

(10)

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e) Co-efficient of determination is,

$$\Rightarrow R^2 = r^2 = (0.97)^2$$

$$\therefore R^2 = 0.9409$$

(Ans)

Ans. to Q No - 7

Demand (kg) x	Price (Tk) y	xy	x^2	y^2
10	25	250	100	625
8	37	296	64	1369
9	40	360	81	1600
7.5	45	337.5	56.25	2025
5	48	240	25	2304
4.5	50	225	20.25	2500
3	55	165	9	3025
2	70	140	4	4900

$$\sum x = 49$$

$$\sum y = 370$$

$$\sum xy =$$

$$\sum x^2 =$$

$$\sum y^2 =$$

$$\therefore \bar{x} = 6.125$$

$$\therefore \bar{y} = 46.25$$

$$2013.5$$

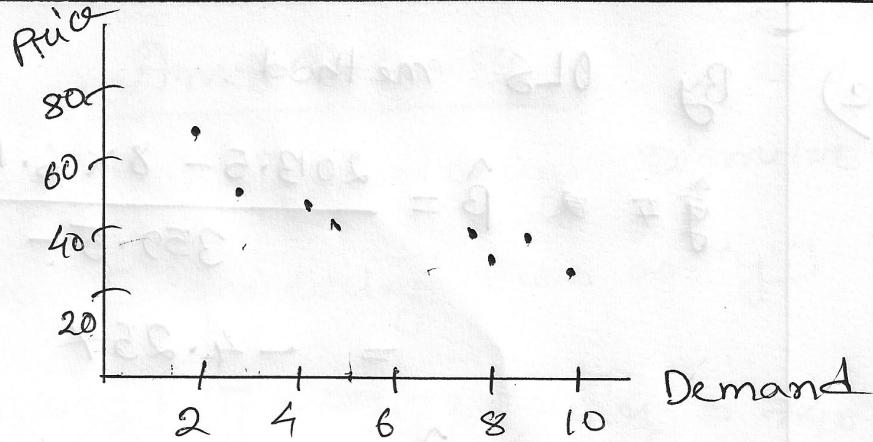
$$359.5$$

$$18348$$

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a)



The diagram shows a negative correlation.
 That means, when the price lowers, the demand increases.

$$b) r = \frac{(8 \times 2013.5) - (49 \times 370)}{\sqrt{(8 \times 359.5 - 49^2)(8 \times 18348 - 370^2)}} \\ = -0.93$$

∴ There exists a strong negative correlation.

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c) By OLS method,

$$\hat{\beta} = \frac{2013.5 - 8 \times 6.125 \times 46.25}{359.5 - 8 \times (6.125)^2}$$

$$= -4.257$$

$$\hat{a} = \bar{y} - \hat{\beta} \bar{x} = 46.25 - (-4.257 \times 6.125)$$

$$= 72.323$$

$$\therefore \hat{y} = 72.323 - 4.257 x$$

d) When $\hat{y} = 52$,

$$52 = 72.323 - 4.257 x$$

$$\Rightarrow x = 4.774$$

When $\hat{y} = 10$,

$$10 = 72.323 - 4.257 x$$

$$\Rightarrow x = 14.64$$

e) $R^2 = (-0.93)^2$

$$= 0.8649.$$

(Ans)

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Ansatz No - 8

Here $\sum n = 8.6$ [considering Diameter as 'n']

$\sum y = 440$ [considering Mass as 'y']

$$\therefore \bar{n} = 1.433, \bar{y} = 73.33; \sum ny = 740,$$

$$\therefore \cancel{\sum n^2} = 14.2; \sum y = 39050$$

$$\therefore B = \frac{740 - 6 \times 1.433 \times 73.33}{14.2 - 6 \times (1.433)^2} = 58.363$$

$$\therefore \hat{a} = \bar{y} - B\bar{n} = -10.32$$

$$\therefore \hat{y} = -10.320 + (58.363)n$$

b)

When $n = 1.3$

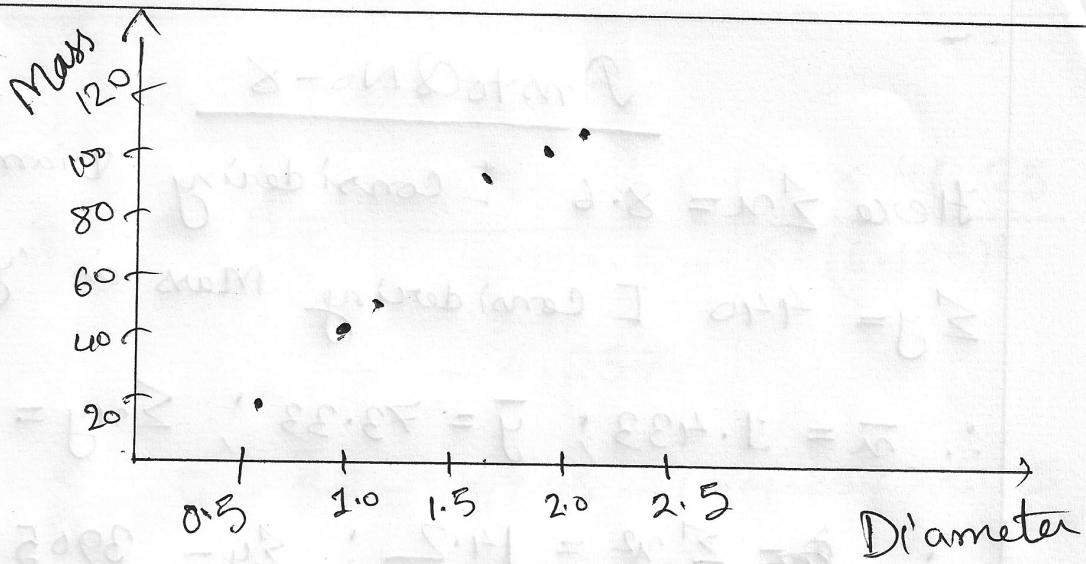
$$\hat{y} = -10.320 + (58.363 \times 1.3)$$

