Answer to the question no: 1

Given, Male Students = 12

Female " = 10

Total " = 12 + 10 = 22

$$P(\text{at most 3 female}) = \frac{{}^{10}C_3 \times {}^{12}C_2 + {}^{10}C_2 \times {}^{12}C_3 + {}^{10}C_2 \times {}^{12}C_4 + {}^{10}C_2 \times {}^{12}C_5}{{}^{22}C_5}$$

$$= \frac{17}{19}$$

$$= 0.895 \quad \text{Ans}$$

Answer to the question no: 2

(a) The Samle Space $= \{(x, y) \in \mathbb{N} : x \neq y, x \leq 10, y \leq 10\}$

Ans

(b) The number on the second ball is smaller than the number on the 1st so, $x > y$

We can write, (2,1), (3,1), (3,2), (4,1), (4,2), (4,3), (5,1), (5,2), (5,3), (5,4), (6,1), (6,2), (6,3), (6,4), (6,5), (7,1), (7,2), (7,3), (7,4), (7,5), (7,6), (8,1), (8,2), (8,3), (8,4), (8,5), (8,6), (8,7), (9,1), (9,2), (9,3), (9,4), (9,5), (9,6), (9,7), (9,8), (10,1), (10,2), (10,3), (10,4), (10,5), (10,6), (10,7), (10,8), (10,9)

∴ Total number of those case = 45

& Sample Space = 90 . Probability = $\frac{45}{90} = \frac{1}{2} = 0.5$ Ans

(1) The number on one ball is even and the other is odd,

(1,2), (1,4), (1,6), (1,8), (1,10), (2,1), (2,3), (2,5), (2,7), (2,9), (3,2), (3,4), (3,6), (3,8), (3,10), (4,1), (4,3), (4,5), (4,7), (4,9), (5,2), (5,4), (5,6), (5,8), (5,10), (6,1), (6,3), (6,5), (6,7), (6,9), (7,2), (7,4), (7,6), (7,8), (7,10), (7,10), (8,1), (8,3), (8,5), (8,7), (8,9), (9,2), (9,4), (9,6), (9,8), (9,10), (10,1), (10,3), (10,5), (10,7), (10,9).

∴ Total number of case = 50.

& Sample space = 90

∴ Probability = $\frac{50}{90} = \frac{5}{9} = 0.556$ Ans

Answer to the question no: 3

(a) Total number of marbles = 5+6+8

$$\frac{{}^8C_1}{{}^{19}C_1} \times \frac{{}^5C_1}{{}^{18}C_1} \times \frac{{}^6C_1}{{}^{17}C_1} = \frac{40}{969}$$

(b) With replacement, with all purple in color are,

$$\left(\frac{{}^8C_1}{{}^{19}C_1}\right)^3 = \frac{512}{6859} = 0.0746$$ Ans

Answer to the question no: 4

Probability of at least one head = 1 − Probability of no head

$$= 1 - \frac{3C_0}{2^3}$$

$$= 1 - \frac{1}{8}$$

$$= \frac{7}{8}$$

$$= 0.875$$ Ans

Answer to the question no: 5

Let, A = Anu & Mumu in the same row

B = Anu & Mumu sit at one of the four corner.

Now,

1	2	3
4	5	6
7	8	9

$A = \{(1,2), (1,3), (2,3), (4,5), (5,6), (7,8), (7,9), (8,9)\}$

$n(A) = 9$

$B = \{(1,3), (1,7), (1,9), (3,7), (3,9), (7,9)\}$

$n(B) = 6$

So, $P(A) = \frac{9}{36} = \frac{1}{4} = 0.25$ &

$P(B) = \frac{6}{36} = \frac{1}{6} = 0.167$

$(A \cap B) = \{(7,9), (1,3)\}$, $n(A \cap B) = 2$

$P(A \cap B) = \frac{1}{18} = 0.056$

$P(A \cap B) = P(A) \times P(B)$

$\Rightarrow \frac{1}{18} \neq \frac{1}{6} \times \frac{1}{6}$ 0.25×0.167

$\Rightarrow \frac{1}{18} \neq 0.04167$

$\therefore$ A & B are not independent.

Answer to the question no: 6

$$P(\text{at least 2}) = 1 - P(\text{every unique})$$

$$= 1 - \frac{{}^{365}P_{15}}{365^{15}}$$

$$= 0.2529 \quad \text{Ans}$$

Answer to the question no: 7

Given,

$P(m) = \frac{1}{2}$ & $P(f) = \frac{1}{2}$

Let, the number of children $= n$

$$P(\text{all same gender}) = \left(\frac{1}{2}\right)^n + \left(\frac{1}{2}\right)^n$$

$$= \frac{2}{2^n}$$

$P(\text{at least 1 child of each gender}) = 0.86$

So, $1 - \frac{2}{2^n} = 0.86$

$\Rightarrow \frac{2}{2^n} = -0.86 + 1$

$\Rightarrow \frac{2}{2^n} = 0.14$

$\Rightarrow \frac{1}{2^n} = \frac{0.14}{2}$

$\Rightarrow 2^n = \frac{2}{0.14}$

$\Rightarrow n \ln 2 = \ln\left(\frac{2}{0.14}\right) = 3.836$

$\therefore n \approx 4$

$\therefore$ 4 children should a family Plan.

