

## ANSWER KEY

Q.	Ans.
1	2
2	5
3	4
4	5
5	4
6	4
7	3
8	1
9	1
10	4
11	1
12	1
13	4
14	4
15	1
16	5
17	3
18	5
19	2
20	4
21	4
22	3
23	2
24	3
25	3
26	5
27	1
28	2
29	1
30	2

Q.	Ans.
31	3
32	5
33	3
34	2
35	1
36	5
37	4
38	3
39	2
40	2
41	2
42	
43	
44	4
45	5
46	1
47	2
48	4
49	1
50	5
51	3
52	2
53	5
54	4
55	5
56	1
57	4
58	4
59	5
60	2

Q.	Ans.
61	2
62	1
63	5
64	5
65	5
66	5
67	3
68	4
69	3
70	2
71	4
72	5
73	3
74	5
75	1
76	2
77	4
78	2
79	5
80	5
81	4
82	1
83	4
84	3
85	4
86	5
87	3
88	3
89	5
90	4

Q.	Ans.
91	3
92	2
93	3
94	4
95	3
96	5
97	5
98	4
99	2
100	2

## Detailed Solutions:

1. The data can be tabulated as follows:

Year	Assets	Sales (% of Assets)	Sales	CSR (% of Sales)	CSR Spending	CSR/Assets
2004	$100 \times 10^7$	0.6	$60 \times 10^5$	$1.67 = \frac{5}{3}$	$100 \times 10^3$	$1 \times 10^{-4}$
2005	$110 \times 10^7$	0.5	$55 \times 10^5$	2.09	$114.95 \times 10^3$	$1.045 \times 10^{-4}$
2006	$125 \times 10^7$	$0.64 = \frac{16}{25}$	$80 \times 10^5$	$2.5 = \frac{5}{2}$	$200 \times 10^3$	$1.6 \times 10^{-4}$
2007	$135 \times 10^7$	$0.67 = \frac{2}{3}$	$90 \times 10^5$	$2.22 = \frac{20}{9}$	$200 \times 10^3$	$1.48 \times 10^{-4}$
2008	$150 \times 10^7$	$0.8 = \frac{8}{10}$	$120 \times 10^5$	2.06	$247.2 \times 10^3$	$1.648 \times 10^{-4}$
2009	$160 \times 10^7$	$1.25 = \frac{5}{4}$	$200 \times 10^5$	1.58	$316 \times 10^3$	$1.975 \times 10^{-4}$

Hence, the increase in spending on CSR was the maximum in 2006.

Hence, **option 2**.

2. From the table in the answer to the first question, the ratio of CSR/Assets was the maximum in 2008 in the years given in the options.

Hence, **option 5**.

3. From the table in the answer to the first question, maximum spending on CSR was approximately 3 crore.

Hence, **option 4**.

4. From the table in the answer to the first question, it is clear that CSR Does not decreases over the specified period.

Hence, **option 5**.

5. The data can be tabulated as follows

Level	1	2	3	4	5
Requirements	55	65	225	255	300
Total Employees	52	65	210	130	330
Ex-Defence	6	8	30	25	60
Ex-Policemen	4	4	9	7	15
% Ex-Defence	11.54	12.31	14.2	19.23	18.18
% Ex-Policemen	7.69	6.15	4.28	5.38	4.54

From the table, the percentage of ex-defence servicemen is highest in level 4.

Hence, **option 4**.

Alternatively,

It is quite clear that the percentage of Ex-defence serviceman comes closer to 20 in level 4 and 5 only, while in other levels it is less than 15.

Now, as  $25 \times 330 > 60 \times 130$ , the percentage of Ex-defence servicemen is highest in level 4.

Hence, **option 4**.

6. From the table in the answer to the first question of the set, it is quite clear that level 4 will incur the highest reduction.

Hence, **option 4**.

7. From the table in the answer to the first question of the set, it is quite clear that Level three represents the lowest number of Ex-policeman.

Hence, **option 3**.

8. Out of the 10 houses, we first place the 7 houses in which the thief will not steal. There are 8 spaces in between and at either ends of these 7 houses where we can place the three houses in which he plans to steal. Thus, the three houses can be selected in  ${}^8C_3 = 56$  ways.

Hence, **option 1**.

9.  $x = (9 + 4\sqrt{5})^{48}$

$$\text{Let } y = (9 - 4\sqrt{5})^{48}$$

Now,

$$(9 + 4\sqrt{5})^{48} \times (9 - 4\sqrt{5})^{48} = (81 - 80)^{48} = 1 \quad \dots (i)$$

$$\text{Also, } (9 + 4\sqrt{5})^{48} + (9 - 4\sqrt{5})^{48}$$

$$= \left[ {}^{48}C_0 9^{48} + {}^{48}C_1 9^{47} (4\sqrt{5}) + {}^{48}C_2 9^{46} (4\sqrt{5})^2 + \dots + {}^{48}C_{47} (9)(4\sqrt{5})^{47} + {}^{48}C_{48} (4\sqrt{5})^{48} \right]$$

$$+ \left[ {}^{48}C_0 9^{48} - {}^{48}C_1 9^{47} (4\sqrt{5}) + {}^{48}C_2 9^{46} (4\sqrt{5})^2 - \dots - {}^{48}C_{47} (9)(4\sqrt{5})^{47} + {}^{48}C_{48} (4\sqrt{5})^{48} \right]$$

$$= 2 \left[ {}^{48}C_0 9^{48} + {}^{48}C_2 9^{46} (4\sqrt{5})^2 + \dots + {}^{48}C_{48} (4\sqrt{5})^{48} \right]$$

$$\therefore x + y = 2(k) = \text{even}$$

Now,

$$0 < 9 - 4\sqrt{5} < 1$$

$$\therefore 0 < (9 - 4\sqrt{5})^{48} < 1$$

$$\therefore 0 < y < 1 \quad \dots \text{(ii)}$$

$$\text{Also, } x = [x] + f, \quad 0 < f < 1 \quad \dots \text{(iii)}$$

$$\therefore [x] + f + y \text{ is even}$$

As  $[x]$  is an integer,  $f + y$  is an integer.

From (ii) and (iii)

$$0 < f + y < 2$$

$$\therefore f + y = 1$$

$$\text{Now, } x(1 - f) = xy$$

$$\text{But from (i), } xy = 1$$

$$\therefore x(1 - f) = 1$$

Hence, **option 1.**

10.  $a_{741}$  has 1 written 741 times.

$\therefore$  The sum of digits of  $a_{741}$  is divisible by 3.

$\therefore a_{741}$  is divisible by 3.

$\therefore a_{534}$  and  $a_{123}$  are also not prime by the same logic.

$\therefore$  (i), (ii), and (iii) are correct.

Option (4) can be safely assumed to be the correct option.

Hence, **option 4.**

11. Income = 3,37,425

Tax up to Rs. 1,90,000 = 0

Tax for the next Rs. 1,10,000 = 10% of 1,10,000

= Rs. 11000

Tax for the next Rs. 37425 = 20% of 37,425

= Rs. 7485

$\therefore$  Income tax = Rs 18,485

Education cess =  $18485 \times 0.02$

Secondary and higher education cess =  $18485 \times 0.01$ .

$\therefore$  Total income Tax payable =  $18485 + 18485 \times 0.02 + 18485 \times 0.01 = \text{Rs } 19039.55$

$$\therefore \text{Required percentage} = \frac{19039.55}{337425} \times 100 \approx 5.64\%$$

Hence, **option 1.**

12. Let Madan's income be  $(x + 5)$  lakhs.

Then his income tax =  $0 \times 160000 + 0.1 \times 140000 + 0.2 \times 200000 + 0.3 \times x = (54000 + 0.3x)$

Total tax payable including surcharges =  $1.03 (54000 + 0.3x)$

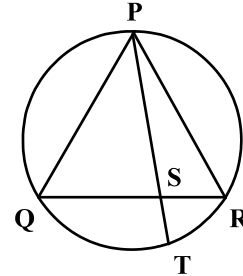
$$\therefore 317910 = 1.03 (54000 + 0.3x)$$

$$\therefore x \approx 848835$$

$$\therefore \text{Madam's income} = 848835 + 500000 = \text{Rs. } 1348835$$

Hence, **option 1.**

13.



As S is not the circumcentre,  $PS \neq ST$  and  $QS \neq SR$

$\therefore$  PT and QR are chords of the circle intersecting at S,

$$PS \times ST = QS \times SR \quad \dots \text{(i)}$$

We know that Arithmetic mean  $\geq$  Geometric mean

$$\therefore \frac{PS + ST}{2} \geq \sqrt{PS \times ST}$$

But as  $PS \neq ST$ ,

$$\frac{PS + ST}{2} > \sqrt{PS \times ST}$$

$$\therefore \frac{PS + ST}{2} > \sqrt{QS \times SR}$$

$$\therefore \frac{PS + ST}{2} > 2\sqrt{QS \times SR}$$

$$\therefore \frac{PS + ST}{PS \times ST} > \frac{2\sqrt{QS \times SR}}{QS \times SR}$$

$$\therefore \frac{1}{PS} + \frac{1}{ST} > \frac{2}{\sqrt{QS \times SR}} \quad \dots \text{(i)}$$

$\therefore$  Option 1 is false.

$$\text{Also, } \frac{QS + SR}{2} > \sqrt{QS \times SR}$$

$$\therefore \frac{2}{QR} < \frac{1}{\sqrt{QS \times SR}}$$

$$\therefore \frac{4}{QR} < \frac{2}{\sqrt{QS \times SR}}$$

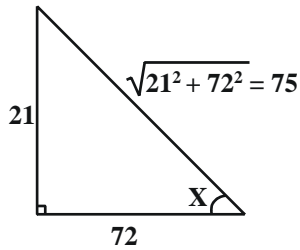
$$\therefore \frac{1}{PS} + \frac{1}{ST} > \frac{2}{\sqrt{QS \times SR}} > \frac{4}{QR} \quad \dots \text{From (i)}$$

Hence, **option 4.**

**Note:** As the result is a general one, we can, without loss of generality, consider an equilateral triangle PQR with point S being the mid-point of QR and verify all options using numbers.

14. Let  $f(X) = 21 \sin X + 72 \cos X$   
 $\therefore f'(X) = 21 \cos X - 72 \sin X$   
 At  $f'(X) = 0$   
 $21 \cos X = 72 \sin X$   
 $\therefore \tan X = \frac{21}{72}$

Drawing the corresponding right triangle we have the following:

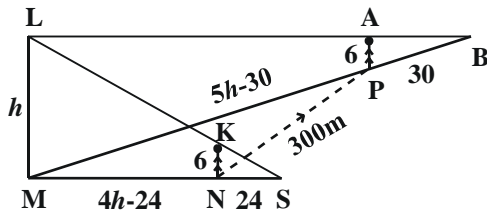


$\therefore f''(X) = -21 \sin X - 72 \cos X$   
 $= -21 \times \frac{7}{25} - 72 \times \frac{24}{25} < 0$   
 $\therefore f(X)$  has a maximum at  $f'(X) = 0$   
 $\therefore$  Maximum value of  $f(X) = 21 \times \frac{21}{75} + 72 \times \frac{72}{75} = 75$

Hence, **option 4.**

15. Required probability =  $(1 - 0.418) (1 - 0.612) (1 - 0.355) (1 - 0.520) \approx 0.069$   
 Hence, **option 1.**

16.



Let LM denote the light house of height  $h$  above the sea level.  
 Let KN denote the man and MN denote the south direction.  
 NS is the shadow of the man.  
 Then,  $KN = 6, NS = 24$   
 Also,  $\angle KNS = 90^\circ$  and  $\angle LMS = 90^\circ$ .  
 By similarity of  $\triangle LMS$  and  $\triangle KNS$ ,

$\frac{LM}{MS} = \frac{6}{24} = \frac{1}{4}$

$\therefore$  If  $LM = h, MS = 4h$  and  $MN = 4h - 24$

The boat moves from N to P along the east.

$\therefore NP = 300$

The man's new position is AP.

$\therefore AP = 6, PB = 30$

$\triangle APB \sim \triangle LMB$

$\therefore \frac{LM}{MB} = \frac{6}{30} = \frac{1}{5}$

$\therefore MP = 5h - 30$

But  $MN^2 + 300^2 = MP^2$

$\therefore 16(h - 6)^2 + 300^2 = 25(h - 6)^2$

$\therefore 300^2 = 25(h - 6)^2 - 16(h - 6)^2$

$\therefore 90000 = 9(h - 6)^2$

$\therefore h = 106$

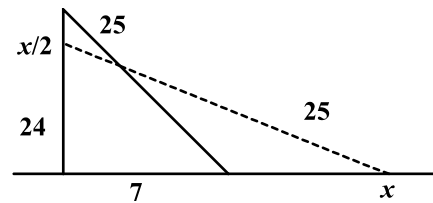
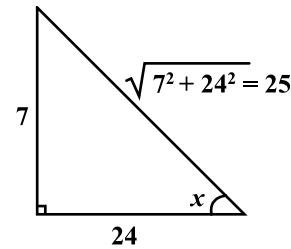
Hence, **option 5.**

17. Refer to the answer to the first question of this set.

The horizontal distance of the man from the light house in the second position =  $5h - 30 = 500$  m

Hence, **option 3.**

18.



Let the base is drawn by  $x$  unit.

$\therefore$  Height of top of the ladder will decrease by  $\frac{x}{2}$ .

$\therefore$  By Pythagoras theorem,

$\therefore \left(24 - \frac{x}{2}\right)^2 + (7 + x)^2 = 625$

$\therefore \frac{x^2}{4} + x^2 - 24x + 14x = 0$

$\therefore \frac{5x^2}{4} = 10x$

$$x = 8$$

Hence, **option 5.**

19.  $f(x) = \log_7\{\log_3(\log_5(20x - x^2 - 91))\}$

As log of negative numbers is not defined,

$$\log_3(\log_5(20x - x^2 - 91)) > 0$$

$$\therefore \log_5(20x - x^2 - 91) > 3^0$$

$$\therefore \log_5(20x - x^2 - 91) > 1$$

$$\therefore 20x - x^2 - 91 > 5$$

$$\therefore 20x - x^2 - 96 > 0$$

$$\therefore x^2 - 20x + 96 < 0$$

$$\therefore (x - 12)(x - 8) < 0$$

$$\therefore 8 < x < 12$$

Hence, **option 2.**

20. If the mechanic wants to catch the bus, he will have 12 minutes to inspect the machines. As inspecting one machine takes 6 minutes, he will be able to identify the faulty machines if the first two machines he inspects are both faulty or both working properly.

