CANARA VIKAAS PU COLLEGE, MANGALURU

Airport Road, Gurunagara, Mangaluru – 575008

BASIC MATHS – ANSWER KEY

I. PART – A.

1) d) $\begin{bmatrix} 6 & 4 \\ 4 & 8 \end{bmatrix}$

2) a) $n = 10 + 5 = 15$.

3) c) $\frac{1}{4}$.

4) d) $\sim q \rightarrow \sim p$.

5) b) $3:7$

6) a) $\frac{\sqrt{3}}{2}$.

7) d) $y = -2$.

8) b) $5e^x - \frac{1}{x}$.

9) b) $\log \frac{(7x+8)}{7} + c$.

10) d) $\frac{x^6}{6} + c$.

II) a) iv) 1.

II. b) i) 7

c) vi) 9.

d) ii) $\frac{\sqrt{3}-1}{2\sqrt{2}}$.

e) iii) 2.

III. 12) $x = 3$.

13) 35.

14) 12.

15) 16.

16) 1.

17. $2A + B = \begin{bmatrix} 2 & 0 \\ -1 & 3 \end{bmatrix}$ $\quad B = \begin{bmatrix} 1 & -1 \\ 3 & 0 \end{bmatrix}$

$$2A = \begin{bmatrix} 2 & 0 \\ -1 & 3 \end{bmatrix} - B \quad = \begin{bmatrix} 2 & 0 \\ -1 & 3 \end{bmatrix} - \begin{bmatrix} 1 & -1 \\ 3 & 0 \end{bmatrix}$$

$$2A = \begin{bmatrix} 1 & 1 \\ -4 & 3 \end{bmatrix} \Rightarrow A = \begin{bmatrix} 1/2 & 1/2 \\ -2 & 3/2 \end{bmatrix}.$$

18. The number of ways 6 can choosen out of 10 when 1 is always included is $= {}^{9}C_{5}$

$$= \frac{9!}{9-5!\,5!}$$

$$= \frac{9 \times \cancel{8}^{2} \times 7 \times \cancel{6} \times \cancel{5}}{\cancel{5} \times \cancel{4} \times \cancel{3} \times \cancel{2} \times 1}$$

$$= 126 \text{ ways}$$

19. Mutually exclusive $P(A \cap B) = 0$.

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

$$= \frac{2}{5} + \frac{1}{7} - 0$$

$$= \frac{14+5}{35} = \frac{19}{35}.$$

20. $\frac{a}{b} = \frac{3}{4}$ $\qquad \frac{8}{15}$.

$$Q = \frac{a}{b} \times \frac{b}{c}$$

$$\frac{a}{b} = \frac{3 \times 2}{4 \times 2} = \frac{6}{8}.$$

$$\frac{c}{d} = \frac{8}{15}.$$

$$a : b : c = 6 : 8 : 15.$$

21)

BD = 1950, BG1 = 50 F = ?

BG1 = BD − TD = 1950 − 50 = 1900.

$$F = \frac{BD \times TG_1}{BG_1} = \frac{1950 \times 1900}{50} = \underline{30,000/-}$$

---

22) Vertex (0,0) focus $(-a, 0) = (-a, 0)$

Parabola lies in −ve x axis.

∴ eqn is $y^2 = -4ax$.

$y^2 = -4 \times 4 \times x$

$\underline{y^2 = -16x}$.

---

23) $y = x^x$.

Taking log on both sides $\log y = x \cdot \log x$.

$$\frac{1}{y} \cdot \frac{dy}{dx} = x \times \frac{1}{x} + \log x$$

$$\frac{dy}{dx} = y\left[1 + \log x\right]$$

$$= \underline{x^x \left[1 + \log x\right]}$$

---

24) $C = q^3 - 3q^2 + 15q + 27$.

$$\frac{dC}{dq} = 3q^2 - 6q + 15.$$

---

25) $$\text{Area} = \int_a^b y \cdot dx.$$

$$= \int_0^1 x^2 \cdot dx = \frac{x^3}{3}\Big|_0^1 = \frac{1^3}{3} - \frac{0^3}{3} = \underline{\frac{1}{3}} \text{ sq. unit}.$$

26) $A = \begin{bmatrix} 2 & 1 \\ 1 & -3 \end{bmatrix}$ $B = \begin{bmatrix} 1 \\ 11 \end{bmatrix}$

$\Delta = \begin{vmatrix} 2 & 1 \\ 1 & -3 \end{vmatrix} = -6-1 = -7.$

$\Delta_1 = \begin{vmatrix} 1 & 1 \\ 11 & -3 \end{vmatrix} = -3-11 = -14.$

$\Delta_2 = \begin{vmatrix} 2 & 1 \\ 1 & 11 \end{vmatrix} = 22-1 = 21$

$\therefore x = \frac{\Delta_1}{\Delta} = \frac{-14}{-7} = 2$

$y = \frac{\Delta_2}{\Delta} = \frac{21}{-7} = -3$

27) i) Start with GRIN and end with GIN = $\frac{4!}{3!} = 4$

ii) All 3E's are together = $\frac{9!}{3!2!2!}$

28) Direct propotions.

