TOPIC .... DATE..............................

Ques1 The probability that a student passes a physics test is 2/3 and probability that he passes both a physics and english test is 14/45. The probability he passes atleast one test is 4/5. what is the probability that he passes tha English test ?

Ans1 Let probability of passing physics test denotedy by $P(P)$

Probability of passing english test denoted by $P(E)$

According to Ques -

$$P(P) = \frac{2}{3} \quad ; \quad P(P \cap E) = \frac{14}{45} \quad ; \quad P(P \cup E) = \frac{4}{5}$$

$$P(E) = ?$$

By addition theorem of probability -

$$P(P \cup E) = P(E) + P(P) - P(E \cap P)$$

$$\frac{4}{5} = P(E) + \frac{2}{3} - \frac{14}{45}$$

$$P(E) = \frac{4}{5} + \frac{14}{45} - \frac{2}{3}$$

$$P(E) = \frac{4 \times 9 + 14 - 2 \times 15}{45}$$

$$P(E) = \frac{36 + 14 - 30}{45}$$

$$P(E) = \frac{20}{45}$$

$$\boxed{P(E) = \frac{4}{9}}$$

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TOPIC .... DATE ....

Ques 2 For any three events A, B and C, Prove that -

$$P[(A\cup B)/C] = P(A/C) + P(B/C) - P(A\cap B/C)$$

L.H.S : $P\left(\frac{A\cup B}{C}\right)$

By conditional probability,

$$P\left(\frac{A}{B}\right) = \frac{P(A\cap B)}{P(B)}$$

$$P\left(\frac{A\cup B}{C}\right) = P\left(\frac{(A\cup B)\cap C}{C}\right) \rightarrow (1)$$

$$P((A\cup B)\cap C) = P((A\cap C)\cup(B\cap C))$$

$$P((A\cap C)\cup(B\cap C)) = P(A\cap C) + P(B\cap C) - P((A\cap C)\cap(B\cap C))$$

$$P((A\cap C)\cup(B\cap C)) = P(A\cap C) + P(B\cap C) - P((A\cap B)\cap C)$$

· Put in conditional probability in Eqn (1)

$$P\left(\frac{A\cup B}{C}\right) = \frac{(P(A\cap C) + P(B\cap C) - P((A\cap B)\cap C)}{P(C)}$$

$$P\left(\frac{A\cup B}{C}\right) = \frac{P(A\cap C)}{P(C)} + \frac{P(B\cap C)}{P(C)} - \frac{P((A\cap B)\cap C)}{P(C)}$$

By conditional probability,

$$\boxed{P\left(\frac{A\cup B}{C}\right) = P\left(\frac{A}{C}\right) + P\left(\frac{B}{C}\right) - P\left(\frac{A\cap B}{C}\right)}$$

Hence proved //

TOPIC .... DATE........................

Ques3 The probabilities of events E_1 and E_2 are 0.40 and 0.60 Respectively. It is also known that $P(E_1 \cap E_2) = 0$. Suppose $P(E/E_1) = 0.20$ and $P(E/E_2) = 0.05$

(a) Are E_1 and E_2 are mutually Exclusive? Explain.

(b) compute $P(E_1 \cap E)$ and $P(E_2 \cap E)$

(c) compute $P(E)$

(d) Apply Baye's theorem to compute $P(E_1/E)$ and $P(E_2/E)$?

Ans3 Given -

$P(E_1) = 0.40$ $\quad$ $P(E_2) = 0.60$

$P(E_1 \cap E_2) = 0$

$P(E/E_1) = 0.20$ $\quad$ $P(E/E_2) = 0.05$

(a) Since, it is given that $P(E_1 \cap E_2) = 0$ this means E_1 and E_2 are disjoints sets, and they do not contain any Element in common. So, they are mutually Exclusive event.