Answer to the question no: 8

(a) Given;

smoker = $P(S) = 0.4$ & non_smoker = $P(ns)$
$= 0.6$

sample space = 20

$P(4 \text{ smoke}) = {}^{20}C_4 \times (0.6)^{16} \times (0.4)^4$

$= 0.035$ Ans

(b) we can write,

$P(x \leq 3) = P(x=0) + P(x=1) + P(x=2) + P(x=3)$

$= {}^{20}C_0 (0.4)^0 \cdot (0.6)^{20} + {}^{20}C_1 (0.4)^1 (0.6)^{19} + {}^{20}C_2 (0.4)^2 (0.6)^{18} + {}^{20}C_3 (0.4)^3 (0.6)^{17}$

$= 0.0159$ Ans

(c) From the question,

$P(x \geq 3) = 1 - \{P(x=0) + P(x=1) + P(x=2)\}$

$= 1 - \{{}^{20}C_0 (0.4)^0 \cdot (0.6)^{20} + {}^{20}C_1 (0.4)^1 \cdot (0.6)^{19} + {}^{20}C_2 (0.4)^2 \cdot (0.6)^{18}\}$ ~~$+ {}^{20}C_3 (0.4)^3 (0.6)^{17}$~~

$= 0.0965$ Ans

(d) Given, $n = 20 \Rightarrow P = 0.4$, $q = 0.6$

Expected value, $E(u) = n \times P = 20 \times 0.4 = 8$

We know,

Variance $= npq$

$= 20 \times 0.4 \times 0.6$

$= 4.8$

$S.D = \sqrt{\text{Variance}} = \sqrt{4.8}$

$= 2.19$ Ans

Answer to the question no: 9

Given, $P_A = 0.23$, $P_B = 0.19 \Rightarrow P_C = 0.13$

$n_A = 3$, $n_B = 4 \Rightarrow n_C = 1$

So, $n_{undecided} = 2$

$n = 3 + 4 + 1 + 2$

$= 10$

And $P_{undecided} = 0.45$

So, $P = \frac{10!}{3! \times 4! \times 2! \times 1!} \times [(0.23)^3 \times (0.19)^4 \times (0.13)^1 \times (0.45)^2]$

$= 5.259 \times 10^{-3}$ Ans

Answer to the question no: 10

(a) Given, $P(SUVs) = 0.14$

$P'(SUVs) = 0.86$

$P(\text{most 3 vehicles}) = P(x=1) + P(x=2) + P(x=3)$

$= {}^3C_1 \times 0.14 \times (0.86)^2 + {}^3C_2 \times (0.14)^2 \times 0.86 + {}^3C_3 \times (0.14)^3 \times (0.86)^0$

$= 0.3639$ Ans

(b) We've got $P(x \leq 3) = 0.3639$ From (a),

$\therefore P(x \geq 4) = 1 - P(x \leq 3)$

$= 1 - 0.3639$

$= 0.6361$ Ans

Answer to the question no: 11

a)

(i) Given, Per hour = 10 persons

In 2.5 hours $= 10 \times 2.5$

$= 25$ persons

From Poisson distribution,

$P(15) = \dfrac{25^{15} \times e^{-25}}{15!}$

$= 0.89 \times 10^{-3}$ Ans

(11) Probability of at least 10,

$$1 - P(x \leq 9)$$

$$= 1 - e^{-25} \times \frac{(25)^9}{9!}$$

$$= 0.9998 \text{ Ans}$$

6)

From the question, Total time between 3.35pm to 7.40pm = 4h 5min = 245 min

if $60 \rightarrow \frac{245}{60} = 4.0833$, $\lambda_{new} = \frac{245}{6}$

So, $60 \rightarrow \frac{10 \times 245}{60} = \frac{245}{6}$

$\therefore$ ~~λ_{new}~~ $\mu = 1$

Now, $P = \frac{e^{-24516} \left(\frac{245}{6}\right)^1}{1!}$

$= 7.54 \times 10^{-17}$ Ans

Answer to the question no: 12

Given,

Probability of 1 Batsman facing difficulty,

$$= \frac{(200 \times 0.004) + (175 \times 0.005)}{175 + 200}$$

$$= 4.467 \times 10^{-3}$$

$\therefore P(x=1) = {}^{375}C_1 \times 4.467 \times 10^{-3} \times (1 - 4.467 \times 10^{-3})^{374}$

$= 0.3135$ Ans