MAT361.4

Final Assignment

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(1)

Here,
Probability of getting any side of number, $P = \frac{1}{5}$

and, Since the spinner spun 5 times.

$\therefore n = 5$

It follows binomial distribution.

$\therefore$ Probability of geeting at most tow 5's,

$$P(X \leq 2) = P(X=0) + P(X=1) + P(X=2)$$

$$= \binom{5}{0}\left(\frac{1}{5}\right)^0\left(1-\frac{1}{5}\right)^{5-0} + \binom{5}{1}\left(\frac{1}{5}\right)^1\left(1-\frac{1}{5}\right)^{5-1}$$

$$+ \binom{5}{2}\left(\frac{1}{5}\right)^2\left(1-\frac{1}{5}\right)^{5-2}$$

$$= 0.94$$

(2)

Solar power Plants failures occur with an average of 5 failures every year. It will follow poisson distribution

$\therefore E(X) = \lambda_Y = 5$

for a week,

$\lambda_W = \frac{5}{\frac{365}{7}}$ [$\because$ 1 year = 365 days = $\frac{365}{7}$ weeks]

$= 0.0959$

$\therefore$ Probability that their will be more than one failure during a particular week,

$P(X>1) = 1 - P(X=0) - P(X=1)$

$= 1 - \frac{e^{-0.0959}(0.0959)^0}{0!} - \frac{e^{-0.0959}(0.0959)^1}{1!}$

$= 1 - 0.909 - 0.087$

$= 0.004$

(3)

we have,
normally distributed

mean, $E(x) = \mu = 185$ cm

varience, $V(x) = \sigma^2 = 2$ cm

$\therefore \sigma = \sqrt{2}$

Probality that a adult people height is greter than 184 c.m,

$P(x > 184)$

$= P(184 < x < \infty)$

$= P\left(\frac{184-\mu}{\sigma} < \frac{x-\mu}{\sigma} < \frac{\infty-\mu}{\sigma}\right)$

$= P\left(\frac{184-185}{\sqrt{2}} < z < \infty\right)$

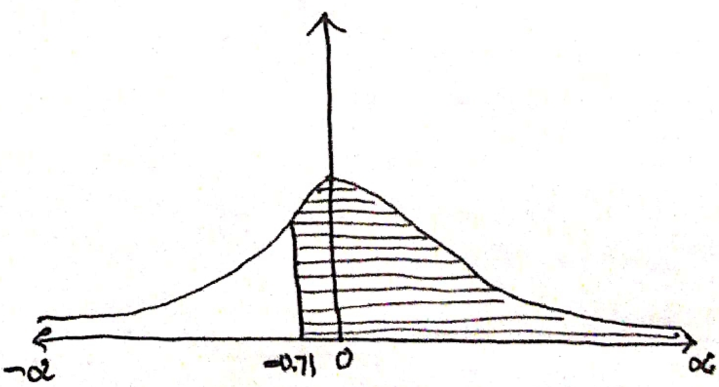
$= F(\infty) - F\left(\frac{184-185}{\sqrt{2}}\right)$

$= 1 - F(-0.707)$

$= 1 - F(-0.71)$

$= 1 - 0.2389 = 0.7611$

Figure:



$$\bar{x} = \frac{60+75+72+65+68}{5} = 68$$

$H_0 : \mu = 70$

$H_1 : \mu < 70$

Test statistic is

$$\frac{\bar{x}-\mu_0}{\sqrt{\frac{s^2}{n}}} \sim t_{(n-1)}$$

$\mu_0 = 70$, $n = 5$

$$s^2 = \frac{\sum(x_i-\bar{x})^2}{n-1}$$

$$= \frac{(60-68)^2+(75-68)^2+(72-68)^2+(65-68)^2+(68-68)^2}{5-1}$$

$$= 34.5$$

$\therefore$ Test statistic is, $\dfrac{68-70}{\sqrt{\frac{34.5}{5}}} = -0.76$

$\therefore$ The rejection region is $]-\infty, -t_\alpha]$

$$=]-\infty, -t_{0.05}]$$

$$=]-\infty, -2.132]$$

$\alpha = 0.05$

P.T.O

Comment:

∵ Test statistic value, -0.76, does not fall in the rejection region.

∴ We can not reject null hypothesis (H_0).

So that, the researcher's assumption, the mean weight of the adult men in Bangladesh is less than 70kg is incorrect.

Blood samples of 5 people were sent to each of two laboratories (Lab 1 and 2) for cholesterol determinations.

∴ it is matched paired t test.

$H_0: \mu_D = 0$

$H_1: \mu_D < 0$

where,

$\mu_D = \mu_y - \mu_x$

here,

μ_x = The mean cholesterol reported by Lab 1

μ_y = The mean cholesterol reported by Lab 2

Test Statistic $= \dfrac{\bar{D}}{\sqrt{\frac{S_D^2}{n}}} \sim t_{n-1}$

from the data we get,

Person (i)	$D_i = Y_i - X_i$
1	42
2	17
3	20
4	-38
5	16

∴ Sample mean difference, $\bar{D} = \dfrac{42+17+20-38+16}{5}$

$= 11.4$

P.T.O

$$\therefore S_D^2 = \frac{\sum_{i=1}^{5}(D_i - \bar{D})^2}{n-1}$$

$$= \frac{(42-11.4)^2 + (17-11.4)^2 + (20-11.4)^2 + (-38-11.4)^2 + (16-11.4)^2}{5-1}$$

$$= 875.8$$

and, $n = 5$

$$\therefore \text{Test static} = \frac{11.4}{\sqrt{\frac{875.8}{5}}}$$

$$= 0.86$$

$\therefore$ Rejection region is; $]-\infty, -t_{\alpha, n-1}]$

here,
$\alpha = 0.1$
$n-1 = 5-1 = 4$

$$=]-\infty, -t_{0.1,4}]$$

$$=]-\infty, -1.533]$$

Comment :

$\because$ Test statistics value (0.86) does not fall in the rejection region.

$\therefore$ we can not reject null hypothesis (H_0)

So that, the assumption, the (population) mean cholestrol levels by Lab 1 is greater than the (population) mean cholestrol ~~mean~~ levels reported by Lab 2 is incorrect.