possibility of losing entirely.

Problem #4
Correct Response: B
Explanation: The expected value of a random variable is also called the mean of the random variable. Over many, many days, we expect the mean number of student who arrive late to be very close to 2.

A is Incorrect. The expected value of a random variable is also called the mean of the random variable. If at least two are late, the mean number who are late will likely be higher than two.

C is Incorrect. Expected value refers to the mean number of students who arrive late, but that number can vary from day to day. Which students are late can vary as well.

Problem #5
Correct Response: C
Explanation: The formula for standard deviation or a random variable is $\sqrt{\Sigma\,(x_i - \mu_x)^2 \cdot P(x_i)}$.

A is Incorrect. Recall that standard deviation involves squared deviations from the mean.

B is Incorrect. Recall that standard deviation represents the typical deviation of the variable from its expected value.

Problem #6
Correct Response: B
Explanation: The variance of the sum (or difference) of two random variables can be found by adding variances only if the two variables are independent.

A is Incorrect. The shape of the two distributions has no impact on whether or not .
C is Incorrect: If X and Y are mutually exclusive, then they cannot both happen, which renders their sum meaningless.

Problem #7
Correct Response: C
Explanation: $P(X > 700)$

$= P(z > \frac{700-530}{120})$

$= P(X > 1.42) = 1 - P\ (Z\ <\ 1.42)$

$=\ 1 -\ 0.9222$

$=\ 0.0778$

A is Incorrect. Recall that finding for a Normal random variable X is equivalent to finding the area to the right of the value x under the appropriate Normal curve. You have found the area to the left of x.

B is Incorrect. Have you calculated the standard score for $700 correctly? Recall that $z = \frac{x-\mu}{\sigma}$

Problem #8
Correct Response: B
Explanation: This is a binomial setting because it is binary (red or not red), independent (cards are replaced before drawing the next card), Number of trials is set at 4, and the probability is the same every time a card is drawn. The Paramenter n represents the number of trials and a card is drawn 4 times. The parameter p represents the probability of success which is 5/10 = 0.5.

Problem #9
Correct Response: C
Explanation: X has a binomial distribution with n = 20 and p = 0.8. The event "at least one student doesn't ride the bus" is the complement of "All the students ride the bus." So $P(X \geq 1) = 1 - P(X = 20) = 1 - 0.0115 = 0.9885$.

A is Incorrect. This is the probability that none of the students rides the bus.

B is Incorrect. This is the probability that exactly one student does not ride the bus.

Problem #10
Correct Response: C
Explanation: The question is equivalent to asking for the probability that the first three people you ask are right-handed (and the first left-hander comes any time after that). Thus the answer is $(0.7)^3$.

A is Incorrect. This is the probability that you have to ask exactly four people.

B is Incorrect. This is the probability that you have to ask exactly three people.