

Q1
a

| x | y |
|----|----|
| 3 | 25 |
| 4 | 24 |
| 5 | 20 |
| 6 | 20 |
| 7 | 19 |
| 8 | 17 |
| 9 | 16 |
| 10 | 13 |
| 11 | 10 |
| 13 | 8 |

$$\bar{y} = \frac{172}{10} = 17.2$$

$$\bar{x} = \frac{76}{10} = 7.6$$

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

$$r = \frac{\sum (76 - 7.6)(172 - 17.2)}{\sqrt{\sum (68.4)^2 \sum (154.8)^2}}$$

$$r = \frac{68.4 \times 154.8}{\sqrt{4678.56 \times 23963.04}}$$

$$r = \frac{10588.32}{11211257.0}$$

$$r = \frac{10588.32}{10588.32} = \boxed{1.000000}$$

(b)

| x | y | x ² | y ² | xy |
|-----------|-----------|----------------|----------------|-------------|
| 20 | 5 | 400 | 25 | 100 |
| 11 | 15 | 121 | 225 | 165 |
| 15 | 9 | 225 | 81 | 135 |
| 25 | 12 | 625 | 144 | 300 |
| 28 | 16 | 784 | 256 | 448 |
| <u>99</u> | <u>57</u> | <u>2155</u> | <u>650</u> | <u>1148</u> |

For $y = ax + b$ per y on x

$$y = a + bx$$

$$b = \frac{n \sum xy - \sum x \sum y}{n \sum x^2 - (\sum x)^2} = \frac{1148 - 99 \times 57}{99^2 - 99^2}$$

$$\frac{1148 - 5643}{9801 - 9801} = \frac{-4495}{0}$$

$$\text{Now } a = \frac{1}{n} (\sum y - b \sum x)$$

$$\frac{1}{99} (57 - 0 \times 99)$$

$$\frac{1}{99} = 57 - 99$$

$$\frac{1}{99} \times 42 = 8.4$$

minimized Q 1-b

for x on y

$a \neq 0, y$

$$b = \frac{n \sum xy - \sum x \sum y}{n \sum y^2 - (\sum y)^2}$$

$$b = \frac{5 \times 1148 - 57 \times 99}{5 \times 99^2 - 57^2}$$

$$b = \frac{97}{49005 - 3249} = \frac{97}{45756} = 0.0021$$

$$a = a = \frac{1}{n} (\sum x - b \sum y)$$

$$= \frac{1}{5} 57 - 99$$

$$\frac{1}{5} \times 42 = 8.4$$

Q2
5

Two possible outcomes = win or Not win

∴ prob- of winning $p = 2/3$

= 10 games

∴ 222 R $p = 2/3$

∴ successive games won & lost independently

$$(i) P(X=4) = \frac{10}{4} \left(\frac{2}{3}\right)^4 \left(\frac{1}{3}\right)^4 = \frac{112}{561} = 0.1996$$

$$(ii) P(X > 4) = 1 - P(X < 4) : \text{4 games lost}$$

$$= 1 - \sum_{x=0}^3 \binom{10}{x} \left(\frac{2}{3}\right)^x \left(\frac{1}{3}\right)^{10-x}$$

$$= 1 - \left[\binom{10}{0} \left(\frac{2}{3}\right)^0 \left(\frac{1}{3}\right)^{10} + \binom{10}{1} \left(\frac{2}{3}\right)^1 \left(\frac{1}{3}\right)^9 + \binom{10}{2} \left(\frac{2}{3}\right)^2 \left(\frac{1}{3}\right)^8 + \binom{10}{3} \left(\frac{2}{3}\right)^3 \left(\frac{1}{3}\right)^7 \right]$$

$$= 1 - \frac{1}{6561} (10 + 16 + 28 + 448)$$

$$= 1 - \frac{577}{6561} = \frac{5984}{6561} = 0.9121$$

$$(iii) P(X > 6) = \sum_{x=6}^{\infty} \binom{10}{x} \left(\frac{2}{3}\right)^x \left(\frac{1}{3}\right)^{10-x}$$

$$= \frac{10}{6} \left(\frac{2}{3}\right)^6 \left(\frac{1}{3}\right)^4 + \frac{10}{7} \left(\frac{2}{3}\right)^7 \left(\frac{1}{3}\right)^3 + \frac{10}{10} \left(\frac{2}{3}\right)^8 \left(\frac{1}{3}\right)^2$$

$$= \frac{100}{6561} (30 + 16 + 2) = \frac{100 \times 48}{6561} = \frac{4800}{6561} = 0.7316$$