(b) $P(E_1 \cap E) = ?$ $\quad$ $P(E_2 \cap E)$

By conditional probability $\quad P(A/B) = \dfrac{n(A \cap B)}{n(B)}$

(or)

By multiplication thm,

$$P(A \cap B) = P(A) \cdot P\left(\frac{B}{A}\right)$$

$P(E_1 \cap E) = P(E_1) \cdot P\left(\frac{E}{E_1}\right)$ $\quad$ $P(E_2/E) = P(E_2) \cdot P\left(\frac{E}{E_2}\right)$

$= 0.40 \times 0.20$ $\quad$ $= 0.60 \times 0.05$

$= 0.0800$ $\quad$ $= 0.0300$

$.60$
$\times 0.05$
30

TOPIC .... DATE....................

(c) $P(E) = ?$

$$P(E) = P(E_1) \cdot P\left(\frac{E}{E_1}\right) + P(E_2) \cdot P\left(\frac{E}{E_2}\right)$$

$$= 0.08 + 0.03$$

$$\boxed{P(E) = 0.11}$$

(d) $P(E_1/E) = ?$ $\qquad$ $P(E_2/E) = ?$

$$P(E_1/E) = \frac{P(E/E_1) \cdot P(E_1)}{P(E/E_1) \cdot P(E_1) + P(E/E_2) \cdot P(E_2)}$$

$$= \frac{0.20 \times 0.40}{0.20 \times 0.40 + 0.60 \times 0.05}$$

$$= \frac{0.08}{0.11} = \frac{8}{11}$$

$$= 0.727$$

$$P(E_2/E) = \frac{P(E/E_2) \cdot P(E_2)}{P(E/E_2) P(E_2) + P(E/E_1) P(E_1)}$$

$$= \frac{0.03}{0.11} = \frac{3}{11}$$

$$= 0.2727$$

$\boxed{\text{Or}}$ $\quad P(E_2/E) = 1 - P(E_1/E) = 1 - 0.727$

$$= 0.272$$

Ques 4 A variable X is distributed at Random between the value 0 & 4 and its probability density function is given by $f(x) = Kx^3(4 - x^2)$ find the value of K?

TOPIC .... DATE ....

$$f(x) = Kx^3(4-x^2)$$

$$\int_0^4 Kx^3(4-x^2)\,dx = 1$$

$$K\int_0^4 (4x^3 - x^5)\,dx = 1$$

$$K\left[x^4 - \frac{x^6}{6}\right]_0^4 = 1$$

$$K\left[256 - \frac{4096}{6}\right] = 1$$

$$K\left[\frac{1536-4096}{6}\right] = 1$$

$$K\left[\frac{-2560}{6}\right] = 1$$

$$K = \frac{-\cancel{6}\,3}{2560} = \frac{-3}{1280}$$

$$\boxed{K = \frac{-3}{1280}}$$

Ques5 In four tosses of a coin, let x be the number of heads. Tabulate the 16 possible outcomes with the corresponding values of ~~a~~ x. By simple counting, derive the probability distribution of x and hence find the Expected value of variance x.

~~Ans~~.

outcomes :- {HHHH, HHHT, HHTH, HTHH, THHH,
HHTT, HTTH, TTHH, THTH, THHT, ~~[illegible]~~
HTHT, TTTH, TTHT, THTT, HTTT, TTTT}

Total outcomes $= 2^4 = 16$

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TOPIC .... DATE............

	x_1	x_2	x_3	x_4	x_5
X	0	1	2	3	4
$P(X)$	$\frac{1}{16}$	$\frac{4}{16}$	$\frac{6}{16}$	$\frac{4}{16}$	$\frac{1}{16}$
x^2	0	1	4	9	16

$$E = \Sigma X P(X)$$

$$= x_1 P(x_1) + x_2 P(x_2) + x_3 P(x_3) + x_4 P(x_4) + x_5 P(x_5) + x_6 P(x_6)$$

$$= 0 \times \frac{1}{16} + 1 \times \frac{4}{16} + \frac{2 \times 6}{16} + \frac{3 \times 4}{16} + 4 \times \frac{1}{16}$$

$$= 0 + \frac{4}{16} + \frac{12}{16} + \frac{12}{16} + \frac{4}{16}$$

$$= \frac{4+12+12+4}{16}$$

$$= \frac{32}{16}$$

$$\boxed{E(x) = 2}$$

mean or Expected value is 2.

$$\text{variance} = \sigma^2 = E(x^2) - (E(x))^2$$

$$= \Sigma x^2 P(x) - (2)^2$$

$$= \left(\frac{4}{16} + \frac{4 \times 6}{16} + \frac{4 \times 9}{16} + \frac{16}{16}\right) - (2)^2$$

$$= \left(\frac{4+24+36+16}{16}\right) - (2)^2$$

$$= \left(\frac{80}{16}\right) - 4$$

$$= 5 - 4$$

$$\boxed{\sigma^2 = 1}$$

TOPIC .... DATE....................................