Suppose A, B, C and D are the machines, and A and B are faulty. He can inspect these machines in  ${}^4P_4 = 24$  ways. If he inspects A and B first, he will be able to catch the bus. If he inspects C and D first, he will know that A and B are faulty and still he will be able to catch the bus.

There are 4 ways in which he can inspect A and B first and 4 ways in which he can inspect C and D first.

$\therefore$  Probability that he will be able to catch the bus

$$= \frac{8}{24} = \frac{1}{3}$$

Hence, **option 4.**

21. Let there be  $10 + n$  teams.

One point is awarded for each match.

The bottom 10 teams will play  ${}^{10}C_2 = 45$  matches against each other and  $10 \times n$  matches against the top  $n$  teams.

Similarly top  $n$  teams will play  ${}^nC_2$  matches against each other &  $10n$  matches against the bottom 10 teams.

Now, each of the bottom ten teams earned half of their total points against each other.

Hence they earned 45 points against the top  $n$  teams.

Hence, top  $n$  teams earned  $10n - 45$  points against the bottom 10 teams.

Now, half of the points earned by each team were earned in games against the ten teams which finished at the bottom 10.

Hence, top  $n$  team earned half of their points against the bottom 10 teams.

Hence,  ${}^nC_2 = 10n - 45$

$$\therefore \frac{n(n+1)}{2} = 10n - 45$$

$$\therefore n^2 - 21n + 90 = 0$$

$$\therefore (n - 6)(n - 15) = 0$$

$$\therefore n = 6 \text{ or } n = 15$$

Now, If  $n = 6$  then top 6 teams will earn  ${}^6C_2 + 10n - 45 = 30$  points, with an average of 5 points.

The bottom 10 will earn an average of 9 points.

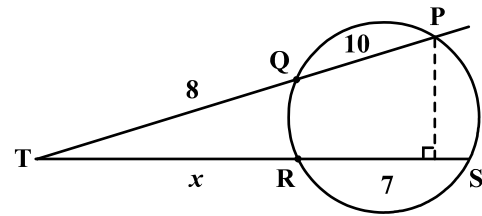
But this is not possible, as the average score of the top  $n$  should be greater than the bottom 10.

Hence,  $n = 15$

$$\therefore \text{Total number of teams} = 10 + n = 10 + 15 = 25$$

Hence, **option 4.**

22. The following diagram represents the given scenario.



Let,  $TR = x$

$$\therefore 8 \times 18 = x(7 + x)$$

$$\therefore x^2 + 7x - 144 = 0$$

$$\therefore x = 9 \text{ or } x = -16$$

But  $x$  cannot be negative.

Hence,  $x = 9$

$$A(\Delta TPS) = \frac{1}{2} \times 18 \times 16 \times \sin 60^\circ$$

$$= 72\sqrt{3} \text{ sq. units}$$

Hence, **option 3.**

23. Let,  $f(n)$  represent the position of winner when  $n$  persons are standing in a circle.

$$f(n) = 2l + 1$$

where,  $n = 2^m + l$  and  $0 \leq l < 2^m$

$$\text{Now, } n = 545$$

$$\therefore n = 512 + 33$$

$$\therefore n = 2^9 + 33$$

$$\therefore l = 33$$

$$\therefore f(545) = 2 \times 33 + 1 = 67$$

Hence, **option 2.**

**Note:** This question is based on the Josephus Flavius problem.

24. Let  $f(n, k)$  represent the position of a winner when there are  $n$  people out of which every  $k^{\text{th}}$  person is eliminated.

We have,

$$f(n, k) = (f(n-1, k) + k) \bmod n$$

$$\text{Now } f(542, 300) = 437$$

Hence,

$$f(543, 300) = (437 + 300) \bmod 543 = 194$$

$$f(544, 300) = (194 + 300) \bmod 544 = 494$$

$$f(545, 300) = (494 + 300) \bmod 545 = 249$$

$\therefore$  A contender at  $249^{\text{th}}$  position will win the election.

Hence, **option 3**.

**Note:** This question is based on the Josephus Flavius problem.

25. Let  $a, b$  and  $c$  be three digits belonging to the set  $\{0, 1, 2, 3, 4\}$

The first number of the two consecutive numbers can be of following types

Type	Count
$1abc$	$5 \times 5 \times 5 = 125$
$1ab9$	$5 \times 5 = 25$
$1a99$	5
1999	1

Hence total number of pairs =  $125 + 25 + 5 + 1 = 156$

Hence, **option 3**.

26. There are 20 cities connected to each other by roads.

Hence there will be  $\frac{20 \times 19}{2} = 190$  roads.

Let the maximum number of candidates be  $n$ .

Hence the number of roads used by these  $n$  candidates will be  $20n$

Now,

$$20n \leq 190$$

$\therefore$  greatest  $n = 9$

Hence, **option 5**.

27. Skipping the digit 5 converts the counting base system to 9 from 10.

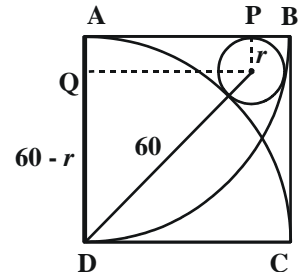
Actual values of digits greater than 5 will change i.e. face value of 6 will be 5, 7 will be 6, and so on.

Hence, 3016 displayed by micromanometer is actually 3015 in base 9

$$\text{Now, } (3015)_9 = 3 \times 9^3 + 0 \times 9^2 + 1 \times 9 + 5 = 2201$$

Hence, **option 1**.

- 28.



Let  $O$  be the centre of the smaller circle.

Let the small circle touch  $AB$  at  $P$ .  $OQ$  is perpendicular to  $AD$ .

Now,  $AO = 60 - r$  and  $OP = r$

Now,

$$OQ^2 = AP^2 = (60 - r)^2 - r^2 \quad \dots (i)$$

Now, in  $\triangle DQO$ ,

$$OQ^2 = DO^2 - DQ^2$$

Now,  $DO = 60 + r$  and  $DQ = 60 - r$

$$DQ = 60 - r$$

$$\therefore OQ^2 = (60 + r)^2 - (60 - r)^2 \quad \dots (ii)$$

$$\therefore (60 - r)^2 + 3600 - 120r = (60 + r)^2$$

From (i) and (ii),

$$\therefore r = 10$$

Hence, **option 2**.

29. There are 240 students in all, out of which 59 do not study any subject out of the given three.

$\therefore$  181 study one or more of Financial Derivatives (FD), Behavioral Finance (BF) and Security Analysis (SA).