Q2.8

$$P(3 \leq X \leq 6) = \sum_{r=3}^6 \binom{10}{r} \left(\frac{2}{3}\right)^r \left(\frac{1}{3}\right)^{10-r}$$

$$= \frac{10}{3} \binom{9}{3} \left(\frac{2}{3}\right)^3 \left(\frac{1}{3}\right)^7 + \binom{10}{4} \left(\frac{2}{3}\right)^4 \left(\frac{1}{3}\right)^6 + \binom{10}{5} \left(\frac{2}{3}\right)^5 \left(\frac{1}{3}\right)^5 + \binom{10}{6} \left(\frac{2}{3}\right)^6 \left(\frac{1}{3}\right)^4$$

$$\frac{(2)^6}{3^{10}} (60 + 160 + 240 + 240)$$

$$\frac{10 \times 644}{6561} = \frac{6440}{6561} \approx 0.98155$$

Q2
9

Each coin has two possible results.

The probability of getting head $= p = \frac{1}{2}$

Toss = 5 times

Therefore,

$$P(2 \text{ head \& 1 tail}) = \binom{5}{2} \left(\frac{1}{2}\right)^2 \left(\frac{1}{2}\right) = \frac{5}{8}$$

$$P(1 \text{ head \& 2 tails}) = \binom{5}{1} \left(\frac{1}{2}\right) \left(\frac{1}{2}\right)^2 = \frac{5}{8}$$

$$\text{probability of head} = \frac{5}{8} + \frac{5}{8} = \frac{10}{8} = 1.25$$

Q 3

(b) Construction of Ungrouped frequency distribution.

| | | | | | | | | | |
|---|---|---|---|---|---|---|----|----|---|
| 2 | 6 | 1 | 8 | 4 | 9 | 3 | 8 | 10 | 1 |
| 4 | 3 | 3 | 0 | 5 | 2 | 1 | 11 | 10 | 6 |
| 5 | 3 | 3 | 2 | 3 | 3 | 2 | 7 | 7 | 7 |
| 1 | 4 | 2 | 4 | 4 | 4 | 4 | 8 | 10 | 2 |
| 7 | 5 | 4 | 5 | 3 | 2 | 3 | 9 | 2 | |

$R = 10 - 0 = 10$
 $W = 10 / 7 = 1.428$

Class Interval CB Tally F CF Class width

| | | | | | |
|-------|----------|----|----|----|---|
| 0-1 | 1-5 | 1 | 4 | 20 | 2 |
| 2-3 | 1.5-3.5 | 11 | 12 | 14 | |
| 4-5 | 3.5-5.5 | 11 | 13 | 15 | |
| 6-7 | 5.5-7.5 | 1 | 6 | 8 | |
| 8-9 | 7.5-9.5 | 1 | 2 | 4 | |
| 10-11 | 9.5-11.5 | 11 | 3 | 5 | |

(c) Ungrouped F Distribution.

| X | Tally | F | CF |
|----|-------|-------------|----|
| 1 | I | 1 | 1 |
| 2 | II | 2 | 3 |
| 3 | III | 3 | 6 |
| 4 | IIII | 4 | 10 |
| 5 | IIII | 5 | 15 |
| 6 | IIII | 4 | 19 |
| 7 | IIII | 3 | 22 |
| 8 | IIII | 2 | 24 |
| 9 | IIII | 1 | 25 |
| 10 | IIII | 2 | 27 |
| | | <u>Σ=27</u> | |