$$\approx 65.552 \text{ kg/cm}$$

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c)



∴ There exists a positive correlation.

Ans. No - 9(a)

$$\text{Here, } \sum n = 48; \sum y = 111; \sum ny = 585;$$

$$\sum n^2 = 320; \sum y^2 = 1303; \bar{n} = 4.8; \bar{y} = 11.1$$

a)

$$\therefore B = \frac{585 - (10 \times 4.8 \times 11.1)}{320 - (10 \times (4.8)^2)} = 0.583$$

$$\therefore \hat{a} = \bar{y} - B\bar{n} = 11.1 - (0.583 \times 4.8) \\ = 8.304$$

$$\therefore \hat{y} = 8.304 + (0.583)n$$

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b) When, $n = 3$,

$$\hat{y} = 8.304 + (0.583) \times 3$$

$$= 10.053.$$

(Ans.)

$$r = \frac{\sum xy - n \bar{x} \bar{y}}{\sqrt{\sum x^2 - n (\bar{x})^2 \sum y^2 - n (\bar{y})^2}} = 0.655$$

There exists a positive correlation.

Ans to Q No - 10

$$B = \frac{\sum xy - n \bar{x} \bar{y}}{\sum x^2 - n (\bar{x})^2} = \frac{5785 - (5 \times \frac{200}{5} \times \frac{139}{5})}{8650 - 5 \times (\frac{200}{5})^2}$$

a) Yes, there's a relation, $= 0.346$

b)

$$\hat{a} = \bar{y} - B \bar{x} = 13.5954$$

So we can see that,

$$\hat{y} = 13.5954 + (0.346)x$$

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c) When, $n = 45$; $\hat{y} = 13.954 + 0.346 \times 45$
 $= 29.524$.

d) fitness =
$$\left(\frac{\sum xy - n \cdot \bar{x} \cdot \bar{y}}{\sqrt{\sum x^2 - n(\bar{x})^2} (\sum y^2 - n(\bar{y})^2)} \right)^2$$

 $= 0.788544 \times 100\%$
 $\approx 78.8544\%$

(Ans.)

P.T.O

(A)

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Ans. to Q No - 11

a) The sum 8 can be found as:

$$(2+6), (3+5), (4+4), (5+3), (6+2) \Rightarrow 5 \text{ ways.}$$

$$\therefore \text{Probability} = \frac{5}{36} \text{ (Ans)}$$

b) Probability of getting a doublet = $\frac{6}{36} = \frac{1}{6}$.

c) Probability of getting a doublet of prime numbers = $\frac{3}{36}$ [∴ there are 3 prime numbers $\rightarrow 2, 3, 5$]

d) Since, the odd numbers are 1, 3, 5,

$$\therefore \text{Probability of odd doublet} = \frac{3}{36}.$$

e) sum greater than 9 can be in the following ways.

$$(4+6), (6+4), (5+5), (5+6), (6+5), (6+6) \Rightarrow 6 \text{ ways}$$

$$\therefore \text{Probability} = \frac{6}{36} = \frac{1}{6} \text{ (Ans)}$$

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- f) An even number on first can be on the following ways

For 2, there are 6 ways.

" 4, " " 6 "

" 6, " " 6 ways.

∴ In total, " " 18 ways.

$$\therefore \text{Probability} = \frac{18}{36} = \frac{1}{2}$$

- g) It can occur in the following ways

(2+3), (2+6), (4+3), (4+6), (6+3), (6+6)

⇒ 6 ways.

$$\therefore \text{Probability} = \frac{6}{36} = \frac{1}{6}$$

(Ans).

$$(d+a) | P.T.O (d+a)(d+a) (d+a) (d+a) (d+a)$$

$$(\text{Ans}) \cdot \frac{1}{6} = \frac{1}{36}$$

(V)

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Ans. to Q.No-12

There are 13 balls which are odd numbered. So, probability of getting a success = $\frac{13}{25}$.

a)

Two successes with replacement

$$= \frac{13}{25} \times \frac{13}{25} = \frac{169}{625}$$

b)

