Section I – Quantitative Aptitude – 40 qs (Time – 40 min)

1. Solve: $\log_{\sqrt{3}}(\log_{\sqrt{3}}x) = 2$

a) $x = 1$ b) $x = 2\sqrt{2}$ c) $x = 3$ **d) $x = 3\sqrt{3}$**

1. (d) $\log_{\sqrt{3}}(\log_{\sqrt{3}}x) = 2$
$\Rightarrow \log_{\sqrt{3}}x = (\sqrt{3})^2$
$\Rightarrow \log_{\sqrt{3}}x = 3$
$\Rightarrow (\sqrt{3})^3 = x$
$\therefore x = 3\sqrt{3}$

2. $f(x) = x^{x/2}$, find $[f(-x)]^2$

a) $(f(x))^2$ b) $2f(x)$ **c)** $\left(\frac{1}{f(x)}\right)^2$ d) $\frac{1}{2f(x)}$

2. (c) $f(x) = x^{x/2} = (x^x)^{1/2} \Rightarrow (f(x))^2 = x^x$
Now, $f(-x) = -x^{-x/2}$

$$[f(-x)]^2 = \left(-x^{\frac{-x}{2}}\right)^2 = (-1)^2 x^{\frac{-x}{2}\times 2}$$

$= x^{-x} = (x^x)^{-1} = \frac{1}{x^x} = \frac{1}{(f(x))^2}$

3. $A = \begin{bmatrix}1 & 0 & 0\\ 0 & 1 & 1\\ 0 & -2 & 4\end{bmatrix}$ and $I = \begin{bmatrix}1 & 0 & 0\\ 0 & 1 & 0\\ 0 & 0 & 1\end{bmatrix}$ and $A^{-1} = \left[\frac{1}{6}\left(A^2 + cA + dI\right)\right]$, then the value of c and d are

a) (-6, -11) b) (6, 11) **c) (-6, 11)** d) (6, -11)

3. (c). We have $A = \begin{bmatrix}1 & 0 & 0\\ 0 & 1 & 1\\ 0 & -2 & 4\end{bmatrix}$ and $I = \begin{bmatrix}1 & 0 & 0\\ 0 & 1 & 0\\ 0 & 0 & 1\end{bmatrix}$ and $A^{-1} = \frac{1}{6}\left(A^2 + cA + dI\right)$

$\Rightarrow 6AA^{-1} = A^3 + cA^2 + dAI \Rightarrow A^3 + cA^2 + dA - 6I = 0$

We find that, $A^2 = \begin{bmatrix}1 & 0 & 0\\ 0 & -1 & 5\\ 0 & -10 & 14\end{bmatrix}$

$A^3 = \begin{bmatrix}1 & 0 & 0\\ 0 & -11 & 19\\ 0 & -38 & 46\end{bmatrix}$

$\therefore A^3 + cA^2 + dA - 6I = 0$

$$\Rightarrow \begin{bmatrix}1 & 0 & 0\\ 0 & -11 & 19\\ 0 & -38 & 46\end{bmatrix} + c\begin{bmatrix}1 & 0 & 0\\ 0 & -1 & 5\\ 0 & -10 & 14\end{bmatrix} + d\begin{bmatrix}1 & 0 & 0\\ 0 & 1 & 1\\ 0 & -2 & 4\end{bmatrix} - 6\begin{bmatrix}1 & 0 & 0\\ 0 & 1 & 0\\ 0 & 0 & 1\end{bmatrix} = 0$$

$$\Rightarrow \begin{bmatrix}1+c+d-6 & 0 & 0\\ 0 & -11-c+d-6 & 19+5c+d\\ 0 & -38-10c-2d & 46+14c+4d-d\end{bmatrix} = \begin{bmatrix}0 & 0 & 0\\ 0 & 0 & 0\\ 0 & 0 & 0\end{bmatrix}$$

$\Rightarrow 1 + c + d - 6 = 0, -11 - c + d - 6 = 0$
$\Rightarrow c + d = 5, -c + d = 17$
On solving, we get $c = -6, d = 11$

Alternate Solution (1)

Given $A = \begin{bmatrix} 0 & 0 & 0 \\ 0 & 1 & 1 \\ 0 & -2 & 4 \end{bmatrix}$

$\therefore$ Characteristic equation of above matrix A is given by

$|A - \lambda I| = 0$

$\Rightarrow \begin{bmatrix} 1-\lambda & 0 & 0 \\ 0 & 1-\lambda & 1 \\ 0 & -2 & 4-\lambda \end{bmatrix} = 0$

$\Rightarrow (1 - \lambda)(4 - 5\lambda + \lambda^2 + 2) = 0$

$\Rightarrow \lambda^3 - 6\lambda^2 + 11\lambda - 6 = 0$

Also by Cayley Hamilton theory (every square matrix satisfies its characteristic equation) we obtain

$A^3 - 6A^2 + 11A - 6I = 0$

Multiplying by A^{-1}, we get

$A^2 - 6A + 11I - 6A^{-1} = 0$

$\Rightarrow A^{-1} = \frac{1}{6}(A^2 - 6A + 11I)$

Comparing it with given relation,

$A^{-1} = \frac{1}{6}(A^2 - cA + dI)$

we get c = -6 and d = 11

Alternate Solution (2)

$A = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 1 \\ 0 & -2 & 4 \end{bmatrix} \Rightarrow |A| = 6$

Adj. $A = \begin{bmatrix} 6 & 0 & 0 \\ 0 & 4 & -1 \\ 0 & 2 & 1 \end{bmatrix}$; $A^2 = \begin{bmatrix} 1 & 0 & 0 \\ 0 & -1 & 5 \\ 0 & -10 & 14 \end{bmatrix}$

$\therefore A^{-1} = \frac{\text{Adj } A}{|A|}$

$= \frac{1}{6}\begin{bmatrix} 6 & 0 & 0 \\ 0 & 4 & -1 \\ 0 & 2 & 1 \end{bmatrix}$

Now given that $A^{-1} = \frac{1}{6}(A^2 - cA + dI)$

$= \frac{1}{6}\begin{bmatrix} 6 & 0 & 0 \\ 0 & 4 & -1 \\ 0 & 2 & 1 \end{bmatrix}$

$= \frac{1}{6}\left\{\begin{bmatrix} 1 & 0 & 0 \\ 0 & -1 & 5 \\ 0 & -10 & 14 \end{bmatrix} + \begin{bmatrix} c & 0 & 0 \\ 0 & c & c \\ 0 & -2c & 4c \end{bmatrix} + \begin{bmatrix} d & 0 & 0 \\ 0 & d & 0 \\ 0 & 0 & d \end{bmatrix}\right\}$

$\Rightarrow \begin{bmatrix} 6 & 0 & 0 \\ 0 & 4 & -1 \\ 0 & 2 & 1 \end{bmatrix} = \begin{bmatrix} 1+c+d & 0 & 0 \\ 0 & -1-c+d & 5+c \\ 0 & -10-2c & 14+4c+d \end{bmatrix}$

$\Rightarrow 1 + c + d = 6$ and $-1 = 5 + c$

$\Rightarrow c = -6$ and $d = 11$

4. In a village M% of male is married to F% of female of the same village. What is the number of married people percentage with respect to the total village population?

a) (M + F)% **b)** $\frac{2MF}{M+F}$ **%** c) $\frac{MF}{M+F}$ % d) $\frac{100}{M+F}$ %

4. (b) Let say total male = x, female = y
Now, M% of x = F% of y
$\therefore$ Mx = Fy

Now, married people population % = $\frac{M\%\text{ of } x + F\%\text{ of } y}{x+y} \times 100\%$

$= \frac{Mx+Fy}{x+y}\%$

$= \frac{Fy+Fy}{\frac{Fy}{M}+y}\%$ [Putting value of x]

$= \frac{2Fy}{\left(\frac{F}{M}+1\right)y}\% = \frac{2F}{\frac{F+M}{M}}\% = \frac{2MF}{M+F}\%$

5. What is the square root of $x^6-2x^5+3x^4+2x^3(y-1)+x^2(1-2y)+2xy+y^2$

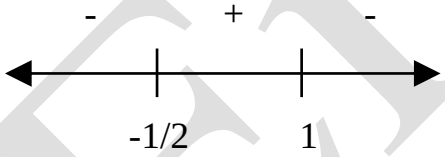
a) $\mathbf{y+x^3-x^2+x}$ b) y^2-x^3-1 c) $x^3-y-x+1$ d) $x^3+y+x+x^2$

5. (a) $x^6 - 2x^5 + 3x^4 + 2x^3 (y - 1) + x^2 (1 - 2y) + 2xy + y^2$
$= y^2 + 2xy - 2x^2y + 2x^3y + x^6 - 2x^5 + 3x^4 - 2x^3 + x^2$
$= y^2 + 2(x - x^2 + x^3)y + x^6 - 2x^5 + 3x^4 - 2x^3 + x^2$
$= y^2 + 2.\ Y.\ (x^3 - x^2 + x) + (x^3 - x^2 + x)^2$
$= (y + x^3 - x^2 + x)^2$
$\therefore$ Square root would be = $(y + x^3 - x^2 + x)$

6. If $f(x) = xe^{x(1-x)}$, then f(x) is

a) increasing on [-1/2, 1] b) decreasing on R
c) increasing on R d) decreasing on [-1/2, 1]

6. (a). $f(x) = xe^{x(1-x)}$
$\Rightarrow f'(x) = e^{x(1-x)} + (1 - 2x)\ x\ e^{x(1-x)}$
$= - e^{x(1-x)} (2x^2 - x - 1) = - e^{x(1-x)} (2x + 1)(x - 1)$



$\therefore$ f(x) is increasing on [-1/2, 1]

7. Let $\cos(\alpha + \beta) = \frac{4}{5}$ and $\sin(\alpha - \beta) = \frac{5}{13}$, where $0 \le \alpha, \beta \le \frac{\pi}{4}$.

Then $\tan 2\alpha$ =

a) 56/33 b) 19/12 c) 20/7 d) 25/16

7. $\cos(\alpha + \beta) = \frac{4}{5} \Rightarrow \tan(\alpha + \beta) = \frac{3}{4}$

$\sin(\alpha - \beta) = \frac{5}{13} \Rightarrow \tan(\alpha - \beta) = \frac{5}{12}$

$$\tan 2\alpha = \tan[(\alpha+\beta)+(\alpha-\beta)] = \frac{\frac{3}{4}+\frac{5}{12}}{1-\frac{3}{4}\cdot\frac{5}{12}} = \frac{56}{33}$$

8. Two circles $x^2 + y^2 = 6$ and $x^2 + y^2 - 6x + 8 = 0$ are given. Then the equation of the circle through their points of intersection and the point (1, 1) is

a) $x^2 + y^2 - 6x + 4 = 0$ **b) $x^2 + y^2 - 3x + 1 = 0$**

c) $x^2 + y^2 - 4y + 2 = 0$ d) none of these

8. (b). The circle through points of intersection of the two circles $x^2 + y^2 = 6 = 0$ and $x^2 + y^2 - 6x + 8 = 0$ is $(x^2 + y^2 - 6) + \lambda (x^2 + y^2 - 6x + 8) = 0$

As it passes through (1, 1)

$(1+ 1 - 6) + \lambda (1 + 1 - 6 + 8) = 0$

$\Rightarrow \lambda = \frac{4}{4} = 1$

$\therefore$ the required circle is

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

or, $x^2 + y^2 - 3x + 1 = 0$

9. If $A = \begin{bmatrix} \alpha & 0 \\ 1 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 0 \\ 5 & 1 \end{bmatrix}$, then value of α for which $A^2 = B$, is

a) 1 b) -1 c) 4 **d) no real values**

9. (d). Given that $A = \begin{bmatrix} \alpha & 0 \\ 1 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 0 \\ 5 & 1 \end{bmatrix}$ and $A^2 = B$

$$\Rightarrow \begin{bmatrix} \alpha & 0 \\ 1 & 1 \end{bmatrix}\begin{bmatrix} \alpha & 0 \\ 1 & 1 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 5 & 1 \end{bmatrix}$$

$$\Rightarrow \begin{bmatrix} \alpha^2 & 0 \\ \alpha+1 & 1 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 5 & 1 \end{bmatrix}$$

$\Rightarrow \alpha^2 = 1$ and $\alpha + 1 = 5$

$\Rightarrow \alpha = \pm 1$ and $\alpha = 4$

$\because$ There is no common value

$\therefore$ There is no real value of α for which $A^2 = B$

10. A set consists of $2n - 1$ elements. What is the number of subsets of this set which contain at most $n - 1$ elements?

a) 2^{2n-2} b) $2^{2n} - 2$ c) $2^{2n} - 1$ d) 2^{2n}

10. The subset can contain 0, 1, 2, ….n – 1 elements

The number of such subsets are

$N = {}^{2n-1}C_0 + {}^{2n-1}C_1 + {}^{2n-1}C_2 + \ldots + {}^{2n-1}C_{n-1}$

Since,

${}^{2n-1}C_0 + {}^{2n-1}C_1 + \ldots {}^{2n-1}C_{2n-1} = 2^{2n-1}$

${}^{2n-1}C_0 = {}^{2n-1}C_{2n-1} = 1$

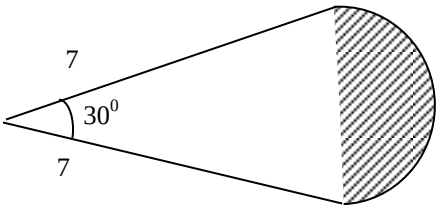
${}^{2n-1}C_1 = {}^{2n-1}C_{2n-2}$

${}^{2n-1}C_2 = {}^{2n-1}C_{2n-3}$

$\therefore 2N = 2^{2n} - 1$

$\therefore N = 2^{2n} - 2$. Hence, (A).

11. From a circular sheet of leather of thickness 2 *cm*, a sector is cut off. What will be the minimum volume of leather to be removed to make it triangular.



a) $\frac{7}{12}cc$ **b)** $\frac{7}{6}cc$ c) $7\,cc$ d) $\frac{7}{3}cc$ e) $\frac{7}{2}cc$

11. Area of the shaded portion = area of sector – area of triangle = $\frac{7}{12}$. $\therefore$ Volume $= \frac{7}{6}cc$. [option – b]

12. A problem in mathematics is given to three students A, B, C and their respective probability of solving the problem is $\frac{1}{2}$, $\frac{1}{3}$ and $\frac{1}{4}$. Probability that the problem is solved is

a) 3/4 b) 1/2 c) 2/3 d) 1/3

12. $P(E_1) = \frac{1}{2}$, $P(E_2) = \frac{1}{3}$ and $P(E_3) = \frac{1}{4}$;

$P(E_1 \cup E_2 \cup E_3) = 1 - P(\overline{E}_1)P(\overline{E}_2)P(\overline{E}_3)$

$= 1-\left(1-\frac{1}{2}\right)\left(1-\frac{1}{3}\right)\left(1-\frac{1}{4}\right)$

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

13. A dice is tossed 5 times. Getting an odd number is considered a success. Then the variance of distribution of success is

a) 8/3 b) 3/8 c) 4/5 **d) 5/4**

13. (d). The event follows binomial distribution with n = 5, p = 3/6 = 1/2.
q = 1 – p = 1/2; $\therefore$ variance = npq = 5/4.

14. If a, b and c are the sides of a scalene triangle and $y = \frac{a^2+b^2+c^2}{ab+bc+ca}$, then

a) $y = 1$ **b) $1 < y < 2$** c) $0 < y < 1$ d) $-1 < y < 1$

14. $a^2 + b^2 + c^2 > ab + bc + ca$ $\therefore$ $\frac{a^2+b^2+c^2}{ab+bc+ca} > 1$

$b^2 + c^2 - a^2 < 2bc$
$c^2 + a^2 - b^2 < 2ca$ $\Rightarrow \therefore a^2 + b^2 + c^2 < 2(ab + bc + ca)$
$a^2 + b^2 - c^2 < 2ab$

or, $\frac{a^2+b^2+c^2}{ab+bc+ca} < 2$

so range is 1<y<2 option (b).

15. If n is such that $36 \le n \le 72$, then $x = \frac{n^2+2\sqrt{n}(n+4)+16}{n+4\sqrt{n}+4}$ satisfies

a) $20 < x < 54$ b) $23 \le x < 58$ c) $25 < x < 60$ **d) $28 \le x < 60$**

15. $x = \frac{\left(\sqrt{n}+2\right)^2\left(n-2\sqrt{n}+4\right)}{\left(\sqrt{n}+2\right)^2} = n-2\sqrt{n}+4 = \left(\sqrt{n}-1\right)^2+3$

for $36 \le x \le 72$
$28 \le x < 60$ ……(d)

16. Find the range of real values of x satisfying the inequalities $3x - 7 \geq 8$ and $5x - 7 \geq 15$.

a) [5, ∞) b) (5, ∞) c) [22/5, ∞) d) (22/5, ∞)

16. (a) Either, $3x - 7 \geq 8$

$\Rightarrow 3x \geq 15$

$\Rightarrow \therefore x \geq 5.$

Or, $5x - 7 \geq 15.$

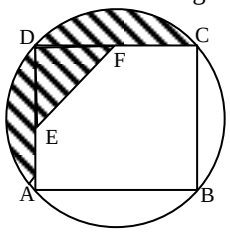
$\Rightarrow 5x \geq 22.$

$\therefore x \geq \frac{22}{5}$

So, $x \geq 5$ [as $5 > \frac{22}{5}$]

$\therefore$ Range of x, $[5, \infty)$

17. In the following diagram, the side of the square ABCD is 4 cm. E & F are the midpoints of AD & CD respectively. Find the area of the shaded region.



a) $(4\pi + 6)cm^2$ **b) $(4\pi - 6)cm^2$** c) $(2\pi + 2)cm^2$ d) $(8\pi - 6)cm^2$

17. AC is the diagonal of the square ABCD as well as the diameter of the circle = $4\sqrt{2}$cm

$\therefore$ Area of the circle = $\pi \times \left(\frac{4\sqrt{2}}{2}\right)^2 = 8\pi \text{ cm}^2$

The area of the square = 16 cm^2

Area of the segments AD & DC = $\frac{8\pi - 16}{2} = (4\pi - 8) \text{ cm}^2$

Now DF = DE = 2 cm (E & F are the midpoint of the side)

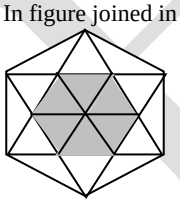
$\therefore$ Area of $\Delta DEF = \frac{1}{2} \times 2 \times 2 = 2 \text{ cm}^2$

$\therefore$ Area of the shaded region = $(4\pi - 8 + 2) \text{ cm}^2 = (4\pi - 6) \text{ cm}^2$. Hence, option (b).

