AP Statistics Ch 7.1 and 7.2 on Random Variables HW Random Variables:

1. Define what a random variable is. What criteria are involved in defining a random variable:

2. Sharon wants to make a fruit basket for her grandma. In the basket, she has 4 oranges, 3 apples and two chocolate bars that each weigh exactly 250g. To get a distribution of the the total weight of the fruit basket, what are the random variables involved? Explain:

3. A man and a woman are both riding a bike a to cross a bridge with a weight capacity of 1200 lbs. Each bike weighs exactly 120lbs. To determine if the bridge can support the weight of both riders, what are the random variables involved?

4. A man plays a game where he rolls a die. If he gets a 1 or 2, he loses $2. If he rolls a 3 or 4, he wins $0.50. If he rolls a 5 or he wins $3. What are the random variables if he plays this game 100 times?

5. Suppose you have two random variables "x" and "y" with corresponding mean μ_x & μ_y and standard deviations σ_x & σ_y , what is the mean and std deviation of "Z" and "W" if $z = x + y$ and $w = x - y$.

6. Continuing from the previous question, are the standard deviations of "W" and "Z" the same or different? Explain:

7. Continuing from question #5, if there is a random variable "T" such that $T = 3x + 4$, what is the mean and standard deviation of "T"? Would you be "converting" or "combining" random variables? Explain

8. What is the difference between "combining" random variables versus "converting" random variables? Explain:

9. When "combining" or "converting" random variables, do the random variables need to be normally distributed? Explain:

10. When "combining" or "converting" random variables, do the random variables need to be independent of one another? Explain:

11. Suppose there are two oranges, from a population distribution of oranges with $\mu_{Or} = 50g$ and $\sigma_{Or} = 4.5g$. If want to find the total weight of the two oranges, what is the mean and standard deviation for the distribution of the combined weight of two oranges?

12. What is the probability of that the two oranges will weigh more than 110grams? Show all your work and steps

13. Suppose the weight distribution of a single large egg has a mean weight of 50g and a standard deviation of 4g, what is the mean weight of a dozen eggs? What is the standard deviation of the weight of a dozen eggs?

14. Suppose a store claims to be selling large eggs and the total weight of a dozen eggs is 500g. What conclusions can you make about the eggs in this store? Explain:

15. Suppose "X" and "Y" are independent random variables with $\mu_x = 7.2$, $\mu_y = 4.5$, $\sigma_x = 2.2$, and $\sigma_y = 3.1$, find the following:

a) μ_{x+y} and σ_{x+y}

b) μ_{x-y} and σ_{x-y}

c) μ_{3x+2y} and σ_{3x+2y}

e) μ_{xy} and σ_{xy}

16. A business man has 20 stores that sells only burgers and hotdogs. The number of burgers and hotdogs sold each week follow a normal distribution, with $\mu_B = 250$, $\mu_{HD} = 370$, $\sigma_B = 12$, and $\sigma_{HD} = 23$. Each hotdog is sold for $2.75 and each burger is sold for $5.75.

a) How much revenue should the business man expect to earn from each store selling HD and burgers each week? Describe the distribution of revenue from each store. What is the mean and standard deviation of this distribution?

b) How much revenue should he be expecting to earn from all 20 stores? Describe the distribution of revenue from all his stores. What is the mean and standard deviation of this distribution?

c) The business man is suspecting that one of his stores is committing foul play because the average revenue from that store is significantly less with a mean of $2000 and stand dev. of $32. Is there evidence to support the business man's claim? Explain:

17. The table below shows the probability distribution of the payout for two different games.

Game #1:

Probability	3/20	7/20	2/20	4/20	3/20	1/20
Payout	-$20	-$10	$0	$5	$10	$60

Game #2:

Probability	5 /30	7/30	8/30	6/30	3/30	1/30
Payout	- $10	- $5	$2	$5	$8	$10

a) What are the random variables involved?

b) What are the mean and standard deviations of the payout for each game? Interpret these results?

c) Suppose the outcomes of both games are independent of each other, if you play each game once, what will be the distribution your payout look like? Explain: