APStatistics 

## Unit 7 Random Variables Free Response

**Directions:** Complete the assignment on this paper. Your answers for this assignment must include reasons; simply stating the answer without justification will earn partial credit.

1. A Roulette wheel has 38 slots numbered 0 to 36 and 00. The wheel is spun and a ball is thrown into the wheel and comes to rest in one of the slots. There are numerous of ways to bet, individual numbers, groups of numbers (1-12, 13-24, etc.), by color (half of the numbers are black and the half are red), and in various other combinations. This problem is going to focus on betting $1.00 on the number group 1-12. If the ball lands in any of the values 1-12 the bet is won and the return is $3.00. If the ball lands on any of the other values the bet is lost.
	1. Compute the expected value of winnings for this game. (4 points)
	2. Interpret this expected value. (4 points)

* 1. What is the average return to the casino from 1,000,000 such bets? (4 points)
1. A venture capital fund has the mandate to invest in new businesses that may be perceived as being too risky by other investors. Suppose that a fund invests its funds in units with no more than one unit per firm in order to diversify its investments. Furthermore, suppose there are two classes of firms with the following distributions of net returns, and assume that all firms operate independently of each other.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Type A firms** |  |  |  |  | **Type B firms** |  |  |  |  |
| % returns | -15 | 0 | 45 |  | -25 | -5 | 0 | 25 | 65 |
| Probability | .30 | .30 | .40 |  | .15 | .15 | .30 | .20 | .20 |

1. Both firms have the same expected return. Compute and interpret it. (6 points)
2. Suppose that a single investor has only one unit to invest. Which type of firm would the investor prefer to invest in and why? (6 points)
3. Suppose the venture fund has 100 units to invest. If it decides to invest them ALL in Type A firms, find the expected average return on ALL 100 investments and compute its standard deviation. (6 points)
4. Between b and c above which would be more likely to yield the expected return? Why? (4 points)
5. Here is a probability distribution for a continuous random variable.



a.) Tell why this is a valid probability distribution. (3 points)

 Determine the following probabilities. (3 points each)

1. P(0 ≤ X ≤ 2)
2. P(1 ≤ X ≤ 3)
3. P(1 < X < 2)
4. P(X < 2)

f.) P(X = 1)