18. Draw a regular hexagon. Connect each corner to the third vertex in the clockwise direction. What is the ratio of the area of hexagon to the new one formed by the crossing lines inside it?

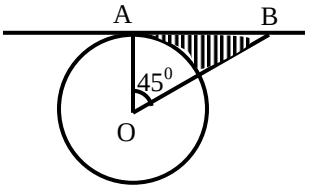
a) 2 : 1 **b) 3 : 1** c) 4 : 1 d) 6 : 1 e) 5 : 1

18. In figure joined in a regular pattern, the areas formed are equal.



Ratio = 18 : 6 => 3:1 Hence, option (b).

19. The circle with center 0 has a radius of 2 cms. AB is tangent to the circle. The area of shaded region is equal to



a) $2 - \pi/2$ b) $\pi/2 - 2$ c) $4 - \pi/2$ d) $\pi/2 - 4$

19. Area of the shaded region
= Area of the right angled triangle AOB – Area of arc AOM
= $\frac{1}{2}\times 2\times 2\times \tan 45° - \frac{4\pi}{8} = 2 - \frac{\pi}{2}$ Hence (a)

20. Let $f_{n+1}(x) = f_n(x) + 1$, if n is a multiple of 3
$= f_n(x) - 1$, otherwise
If $f_1(x) = 0$, find $f_{40}(x) = ?$

a) –12 **b) –13** c) –14 d) None of these

20. $f_{n+1}(x) = f_n(x) + 1$ if n is a multiple of 3
$= f_n(x) - 1$ otherwise
$f_1(x) = 0$
n = 1, $f_2(x) = 0 - 1$
n = 2, $f_3(x) = -1 - 1$
n = 3, $f_4(x) = -1 - 1 + 1$
n = 4, $f_5(x) = -1 - 1 + 1 - 1$
…….
…….
n = 39, $f_{40}(x) = -1 - 1 + 1 - 1 - 1 + 1 \ldots\ldots = -13$
13 times

Hence, option (b)

21. If the sum of the distances of a point from two perpendicular lines in a plane is 1, then its locus is
a) square b) circle c) straight line d) two intersecting lines

21. (a). Let the two perpendicular lines be the co-ordinate axes.
Let (x, y) be the point sum of whose distances from two axes is 1 then we must have
$|x| + |y| = 1$
or $\pm x \pm y = 1$
These are the four lines
$x + y = 1$, $x - y = 1$, $- x + y = 1$, $-x - y = 1$
Any two adjacent sides are perpendicular to each other.
Also each line is equidistant from origin. Therefore figure formed is a square.

22. Let $2\sin^2 x + 3\sin x - 2 > 0$ and $x^2 - x - 2 < 0$ (x is measured in radians). Then x lies in the interval
a) $\left(\frac{\pi}{6}, \frac{5\pi}{6}\right)$ b) $\left(-1, \frac{5\pi}{6}\right)$ c) (-1, 2) **d)** $\left(\frac{\pi}{6}, 2\right)$

22. (d). $2\sin^2 x + 3\sin x - 2 > 0$
$(2\sin x - 1)(\sin x + 2) > 0$
$\Rightarrow 2\sin x - 1 > 0$ ($\because -1 \le \sin x \le 1$)
$\Rightarrow \sin x > ½ \Rightarrow x \in (\pi/6, 5\pi/6)$ ……..(1)
Also $x^2 - x - 2 < 0$
$\Rightarrow (x - 2)(x + 1) < 0 \Rightarrow -1 < x < 2$ ……..(2)
Combining (1) and (2) $x \in (\pi/6, 2)$.

23. Evaluate:
$$\frac{\log_3 \sqrt{243\sqrt{81\sqrt[3]{3}}}}{\log_2 \sqrt[4]{64} + \log_e e^{-10}}$$

a) $\frac{43}{20}$ **b)** $-\frac{43}{102}$ c) $-\frac{33}{20}$ d) $\frac{43}{123}$

23. $$\frac{\log_3 \sqrt{243\sqrt{81\sqrt[3]{3}}}}{\log_2 \sqrt[4]{64} + \log_e e^{-10}}$$

$$= \frac{\log_3 \sqrt{243\sqrt{3^4.3^{\frac{1}{3}}}}}{\log_2 2^{6/4} - 10}$$

$$= \frac{\log_3 \sqrt{3^5.3^{13/6}}}{\frac{6}{4} - 10}$$

$$= \frac{\log_3 3^{43/12}}{-\frac{34}{4}} = \frac{43}{12} \times \frac{(-4)}{34} = -\frac{43}{102}$$

24. If $f(x) = \frac{x+1}{x}$, $x \neq 0$, and $f(g(x)) = x$. Find $g(x)$

a) $\frac{x}{x+1}$ b) $\frac{x}{x-1}$ c) $\frac{1}{x+1}$ **d)** $\frac{1}{x-1}$

24. (d) Given that, $\frac{g(x)+1}{g(x)} = x$

$\Rightarrow g(x) + 1 = x(g(x))$

$\Rightarrow (x - 1)\, g(x) = 1$

$\Rightarrow g(x) = \frac{1}{x-1}$, $x \neq 1$ ($\because$ for $x = 1$, $g(x)$ and $f(g(x))$ are not defined)

25. If $f(x) = \sin^2 x + \sin^2\left(x + \frac{\pi}{3}\right) + \cos x \cos\left(x + \frac{\pi}{3}\right)$ and $g\left(\frac{5}{4}\right) = 1$, the (gof) (x) = …….

25. $f(x) = \sin^2 x + \sin^2\left(x + \frac{\pi}{3}\right) + \cos x \cos\left(x + \frac{\pi}{3}\right)$

$\Rightarrow f(x) = \sin^2 x + \left[\sin\left(x + \frac{\pi}{3}\right)\right]^2 + \cos x \cos\left(x + \frac{\pi}{3}\right)$

$\Rightarrow f(x) = \sin^2 x + \frac{1}{4}(\sin x + \sqrt{3}\cos x)^2 + \frac{1}{2}\cos x\,(\cos x - \sqrt{3}\sin x)$

$= \frac{5}{4}(\sin^2 x + \cos^2 x) = \frac{5}{4}$

$\therefore$ (gof) $x = g[f(x)] = g(5/4) = 1$

Alternate Solution:

$f'(x) = 2 \sin x \cos x + 2 \sin\left(x + \frac{\pi}{3}\right) \cos\left(x + \frac{\pi}{3}\right) - \sin x \cos\left(x + \frac{\pi}{3}\right) - \cos x \sin\left(x + \frac{\pi}{3}\right)$

$= \sin 2x + \sin(2\pi + 2\pi/3) - \sin(2x + \pi/3)$

$= 2[\sin(2x + \pi/3)] \cdot \frac{1}{2} - \sin\left(2x + \frac{\pi}{3}\right) = 0$

$\Rightarrow f(x) =$ constant $= k$

Also $f(0) = 5/4$

$\therefore f(x) = 5/4, \ \forall x \in R$

$\therefore (gof)(x) = g[f(x)] = g(5/4) = 1$

26. If equation $x^2 + x + 4 = 0$ and $ax^2 + bx + c = 0$ (where a, b, c are real numbers) have a common root then what can be a:b:c?

a) 2:4:1 b) 1:5:3 c) 1:4:1 **d) 1:1:4**

26. (d) As roots of the questions $x^2 + x + 4 = 0$ are imaginary. So they have to be conjugate.
Also $ax^2 + bx + c = 0$ roots are also have to be imaginary.
So coefficient ratio has to be same.

$\therefore$ a : b : c = 1 : 1 : 4

27. Find the sum of the series $\frac{1}{10}+\frac{1}{40}+\frac{1}{88}+\frac{1}{154}+.....100^{th}$ term.

a) $\frac{150}{301}$ b) $\frac{75}{151}$ c) $\frac{301}{302}$ **d)** $\frac{25}{151}$

27. $\frac{1}{10}+\frac{1}{40}+\frac{1}{88}+\frac{1}{154}+.....100^{th}$ term.

$\frac{1}{3}\left[\frac{1}{2}-\frac{1}{5}+\frac{1}{5}-\frac{1}{8}.....\frac{1}{5+99\times3}\right]=\frac{1}{3}\left[\frac{1}{2}-\frac{1}{302}\right]=\frac{25}{151}$

Hence, option (d).

28. The sum of 7^{th}, 8^{th} and 9^{th} term of an *AP* is 33, while product of these terms is 935. Find its first term.

a) -31 b) 53 **c) either (a) or (b)** d) None of these

28. Let the 8^{th} term is a_8 and common difference 'd'

Now $(a_8 - d) + a_8 + (a_8 + d) = 33$

$\Rightarrow a_8 = 11$

Again $(a_8 - d) \times a_8 \times (a_8 + d) = 935$

$\Rightarrow a_8^2 - d^2 = 85$

$\Rightarrow d^2 = 121 - 85 = 36$

$\Rightarrow d = \pm 6$

Now if the first term is a_1 then,

$a_1 + (8 - 1)(\pm 6) = 11$

$\Rightarrow a_1 \pm 42 = 11$

$\Rightarrow a_1 = 11 \mp 42$

Hence a_1 = - 31 or 53.

Option (c).

29. In a public gathering, a show was organized for common people. In that show, each contestant is given 4 boxes and asked to choose one of them. Only one of the 4 boxes contains a prize. After the contestant chooses one of the boxes, the host opens that box. If that box contains the prize, the contestant wins. Else, the host allows the contestant a last chance to choose one of the three remaining boxes. What is the probability that the contestant wins the price?

a) 1/3 b) 1/2 c) 1/5 **d) 1/4**

29. Case 1 : The person won on his very first attempt.

Its probability = 1/4

Case 2 : The person won in his 2^{nd} chance. So its probability = 3/4 × 1/3 = 1/4

Total probability = 1/4 + 1/4 = 1/2. Hence, option (b).

