I. Opener: Using the TI-84 to find mean and standard deviation of a random variable

A. Enter the values of random variable X from the insurance company’s risk assessment problem into $L_1$ and enter the corresponding probabilities for each value of X into $L_2$ then use $1-Var\ Stats\ L_1,L_2$ to determine the mean, variance and standard deviation of the probability model.

1. $E(X) = \mu =$
2. $\sigma^2_x =$
3. $\sigma_x =$

B. Now get the center and spread for the computer store probability problem using the TI-84.

1. $E(X) = \mu =$
2. $\sigma^2_x =$
3. $\sigma_x =$

II. Rules for Means and Variances

A. Adding or Subtracting a Constant

1. this transformation shifts the mean so $E(X \pm c) = E(X) \pm c$
2. but does not change the variance or standard deviation so $Var(X \pm c) = Var(X)$

B. Multiplying each Variable by a Constant

1. we have to multiply the mean by the constant so $E(aX) = aE(X)$
2. and multiply the variance by the square of that constant $Var(aX) = a^2Var(X)$

C. Finding Sums or Differences with Two Random Variables

1. the mean of the sum of two random variables is just the sum of their means

$$E(X + Y) = E(X) + E(Y)$$

2. the mean of the difference of two random variables is just the difference of their means

$$E(X - Y) = E(X) - E(Y)$$

3. If the random variables are independent, the variance of their sum or difference is ALWAYS the SUM of their variances $Var(X \pm Y) = Var(X) + Var(Y)$

D. Warning: We do NOT operate with standard deviation! We MUST operate with variance, then take the square root to obtain standard deviation!
III. Practice with Means and Variances

A. Previously, we determined that the insurance company expected to payout $20 per policy and have a profit of $30 per policy. Suppose the company lowers the premium $5 going from $50 per year to $45.
   1. What would be the expected profit now?
   2. What about the standard deviation?

B. What if the insurance company decides to double all payouts, paying $20,000 for death and $10,000 for disability.
   1. What would be the expected payout?
   2. What about the standard deviation?

C. Finally, we know that insurance companies sell more than one policy so they can spread the risk. Consider now two policies. We expect the outcomes to be independent.
   1. What would be the expected payout?
   2. What about the standard deviation?

IV. “For Examples” on pages 391, 393, 395, 396, 397, and 398: The Quiet Nook restaurant offers a Lucky Lovers Special that could save couples money in their romantic dinners.

A. Probability Model page 391

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>Ace of Hearts</th>
<th>Ace of Diamonds then Ace of Hearts</th>
<th>Black Ace</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P(X)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

B. What is the expected discount for a couple? (page 391)

C. What is the standard deviation of the discounts? (page 393)

D. Suppose every couple dining there also has a $5 off coupon. What will be the mean and standard deviation? (page 395)

E. When two couples dine together on a single check, the restaurant doubles the discount offer. What will be the mean and standard deviation? (page 396)

F. If two couples decide to get separate checks, what will be the mean and standard deviation? (page 397)

V. Homework: #'s 28 – 40 evens page 409
LOVE AND EXPECTED VALUES

For Example

On Valentine’s Day the Quiet Nook restaurant offers a Lucky Lovers Special that could save couples money on their romantic dinners. When the waiter brings the check, he’ll also bring the four aces from a deck of cards. He’ll shuffle them and lay them out face down on the table. The couple will then get to turn one card over. If it’s a black ace, they’ll owe the full amount, but if it’s the ace of hearts, the waiter will give them a $20 Lucky Lovers discount. If they first turn over the ace of diamonds (hey—at least it’s red!), they’ll then get to turn over one of the remaining cards, earning a $10 discount for finding the ace of hearts this time.

QUESTION: Based on a probability model for the size of the Lucky Lovers discounts the restaurant will award, what’s the expected discount for a couple?