Random Variables, Means, & Variances

CREDIT: The questions on this document were written by Erik Packard, PhD, Associate Professor of Mathematics at Colorado Mesa University.

- Problem D
    - Let *X* be a score picked at random from the scores 0, 3, 3, and 9. Let *Y* be a score picked at random from the scores 0, 2, and 5.
    - Do the following:
        1. Find the mean, variance, and standard deviation of *X*.
        2. Find the mean, variance, and standard deviation of *Y*.
        3. Let *Z* be a new random variable which is simply 5 added to each score from which *X* was originally chosen. Find the mean, variance, and standard deviation of *Z*. Check that the following rules agree with your calculations. Note that $c = 5$, $X + c$ is the *Z*.

Check: $\mu_{X+c} = \mu_X + c$

$\_\_\_\_\_ = \_\_\_\_\_$

Check: $(\sigma_{X+c})^2 = (\sigma_X)^2$

$\_\_\_\_\_ = \_\_\_\_\_$

4. Let *Z* be a new random variable which is simply each score from which *X* was chosen multiplied by 2. Find the mean, variance, and standard deviation of *Z*. Check that the following rules agree with your calculations. Note that $c = 2$, cX is the *Z*.

Check: $\mu_{cX} = c\mu_X$

$\_\_\_\_\_ = \_\_\_\_\_$

Check: $(\sigma_{cX})^2 = c^2(\sigma_X)^2$

$\_\_\_\_\_ = \_\_\_\_\_$

5. Let *Z* be a new random variable which one score for the *X* numbers picked at random plus one score from the *Y* numbers picked at random. Find the mean, variance and standard deviation of *Z*. (First find all the possible sums). Check that the following rules agree with your calculations. Note that $X + Y$ is the *Z*.

Check: $\mu_{X+Y} = \mu_X + \mu_Y$

$\_\_\_\_\_ = \_\_\_\_\_$

Check: $(\sigma_{X+Y})^2 = (\sigma_X)^2 + (\sigma_Y)^2$

$\_\_\_\_\_ = \_\_\_\_\_$

6. Let Z be a new random variable which one score for the X numbers picked at random minus one score from the Y numbers picked at random. Find the mean, variance, and standard deviation of Z. (First find all the possible differences). Check that the following rules agree with your calculations. Note that $X - Y$ is the Z.

Check: $\mu_{X-Y} = \mu_X - \mu_Y$

$\_\_\_\_\_ = \_\_\_\_\_$

Check: $(\sigma_{X-Y})^2 = (\sigma_X)^2 + (\sigma_Y)^2$

$\_\_\_\_\_ = \_\_\_\_\_$