Q6 If x is the number scored in a throw of a fair die. Show that the chebyshev's inequality gives $P\{|X-\mu|>2.5\}<0.47$ where μ is the mean of x. Also find the actual probability?

$X = 1, 2, 3, 4, 5, 6$

X	1	2	3	4	5	6
P(X)	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$
x^2	1	4	9	16	25	36

$$\mu = E(X) = \frac{1}{6} + 2\times\frac{1}{6} + 3\times\frac{1}{6} + 4\times\frac{1}{6} + 6\times\frac{1}{6} + 5\times\frac{1}{6}$$

$$\mu = \frac{21}{6} = \frac{7}{2}$$

$$\sigma^2 = E(x^2) - (E(x))^2$$

$$= x^2 P(x) - \left(\frac{7}{2}\right)^2$$

$$= \frac{91}{6} - \left(\frac{21}{6}\right)^2 = \frac{105}{36}$$

$$\sigma = \frac{\sqrt{105}}{\cancel{3}6} = 2.91$$

$$P(|X-\mu| \geq K\sigma) \leq \frac{1}{K^2} \qquad \left\{ K^2 = \frac{c^2}{\sigma^2} \right\}$$

$$P(|X-\mu| > c) \leq \frac{\sigma^2}{c^2}$$

$$P\{|X-\mu| > \cancel{c}\, 2.5\} < \frac{2.9167}{(2.5)^2}$$

$$P\{|X-\mu| > 2.5\} < 0.47$$

TOPIC .... DATE........

Now, for Actual probability -

$P(|X-3.5|>2.5) + P(|X-3.5| \leq 2.5) = 1$

$P(|X-3.5|>2.5) = 1 - P(|X-3.5| \leq 2.5\}$

$= 1 - P\{1 \leq X \leq 6\}$

$\boxed{P(|X-3.5|>2.5) = 0}$

Subject - Probability, statistics & Linear algebra

TOPIC Assignment - 2 DATE

Name - Kasak   Branch - AI & DS (B.tech)   Roll no - 02715611922 Section - S11.

Ques 1 A continous distribution of a variable x in the Range (-3, 3) defined as

$$f(x) = \begin{cases} \frac{1}{16}(3+x)^2 ; & -3 < x < -1 \\ \frac{1}{16}(6-2x^2) ; & -1 < x < 1 \\ \frac{1}{16}(3-x)^2 ; & 1 < x < 3 \end{cases}$$

verify that the area under the curve is unity and show that mean is 0.

Solution area under the curve $= \frac{1}{16}\int_{-3}^{-1}(3+x)^2 dx + \frac{1}{16}\int_{-1}^{1}(6-2x^2)dx + \frac{1}{16}\int_{1}^{3}(3-x)^2 dx$

$$= \frac{1}{16}\left[\frac{(3+x)^3}{3}\right]_{-3}^{-1} + \frac{1}{16}\left[6x - \frac{2x^3}{3}\right]_{-1}^{1} + \frac{1}{16}\left[\frac{(3-x)^3}{-3}\right]_{1}^{3}$$

$$= \frac{1}{16}\left[\frac{8}{3}\right] + \frac{1}{16}\left[6 - \frac{2}{3} + 6 - \frac{2}{3}\right] + \frac{1}{16}\left[\frac{8}{3}\right]$$

$$= \frac{1}{6} + \frac{2}{3} + \frac{1}{6}$$

$$= 1$$

$$E(X) = \mu = \int_{-3}^{3} x \cdot f(x)\, dx$$

$$\frac{1}{16}\int_{-3}^{-1} x(3+x)^2 dx + \frac{1}{16}\int_{-1}^{1} x\cdot(6-2x^2)\,dx + \frac{1}{16}\int_{1}^{3} x(3-x)^2 dx$$