Carpenters	Days	Hours
3	6	9
8	12	6

$\therefore 3 \times 6 \times 9 \times x = 8 \times 12 \times 6 \times 360$

$\Rightarrow x = \frac{8 \times 12 \times 6 \times 360}{3 \times 6 \times 9} = 1,280$

29) Given B.G = 24 T = 6 months = $\frac{1}{2}$ yrs $r = 4\% = 0.04$

$BG = TD + x$

$24 = TD \times \frac{1}{2} \times 0.04 \Rightarrow TD = \frac{24 \times 200}{4} = 1200.$

$BG = BD - TD \Rightarrow BD = BG + TD = 1200 + 24 = 1224.$

$BD = \frac{F \times r \times t}{100} \Rightarrow F = \frac{BD \times TD}{2BG} = \frac{1224 \times 1200}{24} = 61,200$

30) Amount obtained by selling 6000 at 108 is

$\frac{6000 \times 108}{100} = 6480$.

Income = Dividend x Stock.

$= \frac{7.5}{100} \times 6000 = 450$.

Income increased by ₹10.

∴ New Income = $\frac{\text{Dividend}}{\text{Amount}} \times$ cash.

$720 = \frac{9}{A} \times 6480$

$A = \frac{9 \times 6480}{720} = 81/-$.

31) SP of washing machine = 13,530.

Sales Tax = 10%.

Let cost price = x.

$\text{Tax} = \frac{10}{100} \times x = \frac{x}{10}$.

Price inclusive Tax = 13,530.

$x + \frac{x}{10} = 13530$.

$\Rightarrow x = 12,300/-$.

32) Let the edge be 'a' then $\frac{da}{dt} = 6 cm/min$.

Surface area = $6a^2$.

$\frac{dA}{dt} = 6 \times 2a \times \frac{da}{dt}$.

$= 6 \times 2 \times 10 \times 6$

$= 720 cm^2/min$.

Volume = a^3

$= 3a^2 \times \frac{da}{dt}$

$= 3 \times 10^2 \times 6$

$= 1800 cm^3/min$

33) $\int \frac{x}{(x-1)(x-2)} \cdot dx$.

$$\frac{x}{(x-1)(x-2)} = \frac{A}{x-1} + \frac{B}{x-2}.$$

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

put $x = 2$, $B = 2$.

$x = 1$ $A = -1$.

$$\int \frac{x}{(x-1)(x-2)} dx = \int \frac{A-1}{x-1} \cdot dx + \int \frac{2}{x-2} \cdot dx = -\log(x-1) + 2\log(x-2) + C.$$

$$= \log \frac{(x-2)^2}{x-1} + C.$$

---

34) $\int_1^2 (x + e^x + 2)\, dx$.

$$= \frac{x^2}{2} + e^x + 2x \Big|_1^2 = \left(\frac{2^2}{2} + e^2 + 2\times 2\right) - \left(\frac{1^2}{2} + e^1 + 2\times 1\right)$$

$$= 2 + e^2 + 4 - \frac{1}{2} - e - 2$$

$$= e^2 - e + \frac{5}{2}.$$

---

35) $A = \begin{bmatrix} 3 & 2 & -1 \\ 3 & 1 & -2 \\ 2 & -3 & -1 \end{bmatrix}$ $B = \begin{bmatrix} 6 \\ 3 \\ -1 \end{bmatrix}$ $X = \begin{bmatrix} x \\ y \\ z \end{bmatrix}$

$|A| = -12$

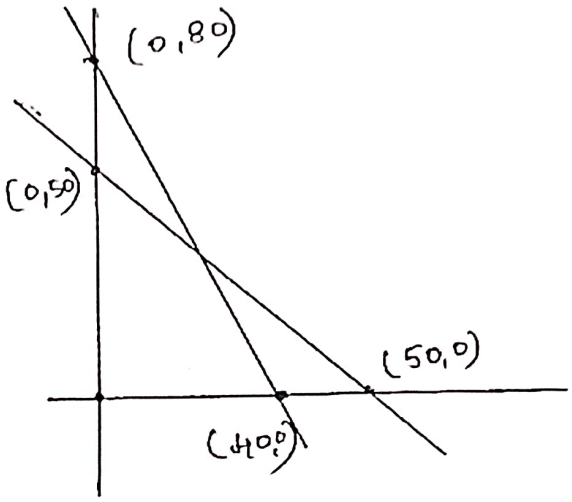
$$\text{adj } A = \begin{bmatrix} -7 & 5 & -3 \\ -1 & -1 & 3 \\ -11 & 13 & -3 \end{bmatrix}$$

$$A^{-1} = \frac{1}{-12}\begin{bmatrix} -7 & 5 & -3 \\ -1 & -1 & 3 \\ -11 & 13 & -3 \end{bmatrix} \qquad \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \frac{1}{-12}\begin{bmatrix} -24 \\ -12 \\ -24 \end{bmatrix}$$

$x = 2$ $y = 1$ $z = 2$

39).

