Name:- Utsav Acharya

Q.no.1

a Ans

Given,

Total student = 100

Juniors = 43

Male = 64

Male Junior = 24

If male, The probability the student is a junior

$$P(\text{Junior} \mid \text{Male}) = \frac{P(\text{Junior and Male})}{P(\text{male})}$$

$$= \frac{24}{100} \times \frac{100}{64}$$

$$= \frac{24}{64}$$

$$= 0.375$$

Hence

Probability $P\left(\frac{\text{Junior}}{\text{Male}}\right) = 0.375$

b Ans

No, The event that the student is a junior and the event that the student is not independent

i.e

From Q.no.1 a

$P(\text{Junior} \mid \text{Male}) = 0.375$

$P(\text{Junior}) = 0.43$

Since,

$0.375 \neq 0.43$

So, it is not independent

Q no: 2

Given, 10% of people fail on the first try

So, probability of fail $p = 0.10$

probability of passing $q = 1 - p$
$= 0.90$

Number of individual $n = 5$

a Ans

when $x = 1$ where, $\sim (n = 5, p = 0.10)$

$P(X=1) = \binom{5}{1} (0.10)^1 (0.90)^4$ $\left[P(X=k) = \binom{n}{k} p^k q^{n-k} \right]$

$= 0.32805$

b Ans

At least $(P\ X \geq 1)$

$1 - P(X=0)$

$P(X=0) = \binom{5}{0} (0.10)^0 (0.90)^5$

$= 0.59049$

Now,

$P(X \geq 1) = 1 - 0.59049$
$= 0.40951$

Q.no-3

Soln,

Given,

Mean $\bar{x} = 315$

Standard deviation $s = 11$

a Ans

Probability of the speed more than 320

$X = 320$

So,

$$Z = \frac{320-315}{11} \quad \left(\frac{x-\bar{x}}{s}\right)$$

$= 0.4545$

Normal distribution in standard table,

$P(Z > 0.4545)$

$= 1 - P(Z < 0.4545)$

$= 1 - 0.6736$

$= 0.3264$

b Ans

between 305 and 320 z-score

So,

for 305, $Z = \frac{305-315}{11} = -0.90909091$

for 330, $Z = \frac{330-315}{11} = 1.36363636$

$P(305 < X < 330)$

So,

$P(Z < -0.9091) = 0.1814$ [-0.91]

$P(Z < 1.36364) = 0.9131$ [1.36]

So,

$= 0.9131 - 0.1814$

$= 0.7317$

Q.no.5

Mean $\bar{x} = 72.7$

standard deviation = 13.1

a Ans

Sample size $n = 38$

Error = $S_{\bar{x}} = \frac{s}{\sqrt{n}} = \frac{13.1}{\sqrt{38}} = 2.1266$

sample distribution;

$\bar{X} \sim N(72.7, 2.166)$

b Ans

betn 70 & 80 (Probability)

So,

$z_1 = \frac{70 - 72.7}{2.166} = -1.25$

$z_2 = \frac{80 - 72.7}{2.166} = 3.37$

$P(Z < -1.25) = 0.1056$

$P(Z < 3.37) = 0.9996$

$P(70 < \bar{x} < 80)$

$P(-1.25 < \bar{x} < 3.37)$

$= 0.9996 - 0.1056$

$= 0.894$

Q. ans

Mean $\bar{x} = 101.82$

standard deviation $s = 1.2$

sample size $n = 6$

confidence level

for a Ans

95% confidence leve,

$df = n-1$

$= 5$

So,

$t_{\frac{\alpha}{2}, 5} = 2.571$

(standard error) $SE = \frac{s}{\sqrt{n}} = \frac{1.2}{\sqrt{6}} = 0.49$

Margin error (ME) $= t^{*} \cdot SE$

$= 2.571 \times 0.49$

$= 1.26$

So, confidence ~~[illegible]~~ interval

$\bar{x} \pm ME$

$= (100.56, 103.08)$

b Ans

if we increase confidence level the interval will be wider

c Ans

The population must be distributed normally.

Q.no.3 ©

90% greater

$P(X>x) = 0.90$

$P(X<x) = 0.10$

So,

$P(Z<z) = 0.10$

$= -1.28$

So,

$x = \bar{x} + zs$

$= 315 + (-1.28) 11$

$= 300.92$

Q no. 4

a Ans

$f(x=27) = 0.30$

$f(x=28) = 0.26$

$f(x=29) = 0.38$

$f(x=30) = 0.06$

b Ans

X and Y are not independent because

$f(27, 2.5) \neq f(x=27) \cdot f(y=2.5)$

Q.no. 8

Soln,

H_0 Vs H_a

$\mu_1 = \mu_2$ $\mu_1 \neq \mu_2$

Pooled ~~[illegible]~~ common variance $= \sqrt{\dfrac{(n_1-1)s_1^2 + (n_2-1)s_2^2}{n_1+n_2-2}}$

$$s_p = \sqrt{\frac{15(5.7)^2 + 8(4.3)^2}{16+9-2}}$$

$= 5.26$

Test statistic

$$t = \frac{\bar{x}_1 - \bar{x}_2}{s_p\sqrt{\frac{1}{n_1} + \frac{1}{n_2}}}$$

$= -1.5$

So,

Degree of freedom

$df = n_1 + n_2 - 2$
$= 16 + 9 - 2$
$= 23$

$t_{critical} = \pm 2.069$

Since,
-1.59 is within the range -2.069,
we fail to reject the

$H_0 = \mu_1 = \mu_2$

Q.no.7

$\mu_0 = 15$

$\bar{x} = 16.46$

$s = 2.6$

$n = 20$

$\alpha = 0.05$

$H_0\ \mu = 15$ Vs $H_a\ \mu > 15$

so,

$$t = \frac{\bar{x} - \mu_0}{s/\sqrt{n}} = \frac{16.46 - 15}{2.6/\sqrt{20}} = 2.51$$

Degree of freedom $df = n - 1$

$= 19$

critical t-value, $df = 19$ $\alpha = 0.05$

$t_{critical} = 1.729$

So,

$t = 2.51 > 1.73$

Reject $H_0\ \mu = 15$

Q. no 1

Mean $\bar{x} = 101.82$

standard deviation $s = 1.2$

sample size $n = 6$

confidence level

for a Ans

95% confidence level,

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$= 5$

So,

$t_{\frac{\alpha}{2}, 5} = 2.571$

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Margin error (ME) $= t^* \cdot SE$

$= 2.571 \times 0.49$

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So,

confidence interval

$\bar{x} \pm ME$

$= (100.56, 103.08)$

b Ans

if we increase confidence level the interval will be wider

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The population must be distributed normally.

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