19BCE245

PS sem 4 4/5/21

1.) The trucking firm wants evidence that the claim is wrong,
i.e. that $\mu < 28000$.
this is designated as H_a.
The complementry statement is designated as H_0.
Thus the hypothesis to be tested are

$H_0 : \mu \geq 28000$ vs $H_a : \mu < 28000$

$\alpha = 0.01$

$$z = \frac{27463 - 28000}{\frac{1348}{\sqrt{40}}} = -2.52$$

$z_\alpha = z_{0.01} = -2.326$.

So, reject H_0 because $z = -2.52 < z_{0.01} = -2.326$
There is sufficient evidence to doubt the trucking firm's claim.

2) Score before coaching :

23 20 19 21 18 20 18 17 23 16 19

Score after coaching: 24 19 21 18 20 22 20 20 23 20 17

∴ Mean of scores before coaching :

$$\frac{23+20+19+21+18+20+18+17+23+16+19}{11}$$

$= 214/11 = 19.45$

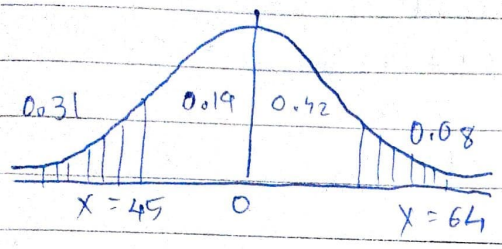
∴ Mean of scores after coaching :

$$= \frac{24+19+21+18+20+22+20+20+23+20+17}{11}$$

$= 224/11 = 20.36$

→ As mean/average of scores increased after coaching, we can say that coaching is effective.

3)



$$z = \frac{X - \bar{X}}{\sigma} \quad ;$$

→ value of z, corresponding to $0.50 - 0.31 = 0.19$ area, is equal to -0.5 (∵ from table)

→ value of z, corresponding to $0.50 - 0.08 = 0.42$ area, is equal to $+1.41$ (∵ from table)

Solving the system of eq.s,

$$\bar{X} - 0.5\sigma = 45 \quad \Rightarrow \quad -1.91\sigma = -19 \Rightarrow \sigma \simeq 10$$
$$\bar{X} + 1.41\sigma = 64$$

Substituting the value of σ in the first eq.,

$$\bar{X} - 0.5 \times 10 = 45$$
$$\Rightarrow \bar{X} = 50$$

∴ answer : **mean = 50**

4) average of doctors heights:

$$\frac{(63 + 65 + 68 + 69 + 71 + 72)}{6} = 68$$

average of engineer's heights:

$$\frac{(61 + 62 + 65 + 66 + 69 + 71 + 72 + 73)}{10} = 67.66$$

as on average doctors height is greater than engineer's height we can say that statement.

5) here,
let X be the random variable counting the numbers of the utility bills reduced by at least one-third in five solar heat installation.
X is the binomial random variable with parameter $n = 5$, $p = 0.6$ and
$q = 1 - 0.6 = 0.4$.

here,

$$P(X \geq 4) = P(X = 4) + P(X = 5)$$
$$= 0.259 + \binom{5}{5} (0.6)^5 (0.4)^{5-5}$$
$$= 0.259 + 0.078$$
$$= 0.337$$

6.) here,

$n = 1000$

x = no of rice eaters = 540

p = sample proportion of rice eaters $\frac{540}{1000} = 0.54$

P = Population proportion of rice eaters $= \frac{1}{2} = 0.5$

H_0 = both rice and wheat are equally popular

$H_1 = P \neq 0.5$

$$z = \frac{p - P}{\sqrt{PQ/n}} = \frac{0.54 - 0.5}{\sqrt{\frac{0.5 \times 0.5}{1000}}} = 2.532$$

Since computed $z < 2.58$ at 1% level of significance therefore H_0 is not rejected and we can conclude that rice and wheat are equally popular.