30. Set A has the set of real number $-10 \le n \le 10$. If two numbers *x*, *y* are picked at random from the set, find the probability that $|x| \le 5$; $|y| \le 5$ and $x + y \le 5$.

a) $\frac{7}{32}$ b) $\frac{1}{4}$ c) $\frac{1}{5}$ d) Data insufficient e) None of these

30. Area of $|x| \le 5$; $|y| \le 5$ and x+y= $\le 5 = 87.5$

Total area = 400

$\therefore \text{Probability} = \frac{87.5}{400} = \frac{7}{32}$

31. A random variable X has the probability distribution:

X:	1	2	3	4	5	6	7	8
p(X):	0.2	0.2	0.1	0.1	0.2	0.1	0.1	0.1

For the events E = {X is a prime number} and F = {X < 4}, the P(E $\cup$ F) is

a) 0.50 **b) 0.77** c) 0.35 d) 0.87

31. (b). P(E) = P(2 or 3 or 5 or 7)

= 0.23 + 0.12 + 0.20 + 0.07 = 0.62

P(F) = P(1 or 2 or 3) = 0.15 + 0.23 + 0.12 = 0.50
P(E ∩ F) = P(2 or 3) = 0.23 + 0.12 = 0.35
∴ P(EUF) = P(E) + P(F) – P(E ∩ F) = 0.62 + 0.50 – 0.35 = 0.77

32. Three cylinders each of height 16 *cm* and radius of base 4 *cm* are standing on a plane so that each cylinder touches the other two. The volume of the region enclosed between the three cylinders (in cm^3) is,

a) $256\left(\sqrt{3}-\pi\right)$ b) $28\left(2\sqrt{3}-\pi\right)$ c) $64\left(\sqrt{3}-2\pi\right)$ d) $512\left(2\sqrt{3}-\pi\right)$ **e)** $128\left(2\sqrt{3}-\pi\right)$

32. Height of cylinder = 16 cm. Radius = 4 cm.
∴ Volume of the required portion = $8\left(2\sqrt{3}-\pi\right)\times 16 = 128\left(2\sqrt{3}-\pi\right)$. [option –e]

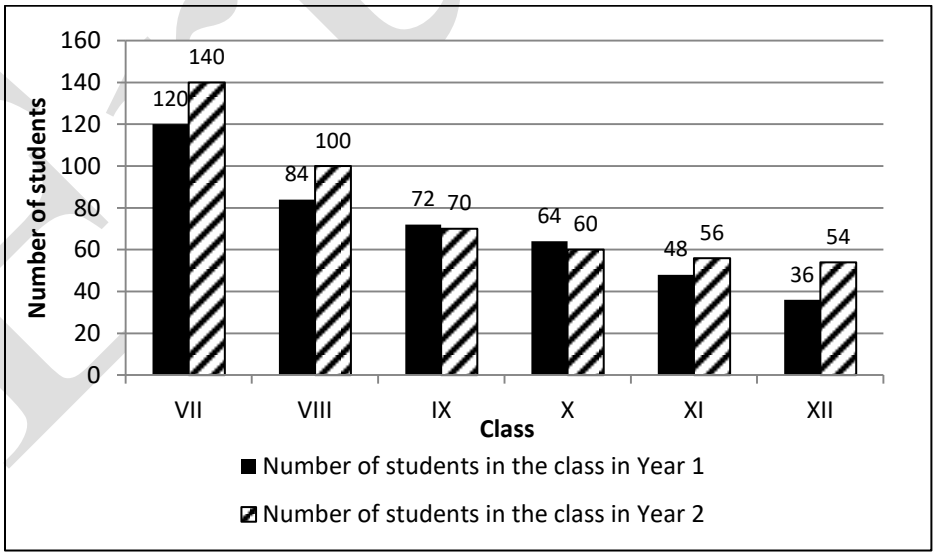
33. If $x = \left(\sqrt{2}+1\right)^{-\frac{1}{3}}$, then find the value of $\left(x-\frac{1}{x}\right)^3+3\left(x-\frac{1}{x}\right)+1$.

a) 0 **b) –1** c) 1 d) 3

33. $x = \left(\sqrt{2}+1\right)^{-\frac{1}{3}}$
$x^3 = \left(\sqrt{2}+1\right)^{-1} = \sqrt{2}-1$
$\frac{1}{x^3} = \frac{1}{\left(\sqrt{2}-1\right)} = \left(\sqrt{2}+1\right)$
$\left(x-\frac{1}{x}\right)^3+3\left(x-\frac{1}{x}\right)+1 = x^3-\frac{1}{x^3}-3\left(x-\frac{1}{x}\right)+3\left(x-\frac{1}{x}\right)+1$
$= \left(\sqrt{2}-1\right)-\left(\sqrt{2}+1\right)+1 = -1$. Hence, option (b).

Directions for questions 34 to 37: Answer the questions on the basis of the information given below.

The following bar chart shows the number of students in all the different classes of DP school in two consecutive years, Year 1 and Year 2 respectively.



It is also known that,
i) New students join the school only in the class VII.
ii) No student leaves the school before passing out from class XII.
iii) The students who failed in a class have to study the same class again.

34. If no students of class XI failed in year 1, then what is the pass percentage of class XII for year 1? (EASY)

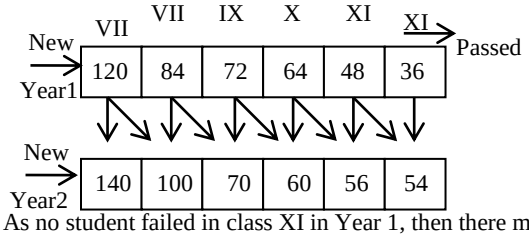
a) $22\frac{2}{9}\%$ b) $16\frac{2}{3}\%$ **c) 83⅓%** d) $77\frac{7}{9}\%$

35. How many students of class IX failed in the year 1, if no student of class XI failed in the year 1? (EASY)
a) 12 **b) 20** c) 10 d) none of these

36. If no student of class XI failed in year 1, then what is the total number of students of the school who failed in that year?
a) 106 b) 115 **c) 122** d) 130 (MEDIUM)

37. If 62 students failed in class VII in Year 1, then how many students were promoted from VIII to IX in this year?
a) Not possible b) 20 **c) 42** d) Cannot be determined

Solution for question 34 to 37:
From the given information, any student from any class, if he/she fails will be in the same class and otherwise, i.e., if he/she passes, will move on to the next class.
For example, any student of class VII, in the next year can either be in class VII or move on to class VIII.
If we tabulate all the given information



34. As no student failed in class XI in Year 1, then there must be 48 students in class XII in Year 2. As there are 54 students, so 54 – 48 = 6 students failed the examination in Year 1 of class XII.

$\Rightarrow$ Pass percentage = $\frac{30}{36} \times 100$

$= \frac{5}{6} \times 100 = 83\frac{1}{3}\%$

Choice (c)

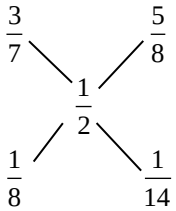
35. As no class 'XI student failed
All the 56 students of class XI of Year 2 are from class X of Year 1.
In class X, number of students failed in class X of Year 1 = 64 – 56 = 8.
In class IX, number of students failed = 72 – (60 – 8) = 20
Choice (b)

36. Counting from the solution to the previous question,
Number of students failed in class VIII = 34
Number of students failed in class VII
= 120 – (100 – 34) = 54
So, total number of failed students
= 6 + 8 + 20 + 34 + 54 = 122
Choice (c)

37. If 62 students failed in VII in Year 1, then number of students were promoted to VIII was 58, so, 42 students failed in VIII.
Hence 84 – 42 = 42 students promoted from VIII to IX in Year 1. Choice (c).

38. In what ratio should two vessels containing spirit and water in the ratio 3 : 4 and 5 : 3 are to be mixed if the third vessel is to contain spirit and water in the ratio 1 : 1.
a) 7 : 4 b) 4 : 7 c) 3 : 7 d) 7 : 3 e) 2 : 5

38.



= 7 : 4. Hence, option (a).

