North South University

Department of Electrical & Computer Engineering

Assignment

Assignment:	**FINAL**
Course Code:	**MAT361**
Course Section:	**04**
Course Name:	**Probability and Statistics**
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1

Pentagon consists of 5 triangles.

The probability of getting any side of number is, $p = \frac{1}{5}$

The spinner spun 5 times.

So, $n = 5$

It will follow the binomial distribution.

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

$$= \binom{5}{0}\left(\frac{1}{5}\right)^{0}\left(1-\frac{1}{5}\right)^{5-0} + \binom{5}{1}\left(\frac{1}{5}\right)^{1}\left(1-\frac{1}{5}\right)^{5-1} + \binom{5}{2}\left(\frac{1}{5}\right)^{2}\left(1-\frac{1}{5}\right)^{5-2}$$

$$= 0.3277 + 0.4096 + 0.2048$$

$$= 0.9421$$

(Ans)

2

Average failures per year = 5

$\therefore\ E(x) = \lambda_y = 5$

1 year = 365 days

1 week = 7 days

$\Rightarrow$ 1 year = $\frac{365}{7}$ weeks = 52.14 weeks

More than one failure during a perticular week.

$P(x>1)$. It will follow poisson distribution.

$$\lambda_w = \frac{5}{52.143} = 0.0959$$

$$P(x>1) = P(x=2) + P(x=3) + P(x=4) + \ldots\ldots$$

We know,

$$P(X=0) + P(X=1) + P(X=2) + P(X=3) + \ldots\ldots = 1$$

$$\Rightarrow P(X=2) + P(X=3) + P(X+4) + \ldots\ldots = 1 - P(X=0) - P(X=1)$$

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

$$\Rightarrow P(X>1) = 1 - \frac{e^{-0.0959}(0.0959)^0}{0!} - \frac{e^{-0.0959}(0.0959)^1}{1!}$$

$$\Rightarrow P(X>1) = 1 - 0.90855 - 0.08713$$

$$\Rightarrow P(X>1) = 4.32 \times 10^{-3} = 0.00432$$

(Ans)

3

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

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

Standard deviation, $\sigma = \sqrt{2}$

$P(x > 184)$

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

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

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

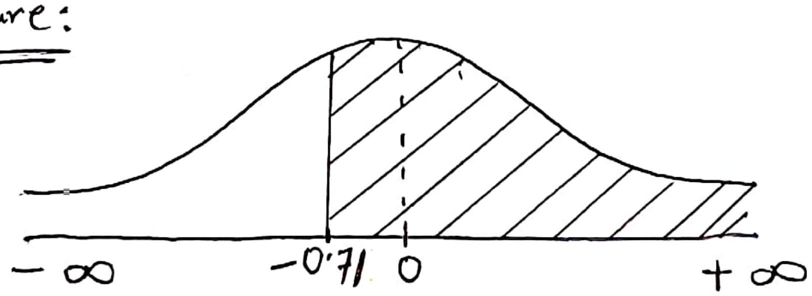
$= P(-0.707 < z < \infty)$

$= F(\infty) - F(-0.71)$

$= 1 - 0.2389$

$= 0.7611$

Figure:



(Ans)

4

$H_0 : \mu = 70$

$H_1 : \mu < 70$

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

here,

$n = 5$

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

$\mu_0 = 70$

~~$s^2 = (60-68)$~~

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

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

$$= \frac{64 + 49 + 16 + 9 + 0}{4}$$

$$= \frac{138}{4}$$

$$= 34.5$$

Test Statistic is $\dfrac{68-70}{\sqrt{\dfrac{34.5}{5}}} = -0.76$

$\alpha = 0.05$

$V = 5-1 = 4$

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

$=]-\infty, -2.132]$

Comment: Since test statistic's value (-0.76) doesn't fall in the rejection region, so we can not reject H_0 (Null Hypothesis).

The researcher's assumption about testing the mean weight of the adult men in Bangladesh is incorrect.

5

We are getting 2 samples from each same person.
So, it's a paired data.

$H_0 : \mu_D = 0$
$H_1 : \mu_D < 0$

Where, $\mu_D = \mu_y - \mu_x$

μ_x = The mean cholesterol by Lab 1
μ_y = The mean cholesterol by Lab 2

Test statistic $= \dfrac{\bar{D}}{\sqrt{\dfrac{s^2_D}{n}}} \sim t_{n-1}$

from the data we get,

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

$\bar{D} = \dfrac{42 + 17 + 20 + -38 + 16}{5}$

$= 11 \cdot 4$

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

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

$$= \frac{936.36 + 31.36 + 73.96 + 2440.36 + 21.16}{4}$$

$$= 875.8$$

$$\text{Test statistic} = \frac{11.4}{\sqrt{\frac{875.8}{5}}} = 0.86$$

$\alpha = 0.10$, $V = 5-1 = 4$

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

$$=]-\infty, -t_{0.10, 4}]$$

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

Comment:

Since the test statistics value doesn't fall in the rejection region, so we can not reject null hypothesis (H_0).

So, the assumption of the mean cholesterol levels reported by Lab 1 is greater ~~to~~ than the mean cholesterol levels reported by Lab 2 is incorrect.

(Ans)