Rp &Rk

Model No 4.5: Problems on series

Formulae: If A, B, C, D are connected in series then

1. Mean $\mu_{A+B+C+D} = \mu_A + \mu_B + \mu_C + \mu_D$
2. Standard deviation $\sigma_{A+B+C+D} = \sqrt{\sigma_A^2 + \sigma_B^2 + \sigma_C^2 + \sigma_D^2}$
3. Mean $\mu_{A-B} = \mu_A - \mu_B$
4. Standard deviation $\sigma_{A-B} = \sqrt{\sigma_A^2 + \sigma_B^2}$.

Problem 19: The mean voltage of a battery is 15 and S.D is 0.2. Find the probability that four such batteries connected in series will have a combined voltage of 60.8 or more volts.
Solution: M-

Problem 20: Three masses are measured as 62.34 kgs, 20.48 kgs, 35.97 kgs with S.D 0.54kgs, 0.21kgs, 0.46kgs. Find the mean and S.D of the sum of the masses.

of Means

Solution:

Problem 21: The diameter of motor shafts in a lot has a mean of 0.249 inch and a S.D of 0.003 inch. The inner diameter of bearings in another lot have a mean of 0.225 inch and a S.D of 0.002 inch.

differences 0.255

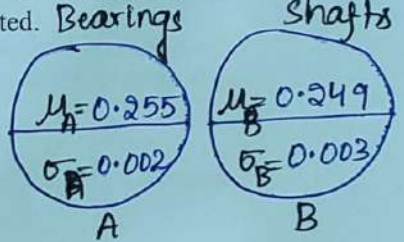
i) What are the mean and the S.D of the clearances between shafts and bearings selected from those lots?

ii) If a shafts and a bearing are selected at random, what is the probability that the shaft will not fit inside, the bearing ? Assume that both dimensions are normally distributed.

Solution:

Let A = Diameter Of the Bearings

B = Diameter Of the Shafts



i) Differences Of Mean & Differences of S.D's:

$\mu = \mu_{A-B} = \mu_A - \mu_B = 0.255 - 0.249 = 0.006$

$\boxed{\mu = 0.006}$

$\sigma = \sigma_{A-B} = \sqrt{\sigma_A^2 + \sigma_B^2} = \sqrt{(0.002)^2 + (0.003)^2} = 0.0036$ $\boxed{\sigma = 0.0036}$

ii) P(The shaft will not be fitting inside bearing)

Problem-19: Mean Voltage of battery $\mu = 15$

SD of the battery $\sigma = 0.2$

Let A, B, C, D be 4 batteries, then their:

Combined Mean $\mu = \mu_{A+B+C+D} = \mu_A + \mu_B + \mu_C + \mu_D$

$= 15+15+15+15 \Rightarrow \boxed{\mu = 60}$

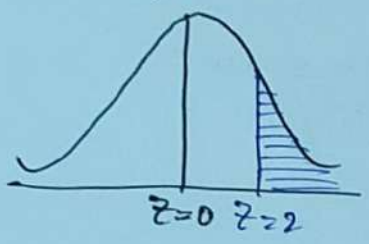
Similarly S.D $= \sigma = \sigma_{A+B+C+D} = \sqrt{\sigma_A^2 + \sigma_B^2 + \sigma_C^2 + \sigma_D^2}$

$= \sqrt{(0.2)^2+(0.2)^2+(0.2)^2+(0.2)^2} = \boxed{\sigma = 0.4}$

$P(X \geq 60.8)$

At $x = 60.8$ $z = \frac{x-\mu}{\sigma} = \frac{60.8-60}{0.4} = \frac{0.8}{0.4} = 2$

$P(z \geq 2)$:



RP: 0.5 - A(0 to 2)

0.5 - 0.4772

$\boxed{RP = 0.0228}$

Problem-20:

Given $\mu_A = 62.34$ $\mu_B = 20.48$ $\mu_C = 35.97$

$\sigma_A = 0.54$ $\sigma_B = 0.21$ $\sigma_C = 0.46$

Mean $\mu = \mu_{A+B+C} = \mu_A + \mu_B + \mu_C = 62.34 + 20.48 + 35.97$

$\therefore \boxed{\mu = 118.79}$

S.D $\sigma = \sigma_{A+B+C} = \sqrt{\sigma_A^2 + \sigma_B^2 + \sigma_C^2} = \sqrt{(0.54)^2+(0.21)^2+(0.46)^2}$

$\therefore \boxed{\sigma = 0.7398}$

Problem 21: The diameter of motor shafts in a lot has a mean of 0.249 inch and a S.D of 0.003 inch. The inner diameter of bearings in another lot have a mean of 0.225 inch and a S.D of 0.002 inch.

differences 0.255

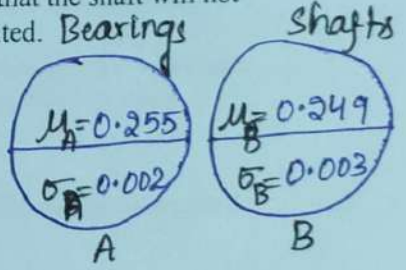
i) What are the mean and the S.D of the clearances between shafts and bearings selected from those lots?

ii) If a shafts and a bearing are selected at random, what is the probability that the shaft will not fit inside, the bearing ? Assume that both dimensions are normally distributed.

Solution:

Let A = Diameter Of the Bearings

B = Diameter Of the Shafts



i) Differences Of Mean & Differences of S.D's:

$$\mu = \mu_{A-B} = \mu_A - \mu_B = 0.255 - 0.249 = 0.006$$

$$\boxed{\mu = 0.006}$$

$$\sigma = \sigma_{A-B} = \sqrt{\sigma_A^2 + \sigma_B^2} = \sqrt{(0.002)^2 + (0.003)^2} = 0.0036$$

$$\boxed{\sigma = 0.0036}$$

ii) P(The shaft will not be fitting inside bearing)

diameter

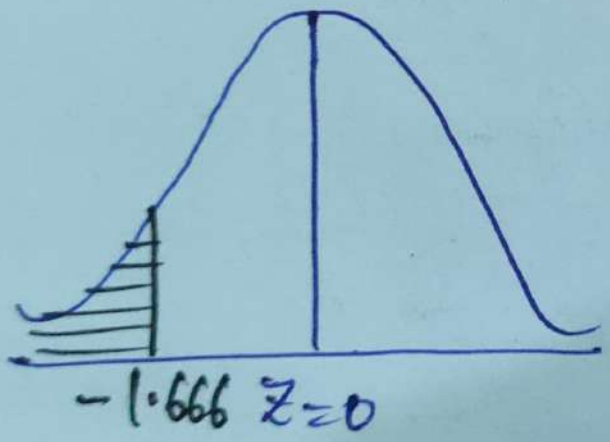
$P(\underline{X} = A - B < 0)$

$P(X = A - B < 0)$

~~$P(Z < -1.666)$~~

At $x = 0$; $Z = \frac{0 - 0.006}{0.0036} = -1.666$

$P(Z < -1.666)$:



RP : 0.5 − A(0 to 1.66)

= 0.5 − 0.4515

RP = 0.0485