Point	$Z = 10500x + 9000y$
(0,50)	₹150000
(0,0)	0
(40,0)	₹420000
(30,20)	₹495000.



Z max at (30,20) = ₹495000.

Z min at (0,0) = 0.

---

40)

$$\frac{\cos 7x + \cos 3x - \cos 5x - \cos x}{\sin 7x - \sin 3x - \sin 5x + \sin x}$$

$$= \frac{2\cos 5x \cdot \cos 2x - 2\cos 3x \cdot \cos 2x}{2\cos 5x \cdot \sin 2x - 2\cos 3x \cdot \sin 2x}$$

$$= \frac{2\cos 2x\,(\cos 5x - \cos 3x)}{2\sin 2x\,(\cos 5x - \cos 3x)} = \cot 2x.$$

---

41)

$$y = x + \sqrt{x^2 - 1}$$

diff w.r.t x.

$$y_1 = 1 + \frac{1}{2\sqrt{x^2-1}} \times 2x$$

$$y_1 = 1 + \frac{x}{\sqrt{x^2-1}}$$

$$y_{11} = 0 + \frac{\sqrt{x^2-1} \times 1 - x \times \frac{1}{2\sqrt{x^2-1}} \times 2x}{x^2 - 1}.$$

$$(x^2-1)\,y_{11} = \sqrt{x^2-1} - \frac{x^2}{\sqrt{x^2-1}}. \Rightarrow (x^2-1)y_{11} + xy_1 - y = 0.$$

36)

$$\frac{9}{(x+1)(x+2)^2} = \frac{A}{x+1} + \frac{B}{x+2} + \frac{C}{(x+2)^2}$$

$$9 = A(x+2)^2 + B(x+1)(x+2) + C(x+1).$$

put $x = -1$, $A = 9$.

$x = -2$, $C = -9$.

$x = 0$. $B = -9$.

$$\therefore \frac{9}{(x+1)(x+2)^2} = \frac{9}{x+1} + \frac{-9}{x+2} + \frac{-9}{(x+2)^2}.$$

37)

p	q	~q	p∧~q	(p∧~q)∨q	p∨q
T	T	F	F	T	T
T	F	T	T	T	T
F	T	F	F	T	T
F	F	T	F	F	F

38)

Unit produce in lot	Total output in lot	Cumulative Average time per lot	Total hours.
1	1	1000	1000
1	2.	80% of 1000 = 800	1600
2	4	80% of 800 = 640	2560
4	8	80% of 640 = 512	4096

∴ Total labour cost of 40 per hour = 4096 × 40

= 163840 /-

VII

42) Proof as in the text book with 3 cases.

OR

43)

Eqn of the circle is given by

$(x-h)^2 + (y-k)^2 +$

$x^2 + y^2 + 2gx + 2fy + c = 0$.

On substituting $(2,-4)$, $(3,-1)$ $c(3,-3)$, $(0,0)$

we get $2g - 4f + c = -20$.

$3g - f + c = -10$.

$c = 0$.

$\Rightarrow g = -2$, $f = 4$.

On checking $(3,-3)$ on eqn of circle we get 0.

$\therefore$ pts are concyclic.

---

44) $(1.1)^4 = (1+0.1)^4$.

using Binomial theorem $(a+b)^n = {}^nC_0 a^n + {}^nC_1 a^{n-1} b + \cdots + {}^nC_n b^n$.

$(1+0.1)^4 = {}^4C_0 1^4 + {}^4C_1 1^3 \times 0.1 + {}^4C_2 1^2 \times (0.1)^2 + {}^4C_3 \times 1 \times (0.1)^3 + {}^4C_4 \times (0.1)^4$

$= 1.4641$.

OR.

AB be the tower, $CD = x$.

Hence $\angle ADB = \angle XAD = 60^\circ$

$\tan 60^\circ = \frac{AB}{BD}$.

$\Rightarrow BD = \frac{75}{\sqrt{3}} \Rightarrow AM = MC \tan 30^\circ = 25$.

$\therefore x = AB - AM$

$= 75 - 25$

$= \underline{50}$.