

AP Statistics: Random Variables

Rules for Means and Variances

Name: _____

Assume X and Y are independent random variables.

1. Find the mean, variance, and standard deviation of X .

X	-1	0	1	2
P	0.3	0.1	0.5	0.1

2. Find the mean, variance, and standard deviation of Y .

Y	2	3	5
P	0.6	0.3	0.1

3. Let $W = 3 + 2X$. Find the mean, variance, and standard deviation of W .

4. Let $W = X + Y$. Find the mean, variance, and standard deviation of W .

5. Let $W = X - Y$. Find the mean, variance, and standard deviation of W .

6. Let $W = X + X$. Find the mean, variance, and standard deviation of W .

7. Let $W = 2X$. Find the mean, variance, and standard deviation of W .

8. Let $W = X - X$. Find the mean, variance, and standard deviation of W .

9. Let $W = -2X + 5Y$. Find the mean, variance, and standard deviation of W .

ANSWERS:

1. Find the mean, variance, and standard deviation of X.

X	-1	0	1	2
P	0.3	0.1	0.5	0.1

$$\text{Mean}(X) = 0.4 \quad \text{SD}(X) = \sqrt{1.04} \approx 1.02 \quad \text{VAR}(X) = 1.04$$

2. Find the mean, variance, and standard deviation of Y.

Y	2	3	5
P	0.6	0.3	0.1

$$\text{Mean}(Y) = 2.6 \quad \text{SD}(Y) = \sqrt{0.84} \approx .9165 \quad \text{VAR}(Y) = .84$$

3. Let $W = 3 + 2X$. Find the mean, variance, and standard deviation of W.

$$\text{Mean}(W) = 3.8 \quad \text{SD}(W) = 5.04 \quad \text{VAR}(W) = 25.4016$$

4. Let $W = X + Y$. Find the mean, variance, and standard deviation of W.

$$\text{Mean}(W) = 3.0 \quad \text{SD}(W) = \sqrt{1.88} \approx 1.37 \quad \text{VAR}(W) = 1.88$$

5. Let $W = X - Y$. Find the mean, variance, and standard deviation of W.

$$\text{Mean}(W) = -2.2 \quad \text{SD}(W) = \sqrt{1.88} \approx 1.37 \quad \text{VAR}(W) = 1.88$$

6. Let $W = X + X$. Find the mean, variance, and standard deviation of W.

$$\text{Mean}(W) = 0.8 \quad \text{SD}(W) = \sqrt{2.08} \approx 1.44 \quad \text{VAR}(W) = 2.08$$

7. Let $W = 2X$. Find the mean, variance, and standard deviation of W.

$$\text{Mean}(W) = 0.8 \quad \text{SD}(W) = 2\sqrt{1.04} \approx 2.04 \quad \text{VAR}(W) = 4.16$$

8. Let $W = X - X$. Find the mean, variance, and standard deviation of W.

$$\text{Mean}(W) = 0 \quad \text{SD}(W) = \sqrt{2.08} \approx 1.44 \quad \text{VAR}(W) = 2.08$$

9. Let $W = -2X + 5Y$. Find the mean, variance, and standard deviation of W.

$$\text{Mean}(W) = 12.2 \quad \text{SD}(W) \approx 5.02 \quad \text{VAR}(W) = 25.16$$

$$W = 5Y - 2X, \text{ so } \text{VAR}(5Y - 2X) = (5^2)(0.84) + (2^2)(1.04) = 25.16$$

OR alternatively, $\text{SD}(5Y) = 5(0.9165) = 4.5825$, so $\text{VAR}(5Y) = 4.5825^2 \approx 21$
 $\text{SD}(2X) = 2(1.02) = 2.04$, so $\text{VAR}(2X) = 2.04^2 = 4.16$
Since "variances of independent random variables add,"
 $\text{SD}(5Y + 2X) = 21 + 4.16 = 25.16$