$$\frac{1}{16}\left[\int_{-3}^{-1} 9x + x^3 + 6x^2 + \int_{-1}^{1}(6x-2x^3)dx + \int_{1}^{3}(9x+x^3-6x^2)dx\right]$$

$$\frac{1}{16}\left[\left[\frac{9x^2}{2} + \frac{x^4}{4} + 2x^3\right]_{-3}^{-1} + \left[3x^2 - \frac{x^4}{4}\right]_{-1}^{1} + \left[\frac{9x^2}{2} + \frac{x^4}{4} - 2x^3\right]_{1}^{3}\right]$$

$$= 0$$

TOPIC .... DATE..............................

Q2 A manufacture who produces medicine bottles, finds that 0.1% of the bottles are defective. The bottles are packed in boxes containing 500 bottles. Find that in 100 such boxes how many boxes are expected to contain.

(i) no deffective. (ii) at least two defective.

Solution (i) $P(\text{defective bottle}) = p = 0.001 = \frac{.1}{100}$.

$$m = np = 500 \times \frac{0.1}{100} = 0.5$$

(i) $$P(\text{no defective}) = \frac{e^{-m} \cdot m^r}{r!}$$

$$P(r=0) = e^{-0.5} \cdot \frac{(+0.5)^0}{\underline{0}}$$

$$= 0.6065$$

$$\text{For 100 boxes} = 0.6065 \times 100$$
$$= 60.65$$
$$= 61$$

So, 61 boxes are expected to contain no. defective medicine bottle.

(ii) $P(\text{atleast two defective}) = 1 - \{P(0) + P(1)\}$

$$= 1 - \left\{\frac{(.5)^0}{\underline{0}} e^{-0.5} + \frac{(.5)^1}{\underline{1}} \times e^{-0.5}\right.$$

$$= 1 - \{0.606 + 0.303\}$$
$$= 1 - 0.909$$
$$= 0.091$$

TOPIC .... DATE.............................

No. of boxes containing no defective bottle $= 100 \times .6065$

$\simeq 61$

No. of containing 1 defective bottle $= 100 \times 0.3033$

$\simeq 30$

Atleast two defective bottle $\simeq 100 - (61+30)$

$\simeq 9$

Q3 If the heights of 300 students are normally distributed with mean 68 inch and standard deviation 3 inch how many students have heights -

(i) greater than 72 inch. (ii) between 65 and 71 inch.

$n = 300 \qquad \mu = 68 \qquad \sigma = 3$

(i) greater than 72 inch - $X \geq 72$

$X = 72 \qquad\qquad Z = \dfrac{x - \mu}{\sigma}$

$Z = \dfrac{72-68}{3} = \dfrac{4}{3} = 1.33$

$P(X \geq 72) = P(Z \geq 1.33)$

$= 0.5 - P(Z = 1.33)$

$= 0.5 - 0.4082$

$= 0.0918$

For 300 students $= 0.0918 \times 300 = 27.54$

$\simeq 28$

(ii) $65 \leq X \leq 71$

$X = 65$	$X = 71$
$Z = \dfrac{65-68}{3} = \dfrac{-3}{3} = -1$	$Z = \dfrac{71-68}{3} = 1$

$P(65 \leq X \leq 71) = P(-1 \leq Z \leq 1)$

$= P(Z = -1) + P(Z = 1)$

$= 0.3413 + 0.3413$

$= 0.6826$

For 300 students $= 300 \times 0.6826 \simeq 205$

TOPIC .... DATE ....

Q4 If the probability of a Bad Reaction from a certain injection is 0.001, determine the chance that out of 1000 individuals more than two have Bad Reactions?