Exactly one success probability

$$= \left(\frac{13}{25} \times \frac{12}{25} \right) + \left(\frac{12}{25} \times \frac{13}{25} \right)$$

$$= \frac{312}{625} \quad (\text{Ans})$$

c)

Probability of getting no success is

$$= \left(\frac{12}{25} \times \frac{12}{25} \right) = \frac{144}{625}$$

\therefore At least one success = $1 - \frac{144}{625}$

$$= \frac{481}{625} \cdot \frac{504}{625} \quad (\text{Ans})$$

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- d) From (c), we ~~for~~ found the ans,
 which is $\frac{169}{625}$ (Ans) $\frac{144}{625}$

Ans. to Q No - 13

\therefore Total number of students doing
 either French or Spanish

$$= 32 + 36 - 8 = 60.$$

\therefore Students enrolled in none of the
 courses $= 120 - 60 = 60$,

$$\therefore \text{Probability} = \frac{1}{2} \text{ (Ans)}.$$

Ans. to Q No - 14

Let Probability of having heart attack $= P(H)$

in . . . in treating with

meditation and Yoga $= P(C_1)$

Probability of treating with drugs $= P(C_2)$

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Here, $P(H) = 0.4$; $P(C_1) = \cancel{0.4 \times 0.7} = 0.28$ 0.5

$$P(C_2) = \cancel{0.4 \times 0.75} = 0.30 \quad 0.5$$

$$P(H|C_1) = 0.4 \times 0.7 = 0.28; P(H|C_2) = 0.4 \times 0.75 = 0.30$$

Applying Bayes theorem,

$$\begin{aligned} P(\cancel{H}, C_1 | H) &= \frac{P(C_1) \cdot P(H|C_1)}{P(C_1) \cdot P(H|C_1) + P(C_2) \cdot P(H|C_2)} \\ &= \frac{0.5 \times 0.28}{(0.5 \times 0.28) + (0.5 \times 0.30)} \\ &= 0.48 \text{ (Ans)} \end{aligned}$$

Ans to Q No - 15

Here,

Probability of transfer of Red ball

$$= P(T_R) = \frac{3}{7}$$

Probability of transfer of Black ball

$$= P(T_B) = \frac{4}{7}$$

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Probability of picking red ball from
Bag - II is = $P(R)$.

Applying Bayes theorem,

$$P(T_B|R) = \frac{P(T_B) \times P(R|T_B)}{P(T_B)P(R|T_B) + P(T_R)P(R|T_R)}$$

$$= \frac{\frac{4}{7} \times \left(\frac{4}{9+1}\right)}{\frac{4}{7} \cdot \frac{4}{10} + \frac{3}{7} \cdot \frac{5}{10}} = \frac{16}{31} \quad (\text{Ans.})$$

Ans to Q No - 16

a) Here, $n = 11$.

This is a cyclic permutation. Therefore,
the ans is $(11-1)! = 10! = 3628800$.

b) If we consider Snigho and Mugdho
as one, then the rest of the

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faculties can sit in $2!(10-1)!$ ways
~~725760~~
 on, ~~362880~~ ways.

∴ If Snigdha and Mugdha doesn't want to sit together, then there are

$$\begin{aligned} & \quad 725760 \\ \cancel{368} \quad & 362880 - \cancel{362880} \text{ ways.} \\ & = \cancel{3265920} \text{ ways} \\ & \quad 2903040 \end{aligned}$$

c) Probability $P(A) = \frac{\cancel{3265920}}{\cancel{32659200}} = \frac{2903040}{3628800} = \frac{0.8}{0.8}$ (Ans)

d) Same as (a) i.e $(11-5-1)!$ ways
 $= 120$ ways.

Ans. to Q.No - 17

a) 3 students can be chosen from 5 students in 5C_3 ways.
 $= 10$ ways.

(2u)

19(a)

b) They can be arranged in line in $3!$ ways = ~~6~~ 6 ways.

c) Here, the modal class is the 'Laptop' preferred class,

Probability of preferred device being mobile phone = $\frac{3}{10}$

\therefore Probability of preferred device being Tablet = $\frac{2}{10}$

\therefore Probability of preferred device being Laptop = $\frac{5}{10}$.

So, we can see that ~~the~~ probability of laptop being preferred device is highest.

d) BRACU can chose them in $3C_1 \times 2C_1 \times 5C_1$ ways

$$= 3 \times 2 \times 5 = 30 \text{ ways.}$$

(Ans)

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Ans. to Q No - 18

- a) Since there are 5 sections, a student can fail in exactly one section in 5C_1 ways = 5 ways.
- b) A student can fail in 3 out 5 section in 5C_3 ways = 10 ways.
- c) A student can fail in ${}^5C_1 + {}^5C_2 + {}^5C_3 + {}^5C_4 + {}^5C_5$ ways
 $= 31$ ways.
- d) A student can pass only if he passes in 5 sections. In each section, passing probability is 0.5,
 \therefore Probability of passing the final test $= (0.5)^5 = 0.03125$

(Ans.)