Final Assignment

MAT 361

Name : Mahmudul Hasan

ID : 1921675042

Section : 04

Faculty initial : IJh

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Mahmudul Hasan
1921675042

Answer to the question No: 1

here, Pentagon consists five triangles 1 to 5.

so, Probability of getting 5, $p = \frac{1}{5}$
$= 0.2$

Again, Spinner spun 5 times ~~∴ number of trials n~~

∴ number of trial, $n = 5$

By binomial distribution probability of getting at most two 5's is,

$\left[\because P(X=k) = \binom{n}{k} p^k (1-p)^{n-k} \quad k=1,2,\dots n\right]$

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

$= \binom{5}{0} \times (0.2)^0 \times (1-0.2)^{5-0} + \binom{5}{1} \times (0.2)^1 \times (1-0.2)^{5-1} + \binom{5}{2} \times (0.2)^2 \times (1-0.2)^{5-2}$

$= (1 \times 1 \times 0.33) + (5 \times 0.2 \times 0.41) + (10 \times 0.04 \times 0.51)$

$= 0.944$

Answer

∴ the probability of getting at most two 5's is 0.944.

Answer

Answer to the question No. 2

According to question, average 5 failures per year.

$\therefore$ mean per year $= 5$

$\therefore$ mean ~~per~~ failures per day $= \frac{5}{365}$

So, mean failures per week $= \frac{5}{365} \times 7$ [1 week = 7 days]

$= 0.0958$

we know, In poison distribution mean = variance

and variance $V(x) = \lambda$. $\therefore \lambda = 0.0958$

~~$\therefore$ The probability that there will be of po~~

The poison distribution, $P(X=k) = \frac{e^{-\lambda} \lambda^k}{k!}$.

as we know the whole probability $= 1$

$\therefore$ the probability that there will be more than one failure during a patiellar week,

$P(X>1) = P(X=2) + P(X=3) + P(X=4) + \cdots$

We know,

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

$\therefore P(X=2) + P(X=3) + P(X=4) + \cdots = 1 - P(X=0) - P(X=1)$

$$= 1 - \frac{e^{-0.0958}(0.0958)^0}{0!} - \frac{e^{-0.0958}(0.0958)^1}{1!}$$

$$= 1 - 0.9086 - 0.0871$$

$$= 0.0043$$

Answer.

Answer to the question NO. 3

here, Normally distributed value of

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

and, variance $= \sigma^2$
$\therefore \sigma^2 = 2$ cm
$\therefore \sigma = \sqrt{2}$

Calculating the probability that a adult people height is grater than 184 cm is,

$P(x > 184)$

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

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

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

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

$= F(\infty) - F(-0.707)$

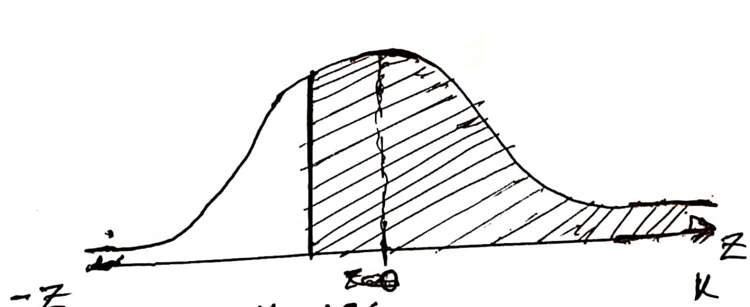
$= 1 - F(-0.707)$

$= 1 - 0.2389 = 0.7611$

~~= 0.7611~~

Answer.

Figure:



$x = 184$

$\mu = 185$

$Z = 0$, $Z = -0.707$

Answer to the question No. 4

here,

$H_0 : \mu = 70$ (Null hypothesis)

$H_1 : \mu < 70$

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

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

$$= 68$$

$\mu_0 = 70$ & $n = 5$

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

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

$$= 34.5$$

$$\therefore s = \sqrt{34.5}$$

$$= 5.8737$$

So, Test statistic $= \dfrac{68-70}{\sqrt{\dfrac{34.5}{5}}}$

$$= -0.76\cancel{8}$$

The rejection regions is $]-\infty, -t_a]$

the significane. $a = 5\%$ $\quad v = n-1$

$= 0.05 \qquad = 5-1$

$= 4$

$\therefore$ The rejection region $]-\infty, -t_{0.05}]$

$=]-\infty, -2.132]$

comment : Since test statisties value -0.76 doesn't fall in the rejection region. So we can not reject Ho (Null Hypothesis).

So, the reseachor's assumption about testing the ~~the mean~~ mean weight of the adult men is Bangladesh is incorrect.

Answer to the question No. 5

According to question, we are taking lab 1 and lab 2 samples data from same each person.

~~If~~ Indeet it should be paired data.

Since it is a matched paired t test ~~so~~, and Lab 1 data is greater than the mean cholesterol levels reported ~~the~~ by Lab 2, ~~the~~ so,

$H_0 : \mu_D = 0$

$H_1 : \mu_D < 0$ where $\mu_D = \mu_y - \mu_x$

here, μ_y = The mean cholesterol of lab 2

μ_x = the mean cholesterol by lab 1

we know, matched paired t test's

$$\text{Test statistic} = \frac{\bar{D}}{\sqrt{\frac{S^2 D}{n}}} \sim t_{(n-1)}$$

$D = Y - X$, so from sample data we get,

$D_i = Y_i - X_i$
42
17
20
-38
16

here,

number of paired observation,

$n = 5$

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

$$= 11.4$$

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

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

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

$$= 875.8$$

$$\therefore \text{The test statistic} = \frac{11.4}{\sqrt{\frac{875.8}{5}}}$$

$$= 0.86$$

level of significance, $\alpha = 10\%$
$= 0.1$

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

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

$=]-\infty, -1.533$

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

So, the (population) mean cholesterol levels reported by Lab 1 is greater than the mean cholesterol levels reported by Lab 2 is incorrect.