39. How many different permutations can be made out of the letters of the word, "ASSISTANTS" taken all together?

a) $10!$ b) $\frac{10!}{2!\ 2!\ 2!}$ **c)** $\frac{10!}{4!\ 2!\ 2!}$ d) $\frac{10!}{4!\ 4!\ 2!}$

39. (C) ASSISTANTS
No. of letters = 10
S = 4; A = 2; T = 2
$\therefore$ Arranged in = $\frac{10!}{4! \times 2! \times 2!}$ ways

40. The domain of $\sin^{-1}[\log_3 (x/3)]$ is

a) [1, 9] b) [-1, 9] c) [-9, 1] d) [-9, -1]

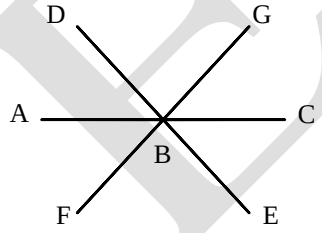
40. (a). $f(x) = \sin^{-1}\left(\log_3\left(\frac{x}{3}\right)\right)$ exists

if $-1 \le \log_3\left(\frac{x}{3}\right) \le 1 \Leftrightarrow 3^{-1} \le \frac{x}{3} \le 3^1$

$\Leftrightarrow 1 \le x \le 9$ or $x \in [1, 9]$

Section II – Quantitative Aptitude (Non MCQ) – 20 qs (Time – 40 min)

41. In the given figure, if $\angle DBG$ is equal to 55° and $\angle CBF$ is equal to 115°, then what is the value of $\angle EBC$ (in Degree)?



a) 70 b) 30 c) 80 **d) 60**

41. (d).
As two straight line DE and FG meeting at point B, then $\angle DBG = \angle EBF$.
$\therefore \angle EBF = 55°$
And $\angle FBC = 115°$
$\therefore \angle CBF = 115° - 55° = 60°$

42. The number of solutions for the equation $7x + 13y = 157$, where x and y are natural numbers, is:

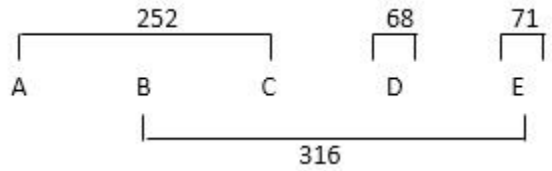
a) 4 b) 1 **c) 2** d) infinite

42. Hence option (c).

43. In the land of the Heavyweights the average weight of 3 men A, B, C is 84 kgs. Another heavyweight D joins the group and the average now becomes 80 kgs. If another man E, whose weight is 3 kgs more than that of D, replaces A, then the average weight of B, C, D, E becomes 79 kgs. Find the weight of the A (in Kg).

a) 68 b) 71 c) **75** d) 80 e) 72

43. **Short Cut :** Need to show that draw the chart shown below



Weight of B & C => 316 – [68 + 71] => 177 kg
So weight of A => 252 – 177 => 75 Kg.

Short Cut :
The weight of D would be 80 – (3 × 4) = 68, therefore the weight of another person would be 3 kgs more than D i.e. 71 kgs. Now if this man replaces A and the group average of 4 decreases by 1 then the weight of A should be 4 kgs more than this man, i.e. 75 kgs.

44. The difference between two numbers is 1365. When larger number is divided by the smaller one, the quotient is 6 and the remainder is 15. The smaller number is –

a) 240 b) 360 **c) 270** d) 295

44. (c) Let the smaller number = x
Then larger number = (x + 1365)
∴ 6x + 15 = x + 1365
⇒ 6x – x = 1365 – 15 ⇒ 5x = 1350 ∴ x = 270

45. Given that the unit digit of (1 + 2 + 3 + …..+ 1997 + 1998 + 1999 + 1998 + 1997+ …..+ 3 + 2 + 1 is P, find the value of P.

a) 1 b) 2 c) 3 d) 7

45. 2(1+2+….+1998) + 1999
= 1998 × 1999 + 1999 = 1999 × 1999
⇒ unit digit (P) = 1

46. The product of three consecutive integers is 720, then their sum is –

a) 27 b) 45 c) 18 d) 54

46. (a) Let three numbers are (x - 1), x, (x + 1)
∴ (x - 1). x. (x + 1) = 720
⇒x $(x^2 - 1)$ = 720 ⇒x^3 – x – 720 = 0
⇒$x^3 – 9x^2 + 9x^2 – 81x + 80x – 720 = 0$
⇒x^2 (x - 9) + 9x (x - 9) + 80 (x - 9) =0
⇒ (x - 9) $(x^2 + 9x + 80)$ = 0
∴ x = 9 [∵ $x^2 + 9x + 80 \neq 0$ for real x]
∴ Sum of the numbers = 8 + 9 + 10 = 27.

47. What is the sum of money on which the difference between the compound interest and the simple interest in 2 years is Rs. 15 at the interest rate of 5% p.a. (in Rs.)?

a) 7200 b) 4500 c) 3000 d) 1500 **e) 6000**

47. Let the required sum of money be *P*.
SI Here, $R = 5$, $T = 2$.

So, $I = \frac{P \times R \times T}{100} \Rightarrow I = \frac{P \times 5 \times 2}{100} = \frac{P}{10}$. So, the simple interest = $\frac{P}{10}$.

CI Here, $r = 5$, $n = 2$.

So, $I = P\left\{\left(1+\frac{r}{100}\right)^n - 1\right\} \Rightarrow I = P\left\{\left(1+\frac{5}{100}\right)^2 - 1\right\} = P\left\{\left(\frac{21}{20}\right)^2 - 1\right\} = \frac{41P}{400}$.

∴ the compound interest = $\frac{41P}{400}$.

From the question, $\frac{41P}{400} - \frac{P}{10}$ = Rs. 15 $\Rightarrow \frac{P}{400}$ = Rs. 15. $\therefore$ P = Rs. 6000. $\therefore$ the required sum of money is Rs. 6,000. Hence, option (e).

Alternate solution

SI × 5% = 15

$\therefore$ SI = $\frac{15\times100}{5} = 300$

So, sum of money = 300 × $\frac{100}{5}$ = Rs.6000

48. What is the highest power of 54 that divides 31! completely?

a) 0 b) 1 **c) 4** d) 5 e) 6

48. Power of 3 in 31! = $3^{14} = (3^3)^{14}. 3^2 = (27)^4.9$
54 = 27 × 2. Hence highest power of 27 is 4.

49. What is the remainder when $(10^3 + 9^3)^{752}$ is divided by 12^3?

a) 1 b) 729 c) 752 d) 1000 e) 752

49. $\frac{\left(10^3+9^3\right)^{752}}{12^3} \Rightarrow \frac{(1729)^{752}}{1728}$ =1. Hence, option (a).

50. p and q are two prime numbers such that p < q < 50. In how many cases would (q + p) be also a prime number?

a) 5 **b) 6** c) 7 d) 1 e) 4

50. The prime numbers of form p+q are :
{(2+3 = 5), (2 + 5 =7), (2 + 11 =13), (2 +17=19), (2+ 29 = 31), (2 + 41 = 43)}

51. A quadratic function $f(x)$ attains a minimum of –5 at x = 1. The value of the function at x = 0 is – 4. What is the value of $f(x)$ at x = 8?

a) 55 **b) 44** c) 33 d) 88 e) 99

51. $-\frac{b}{2a}$ =1 or –b = 2a
or a + b + c = –5
or a – 2a + c = –5 or c – a = – 5

f (0) = –4 or c = –4
or –4 –a = –5
or a = 1 and b= –2
so f (x) = x^2–2x–4
f(8)= 44. Hence, option (b).

52. If $\sin^2\theta + 3\cos\theta - 2 = 0$, then $\cos^3\theta + \sec^3\theta$ is equal to

a) 28 b) 9 c) 4 d) 0.75 **e) 18**

52. $\sin^2\theta + 3\cos\theta - 2 = 0 \Rightarrow \cos^2\theta - 3\cos\theta + 1 = 0$
$\therefore \cos^2\theta + 1 = 3\cos\theta$
$\therefore \cos\theta + \sec\theta = 3$
$\therefore \cos^3\theta + \sec^3\theta + 3.(\cos\theta + \sec\theta) = 27$
$\therefore \cos^3\theta + \sec^3\theta = 18$

53. Let k be a positive real number and let

$$A = \begin{bmatrix} 2k-1 & 2\sqrt{k} & 2\sqrt{k} \\ 2\sqrt{k} & 1 & -2k \\ -2\sqrt{k} & 2k & -1 \end{bmatrix} \text{ and } B = \begin{bmatrix} 0 & 2k-1 & \sqrt{k} \\ 1-2k & 0 & 2\sqrt{k} \\ -\sqrt{k} & -2\sqrt{k} & 0 \end{bmatrix}$$

If det (adj A) + det (adj B) = 10^6. Then [k] is equal to

[Note : adj M denotes the adjoint of square matrix M and [k] denotes the largest integer less than or equal k.]

53. $|A| = \begin{vmatrix} 2k-1 & 2\sqrt{k} & 2\sqrt{k} \\ 2\sqrt{k} & 1 & -2k \\ -2\sqrt{k} & 2k & -1 \end{vmatrix}$

$= \begin{vmatrix} 2k-1 & 0 & 2\sqrt{k} \\ 2\sqrt{k} & 1+2k & -2k \\ -2\sqrt{k} & 1+2k & -1 \end{vmatrix}$, $C_2 \to C_2 - C_3$

$= \begin{vmatrix} 2k-1 & 0 & 2\sqrt{k} \\ 4\sqrt{k} & 0 & 1-2k \\ -2\sqrt{k} & 1+2k & -1 \end{vmatrix}$, $R_2 \to R_2 - R_3$

$= (1 + 2k)(8k - 4k + 4k^2 + 1) = (2k + 1)^3$

Also $|B| = 0$ as B is skew symmetric of odd order.

$\therefore |\text{Adj } A| + |\text{Adj } B| = |A|^2 + |B|^2 = 10^6$

$\Rightarrow (2k + 1)^6 = 10^6 \Rightarrow 2k + 1 = 10 \Rightarrow k = 4.5$

$\therefore [k] = 4$

54. For positive real numbers x, y, z, find the min $(x+y+z)\left(\frac{1}{x}+\frac{1}{y}+\frac{1}{z}\right)$.

a) 1 b) $\sqrt{3}$ c) **9** d) 27

54. $(x+y+z)\left(\frac{1}{x}+\frac{1}{y}+\frac{1}{z}\right)$

We know, A.M. $\geq$ H.M.

