1) b) 18

2) c) If $AX = B$ then $X = B^{-1}A$

3) d) 24

4) c) 1024 ways

5) c) $\frac{1}{3}$

6) a) $x^2 - 2ax + y^2 = 0$

7) d) $-\frac{1}{2}$

8) a) $\frac{1}{\sqrt{3}}$

9) a) 0

10) b) $-\frac{1}{x^2}$

11) a) $b_d = \frac{AR}{AR - MR}$

12) b) 8

13) b) $A = \frac{a}{i}\left[(1+i)^n - 1\right]$

14) b) An endowment fund to give scholarship to a student.

15) d) AM ≥ GM ≥ HM

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

17) b) −1 to 1

18) a) $r = \pm\sqrt{b_{xy} \times b_{yx}}$

19) c) an optimal solution.

20) d) all the above.

21) $I - B = \begin{bmatrix} 0.50 & -0.30 \\ -0.41 & 0.67 \end{bmatrix}$

$|I - B| = 0.212$ positive.

Main diagonal elements of $I - B$ are positive.

∴ The system is viable.

22) $(x-h)^2 + (y-k)^2 = r^2$

$(x-3)^2 + (y-5)^2 = 25$

$x^2 + y^2 - 6x - 10y + 9 = 0$

23) $3x^2 = 27$

$x^2 = 9$

$x = \pm 3$

24) Average speed

$= \frac{n}{\sum \frac{1}{x}}$

$= \frac{3}{\frac{1}{48} + \frac{1}{40} + \frac{1}{32}}$

$= 3 \times \frac{480}{37} = 38.92$

25) No. of ways $= {}^{32}C_4$

$= \frac{32 \times 31 \times 30 \times 29}{4 \times 3 \times 2 \times 1}$

$= 35960$

26) $y_1 = 3e^{3x+2}$

$y_2 = 9e^{3x+2}$

27) $a = 9000$ $i = 0.15$

$P = \frac{a}{i} = 60{,}000$.

28) $r = \frac{\sum xy}{\sqrt{\sum x^2 \sum y^2}}$

$= \frac{120}{\sqrt{90 \times 640}}$.

$= 0.5$.

29) $\frac{(-\sin\theta)(\cot\theta)(-\sec\theta)}{(-\sin\theta)(-\cot\theta)\sec\theta}$

$= 1$

30) $\frac{dx}{dp} = 4p$.

$b_s = \frac{p}{x}\frac{dx}{dp}$

$= \frac{p}{2p^2+5}(4p)$.

$= \frac{4p^2}{2p^2+5} = \frac{36}{23}$

31) $n(2^{n-1}) = 448$.

$n = 7$.

32) $xy = I$.

$\begin{bmatrix} 1 & 6-3p & -9-3q \\ 0 & -3+2p & 6+2q \\ 0 & 8-4p & -11-4q \end{bmatrix} = I$

$6 - 3p = 0 \quad p = 2$.

$-9 - 3q = 0 \quad q = -3$

(or) $y = x^{-1}$ $|x| = -1$

$= \begin{bmatrix} 2 & 1 & -1 \\ 0 & 2 & 1 \\ 5 & 2 & -3 \end{bmatrix}$

$\therefore p = 2 \quad q = -3$.

33) $\frac{\partial P}{\partial L} = 4k - 2L$

$\frac{\partial P}{\partial k} = 4L + 2k$.

$L\frac{\partial P}{\partial L} + k\frac{\partial P}{\partial k} = 4kL - 2L^2 + 4kL + 2k^2$

$= 8kL - 2L^2 + 2k^2$

$= 2P$.

or by Euler's theorem.

34) $\frac{(3!)! \times 2!}{5!}$.

$\frac{6! \times 2!}{5!} = 12$.

35) Dividend $= \frac{FV \times n \times r}{100}$.

$1620 = \frac{20 \times n \times 9}{100}$.

$n = 900$.

36) $4i = 4k$

$k = 1$

$y^2 = x$.

$LR = 4a = 1$

Focus $= (\frac{1}{4}, 0)$

37) $A = \{$odd no. on first throw$\}$.

$P(A) = \frac{18}{36} = \frac{1}{2}$

$B = \{$even no on second throw$\}$

$P(B) = \frac{18}{36} = \frac{1}{2}$

$A \cap B = \{$odd no on both$\}$.

$= \{(1,1), (1,3), (1,5), (3,1), (3,3), (3,5), (5,1), (5,3), (5,5)\}$.

