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Program :- BIT
Course code- EB3125
Course Title - Statestecs
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Q no 1 a.

i.

⇒ Number of personal fouls committed by all NBA player during the 2008 _ 2009 seasons is Population.

ii.

⇒ Yield of potatoes per acre for 10 pieces of land is Sample.

iii.

⇒ Weekly salaries of all employees of a company is Population.

iv.

⇒ Number of computers sold during to past week at all computer stores in Mesa mall is sample.

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Q. no 1. b. i

People	mid value (x)	Frequency	f(x)	x^2	fx^2
120-130	125	3	375	15,625	46875
130-140	135	6	810	18,225	109,350
140-150	145	7	1015	21,025	147,175
150-160	155	12	1860	24,025	288,300
160-170	165	7	1155	27,225	190575
170-180	175	5	875	30,625	153,125
		$\Sigma(f) = 40$	$\Sigma fx = 6090$		$\Sigma fx^2 = 935400$

ii.

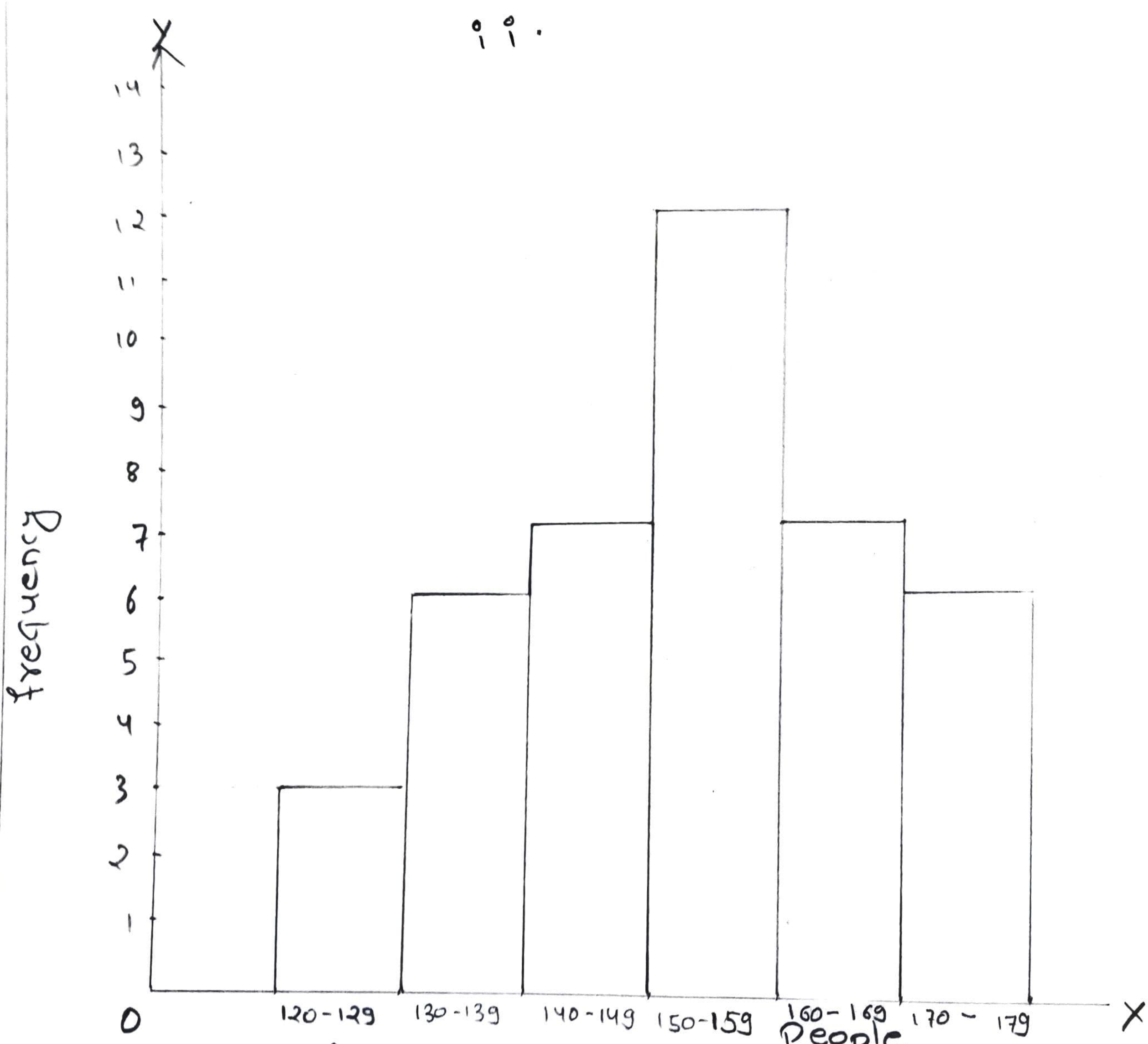

fig: Histogram

1.b.iii.

⇒ Soln.