$= \left(\frac{x+y+z}{3}\right) \geq \left(\frac{3}{\frac{1}{x}+\frac{1}{y}+\frac{1}{z}}\right)$

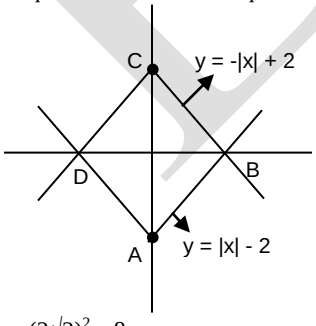
So, $(x+y+z)\left(\frac{1}{x}+\frac{1}{y}+\frac{1}{z}\right) \geq 9$

$\therefore$ The minimum value = 9. Option (c).

55. Calculate the area bounded by the curve y = |x| - 2 and y = -|x| + 2.

a) 4 b) $2\sqrt{2}$ **c) 8** d) None of these

55. Required area = area of square ABCD



$\therefore (2\sqrt{2})^2 = 8$

Hence, option (3).

56. If average of six consecutive even numbers are 31. Then what is the sum of smallest and largest numbers from the six numbers?

a) 52 **b) 62** c) 72 d) 80

56. (b) As the average = 31
∴ Numbers are 26, 28, 30, 32, 34, 36
∴ Sum = 26 + 36 = 62

57. Let P and Q be 3 × 3 matrices $P \neq Q$. If $P^3 = Q^3$ and $P^2Q = Q^2P$ then determinant of $(P^2 + Q^2)$ is equal to :

a) -2 b) 1 **c) 0** d) -1

57. (c). Given $P^3 = Q^3$ ……(1)
And $P^2Q = Q^2P$ ……(2)
Subtracting (1) and (2), we get
$P^3 - P^2 Q = Q^3 - Q^2P$
$\Rightarrow P^2 (P - Q) + Q^2 (P - Q) = 0$
$\Rightarrow (P^2 + Q^2) (P - Q) = 0$
$\Rightarrow |P^2 + Q^2| = 0$ as $P \neq Q$

58. Bottle A contains 100 ml of milk and bottle B contains 100 ml of water. 5 ml of water is poured from bottle B to A and mixed well. Then pour back from A to B so that again each contains 100 ml of liquid.
Then,

1. **fraction of water in A is equal to fraction of milk in B**
2. fraction of water in A is more than fraction of milk in B
3. fraction of water in A is less than fraction of milk in B
4. It depends on how well the contents were mixed

Choose the right one

a) 1 b) 2 c) 3 d) 4

58. (a) Initially, A contains 100 ml of pure milk.
B contains 100 ml of pure water.
After one transaction,
A contains 105 ml of milk & water in 20 : 1 ratio & B contains 95 ml of water.
After second transaction, A contains 95.24 ml. of milk & 4.76 ml. water
B contains 95.24 ml. of water & 4.76 ml. milk.

59. A can finish a job in 12 days and B when working at twice his efficiency finishes a job in 9 days. How many days will they take if they work for two days alternately working at their standard rate given that A starts first?

a) 4 b) 12 **c) 14** d) 16

59. A finishes the job at standard rate in 12 days. So in 1 day, the part of job done by A = $\frac{1}{12}$

Similarly the part of job done by B in day = $\frac{1}{2\times 9} = \frac{1}{18}$

If A works for 2 days followed by 2 days of B at standard rate.

Part of work done = $\frac{2}{12}+\frac{2}{18}=\frac{1}{6}+\frac{1}{9}=\frac{6+4}{36}=\frac{5}{18}$

So, in (2 alternate days work of 'A' and 'B') 3 × 4 = 12 days,

they will finish $3\times\frac{5}{18}=\frac{15}{18}$ th of the work.

Work Remaining = 1 - $\frac{15}{18}=\frac{3}{18}=\frac{1}{6}$

This is finished by A alone in $\frac{1}{\frac{6}{12}}$ = 2 days.

Hence, total number of days = 12 + 2 = 14 days. Hence, [3].

60. Two arithmetic progressions AP_1 and AP_2 are as below.

AP_1 : 11, 17, 23, ……., 425.

AP_2 : 19, 24, 29, ……, 429.

Find the number of common terms.

a) 10 b) 13 **c) 14** d) None of these

60. We need to find first common term and difference between two consecutive common terms, as it will be another arithmetic progression.
First common term : 29
Gap between two common term = LCM of two common difference
$= 5 \times 6 = 30.$
So common terms are 29, 59, 89 …….
Now last common term before 425 is the last divisible by 30 just before (425 - 29) which is 390.
So $29 + 30 (n - 1) \leq 425$
$\Rightarrow 30 (n - 1) \leq 396$
$\Rightarrow 30 (n - 1) = 390$
$\Rightarrow n = 14$
Hence 14 common terms. Option (c).

Section III – Verbal Ability – 40 Qs (Time – 40 min)

Directions for questions 61 to 66: Read the following passage carefully and answer the questions below it. Certain words are given in bold to help you locate them while answering some of the questions.

By the time a child is six or seven she has all the essential avoidances well enough by heart to be trusted with the care of a Younger child. And she also develops a number of simple techniques. She learns to weave firm square balls from palm leaves, to make pinwheels of palm leaves or frangipani blossoms, to climb a coconut tree by walking up the trunk on flexible little feet, to break open a coconut with one firm well-directed blow of a knife as long as she is tall, to play a number of group games and sing the songs which go with them, to tidy the house by picking up the litter on the stony floor, to bring water from the sea, to spread out the copra to dry and to help gather it in when rain threatens, to go to a neighboring house and bring back a lighted faggot for the chief's pipe or the cook-house fire.

But in the case of the little girls all these tasks are merely supplementary to the main business of baby-tending. Very small boys also have some care of the younger children, but at eight or nine years of age they are usually relieved of it. Whatever rough edges have not been smoothed off by this responsibility for younger children are worn off by their contact with older boys. For little boys are admitted to interesting and important activities only so long as their behavior is **circumspect** and helpful. Where small girls are **brusquely** pushed aside, small boys will be patiently tolerated and they become adept at making themselves useful. The four or five little boys who all wish to assist at the important, business of helping a grown youth lasso reef eels, organize themselves into a highly efficient working team; one boy holds the bait, another holds an extra lasso, others poke eagerly about in holes in the reef looking for prey, while still another tucks the captured eels into his **lavalava**.

The small girls, burdened with heavy babies or the care of little staggerers who are too small to adventure on the reef, discouraged by the hostility of the small boys and the scorn of the older ones, have little opportunity for learning the more adventurous forms of work and play. So while the little boys first undergo the chastening effects of baby-tending and then have many opportunities to learn effective cooperation under the supervision of older boys, the girls' education is less comprehensive. They have a high standard of individual responsibility, but the community provides them with no lessons in cooperation with one another. This is particularly apparent in the activities of young people: the boys organize quickly; the girls waste hours in **bickering**, innocent of any technique for quick and efficient cooperation.

61. What is the underlying motive of the passage?
    a) **To discuss elaborately differences in the upbringing of girls and boys**
    b) To ignore the education of girls
    c) To depict a day in the life of an average young girl
    d) To demarcate the role of young girls
    e) Only (a) & (c)

62. The techniques in paragraph one can be described as
    a) household chores b) elementary physical skills c) basic responsibilities
    d) **important and practical social skills** e) None of these

63. The passage states that a child of six or seven is
    a) matured enough to handle all tasks
    b) forcibly entrusted with responsibilities
    c) whimsical d) subjected to exploitation
    e) None of these

64. Which one of the following statements best points out the distinction between boys and girls?
    a) But in the case of the little girls all these tasks are merely supplementary to the main business of baby-tending
    b) Very small boys also have some care of the younger children, but at eight or nine years of age they are usually relieved of it.
    c) Where small girls are brusquely pushed aside, small boys will be patiently tolerated and they become adept at making themselves useful.
    d) The small girls, burdened with heavy babies or the care of little staggerers who are too small to adventure on the reef, discouraged by the hostility of the small boys and the scorn of the older ones, have little opportunity for learning the more adventurous forms of work and play.
    e) None of these

65. The author has used the ……technique in handling the above passage.
   a) description and interpretation of observations
   b) Presentation of facts without comment.
   c) Description of evidence to support a theory.
   d) Generalization from a particular viewpoint.
   e) None of these

66. From the passage it can be said that
   a) the upbringing of a child is area specific
   b) a child's psychology is governed by the society he/she lives in
   c) parents are responsible for their wards well- being
   d) a girl child is neglected e) Only (a) & (c)

61. a. It is to highlight the discrimination in upbringing between boys and girls
62. d. These skills refer to the helpful social skills necessary in performing daily activities
63. a; the first line of the passage testifies the answer.
64. d; the statement distinctly highlights the roles and responsibility of the girls compared to that of the boys
65. a. The author presents facts about the boys and girls and the differences between their education and development. These facts are then interpreted and analyzed and further inferences are drawn from them. Such inferences are "This is particularly apparent in the activities of young people: the boys organize quickly; the girls waste hours in bickering, innocent of any technique for quick and efficient cooperation". Thus the author uses description and interpretation. Thus option (1) is the correct answer. As there are personal and subjective inputs from the author, there is some commentary and thus (2) is wrong. No particular theory is proposed and thus (3) is wrong. There is no use of generalization as evident from the passage. Thus (4) is also wrong. Hence (1).
66. d. The given passage maps the progress of a girl child in early years of her development. The series of events bear a testimony to the above statement.

Directions for questions 67 to 72: Read the following passage carefully and answer the questions below it. Certain words are given in bold to help you locate them while answering some of the questions.