$P(A \cap B) = \frac{9}{36} = \frac{1}{4}$

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

∴ A and B are indep.

38. $\tan x = 2$

$\frac{\tan x + \tan y}{1 - \tan x \tan y} = 42$

$\frac{2 + \tan y}{1 - 2\tan y} = 42$

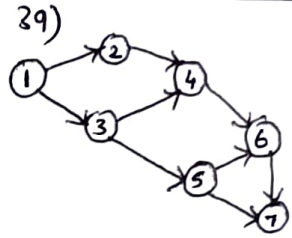
$42 - 84\tan y = 2 + \tan y$

$40 = 85\tan y$.

$\tan y = \frac{40}{85} = \frac{8}{17}$.

$y = \tan^{-1}(\frac{8}{17})$

39)




40) ~~$\cos y \frac{dy}{dx} = x \cos(a+y) \frac{dy}{dx}$~~

~~$\cos y = x \cos(a+y)$~~

$x = \frac{\sin y}{\sin(a+y)}$

$\frac{dx}{dy} = \frac{\sin(a+y)\cos y - \sin y \cos(a+y)}{\sin^2(a+y)}$

$= \frac{\sin(a+y-y)}{\sin^2(a+y)}$

$= \frac{\sin a}{\sin^2(a+y)}$

$\frac{dy}{dx} = \frac{\sin^2(a+y)}{\sin a}$.

41) a) $c = 0$

$2g + 4f + c = -5$

$4g + c = -4$

$g = -1 \quad f = -3/4$

$2x^2 + 2y^2 - 4x - 3y = 0$.

41) b) $\begin{bmatrix} 3 & -1 & 2 \\ 2 & 1 & -1 \\ 1 & 3 & -5 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 13 \\ 3 \\ -8 \end{bmatrix}$

$AX = B$

$X = A^{-1}B$

$|A| = -6 - 9 + 10 = -5$.

$\text{adj } A = \begin{bmatrix} -2 & 1 & -1 \\ 9 & -17 & 7 \\ 5 & -10 & 5 \end{bmatrix}$.

$X = -\frac{1}{5}\begin{bmatrix} -26+3+8 \\ 117-56-56 \\ 65-30-40 \end{bmatrix} = \begin{bmatrix} 3 \\ -2 \\ 1 \end{bmatrix}$

$x = 3 \quad y = -2 \quad z = 1$

42) a) $\frac{x-2}{(x+2)(x-1)^2} = \frac{A}{x+2} + \frac{B}{x-1} + \frac{C}{(x-1)^2}$

$x - 2 = A(x-1)^2 + B(x+2)(x-1) + C(x+2)$

$A = -\frac{4}{9} \quad B = \frac{4}{9} \quad C = -\frac{1}{3}$.

$\frac{x-2}{(x+2)(x-1)^2} = -\frac{4}{9(x+2)} + \frac{4}{9(x-1)} - \frac{1}{3(x-1)^2}$

42) b) $\tan(A+B) = \tan 45$.

$\frac{\tan A + \tan B}{1 - \tan A \tan B} = 1$

$\tan A + \tan B = 1 - \tan A \tan B$

$(1 + \tan A)(1 + \tan B) = 2$.

$\left(1 + \tan 22\tfrac{1}{2}\right)^2 = 2$.

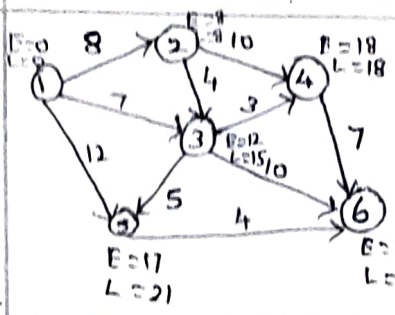
$\tan 22\tfrac{1}{2}^\circ = \sqrt{2} - 1$

43) a).

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| EST | 0 | 0 | 0 | 8 | 8 | 12 | 12 | 12 | 18 | 17 |
| EFT | 8 | 7 | 12 | 12 | 18 | 15 | 17 | 22 | 25 | 21 |
| LST | 0 | 8 | 9 | 11 | 8 | 15 | 16 | 15 | 18 | 21 |
| LFT | 8 | 15 | 21 | 15 | 18 | 18 | 21 | 25 | 25 | 25 |

C.P 1 - 2 - 4 - 6

Duration = 25 weeks.