No. of students who study both FD and SA but not BF

$$= 4 \times \text{no. of students who study all three} = 4 \times 4 = 16$$

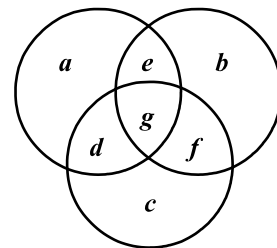
$$= 2 \times \text{no. of students who study both FD and BF but not SA}$$

SA

Also, no. of students who study both FD and SA but not BF = no. of students who study both BF and SA = 16

$\therefore$  We have the following:

**FD (48)**



**SA (124)**

$\therefore$  No. of students who study only BF

$$= 181 - 124 - 20 - 8 = 29$$

Hence, **option 1**.

30. PL + PM will be minimum if P lies on LN. PM + PO will be minimum if P lies on OM.

∴ PL + PM + PN + PO will be minimum, only if P is the point of intersection of diagonals of quadrilateral LMNO.

$$\text{Now, LN} = \sqrt{(-5 - 0)^2 + (0 - 5)^2} = 5\sqrt{2}$$

$$\text{MO} = \sqrt{(1 - (-1))^2 + (-1 - 5)^2} = 2\sqrt{10}$$

$$\therefore \text{LN} + \text{MO} = 5\sqrt{2} + 2\sqrt{10}$$

$$\therefore \text{PL} + \text{PM} + \text{PN} + \text{PO} = 5\sqrt{2} + 2\sqrt{10}$$

Hence, **option 2**.

31.  $x_1x_2x_3x_4x_5x_6x_7$  can be of the form  $abcdabc$  or  $abcabcd$ .

$abc$  can be chosen in  $10 \times 10 \times 10 = 1000$  ways.

$d$  can be chosen in 10 ways.

∴  $x_1x_2x_3x_4x_5x_6x_7$  can be chosen in  $2 \times 1000 \times 10 = 20000$  ways.

However, this includes the ways in which all of  $a, b, c$  and  $d$  are 0, 1, 2, 3, ..., 9, twice.

We subtract these numbers to get  $20000 - 10 = 19990$

We also don't want 2000000.

∴ The total number of ways = 19989.

Hence, **option 3**.

32. It can be observed that, irrespective of the value of  $x$ , mode of these numbers will be 4.

Now, the median of these numbers will depend on the value of  $x$ ,

If  $x < 4$  then the median of these seven numbers will be 4.

Now, as the mode is 4, the median cannot be 4.

(the question states that mean, median and mode are arranged in ascending order.)

Hence  $x$  cannot be less than 4.

Now,

$$\text{If } 4 < x \leq 8$$

the median will be  $x$  & the mean will be,  $\frac{50+x}{7}$

$$\text{Now } \frac{50+x}{7} > 7 \text{ and } x \leq 8$$

$$\therefore 4, x \text{ and } \frac{50+x}{7} \text{ will form an AP only if } \frac{50+x}{7} > x$$

$$\therefore \frac{50+x}{7} - x = x - 4$$

$$\therefore \frac{50+x}{7} + 4 = 2x$$

$$\therefore x = 6$$

Hence,  $x = 6$  is a possible answer.

Now, if  $x > 8$  then median will be 8 & mean will be

$$\frac{50+x}{7}$$

Now, if  $x > 8$  then  $\frac{50+x}{7}$  is greater than 8.

∴ Increasing order of mean, median and mode will be,

$$4, 8, \frac{50+x}{7}$$

Now, they are in A.P.

$$\therefore 8 - 4 = \frac{50+x}{7} - 8$$

$$\therefore 12 = \frac{50+x}{7}$$

$$\therefore x = 12 \times 7 - 50$$

$$\therefore x = 34$$

Hence, sum of all possible values of  $x = 6 + 34 = 40$

Hence, **option 5**.

33. It is convenient to solve this question by evaluating options.

**Option 1:**

If 71 and 82 are fourth & fifth numbers then, sum of first three numbers is,

$$76 + 80 + 91 = 247$$

But, 247 is not divisible by 3.

Hence, they cannot be fourth & fifth numbers.

∴ Option 1 is not possible.

**Option 2:**

Fourth and fifth numbers are 71 and 76.

Sum of first three numbers will be,

$$80 + 91 + 82 = 253$$

It is also not divisible by 3.

Hence, option 2 is also not possible.

**Option 3:**

Fourth and fifth numbers are 71 and 80.

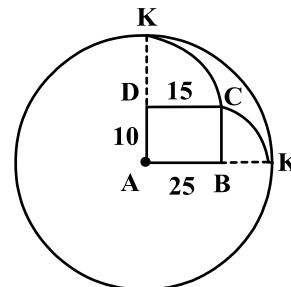
Hence, sum of first three numbers will be

$$76 + 82 + 91 = 249, \text{ which is divisible by 3.}$$

Hence, they can be fourth and fifth numbers.

Hence, **option 3**.

34.



Area available after building the shed = area of major sector AKP + area of sector BPC + area of sector KDC

$$= \frac{3}{4} \times \pi \times 25^2 + \frac{1}{4} \times \pi \times 10^2 + \frac{1}{4} \times \pi \times 15^2$$

$$= 550\pi$$

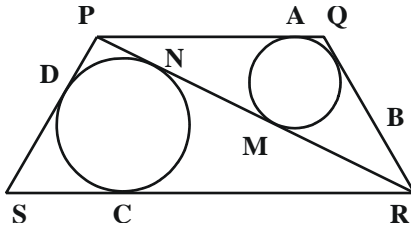
$$\text{Initial area} = 625\pi$$

Now, area of  $625\pi$  costs Rs. 1000.

$$\therefore \text{Area of } 550\pi \text{ will cost } \frac{1000}{625} \times 550 = \text{Rs. } 880$$

Hence, **option 2**.

35.



Let  $O_1$  touch PQ at A and QR at B.

$O_2$  touches PS at D and RS at C.

**Using Statement I:**

Quadrilateral PQRS is a tangential quadrilateral.

$$\therefore PQ + SR = PS + QR$$

$$\therefore PA + AQ + SC + CR = SD + DP + QB + BR$$

$$\therefore \text{Now } SC = SD \text{ and } QA = QB$$

$$\therefore PA + CR = DP + BR$$

$$\text{Now, } PA = PM, CR = RN, DP = PN, BR = RM$$

$$\therefore PM + RN = PN + RM$$

$$\therefore PN - MN + RM - MN = PN + RM$$

$$\therefore MN = 0$$

Hence, statement I is sufficient to answer the question.

**Using statement II alone,**

Statement II alone gives  $O_1 = 5$  and  $O_2 = 6$ , which does not give any information about quadrilateral PQRS.

Hence, statement II alone is insufficient.

Hence, **option 1**.

36.  $PQ \times RQ = XXX$

$\therefore X$  is the unit's digit of  $Q^2$ .

$\therefore X$  can be 1, 4, 5, 6 or 9.

$$\text{Let } X = 111 = 3 \times 37 \dots \text{not of the form } PQ \times RQ$$

$$\text{Let } X = 444 = 12 \times 37 \dots \text{not of the form } PQ \times RQ$$

$$\text{Let } X = 555 = 15 \times 37 \dots \text{not of the form } PQ \times RQ$$

$$\text{Let } X = 666 = 18 \times 37 \dots \text{not of the form } PQ \times RQ$$

$$\text{Let } X = 999 = 27 \times 37, \text{ which is of the form } PQ \times RQ$$

$$\therefore P + Q + R + S = 2 + 3 + 7 + 9 = 21$$

$\therefore$  The question can be answered without any of the statements.