The maximum frequency of the given data is 12, so 150 - 159 is model class.

here, $L = 150$

$f_1 = 12$

$f_0 = 7$

$f_2 = 7$

$h = 10$

$$M_0 = L + \frac{f_1 - f_0}{(f_1 - f_0) + (f_1 - f_2)} \times h$$

$$= 150 + \frac{5}{5+5} \times 10$$

$$= 150 + 5 = 155$$

$\therefore$ mode $= 155$

Now,

$$\text{Mean } (\bar{x}) = \frac{\Sigma fx}{\Sigma f}$$

$$= \frac{6090}{40}$$

$$= 152.25$$

1.b.iv.

⇒ Soln.

$$\text{Standard deviation } (\sigma) = \sqrt{\frac{\Sigma fx^2}{N} - \left(\frac{\Sigma fx}{N}\right)^2}$$

$$= \sqrt{\frac{935,400}{40} - \frac{37088100}{1600}}$$

$$= \sqrt{23385 - 23180.06}$$

$$= \sqrt{204.94}$$

$$= 14.315$$

1. b. iv.

$\Rightarrow$ variance $= \sigma^2 = 14.315^2$

$= 204.94$

Q no 2 a

=> Mutually exclusive events are things that can't happen at the same time. For example you can't run backwards and forwards at the same time. The events "running forward" and "running backwards" are mutually exclusive

Q. no 2 b (i)

=> 1. Probability a salesman selected at random above average and excellent potential:

P(above averge and excellent) = $\frac{135}{500}$

= 0.27

ii.

=> Probability of random selection above average or excellent potential:

P(above average or excellent) = $\frac{93 + 72 + 135}{500}$

= $\frac{300}{500}$

= 0.60

iii.

=> Probability of below average selected person from good potential:

P(average) = $\frac{12}{12+60+72}$ = $\frac{1}{12}$ = 0.083

Q. no. 2. c.

⇒ It's a binomial problem with $n = 10, p = 0.05,$
$q = 1 - 0.05 = 0.95$.

i.

⇒ $P(x = 0) = 0.95^{10} = 0.5987$

ii.

⇒ $P(x >= 1) = 1 - P(x = 0)$
$= 1 - 0.5987$
$= 0.4013$

iii.

⇒ Mean of binomial distribution is: $\mu = n * p$
$= 10 \times 0.05$
$= 0.5$

Standard deviation of the distribution is: $\sqrt{npq}$
$= \sqrt{10 \times 0.05 \times 0.95}$
$= 0.6893$

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8 no 3 ..

) Solution

Let x be the probability that James win cash prize in lottery

To building the probability distribution for x . given

x	0	10	100	500
$p(x=x)$	0.45	0.30	0.20	0.05

i) exactly RM 100.

$P(x=100) = 0.20$

The probability that James win exactly RM 100 if he buys a single ticket is 0.20 //

ii) $p(x \leq 100) = p(x=0) + p(x=100) + p(x=100)$.

$= 0.45 + 0.30 + 0.20$

$= 0.95$.

iii)

$E(x) = x = \Sigma n \cdot p(x=n)$

$= 0 \times 0.45 + 10 \times 0.30 + 100 \times 0.20 + 500 \times 0.05$.

$= 0 + 3 + 20 + 25$.

$= 48$.

Q. no. 3. b.

$\Rightarrow$

$$\frac{e^{-\lambda}\lambda^{x}}{x!}$$ (where $\lambda = 3.1$, $x=4$) [probability exactly four theft occur in a minute].

$$= e^{-3.1}\left(\frac{3.1^{4}}{4!}\right)$$

$$= 0.17335$$

$$\frac{e^{-\lambda}\lambda^{x}}{x!}$$ (wher $\lambda = 3.1$ & $x=0$) [probability there are no theft in a minute].

$$e^{-3.1}.\left(\frac{3.1^{0}}{0!}\right)$$

$$= 0.04505$$

$$\frac{e^{-\lambda}\lambda^{x}}{x!}$$ (probability at least one theft in minute).

$$= 1 - e^{-3.1}.\left(\frac{3.1^{0}}{0!}\right)$$

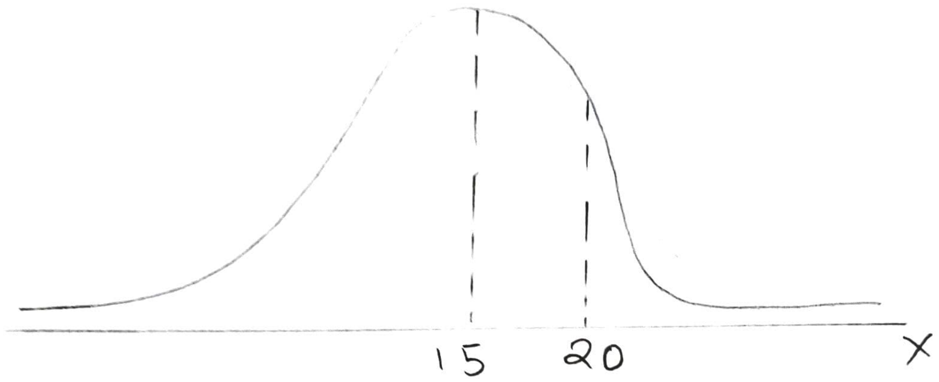
$$= 0.04505$$

Q. no. 3. C.

⇒ Solution:

Let X be the length of tame (in minutes) a person is tuned to the station. Then.

a) $P(X>20) = ?$



The Z-value corresponding to X - 20 is
$z\,(20-15.0)/3.5 = 1.43$

i. Hence, $P(X>20) = 0.5 - P(0<Z<.143)$
$= 0.5 - 0.4236$
$= 0.0764.$

ii. Hence, $P(X<10) = z = (10-15)/3.5 = -1.43.$
$= P(-1.43 < Z < 0)$
$= P(0<z<-1.43)$
$= 0.4236.$

iii. Hence, Between 10 and 12 the goal is to find.
$P(10<x<12)$
The Z value corresponding to $x = 10$ is $Z = (10-15)/3.5 = 1.43$
The z value corresponding to $X = 12$ is Z
$= (12-15)/3.5 = -0.86.$

Hence, $P(10 < X < 12) = P(-1.43 < Z < -0.86)$

$= P(-1.43 < Z < 0) - P(-0.86 < Z < 0)$

$= P(0 < Z < 1.43) - P(0 < Z < 0.86)$

$= 0.4236 - 0.3051$

$= 0.1185$

Q. no 4.b

⇒ Distribution Involving Sample Means

(R) Given,

$X = 27$

$S = 3$

$\mu = 25$

$\sigma = 3$

$n = 20$

$z = \frac{27-25}{3} = 0.6668$

$1 - 0.6668 = 0.3336$

or,

33.36

$$z(27) = \frac{(27-25)}{(3/\sqrt{20})}$$

$$= 2.981$$

$$P(z > 27) = P(z > 2.981)$$

$$= 0.014$$

Q. no. 4.c.

⇒ Soln.

$\bar{X} = 45$

$S = 12$

$n = 50$

for 95% CI = 1.96

we know,

$$CI = \bar{x} \pm z * 12 \,(6/\sqrt{n})$$

$$CI = 4 \pm 1.96 * \frac{12}{\sqrt{50}}$$

$$CI = 45 \pm 3.326$$

$$CI = 45 + 3.326 \text{ and } 45 - 3.326$$

$$= 48.326 \text{ and } 41.674$$

∴ CI = 41.674 minutes and 48.326 minutes

Q.no. 5 a.

⇒ Type I Error.

The rejection of null hypothesis when it is true is called type I error i.e. if true null hypothesis H_0 is rejected, it is said to be type I error. The probability of Type I error is denoted by a.

Type II error:

If false null hypothesis H_0 is accepted, it is said to be type II error i.e. the acceptance of null hypothesis when it is false is called type II error. The probability of type II error is denoted by β.

Q.no. 5.b

⇒ The null hypothesis states that a population parameter (such as the mean, the standard deviation, and so on) is equal to a hypothesized value. The alternative states that a population parameter is smaller, greater, or different than the hypothesized value in the null hypothesis.

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q.no. 5. C.

Player	Height(x)	Goals(y)	$(x-\bar{x})$	$\Sigma(x-\bar{x})(y-\bar{y})$	$(x-\bar{x})^2$	$(y-\bar{y})$	$(y-\bar{y})^2$
1	175	11	-4.5	17.55	20.25	-3.9	15.21
2	178	15	-1.5	0.15	2.25	0.1	0.01
3	173	12	-6.5	18.85	42.25	-2.9	8.41
4	183	17	3.5	7.35	12.25	2.1	4.41
5	180	15	0.5	0.05	0.25	0.1	0.01
6	188	19	8.5	34.85	72.25	4.1	16.81
7	180	16	0.5	0.05	0.25	1.1	1.21
8	185	18	5.5	1705	30.25	3.1	9.61
9	175	11	-4.5	7.55	20.25	-3.9	15.61
10	178	15	-1.5	0.1	2.25	0.1	0.01
	$\Sigma x = 1795$	$\Sigma y = 149$		$= 113.55$	$\Sigma(x-\bar{x})^2 = 202.5$		$\Sigma(y-\bar{y})^2 = 70.9$

$$\Rightarrow \bar{x} = \frac{\Sigma x}{n} = \frac{1795}{10} = 1795$$

$$\bar{y} = \frac{\Sigma y}{n} = \frac{149}{10} = 14.9$$

$$b_1 = \frac{\Sigma(x-\bar{x})(y-\bar{y})}{\Sigma(x-\bar{x})^2}$$

$$= \frac{113.55}{202.5}$$

$$= 0.5607$$

$b_0 = \bar{y} - b\bar{x}$

$= 149 - 0.5600(179.31)$

$= 249 - 100.42$

$= 85.62$

$\hat{y} = 0.560x + 85.62$