P (Bad Reaction from a certain Injection) = 0.001

μ = mean = np = 1000×0.001

$= 1$

$$P(r) = \frac{e^{-m} m^r}{\lfloor r}$$

P(more than 2) $= P(r > 2)$

$= 1 - \{P(r=0) + P(r=1) + P(r=2)\}$

$= 1 - \left\{\frac{e^{-1} \cdot 1^0}{\lfloor 0} + \frac{e^{-1}(1^1)}{\lfloor 1} + \frac{e^{-1}(1^2)}{\lfloor 2}\right\}$

$= 1 - \{0.367 + 0.367 + 0.183\}$

$= 1 - 0.917$

$= 0.083$

Q5 A die is tossed thrice Getting "5" or "6" on the die in a toss is taken as success. Find the mean and variance of number of success?

$n = 3$ $\quad p = \frac{2}{6} = \frac{1}{3}$ $\quad q = \frac{2}{3}$

$m = np = 3 \times \frac{1}{3} = 1$

variance $= \sigma^2 = npq = 3 \times \frac{1}{3} \times \frac{2}{3}$

$= \frac{2}{3}$

TOPIC .... DATE ....

Q6 Calculate the first 4 moments for following frequency distribution about the mean. Also calculate B_1 & B_2 then comment upon the nature of the frequency distribution

x	f	fx	$(x-\bar{x})$	$f(x-\bar{x})$	$f(x-\bar{x})^2$	$f(x-\bar{x})^3$	$f(x-\bar{x})^4$
-4	3	-12	-4	-12	48	-192	768
-3	4	-12	-3	-12	36	-108	324
-2	5	-10	-2	-10	20	-40	80
-1	7	-7	-1	-7	7	-7	7
0	12	0	0	0	0	0	0
1	7	7	1	7	7	7	7
2	5	10	2	10	20	40	80
3	4	12	3	12	36	108	324
4	3	12	4	12	48	192	768
	50	0	0	0	222	0	2358

$$\bar{x} = \frac{\Sigma fx}{\Sigma f} = 0$$

$$\mu_1 = \frac{\Sigma f(x-\bar{x})}{N} = 0$$

$$\mu_2 = \frac{\Sigma f(x-\bar{x})^2}{N} = \frac{222}{50} = 4.44$$

$$\mu_3 = \frac{\Sigma f(x-\bar{x})^3}{N} = 0$$

$$\mu_4 = \frac{\Sigma f(x-\bar{x})^4}{N} = \frac{2358}{50} = 47.16$$

$$\beta_1 = \frac{\mu_3^2}{\mu_2^3} = 0$$

$\boxed{\text{Symmetrical}}$

$$\beta_2 = \frac{\mu_4}{\mu_2^2} = \frac{47.16}{(4.44)^2}$$

$$\beta_2 = \frac{47.16}{19.71}$$

$$\boxed{\beta_2 = 2.39}$$

~~Positive skewed~~ $\boxed{\text{Platykurtic}}$

TOPIC .... DATE....................................

Q7 Determine the Binomial distribution for which mean = 2 variance and mean + variance = 3 also ~~we~~ find $P(x \le 3)$

Given

Let mean be denoted by μ and variance be σ^2

$\mu = 2\sigma^2 \rightarrow ①$ $\qquad$ $\mu + \sigma^2 = 3 \rightarrow ②$

From Eqn ①

$2\sigma^2 + \sigma^2 = 3$

$\boxed{\sigma^2 = 1}$

variance is 1

mean is 2.

since for Binomial distribution

$np = 2 \rightarrow ③$ $\qquad$ $npq = 1 \rightarrow ④$

from ③

$2q = 1$

$\boxed{q = 1/2}$

$\boxed{p = 1 - q = \frac{1}{2}}$

$\boxed{n = 4}$

Binomial distribution = $\left(4, \frac{1}{2}, \frac{1}{2}\right)$

$$P(x \le 3) = {}^nC_x p^x q^{n-x}$$

$$= {}^4C_0 \left(\frac{1}{2}\right)^0 \left(\frac{1}{2}\right)^4 + {}^4C_1 \left(\frac{1}{2}\right)^1 \left(\frac{1}{2}\right)^3 + {}^4C_2 \left(\frac{1}{2}\right)^2 \left(\frac{1}{2}\right)^2 + {}^4C_3 \left(\frac{1}{2}\right)^3 \left(\frac{1}{2}\right)$$

$$P(x \le 3) = \left(\frac{1}{2}\right)^4 \left[1 + 4 + 6 + 4\right]$$

$$= \left(\frac{1}{2}\right)^4 [15] = \frac{15}{16}$$ Ans//

TOPIC .... DATE....................