Hence, **option 5**.

37. From the data, till 150000 sq. ft., the electricity cost increased in geometric progression with a common ratio of 1.5. Thereafter it increased in arithmetic progression with common difference of 10000.25.

Total cost = Labour + Material + Electricity + Administrative cost

We therefore have the following:

Output	Electricity	Total cost	Cost per sq. ft.
25000	3800	76350	3.054
50000	5700	109200	2.184
75000	8550	141550	1.8873
100000	12825	174825	1.7483
125000	19237.5	208987.5	1.6719
150000	28856.25	245556.25	1.6370
175000	38856.5	288506.5	1.6486
200000	48856.75	336856.75	1.6843

Thus the estimated cost per square foot of output is minimum for 150000 square feet output.

Hence, **option 4**.



38. Consider the following diagram,

Output	Material Cost	Spoilage cost per sq. ft.	Spoilage cost	Usage cost	Usage cost per sq. ft.
25000	11050	0.042	1050	10000	0.4
50000	22000	0.04	2000	20000	0.4
75000	33000	0.04	3000	30000	0.4
100000	44000	0.04	4000	40000	0.4
125000	54750	0.038	4750	50000	0.4
150000	65700	0.038	5700	60000	0.4
175000	76650	0.038	6650	70000	0.4
200000	88000	0.04	8000	80000	0.4

It is clear from the table that the estimated cost of material usage per square feet of output remains constant for all levels of monthly output.

Hence, **option 3**.

39. Consider the following table,

Output	Electricity cost	Electricity cost per sq. ft.
25000	3800	0.15
50000	5700	0.11
75000	8550	0.11
100000	12825	0.13
125000	19237.5	0.15
150000	28856.25	0.19
175000	38856.5	0.22
200000	48856.75	0.24

Comparing the values of Electricity cost per square feet, with the given options, we can conclude that the option B represents the graph which is closest to electricity cost per square feet.

Hence, **option 2**.

40. Let Mr. Sanyal have Rs.100 to invest on 1<sup>st</sup> January.

Let his investments in Gold, US bonds and UK bonds be  $x, y$  and  $z$  respectively.

Then  $x + y + z = 100$  ... (i)

The value of his investment in gold on 31<sup>st</sup> August =  $20720x/20000 = 1.036x$

The value of his investment in US bonds on 31<sup>st</sup> August

$$= \frac{45y}{40} + \frac{y \times 10 \times 8}{12 \times 100} = 1.192y$$

The value of his investment in EU bonds on 31<sup>st</sup> August

$$= \frac{63z}{60} + \frac{z \times 20 \times 8}{12 \times 100} = 1.183z$$

$$\therefore 1.036x + 1.192y + 1.183z = 113 \quad \dots \text{(ii)}$$

Calculating in a similar way for September,

$$1.0425x + 1.25y + 1.217z = 116.25 \quad \dots \text{(iii)}$$

Solving (i), (ii) and (iii),

$x \approx 38\%$ ,  $y \approx 38\%$  and  $z \approx 24$

Hence, **option 2.**

41. It is easy to identify that the return on gold and silver was never highest.

The values of assets considering interest rates and exchange rates are as follows:

Month	Gold	Silver	US Bonds USD	EU Bonds Euros	UK Bonds Pounds	Jap Bonds Yen
January	20000	300	40.33	61.00	70.88	0.50
February	20100	302	41.68	63.55	72.78	0.51
March	20250	307	42.03	65.10	73.66	0.53
April	20330	310	43.40	66.13	74.55	0.53
May	20400	312	43.75	67.71	76.50	0.54
June	20500	318	44.10	68.75	77.40	0.55
July	20650	330	46.57	70.35	79.39	0.57
August	20720	335	48.00	71.40	80.30	0.57
September	20850	340	50.53	73.60	82.33	0.59
October	20920	342	53.08	75.83	83.25	0.60
November	20950	345	54.58	76.92	84.74	0.62
December	21000	350	55.00	78.00	86.25	0.63

The percentage increase in each asset over the previous month is as follows. The maximum returns are indicated in bold.

	Gold	Silver	US Bonds USD	EU Bonds Euros	UK Bonds Pounds	Jap Bonds Yen
February	0.50	0.67	3.35	<b>4.18</b>	2.68	2.42
March	0.75	1.66	0.82	<b>2.44</b>	1.22	2.38
April	0.40	0.98	<b>3.27</b>	1.59	1.20	0.41
May	0.34	0.65	0.81	2.38	<b>2.62</b>	2.34
June	0.49	1.92	0.80	1.54	1.18	<b>2.30</b>
July	0.73	3.77	<b>5.59</b>	2.33	2.57	2.27
August	0.34	1.52	<b>3.08</b>	1.49	1.15	0.40
September	0.63	1.49	<b>5.26</b>	3.08	2.52	4.05
October	0.34	0.59	<b>5.06</b>	3.03	1.12	2.16
November	0.14	0.88	<b>2.83</b>	1.43	1.79	2.13
December	0.24	1.45	0.76	1.41	1.78	<b>2.10</b>

$\therefore$  The value of Mr. Sanyal's investment at the end of December =  $800000 \times 1.0418 \times 1.0244 \times \dots \times 1.0210$   
 $\approx 800000 \times 1.462$ , which is a gain of approximately 46.2%

The closest option is option 2.

Hence, **option 2.**

42.

	Gold	Silver	US Bonds USD	EU Bonds Euros	UK Bonds Pounds	Jap Bonds Yen
Q I	1.25	2.33	4.19	6.72	3.93	4.86
Q II	0.84	2.58	1.61	3.96	3.82	4.70
Q III	0.97	3.03	8.50	4.62	3.70	4.48
Q IV	0.38	2.34	3.61	2.86	3.60	4.28

We can see that silver consistently gave better returns than gold in the given period.

Mr. Sanyal's investment strategy and corresponding returns are as follows:

Quarter	Bullion	Returns	Other instrument	Returns
Q I	Gold	1.25%	Indian FD	6.25%
Q II	Silver	2.58%	EU Bonds	3.96%
Q III	Silver	3.03%	Indian FD	6.25%
Q IV	Silver	2.34%	Indian FD	6.25%
<b>Value</b>	<b>Rs. 438053</b>		<b>Rs. 498785</b>	

∴ Total value of his assets at the end of the year = Rs. 936838

Had he invested in US bonds, he would have got  $800000 \times 55/40.33 = \text{Rs. } 1091000$

Had he invested in UK Bonds, he would have got  $800000 \times 86.25/70.88 = \text{Rs. } 973476$

Had he invested in EU Bonds, he would have got  $800000 \times 78/61 = \text{Rs. } 1022950$

Had he invested in Japanese Bonds, he would have got  $800000 \times 0.63/0.50 = \text{Rs. } 1008000$

Had he invested the entire amount in his Indian bank, he would have got  $800000 \times 1.25 = \text{Rs. } 1000000$

∴ All the options are incorrect.

