

Combining Random Variables Quiz

1. At a large regional collegiate women's swim meet, an official records the time it takes each swimmer to swim 100 meters for all swimmers who compete in only one stroke category. The following table shows the mean times and corresponding standard deviations for the collegiate women at the swim meet for each of the four stroke categories.

| Stroke Category | Mean 100 meter Time | Standard Deviation |
|-----------------|---------------------|--------------------|
| Backstroke | 55.6 seconds | 0.70 seconds |
| Breaststroke | 63.3 seconds | 0.92 seconds |
| Butterfly | 54.4 seconds | 0.94 seconds |
| Freestyle | 50.2 seconds | 0.76 seconds |

For each of the 4 stroke categories, consider a random variable representing the time of a randomly selected swimmer in that category. What is the standard deviation of the sum of the 4 random variables?

- (A) 0.83 seconds
(B) 1.67 seconds
(C) 2.80 seconds
(D) 3.32 seconds
(E) 3.76 seconds
2. A player pays \$15 to play a game in which a chip is randomly selected from a bag of chips. The bag contains 10 red chips, 4 blue chips, and 6 yellow chips. The player wins \$5 if a red chip is selected, \$10 if a blue chip is selected, and \$20 if a yellow chip is selected. Let the random variable X represent the amount won from the selection of the chip, and let the random variable W represent the total amount won, where $W = X - 15$. What is the mean of W ?
- (A) \$10.50
(B) \$4.50
(C) -\$4.50
(D) -\$6.50
(E) -\$10.50
3. The distribution of random variable R has mean 10 and standard deviation 4. The distribution of random variable S has mean 7 and standard deviation 3. If R and S are independent, what are the mean and standard deviation of the distribution of $R - S$?
- (A) Mean 3 and standard deviation 1
(B) Mean 3 and standard deviation 5
(C) Mean 3 and standard deviation 7
(D) Mean 17 and standard deviation 1
(E) Mean 17 and standard deviation 5

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4. Show all your work. Indicate clearly the methods you use, because you will be scored on the correctness of your methods as well as on the accuracy and completeness of your results and explanations.

Company F sells fabrics known as fat quarters, which are rectangles of fabric created by cutting a yard of fabric into four pieces. Occasionally the manufacturing process results in a fabric defect. Let the random variable X represent the number of defects on a fat quarter created by Company F. The following table shows the probability distribution of X .

| | | | | | |
|-------------|------|------|------|------|-----------|
| X | 0 | 1 | 2 | 3 | 4 or more |
| Probability | 0.58 | 0.23 | 0.11 | 0.05 | 0.03 |

If a fat quarter has more than 2 defects, it cannot be sold and is discarded. Let the random variable Y represent the number of defects on a fat quarter that can be sold by Company F.

- (a) Construct the probability distribution of the random variable Y .
- (b) Determine the mean and standard deviation of Y . Show your work.

Company G also sells fat quarters. The mean and standard deviation of the number of defects on a fat quarter that can be sold by Company G are 0.40 and 0.66, respectively. The fat quarters sell for \$5.00 each, but are discounted by \$1.50 for each defect found.

- (c) What are the mean and standard deviation of the selling price for the fat quarters sold by Company G?

5. At a certain company, loan agents are paid based on the number of loans they close in a day. Based on company records, the number of loans X that a randomly selected loan agent closes on a randomly selected day has the probability distribution below.

| | | | | | | | |
|--------|------|------|------|------|------|------|------|
| x | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| $P(x)$ | 0.05 | 0.10 | 0.22 | 0.30 | 0.18 | 0.12 | 0.03 |

At the company, the daily salary of a loan agent is \$150 plus \$50 per loan closed. Let Y represent the amount of money made by a randomly selected loan agent on a randomly selected day. Which of the following statements is NOT true?

- (A) The mean of X is less than the mean of Y .
- (B) The standard deviation of Y is approximately \$71.
- (C) The mean daily salary is greater than \$350 per day.
- (D) The standard deviation of X is less than the standard deviation of Y .
- (E) The shape of the probability distribution of Y is unimodal and roughly symmetric.

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6. Data were collected on the ages, in years, of the men and women enrolled in a large sociology course. Let the random variables M and W represent the ages of the men and women, respectively. The distribution of M has mean 20.7 years and standard deviation 1.73 years. The distribution of W has mean 20.2 years and standard deviation 1.60 years. Of all of those enrolled in the course, 54 percent are men and 46 percent are women. What is the mean age of the combined distribution of both men and women in the course?
- (A) 20.2 years
 - (B) 20.43 years
 - (C) 20.45 years
 - (D) 20.47 years
 - (E) 40.9 years
7. The random variable X has mean 12 and standard deviation 3. The random variable W is defined as $W = 7 + 2X$. What are the mean and standard deviation of W ?
- (A) The mean is 24, and the standard deviation is 6.
 - (B) The mean is 24, and the standard deviation is 13.
 - (C) The mean is 31, and the standard deviation is 3.
 - (D) The mean is 31, and the standard deviation is 6.
 - (E) The mean is 31, and the standard deviation is 13.