Q8 Compute Karl pearson's cofficient of ~~skewness~~ correlation for the data :-

Marks obtained (x)	Frequency (y)	x	$(x-\bar{x})$ X	$(y-\bar{y})$ Y	XY	X^2	Y^2
0-10	6	5	-30	-8	240	900	64
10-20	12	15	-20	-2	160	400	4
20-30	22	25	-10	8	-80	100	64
30-40	24	35	0	10	0	0	100
40-50	16	45	10	2	20	100	4
50-60	12	55	20	-2	-40	400	4
60-70	8	65	30	-6	-180	900	36
			0	2	120	2800	276

$\boxed{\bar{x} = 35}$ $\boxed{\bar{y} = 14.28} \simeq 14$

$$r = \frac{\Sigma XY}{\sqrt{\Sigma X^2 \Sigma Y^2}} = \frac{120}{\sqrt{2800 \times 276}}$$

$$= \frac{120}{10\sqrt{28 \times 276}}$$

$$= \frac{12}{87.9}$$

$$\boxed{r = 0.13}$$

So, Karl pearson's cofficient of skewness is 0.13.

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TOPIC PSLA (Assignment - 3) DATE

NAME : KASAK ROLL NO: 02715611922 B.Tech {AI & DS}

Section - S11

Ques 1 If P is the pull required to lift a load W by means of a Pully block. Find a linear law of the form $P = mW + C$ connecting P and W using the following data.

P	W	PW	W^2
12	50	600	2500
15	70	1050	4900
21	100	2100	10000
25	120	3000	14400
73	340	6750	31800

$P = C + mW$

Normal Eqn's are.

$\Sigma P = nC + m\Sigma W$

$\Sigma PW = C\Sigma W + m\Sigma W^2$

$85\,[73 = 4C + 340\,m] \Rightarrow 6205 = 340C + 28900m$

$6750 = 340C + 31800\,m \Rightarrow \underline{6750 = 340C + 31800m}$

$-545 = -2900\,m$

$\boxed{C = 2.27}$ $\boxed{m = 0.1879}$

So, Equation is $\boxed{P = 2.27 + 0.1879W}$

For $W = 150$ Kg

$P = 2.27 + 0.1879(150)$

$\boxed{P = 30.455 \text{ kg}}$

TOPIC .... DATE..............................

Q2 Fit a second degree parabola to following data -

x	y	x^2	x^3	x^4	xy	x^2y
0	1	0	0	0	0	0
1	1.8	1	1	1	1.8	1.8
2	1.3	4	8	16	2.6	5.2
3	2.5	9	27	81	7.5	22.5
4	6.3	16	64	256	25.2	100.8
10	12.9	30	100	354	37.1	130.3

General Eq^n for second degree parabola: $y = a + bx + cx^2$

Normal Equations are:

$$\Sigma y = na + b\Sigma x + c\Sigma x^2$$

$$\Sigma xy = a\Sigma x + b\Sigma x^2 + c\Sigma x^3$$

$$\Sigma x^2 y = a\Sigma x^2 + b\Sigma x^3 + c\Sigma x^4$$

$$12.9 = 5a + 10b + 30c \rightarrow (1)$$

$$37.1 = 10a + 30b + 100c \rightarrow (2)$$

$$130.3 = 30a + 100b + 354c \rightarrow (3)$$

$$25.8 = \cancel{10a} + 20b + 60c$$

$$37.1 = \cancel{10a} + 30b + 100c$$

$$-11.3 = -10b - 40c$$

$$\boxed{10b + 40c = 11.3} \rightarrow (4)$$

$$111.9 = \cancel{30a} + 90b + 300c$$

$$130.3 = \cancel{30a} + 100b + 354c$$

$$-18.4 = -10b - 54c$$

$$\boxed{10b + 54c = 18.4} \rightarrow (5)$$

solving (4) & (5)

$$\cancel{10b} + 40c = 11.3$$

$$\cancel{10b} + 54c = 18.4$$

$$14c = 7.1$$

$\boxed{a = 1.4}$ $\boxed{c = 0.547}$ $\boxed{b = -1.05}$

So, Eq^n is, $y = 1.4 + (-1.05)x + 0.547x^2$

$$\boxed{y = 1.4 - 1.05x + 0.547x^2}$$

TOPIC .... DATE ....