43) b) Middle term $= 2n C_n x^n$

$= t_{n+1}$

$= \frac{(2n)!}{n!\,n!} x^n$

$= \frac{1.2.3.\ldots(2n-1)(2n)}{n!\,n!} x^n$

$= \frac{1.3.5.\ldots(2n-1).2^n n!}{n!\,n!} x^n$

$= \frac{1.3.5.\ldots(2n-1).2^n x^n}{n!}$

44) a) $\Sigma x = 162 \quad \Sigma y = 171$

$\bar{x} = 18 \quad \bar{y} = 19$.

$\Sigma xy = 431 \quad \Sigma x^2 = 598$

$\Sigma y^2 = 338$

$r = \frac{\Sigma xy}{\sqrt{\Sigma x^2 \Sigma y^2}} = 0.959$

44) b). $y_1 = -a\sin mx\,(m) + b\cos mx\,(m)$

$y_2 = -a\cos(mx)\,(m^2) - b\sin mx\,(m^2)$

$= -m^2(a\cos mx + b\sin mx)$

$= -m^2 y$

$y_2 + m^2 y = 0$.

45) a) $f'(x) = 6x^2 + 18 + 12$

When $f'(x) = 0 \quad x^2 + 3x + 2 = 0$

$x = -2, \; x = -1$

Stationary values are $-3, -4$

Stat. pts $(-2, -3)$ & $(-1, -4)$

45) b) $B = \begin{bmatrix} \frac{1}{4} & \frac{2}{3} \\ \frac{1}{6} & \frac{1}{6} \end{bmatrix} \quad I - B = \begin{bmatrix} \frac{3}{4} & -\frac{2}{3} \\ -\frac{1}{6} & \frac{5}{6} \end{bmatrix}$

$|I - B| = \frac{5}{8} - \frac{1}{9} = \frac{37}{72}$

$\text{adj}(I - B) = \begin{bmatrix} 5/6 & 2/3 \\ 1/6 & 3/4 \end{bmatrix}$

$X = (I - B)^{-1} D$.

$= \frac{72}{37}\begin{bmatrix} 5/6 & 2/3 \\ 1/6 & 3/4 \end{bmatrix}\begin{bmatrix} 80 \\ 40 \end{bmatrix}$

$= \frac{1}{37}\begin{bmatrix} 6720 \\ 3120 \end{bmatrix} = \begin{bmatrix} 181.62 \\ 84.32 \end{bmatrix}$.

output $x = 181.62 \quad y = 84.32$.

46) a) I: Income $= \frac{12}{16} \times 16 \times 24$

$= ₹288$

II: Income $= \frac{15}{24} \times 16 \times 24$.

$= ₹240$.

I share is better investment

46) b)

| | | | | | |
|---|---|---|---|---|---|
| $x_1$ | 10 | 0 | 22 | 0 | |
| $x_2$ | 0 | 15 | 0 | 11 | |
| Corner pts | (0,0) | (10,0) | (4,9) | (0,11) | |
| Z | 0 | 60 | 96 | 88 | |

$Z_{max} = 96 \quad x_1 = 4 \quad x_2 = 9$

47) a) $\Sigma x = 1686 \quad \Sigma y = 1690$

$\bar{x} = 168.6 \quad \bar{y} = 169$.

$b_{xy} = 0.556 \quad b_{yx} = 0.61$

$X = 0.556Y + 74.636$

$Y = 0.16Y + 66.154$.

When $x = 164$, $Y = 169.19$ cm.

$\Sigma xy = 285182$

$\Sigma x^2 = 284666 \quad \Sigma y^2 = 286056$

47) b) $P(\bar{A}) = \frac{1}{4} \quad P(\bar{B}) = \frac{1}{2} \quad P(\bar{C}) = \frac{1}{3}$

(i) $P(\text{all}) = P(A)P(B)P(C)$

$= \frac{1}{4}$.

(ii) $P(\text{only one}) = \frac{3}{4} \times \frac{1}{2} \times \frac{1}{3} + \frac{1}{4} \times \frac{1}{2} \times \frac{1}{3} + \frac{1}{4} \times \frac{1}{2} \times \frac{2}{3} =$

$\frac{3}{24} + \frac{1}{24} + \frac{2}{24} = \frac{6}{24} = \frac{1}{4}$.

(iii) $P(\text{at least one}) = 1 - P(\text{none})$

$= 1 - \frac{1}{4} \times \frac{1}{2} \times \frac{1}{3} = \frac{23}{24}$