- 
43. The question is not worded clearly.
44. In the passage it is mentioned that workers on the shop-floor design the 'operating procedure' along with the supervisor. This happens at the lowest level of the organization providing flexibility and yet standardization which helps in defect-free production. In essence, the workers adapt to changes and problems and accordingly alter the operating procedures. Hence, the correct answer is **option 4**.
45. Option 1 is incorrect as there is no mention of any workers' union in the passage and is irrelevant to the Toyota type of production system. Option 2 is incorrect as it is mentioned that workers on the shop-floor design the 'operating procedure' along with the supervisor. It can be inferred that for the most part, the production system is designed by the workers and hence the existence of powerful management to create unique strategies is not a prerequisite. The worker's are not only problem solvers but improvise on existing processes and make changes at their level. Hence, the highest level of worker participation and contribution is an essential component. This happens only because the management has faith in the workers' abilities to solve problems and grants them the proper machinery to do so. Hence, the correct answer is **option 5**.
46. The 'specialists' in options 3 and 4, 'managers' in option 2 and 'products tested extensively by customers in simulated conditions' in option 5 are beyond the scope of data presented in the passage. Option 1 is the central theme of the passage. Hence, the correct answer is **option 1**.
47. "Different work norms in contiguous assembly lines" is in sync with the philosophy of Toyota to provide customer order in exact specification required even in a batch size of 1. This can happen when workers at the lowest level are involved in problem solving or improving on existing work norms. This validates option 2 as the best defense. 'Rights of managers' in option 1, 'rights of workers' in option 3, and 'investments' in option 4 bring in new data. The latter part of option 5 is contrary. Hence, the correct answer is **option 2**.
48. In the sentence the blank following the adjective 'sympathetic' is best filled with 'heart'. Eliminate options 1, 2 and 3. Between options 4 and 5, the second blank can be best filled by 'ingenuity' as ingenuity means skilfulness of conception, while 'thoughts' indicate the mental activity that takes place. In this context, 'ingenuity' is more appropriate as it indicates how the author has refined his composition to the best of his skilfulness. Hence, the correct answer is **option 4**.
49. The first blank should be filled with 'in' as 'to' cannot be followed by the gerund form of the word. Eliminate options 2 and 3. The second blank should be filled with 'to' as the sentence implies reaching a particular destination. 'Getting in' usually does not denote physically or literally getting in but gaining admission or entry into a certain place, hence 'to' is a more appropriate word to be used. The third blank should be filled with 'it' as the blank indicates the place where the person has gotten to. Hence, the correct answer is **option 1**.

50. The first blank should be filled by 'if, which in this context means 'supposing that' or 'in case of'. 'As' cannot be used as it is not consistent with the next part of the sentence.  
The most appropriate word to fill the second blank would be 'of' as it denotes the shade which is cast by the banyan tree. For the word 'under' to be an appropriate answer, the words 'in the shade' need to be omitted.  
The word that best fills the third option would be 'to' as it indicates the person will return.  
Hence, the correct answer is **option 5**.
51. Options 1, 2, 4 and 5 contain words opposite in meaning in their noun forms; option 3 contains opposites in the adverb form.  
Hence, the correct answer is **option 3**.
52. The passage raises the concern over what the author describes as 'Fitness-Faking Technology' and the neglect towards fitness. He feels this will eventually lead to the extinction of the entire species due to allocation of time and resources to pleasures rather than to their children.  
Hence, the correct answer is **option 2**.
53. The author mentions that after a certain level of evolution, intelligent life forms focus more on their own pleasure than on the fitness of their species. The second paragraph states just that with 'runaway-consumerism' and 'virtual-reality narcissism' in the context of aliens.  
Hence, the correct answer is **option 5**.
54. Option 1 with 'violent crimes' and 'gang warfare', option 2 with 'government's desire to control', option 3 with 'colonial expansion through wars' for technologically advanced countries, and option 5 with 'search for expansion by all countries' are not in sync with the ideas presented in the passage.  
The essence of the passage is that fitness-faking technologies and consumerism provides narrow indulgence that takes people from the larger issues. This is in sync with the probable scenario of European renaissance.  
Hence, the correct answer is **option 4**.
55. Statement II is irrelevant to the topic- it opens a new thread of thought to the argument and hence it neither challenges nor supports the ideas presented in the passage.  
Statement IV supports the idea and statements I, III and V challenge the idea that fitness-faking gadgets lead to consumerism and virtual reality narcissism leading to focus on own pleasure than on the bigger picture of survival.  
Hence, the correct answer is **option 5**.
56. The words 'Harsh' 'Heartless' and 'apathetic' can be eliminated as they indicate a negative tone in the line, whereas from the sentence we can deduce that its tone is neutral and matter of fact.  
Hence options 2, 3 and 4 can be eliminated.  
From the adjective 'unchangeable', the word 'action' is more appropriate than 'activities'.  
Hence, the correct answer is **option 1**.
57. I does not follow the statement as it is not implied that an impression should always lead to an idea.  
II logically follows the statement as one cannot make ideas of impressions that one has not yet had.  
III logically follows from the sentence as the colour of the XAT test booklet acts as an impression to the student while the idea of the colour of her television set is raised from her impression of the booklet. The colour acts as a commonality between the impression and the idea.  
IV directly follows from the statement as it implies that the base of the idea of the colour of a television set arises from an impression.  
Hence, the correct answer is **option 4**.
58. Option 5 weakens the premise that concentration levels are fleeting.  
Option 1 with "from arguments to aphorism" weakens the premise while "from thoughts to puns" strengthens the premise that concentration levels are fleeting.  
Option 2 simply adds more data to the discussion.  
Option 3 neither strengthens nor weakens the premise.  
Option 4 indicates that the modern generation due to various forms of media has lesser capacity to concentrate - the number of people who fall asleep while reading a book has increased, indicating lack of concentration.  
Hence, the correct answer is **option 4**.
59. Option 1 with "from arguments to aphorism" weakens the premise while "from thoughts to puns" strengthens the premise that concentration levels are fleeting.  
Option 2 simply adds more data to the discussion.  
Option 4 strengthens the premise.  
Option 3 neither strengthens nor weakens the premise.  
Option 5 with "judges having grown up with access to internet becoming better at complex cases" weakens the premise "internet is chipping away the capacity to

concentrate”.

Hence, the correct answer is **option 5**.

60. Options 1 and 4 can be implied from the data.  
This is a case of Only If X then Y, Main statement: Only If one acknowledges the existence of randomness, then one can deal effectively with it. The conclusions that can be drawn are:
- A. If one can deal effectively with randomness then one can acknowledge its existence.
  - B. If one does not acknowledge the existence of randomness, then one cannot deal effectively with it. Option 5 is implied from conclusion B,
- Option 3 with 'only if' can be implied from conclusion A whereas option 2 reverses the relationship.  
Hence, the correct answer is **option 2**.
61. All the options except 2 are implied. The verse mentions the effects of war and not about what happens after the war; nor can it be implied that humanity will reunite afterwards in peace.  
Hence, the correct answer is **option 2**.
62. 'Slush' is the word that best fills the first blank, 'slush' means soft mud or slop, while 'sludge' means mud, mire, or ooze covering the ground or forming a deposit, as on a riverbed. As the writer is in the Himalayas it is implied that he/she will encounter slush rather than sludge. 'Slosh' cannot be an answer as it is a verb while the blank has to be filled up with a noun.  
In the second blank it is mentioned that the writer and his/her children are in the Ganges delta and are more likely to wade through 'sludge' than 'slush'. 'Slosh' is a verb form and hence cannot be inserted.  
In the third blank the best word which can fill the blank is 'sloshing', sloshing means to splash, wade, or flounder in water while 'sludging' means settling out of solid particles from solution and 'slushing' means to make a squelching or splashing sound, both of which are inconsistent with the sentence  
Hence, the correct answer is **option 1**.
63. The first blank can best be filled by 'feckless' which means 'unthinking and irresponsible'.  
The other words: 'felon' which means a person who has committed a felony; 'feral' which means existing in a wild or untamed state; 'federate' which means a cause to join into a league, federal union, or similar association; 'febrile' which means having or showing the symptoms of a fever; are not appropriate in the given context.