Q4 In a city A 20% of a Random Sample of 900 school boys had a certain slight physical defect. In another city B 18.5% of a Random sample of 1600 School boys had the same defect. Is difference between the proportion significant.

Ho: Let the difference between proportion significant

$n_1 = 900 \qquad p_1 = 20\% = 0.20$

$n_2 = 1600 \qquad p_2 = 18.5\% = 0.185$

$$P = \frac{n_1 p_1 + n_2 p_2}{n_1 + n_2}$$

$$= \frac{900 \times 0.20 + 1600 \times 0.185}{2500}$$

$$= \frac{180 + 296}{2500} = 0.1904$$

$$Q = 0.8096$$

$$z = \frac{p_1 - p_2}{\sqrt{PQ\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}} = \frac{0.20 - 0.185}{\sqrt{0.1904 \times 0.8096\left(\frac{1}{900} + \frac{1}{1600}\right)}}$$

$$z = \frac{0.015}{\sqrt{0.1541\left(\frac{25}{14400}\right)}}$$

$$z = \frac{0.015 \times 120}{5\sqrt{0.1541}}$$

TOPIC .... DATE........

$$Z = \frac{0.015 \times 24}{\sqrt{0.1541}}$$

$$= \frac{0.36}{\sqrt{0.1541}}$$

$$= 0.917$$

$$Z = 0.917 < 1.96$$

So, hypothesis is accepted

Hence, the difference between proportion is significant

TOPIC .... DATE..............................

In a locality 18000 families, a sample of 840 families was Selected at Random. Of these 840 families, 206 families were found to have a monthly income of Rs. 250 or less. It is desired to Estimate how many out of 18000 families have a monthly income of Rs. 250 or less. within what limits would you place your Estimate?

Given $n = 840$ $\quad x = 206$ $\quad$ 18000

$\downarrow$

840

$\downarrow$

206 — Monthly income $205 \leq$

families who have monthly income of Rs 250 or less $(p) = \frac{206}{840}$

$$p = 0.245$$

Hence 24.5% families have monthly income of 'Rs. 250 or less'

limit

$$p \pm 3\sqrt{\frac{pq}{n}}$$

$$0.245 \pm 3\sqrt{\frac{0.245 \times 0.754}{854}}$$

$$(0.2005, 0.289)$$

Hence, the limit is (20% and 29% approx)

TOPIC .... DATE....................................

Q7 The means of two large sample of 1000 & 2000 members are 168.75 and 170 Respectively. Can the Sample be Regarded as drawn from the Same population of SD 6.25 ?

$\boxed{\text{Given}}$: $n_1 = 1000$ $\quad$ $n_2 = 200$

$\bar{x}_1 = 168.75$ $\quad$ $\bar{x}_2 = 170$

$$\boxed{\sigma = 6.25}$$

H_0 : Let the Samples are drawn from the same Population.

$$z = \frac{\bar{x}_1 - \bar{x}_2}{\sigma\sqrt{\frac{1}{n_1} + \frac{1}{n_2}}} = \frac{168.75 - 170}{6.25\sqrt{\frac{1}{1000} + \frac{1}{2000}}}$$

$$= \frac{1.25}{6.25\sqrt{\frac{3}{2000}}}$$

$$= \frac{\sqrt{2000}}{5\sqrt{3}} = \frac{\cancel{20}\,4\sqrt{5}}{\cancel{5}\sqrt{3}} = \frac{4\sqrt{5}}{\sqrt{3}}$$

$$= -5.1$$

for 5% of significant Result

$z < 1.96$

So, Hypothesis is accepted.

Hence, Samples are drawn from Same population.