Let's get one thing clear at the outset: if there has been a budget in recent times that deserves to be called a game-changer, then that was the one for 1991. It was a do-or-die situation. Foreign exchange reserves had hit rock-bottom. Part of the gold reserves had to be **mortgaged.** The economy was in **shambles**. Both government and private industry were in a curious stupor. The Narashima Rao leadership felt that only one way was still left to explore – the way that China had adopted 13 years ago and found success: reforms. Rajiv Gandhi read the writing on the wall but he couldn't get cracking. The Rao-Singh team did it, and India hasn't looked back since. The India story at the beginning of the second decade of the century has been different, and the thrust, as well as, the quality of the budget had to be different. Most budgets – not excepting the latest one- tend to be occupied with what can be called issues of the day. The major ones among them could be listed as inflation particularly food inflation, **rampaging black** money, raging unemployment, and the lack of a **zing** in infrastructure development. On top of all this comes the sign of an aborted trickle-down effect that seems to have been waylaid in midway by vested interests, taking advantage of the shortcomings of the governance. The result has been intense **deprivation** of those at the bottom of the pyramid.
Budget 2011 has addressed these issues. The social sector allotment has been hiked by 23%. The total outlay meant for it exceeds what has been **earmarked for** defence. This would mean more funds for health, education and housing. The food and fertiliser subsidies have been left largely untouched. There has been an equally sharp rise in infrastructure investment**.** If even a reasonable part of these large funds finally comes to the desired beneficiary and is deployed with reasonable probity, there would be a major change at the grassroots level. Pranab Mukherjee expects the new unique identification number also to help matters.
The finance minister, a veteran of many battles, has been aware of the odds that face any such task. He has changed tack and suggested direct cash transfer to the targeted sections in some items. If it works, nothing like it. But cash is a deadly thing. It is prone to get lost all too easily. In any case, it will take quite a few years before the results show up.

67. Which of the following can be inferred from the passage?
   a) Infrastructure investment has found new lease of life.
   b) Reforms are the key words in Budget 2011.
   c) Most budgets suffered from loop holes.
   d) Budget 2011 has been inspired by Rao Singh team.
   e) None of these

68. Which one of the following is not true in the context of the passage?

a) China's adaptability to different social strata is the secret of a healthy economy.
b) The year 1991 was a tough situation for India
c) Rajiv Gandhi could not steer pass India to a better economic scenario.
d) Budget 2011 cannot possibly address any sensitive issues.
e) None of them.

69. Which of the following is true in the context of the passage?
a) Indian Budgets were all tactfully handled.
b) Cash in the only remedy for all sectors.
c) The government and the private sector performed miraculously in 1991.
d) The food and agriculture subsidies have not been addressed in this budget.
e) None of these.

70. The author's main objective in writing this passage is
a) To project how the year 1991 gave India a new turn in its economy.
b) To differentiate between the Budget 1999 and the budget 2011.
c) To show the characteristics of the budget in general.
d) To analyze the budget 2011-12.
e) None of these

71. According to the passage, which one of the following is a limitation?
a) **If funds could only get channelized to the desired** beneficiary & be deployed with reasonable probity.
b) Direct cash transfer to the targeted section in some cases.
c) Cash is prone to get lost all too easily.
d) Budgets in the past tended to be occupied with major issues only.
e) None of these.

72. What could be the prime cause of "intense deprivation at the bottom of the pyramid"?
a) Most Budgets tend to be occupied with the conventional issues.
b) Some people have banked upon the shortcomings of the government.
c) Unemployment is the root cause of all trouble.
d) With the passage of time, sensitive & latest issues have been overlooked.
e) None of these

67. (e) None of these; budget 2011-12 has addressed the deprived issues. These issues have been enveloped by major issues like inflation, black money, food inflation and other related criteria .The above statements are inherent parts of the budget 2011-12.
68. (d). This statement is not true in the context of the passage. Budget 2011 has actually addressed these sensitive issues to alleviate intense deprivation at the bottom of the pyramid.
69. (d). The food and fertiliser subsidies have not been touched. They remain unchanged. Other information furnished above is not true in the context of the passage.
70. (d). The only objective of the author is to analyse the pros & cons of the Budget 2011-12
71. (a). If we discuss limitation from the contextual point of view, than (1) is viable. Budget can only get executed properly if this limitation is taken care of.
72. (d) Most Budgets were occupied with all time major issues; in doing so they have neglected the latest ones. Eventually persistent ignorance has led to intense deprivation at the bottom of the pyramid. Other sentences are also factors in segregation.

Directions for questions 73 to 78: Indicate which phrase, clause or sentence you consider the most appropriate to complete the following incomplete sentence.

73 His speech was optimistic, but at the end of it
a) he struck a note of caution. b) I am as fit as a fiddle.
c) he steered a steady course. d) he lay on a bed of roses.

73. (c). The use of the word "but" suggests that there must be something antonymous to optimistic at the "end of it". From the given options, the best one is (a). 'a note of caution' means being cautious as opposed to being optimistic. "fit as a fiddle' means to be in perfect health. 'steer a steady course' means to be unwavering in action or thought. "a bed of roses' means having excessive luxury or being coddled and spoilt by not facing any hardship. None of these fit the aforementioned context. Hence (c). [VA / Phrasal Usage / Medium]

Directions for questions 74 - 78 : Select the option that best expresses the phrasal usage from the given choices.

74. a) He said that may God pardon this sinner.
b) **He prayed that God may pardon the sinner.**
c) He said that God might pardon the sinner.

d) He prayed that God might pardon that sinner.

74. (b). The correct usage will be the use of "may" with "pardon the sinner". It represents a prayer to God. "may God…" in (a) should be expressed with quotation marks. "God might" in (c) and (d) suggest actual choice with God. Reference to God is in the form of an abstraction, and cannot give the sense of actual choice or ability. [VA / Phrasal Usage / Medium]

75. a) The teacher said to us that the prize will be presented tomorrow.
b) The teacher told us that the prize will be presented tomorrow.
c) **The teacher told us that the prize would be presented tomorrow.**
d) The teacher told to us that the prize would be presented the next day.

75. (c). The part of the statement that follows "told us" refers to a past tense, as in a past statement. Thus the past form "would" is the most appropriate use. By the same reasoning "the prize will…" from (a) and (b) requires the use of quotation marks. "told to us" from (d) is redundant. "told us" is sufficient. Hence (c). [VA / Phrasal Usage / Tough]

76. a) He said that fie what a heinous crime you have committed.
b) He said fie and further remarked that what a heinous crime he had committed.
c) He expressed his contempt and remarked that he had committed a heinous crime.
d) **He exclaimed with disgust that he had committed a heinous crime.**

76. (d). The statement in (d) connects "disgust" and "committed" directly. (c) is close but separates the sense of "expressed" and "remarked" with "and". Moreover, as compared to (d), (c) is verbose. Both (a) and (b) make use of phrases that would require quotation marks. Hence (d). [VA / Phrasal Usage / Tough]

77. a) The hermit said that let his will be done, O God.
b) The hermit wished that O God let thy will be done.
c) **The hermit wished that God's will be done.**
d) The hermit wished the will of God might be done.

77. (c). The phrases following "that" in (a) and (b) require quotation marks. "might be done" in (d) suggests someone else, in particular, doing God's will. This distorts the connotation. (c) is perfectly stated. Hence (c). [VA / Phrasal Usage / Medium]

78. a) The Englishman said that God bless you, my good boy.
b) **The Englishman prayed that God bless his good boy.**
c) The Englishman prayed to God to bless the good boy.
d) The Englishman prayed to God that to bless the good boy.

78. (b). It is the most concisely constructed statement. The end phrase of the statement in (a) is a quotation and cannot follow "said that", it requires quotation marks. (c) is unnecessarily wordy. In the given context, "prayed to God to" is an excessive usage. "that to bless" in (d) causes it to become a modifier, thus causing the statement to become incomplete. Hence (b). [VA / Phrasal Usage / Medium]

Directions for questions 79: Read the statement given in the following questions carefully and find out how many errors, if any, are present in them. Ignore any errors of punctuation.

79. Riches naturally gain a man a favorable reception in the world, and gave merit a double luster, when a person is endowed with them; and supply its place, in a great measure, though it is absent.

a) 0 b) 2 **c) 3** d) 4

79. There are three errors. In "and gave merit a double", the use of past tense gave is wrong, as it is speaking of a general condition, and not a particular time of action. Thus following "gain a man" the correct usage will be "and give merit".
In "…endowed with them" them seems to speak of riches, but we see that riches cannot be given a double luster, rather it speaks of merit. And thus it should be singular "endowed with it".
At the end, "though" is wrongly used. By the logic of the statement it presents two alternatives. The most fitting conjunction will be "and".

Directions for questions 80: Choose the sentence which is grammatically incorrect.

80. A. Justice in a capitalist society, today as is always an ideological and practical instrument in class strength.
B. The problem with the concept of justice is that it is fundamentally a judicious or legal concept.
C. It is common for philosophers to ridicule, as woolly, the arguments of people that one position in some deep controversy has the better of the case.
D. The Orkney islands were formerly dependencies of Norway and Denmark.

a) A, C b) A, B, C **c) A, B** d) A, C, D

80. (c) is the correct answer because (A) should be "justice…… today as has been always. The sentence should be in present perfect form and not in simple present form. In (B) the word will be 'juridical' or judicial which means connected to law.

81.

82.

83.

84.

Direction for questions 86 and 87: For each of the following questions complete the given sentence with the best possible option.