The second blank can best be filled by 'felicitate' which means to congratulate or in this case to honour the person.

'Facilitate' means to make something easy or easier which is inconsistent with the sentence and is inappropriate in the given context.

The third blank describes the physical aspect of the boy and can best be filled by the word 'freckles' which refers to spots on the skin.

The fourth blank would be best filled by 'felicific' which means intended to produce happiness.

It would be most appropriate as it is intended to cheer up Arun's father who is recuperating after a serious illness.

Hence, the correct answer is **option 5**.

64. In the paragraph the word persons in the first line has a missing apostrophe (') as it needs to be in the possessive case.  
After the word 'development' there needs to be a comma (,) required to separate the two clauses.  
After 'competence' a period or a full-stop is required to denote the end of the sentence (.)  
After the word 'efficiency' a comma (,) is required as it divides two clauses.  
The second sentence ends with the word 'development', hence a full stop or period (.) is required.  
A colon (:) needs to be placed after the word 'itself' as it introduces a logical consequence.  
A full stop or period (.) is required after 'inquiry' to indicate the end of the sentence.  
Hence, the correct answer is **option 5**.
65. Water gets dirty to render something clean.  
A battery goes dead after it plays music.  
Wood burns to provide food.  
Juice ferments to provide wine.  
It is not necessary for rain to thunder, to turn into hail.  
It does not follow the relation displayed by the other options.  
Hence, the correct answer is **option 5**.
66. Options 1, 2, 3, and 4 contain idioms in the first part and an illustration of the idiom in the second part.  
However in option 5, the first part of the sentence contains an idiom and the second part contains an illustration which is opposite in meaning to what the idiom means.  
Hence, the correct answer is **option 5**.

67. Statement 2 introduces the paragraph with a sentence wherein directors are positioned as fiduciaries. This is followed by statement 1 which gives the meaning of the word 'fiduciary'.  
Statement 3 follows giving the origin of the word and what is expected of a fiduciary.  
Statement 4 concludes the paragraph by stating the activities of a fiduciary.  
Hence, the correct answer is **option 3**.
68. Statement c sets the tone for the paragraph with the introduction of international organizations.  
Statement a follows giving the significance of international organizations.  
Statement f follows with an illustrating of how and why international organizations were established  
Statement e continues with another illustration.  
Statement b cannot follow statement D as statement D reiterates what has been given in the passage and acts as a conclusion. The best sequence is c a f e b d.  
Hence, the correct answer is **option 4**.
69. Statement i mentions that proper decisions cannot be made in a weakened physical state, thereby weakening the logic that choosing low physical fidelity is acceptable as long as cognitive fidelity in a team situation is maintained through subjecting soldiers to pressure situations in a simulated combat setting.  
Statement iv weakens the logic as it implies that simulated exercises tend to induce a systematic type of 'correct' behaviour and is against the idea of naturalistic decision making.  
Statement ii delves on mental stress and statement v delves on recruitment processes, which do not weaken the logic of the passage. Statement iii strengthens the logic of the passage.  
Hence, the correct answer is **option 3**.
70. The exaggerated notion of human need for order and the prevalence of theories due to sensationalism mentioned in statement i weakens the underlying logic of the passage.  
Statement ii weakens the logic by stating that there is randomness even in order.  
Statement iii does not weaken the logic as even if the sample size is small, it still provides order in randomness.  
Statement iv weakens the passage as it implies that it has nothing to do with someone controlling the various events that occur.  
Statement v strengthens the underlying logic presented.  
Hence, the correct answer is **option 2**.
71. Statement iii does not strengthen the case for argument as it means that the conspiracy theories and suspicion of sinister forces crops up due to novelists and movie-makers who have no control over the various events which occur.  
Statement iv does not strengthen the argument as it is not necessary that a movement to reintroduce the teachings of the bible and the presence of God in schools be a conspiracy of some sort, it may be an effort to make students aware of the religious part of life.  
Statement i with 80% unexplained phenomena, Statement ii with photographic evidence and Statement v with inaccurate depiction arouse suspicions of a sinister mind at work.  
Hence, the correct answer is **option 4**.
72. 'Penalties leading to increased undesirable behavior' in statement i cannot be implied from the passage  
The passage indicates that monetary incentives are important but not the sole criterion. Statement ii with 'wasteful exercise' is thus eliminated.  
The passage veers towards and presents data to support the findings of the MIT researchers. Statement iii with 'flawed exercise from the start' can thus be eliminated.  
Statement iv reflects on the need to bring about a shift in the incentive system and include other factors that motivate a person to work effectively. It is logically consistent with the paragraph.  
Statement v is also in sync- monetary incentives work well in respect of tasks requiring mechanical skills and incentives such as greater autonomy at work, less interference from management motivate people involved in activities requiring high level cognitive skills.  
Hence, the correct answer is **option 5**.
73. Statement i is not consistent with the views of paradox. Even though the fly perceives the arrow to be at rest, in reality the arrow is in motion and hence cannot belong to the realm of being  
'Subject to moral standards' negates statement ii.  
'Maintaining balance' negates statement 3.  
Statement iv is in sync with the notion of perpetual flux being erroneous.  
Statement 5 is a conclusion that can be drawn from the idea of Paradox.  
Hence, the correct answer is **option 3**.

