Thursday, April 11, 2019
7:46 PM

KEY

$$\mu = \sum x_i p_i \qquad \sigma^2 = \sum (x_i - \mu)^2 p_i$$

Statistics Honors — 6.2 Day 6 (Linear Transformation of Mean & St. Dev)

1) GAIN COMMUNICATIONS

Military Division: The ***random variable X*** represents the number of communications units sold by the Gain Communications military division. Here is the distribution of this variable:

X = units sold	1000	3000	5000	10,000
Probability	0.1	0.3	0.4	0.2

i) Find the mean (μ_X): L1 : X L2: P(X) L3: L1 · L2 sum(L3) = $\boxed{\mu_X = 5000}$

ii) Find the variance ($\sigma_X{}^2$): L4: (L1 − 5000)^2 · L2 sum (L4) = $\boxed{\sigma_X^2 = 7{,}800{,}000}$

iii) Find the standard deviation (σ_X): $\sigma_X = \sqrt{7{,}800{,}000} = \boxed{2792.8480}$

Civilian Division: The ***random variable Y*** represents the number of communications units sold by the Gain Communications civilian division. Here is the distribution of this variable:

Y = units sold	300	500	750
Probability	0.4	0.5	0.1

i) Find the mean (μ_Y): L1 : Y L2: P(Y) L3: L1 · L2 sum(L3) = $\boxed{\mu_Y = 445}$

ii) Find the variance ($\sigma_Y{}^2$): L4: (L1 − 445)^2 · L2 sum (L4) = $\boxed{\sigma_Y^2 = 19225}$

iii) Find the standard deviation (σ_Y): $\sigma_Y = \sqrt{19225} = \boxed{138.6542}$

(A) Let **T = X + Y** = the total number of units sold by the Gain Communications of military and civilian divisions.

What is the ***mean of T***?

$$\mu_T = \mu_{X+Y} = \mu_X + \mu_Y = 500 + 445 = \boxed{5445}$$

Write a sentence explaining what this means:

On average, the number of units sold by both the military and civilain divisions is 5445.

(B) How much ***variability*** is there in the total number of units sold by the Gain Communications of military and civilian divisions.

$$\sigma_T = \sigma_{X+Y} = \sqrt{\sigma_X^2 + \sigma_Y^2} = \sqrt{780{,}000 + 19225} = \boxed{2796.2877}$$

Write a sentence explaining what this means:

It would not be unusual for the combined divisions to sell from 2649 (5445 - 2796) to 8241 (5445 + 2796) units.

$\sigma = \sqrt{5}$ $\sigma = \sqrt{9} = 3$

2) X, Y, *and Z* are independent random variables:

GIVEN: $\mu_X = 15$ $\mu_Y = 4$ $\sigma_X^2 = 5$ $\sigma_Y^2 = 9$

(A) Suppose all the data values for random variable X were doubled, find the following of the new data:

i) Mean $= 2\mu_x = 2(15) = \boxed{30}$

ii) Standard deviation $= 2\sigma_x = 2(\sqrt{5}) = \boxed{2\sqrt{5}}$

iii) Variance $= \sigma^2 = (2\sqrt{5})^2 = \boxed{20}$

(B) Suppose all the data values for random variable Y were tripled and subtracted by 4, find the following of the new data:

i) Mean $= 3\mu_y - 4 = 3(4) - 4 = 12 - 4 = \boxed{8}$

ii) Standard deviation $= 3\sigma_x = 3(3) = \boxed{9}$

adding or subtracting a number does not affect std. dev.

iii) Variance $= \sigma^2 = (9)^2 = \boxed{81}$

(C) Find the mean of:

i) X + Y $= \mu_x + \mu_y = 15 + 4 = \boxed{19}$

ii) X – Y $= \mu_x - \mu_y = 15 - 4 = \boxed{11}$

(D) Find the standard deviation of: No rule for std. dev., find σ^2 + $\sqrt{}$ ans.

i) X + Y $= \sqrt{\sigma_x^2 + \sigma_y^2} = \sqrt{5+9} = \sqrt{14} = \boxed{3.7417}$

ii) X – Y $= \sqrt{\sigma_x^2 + \sigma_y^2} = \sqrt{5+9} = \sqrt{14} = \boxed{3.7417}$

* always add for variance