86. Bonded labour has existed in India for centuries (……) The system grew out of extreme poverty and helplessness of S.C., adivasis and tribes.
a) The adivasis who are chiefly bonded labor have depended on wage income.
b) One item of 20 point economic programme was abolition of bonded labor.
c) It came as a great surprise to most urban dweller, that millions of landless labors were slaves.
d) **It is a peculiar phenomenon** of our agricultural economy.

86. We may take it that the shortest way for a tyrant to get rid of a troublesome champion of liberty is to raise a huge cry against him as an unpatriotic person, and have the mob to do the rest after supplying them with a well tipped ringleader. (……..)
a) Those who put their faith in it soon find that proletariats are never revolutionary and that their direct action, when it is controlled at all is controlled by the police.
b) Now comes the question, if we cannot govern ourselves what can we do to save ourselves from being at the mercy of those who can govern.
c) This is complete harmony with a radical but a more poetic conception of democracy.
d) **None of these**.

86. In the statement following the blank the words "first strike objective" and "retaliatory" connect to "priority hit list" in (c). Hence (c). [First statement / Keyword / Easy]

87. The statement before the blank establishes Bush's perception of his actions against Iraq. The line following blank presents a comparative example for the justification of said actions. Thus the blank must contain a line that primarily justifies the actions. Questions don't fit into the blank, thus (a) and (d) can be eliminated. (c) does not connect to the preceding statement as it speaks of "it" which cannot refer to "actions". Hence (b). [Mid statement / Logical / Medium]

Directions for questions 87: Each of the following questions has a paragraph from which one sentence has been deleted. From the given options, choose the one that completes the paragraph in the most appropriate way.

87. At age 29, Pervez, a young Parsi women, decides to leave her Goan musician husband and return to city her birth, Mumbai. (…….). But Pervez is determined to live on her terms. Unable to fit into the social whirl gig of Marine Drive, she prefers to move to Kalian and start an MA in psychology.
a) To the traditional Parsi relatives of Pervez, this is a social blasphemy and she comes in for some castigation.
b) **This was something unheard of in her community** and led to Pervez being immediately ostracized.
c) She did this quite reluctantly keeping in mind the conservative sensibilities of her community.
d) To the conservative Parsi community obsessed with success, Pervez is a failure, neither educated nor rich nor married.

Directions for questions 88: Fill in the blanks with the most appropriate set of words.

88. The Prime Minister announced that as the country is financially hard pressed _____ at all levels is _____.
a) paucity, avoidable
b) bankruptcy, expected
c) **austerity, urged**
d) sacrifice, discouraged

Directions for questions 89 to 92:

89. The self-immolation and the protests would appear to _____ that anger is growing in Aba prefecture, a mainly ethnic Tibetan part of the southwestern province of Sichuan that has been the centre of defiance of Chinese _____.
A. signal, control B. move, attack C. point out, regime D. generalize, power
a) Only A b) Only B c) **Both A and C** d) Both B and D e) All of the above

90. A brief biography on the website of a campaign for his freedom was all that the Israelis _____ of the life of Gilad Shalit until he appeared, gaunt and tired, on television after Gaza's Islamist Hamas rulers _____ him from five years' captivity.

A. thinking, imprisoned B. knew, freed
C. assorted, enrolled D. acknowledged, released

a) Only A **b) Only B** c) Both A and B d) Both B and D e) All of the above

91. The 'shortage occupation list' is a list of jobs where Britain _____ non-EU professionals to come to the country and take up _____.

A. allows, employment B. permits, jobs
C. consents to, engagements D. admits, appointments

a) Only A b) Only B **c) Both A and B** d) Both B and D e) All of the above

92. In a country _____ by a phalanx of indomitable ladies, women's empowerment has _____ some muscle because of Bhim Singh.

A. ruled, achieved B. run, gained
C. governed, acquired D. struck, earned

a) Only A b) Only B c) **A, B and C** d) B, C and D e) All of the above

89. (c) We can see from the given choices that (A) fits the given statement, as the protests are 'signaling' the growth of anger in the Tibetan province. And also the sense that we get from the second blank is that this province is the centre of defiance of Chinese "control". From (B) the first word "move" does not fit with "protests appear to…". Also the second word "attack" does not fit against "defiance". Hence (B) is incorrect. (C) also fits as "point out" is very close in meaning to "signal" and thus the "protest appear to point out", makes perfect sense. Also "regime" works perfectly against "defiance". (D) is also wrong as "power" works with "defiance", but "the protests would appear to generalize" makes no sense. Hence (A) and (C) are correct choices. Hence (3).

90. (b) Checking for the second blank through the answer choices will make the question easier. The blank is followed by "from", and so only two choices work, (B) and (D). (A) and (C) don't work as "he" cannot be "imprisoned from" or "enrolled from" "captivity". Then checking for the first blank, we can conclude that (D) also is wrong. It follows from "…a campaign for his freedom…" that "acknowledged" means a cover-up, which does not fit with "freedom". The only fitting choice then is (B) which conveys the meaning that the Israelis "knew" little about Giled Shalit, until he appeared after being freed from five years of captivity. Hence (2).

91. (c) Going by the first blank we can eliminate choice (D), as "…where Britain admits non-EU professionals to come to the country and…" does not make any sense. By the second blank, (C) also can be eliminated as, taking up "engagements" is by direction a wrong usage, of the word.

(A) and (B) both work as "allows" and "permits" both are very close in meaning and fit the first blank perfectly against "Britain". Also "employment" and "jobs" are very close to each other in meaning and fit perfectly against "and take up" which requires a word for 'work'. Hence (3).

92. (c) Checking by the first blank we can answer the question, as all the words in the given choices fit in the second bank. The second blank may take "achieved", "gained", "acquired" and "earned" as they mean roughly the same thing. Thus the word's for the first blank are the answering criteria.

(A), (B) and (C) all fit as once again "ruled", "run" and "governed" are all synonymous and thus all three give the correct sense. (D) is wrong as "a country struck by…" makes no sense. Hence (3).

Directions for questions 93 to 96: Each sentence has some underlined/highlighted word(s). Find a suitable replacement, if required, from the options given. (e) will be the answer if no correction is required.

93. He was told that his cousin was in hot water over that issue.

a) in better situation b) in depression c) in congenial way
d) at across **e) No correction required**

94. Mr. Roy is still in vigorous health, although he is on the wrong edge of sixty.

a) in the wrong part **b) on the wrong side** c) on the wrong part of sixty
d) at the wrong side e) No correction required

95. That solicitor is guilty <u>about sharp practice</u>

a) in sharp practice b) about sharp practice c) at sharp practice
d) of sharp practice e) No correction required

96. As an author he has often <u>snapped their toes in</u> convention.

a) snapped his toes b) snapped his fingers with **c) snapped his fingers at**
d) snapped their fingers in e) No correction required

93. (e). No correction required.
94. (b). on the wrong side.
95. (d). of sharp practice.
96. (c). snapped his fingers at.

<u>Directions for questions 97:</u> Read each sentence to find out whether there is any error in it. The error, if any, will be in one part of the sentence. The number of that part is the answer. If there is no error, the answer is (e). (Ignore the errors of punctuation, if any).

97. (a)There was no discrimination, **(b) as the court observed**, as facilities are (c) given and expenditure incurred by (d) central and state governments for other religions, too (e) no error

97. The error lies in segment 2; the correct form is : <u>the court observed</u>

<u>Direction for questions 98 to 100</u> : Given below are a number of sentences. Sentences 1 and 6 are fixed. The sentences marked A, B, C, D have been jumbled. Arrange them in the right order to make meaningful paragraphs.

98. 1. The term "informal sector" was first used by Keith Hart in his influential paper on urban unemployment in Ghana (1970).

A. There are no guidelines that show how to classify activities that have some characteristics of both sectors and hence the division is said to be logically inconsistent.

B. No one definition of the informal sector is accepted by all. The informal-formal sector classification has been criticized for a number of reasons – it is said to be crude, simple and vague.

C. Investigators using the dualistic classification assume that the formal and informal sectors are independent when in fact there is continuous interaction between them. Finally, the urban informal sector and the urban poor are considered as synonymous.

D. There is still a lot of controversy regarding the formal-informal sector classification.

6. But not all people in the informal sector are poor, and neither are all poor people in the informal sector.

a) BADC **b) DBAC** c) DBCA d) ACDB

98. The correct sequence is DBAC. D speaks of the (formal) informal sector, defined in (1). B concludes from this stating there is no commonly accepted definition, while introducing the formal sector. A echoes the factor of "crude, simple and vague" from B in "no guidelines". Finally C brings in "dualistic classification" to round of the argument. (6) continues the decision of "informal" and "poor". [6 liner (1ABCD6) / Logical / Hard]

99. 1. The train had just left Nagpur.
A. The horizon lay interspersed with silken clouds – plain white balls of unblemished cotton.
B. It would be some time before it reached Hyderabad, my destination.
C. It was as if I was in the midst of a celestial play.
D. The deep blue sky spread over the craggy Deccan expanse.
6. The sun was at its playful best.

a) ADCB b) BCDA c) ACBD **d) BDAC**

100. 1. Blind courage is an animal virtue.
A. It is indispensable in a world full of dangers an evils.
B. Such animals courage seems therefore beautiful rather than cruel or desperate.
C. And, being the lowest and most instinctive of virtues, it is the one most widely admired.
D. A certain insensibility and dash are requisite to skirt the precipice without vertigo.
6. But it ceases to be, when the love of danger begins to lead men into evils which are unnecessary to face.

a) ADBC b) ABCD c) BDAC d) DCAB