74. Option 1 cannot be implied from Herodox's idea with the idea of 'purity'.  
Option 2 cannot be implied with 'procedure oriented'.  
Option 3 cannot be in sync with Herodox's idea with 'conflict-preservation' and 'maintaining balance'.  
'study in a systematic manner would be meaningful' negates option 4.  
Option 5 is implied by Herodox's idea as it mentions that there is no notion of a constant reality- numerous realities across times and across human cultures and civilizations.  
Hence, the correct answer is **option 5**.
75. Reviewers 2 and 5 have given their analysis on the basis of the reactions of people- it can be implied that they have not gone into much detail.  
Reviewer 4 focuses on the image of the author and makes references to her previous works rather than this novel, which shows that the reviewer has given an overall picture of the author's works and not really had an indepth read of the novel.  
Between Reviewer 1 and 3, reviewer 1 has mentioned that the novel is life-changing for himself too. Reviewer 3 reflects on the philosophy which may have been portrayed in the novel.  
It is apparent that while Reviewer 3 noticed the positive light in which the philosophy of life is put in, Reviewer 1 goes further than that by stating that he/she adopted the philosophy mentioned in the novel- Reviewer 1 has gone in greater depth than Reviewer 3.  
Hence, the correct answer is **option 1**.
76. From all the reviews the one which can be most easily validated is that given by Reviewer 2. It can be verified through any survey whether the book is more popular among the youth than the older population. Reviews 1, 3 and 4 are personal opinions and cannot be verified objectively.  
Review 5 indicates an intangible and emotional reaction of readers which may not be easy to validate.  
Hence, the correct answer is **option 2**.
77. Review 4 does not mention anything about the current novel written by the author but compliments the author on her previous works and the general perception of the author's writing. There is no critical analysis of any sort present. All the other reviewers have put forth their views or the general reaction to the book by people but they have focused on the novel unlike review 4.  
Hence, the correct answer is **option 4**.
78. Statement ii is not a concern of the government. It merely indicates mismanagement of the company and will weaken the case to be made against the government.  
Statement iv uses phrases like 'we are not to blame' 'government is not doing enough'. These are emotional and evasive statements without any concrete data.  
Statement v is not a valid reason as the government had already scaled down the requirement significantly- if this were a reason, it should have been raised at the start itself.  
Statements i and iii indicate severe external factors which were out of the company's hands and wherein nothing much could be done to prevent them.  
Hence, the correct answer is **option 2**.
79. Statement i does not reflect the thoughts of a forward looking person. Risk is an important part of business dealings, without any risk there won't be growth. The CEO needs to be objective and take a step which will benefit all the stakeholders of the company. Also many of the obstacles present last time are not present this time.  
Statement ii shows personal bias (which was shown by the other party last time and was one of the reasons why the deal did not go).  
Statement iii shows an impractical line of thought which may probably be theoretically possible but not practically so.  
Statement iv shows an appropriate line of thought wherein the CEO is thinking about the company as a whole and also trying to get the best out of the deal.  
Statement v shows that the CEO is being practical and also business-minded.  
Both, statements iv and v indicate astute business sense and favourable outcomes for ABC.  
Hence, the correct answer is **option 5**.
80. Option 5 shows the best reason for an investor to stay away from the resultant entity as it indicates lack of foresight and proper planning on the part of LMN. The option shows that even after the merger, the combined company will be worse-off.  
The other statements while being negatives are not that important to an investor to stay away from the company. They pale in comparison to problems stated in option 5.  
Hence, the correct answer is **option 5**.
81. The opening statement would be Statement c which gives an idea of the current scenario in the global wind

turbine industry. If the global scenario is robust, it requires explaining what is specifically wrong with Leone Energy.

Statement b should follow with the fact that the sales volume during the year has increased due to which logically, the profits should also have gone up. Instead, there have been losses.

Statement e should be the concluding statement mentioning that the reason profits have fallen even though sales volume has increased can only be due to the fact that the energy is being supplied at a price which is not profitable. Hence one cannot blame external factors for the state of affairs in the company.

Hence, the correct answer is **option 4**.

- 82.** It is given that the silver bar is of 31 inches and each day's rent is 1 inch of the bar.

Any natural number,  $x$  can be represented as the summation of different powers of 2.

For example,  $7 = 1 + 2^1 + 2^2$  (Here 7 can be represented in the form of summation of powers of 2. Similarly,  $6 = 2^1 + 2^2$  and  $15 = 1 + 2^1 + 2^2 + 2^3$ ).

So any natural number between 1 to  $2^n - 1$  can be represented as the summation of combination of powers of 2 from  $2^0, 2^1, 2^2 \dots, 2^{(n-1)}$ .

$$31 = 2^5 - 1$$

$$31 = 1 + 2^1 + 2^2 + 2^3 + 2^4$$

So if the person makes 5 parts of lengths 1", 2", 4", 8", 16", he should be able to pay the rent of 1 inch to the owner on a daily basis.

For example, on the first day he will give the bar of 1" to the landlady, on the second day he will give 2" bar and take back 1" bar he had given on the previous day, on the third day he will give the 1" bar, on the fourth day he will give the 4" bar and take back the 2" and 1" bar and so on till 31 days.

Hence, **option 1**.

- 83.** Statement III is the most rational, practical and effective way. It addresses the problem directly, opens channels of communication with the aggrieved party and tacitly gains their confidence.

Statement IV shows an indication that the company is not biased towards its employees and is fair and objective. It will take action against the guards who are (found) guilty. It also implies that the guards will be investigated (and not that they will be punished). But it makes a promise to the workers that action is being taken. This ensures the workers a sense of security and sends across a message that the company is fair and unbiased and will ensure the well-being of the workers.

Statement I is not an expected decision from CMT management as this will indicate that the management has bent to the will of unethical contractors and is not concerned about the well-being of its workers.

Statement II, although is a theoretically appropriate step, may not be practically effective as instead of trying to expose the contractors, the management should address the issue of the ones who are affected: the contract labourers.

Statement V looks at a temporary short-term solution which may not be effective as the root cause of the problem is not the issue of wages but that of the contractors who are wary about the investigations undertaken by the company. Secondly, it may give rise to the problem of displeasing CMMS- one solution giving rise to another problem.

Hence, the correct answer is **option 4**.

- 84.** One needs to take into account the fact that CMMS has to protect the needs of its members first and then of the contract labourers- it cannot ignore the problems of the contract labourers as CMMS is a labour union which aims at development of the labour class. Hence option 3 would be the most appropriate reaction from CMMS.

Options 1 and 5 present a very apathetic picture of CMMS and give out a message that it is only interested in its own development.

Options 2 and 4 will affect the interests of the existing members of the union and cause unrest amongst them. Further the contract labourers have not asked to be part of any union but just for better wages- it will not solve the existing problem.

Hence, the correct answer is **option 3**.

- 85.** The government at the national level needs to make a policy that will permanently solve the labour issues. Options 1, 3 and 5 focus only on the problems in CTM while the issue of contract labour exploitation is a national concern.

Option 2 does not ensure security and development of the labourers, it will have no significant implications at the national level.

Option 4 looks at the big picture and kick-starts the process of ensuring the security and welfare of the labourers all over the country.

Hence, the correct answer is **option 4**.

- 86.** The statement mentions that the law and order situation outside the mill will cause problems for the workers in the future. Hence the immediate priority for CTM should be contract labourers who are demanding



job security and same wages as regular employees. If the unrest is not resolved, it will provide fuel to fire to the miscreants outside the CTM and may render the situation to go out of hand.

Between options 1 and 5, option 5 takes into the consideration the entire class of contract labourers who are up in arms.

Hence, the correct answer is **option 5**.

- 87.** Three managers have opted for Room No.302.  
Hence, only one among these three managers will get room as per their best preferences.  
Hence at the most three professionals will get rooms as per their first preferences.  
Hence, **option 3**.

- 88.** At least two managers will not get their best preference as three managers have the same first preference.  
Hence by this condition the sum of the preference ranking will be at least  $1 + 1 + 1 + 2 + 2 = 7$ .  
Now, if we can allot the rooms with preference rankings such that their sum is 7, our answer will be 7.  
Following arrangement has preference ranking sum 7.

M <sub>1</sub>	M <sub>2</sub>	M <sub>3</sub>	M <sub>4</sub>	M <sub>5</sub>
302	304	303	305	301

Hence, **option 3**.

- 89.** We first allot the maximum possible first preferences. Then one of the allotments for minimum preference ranking is,

M <sub>1</sub>	M <sub>6</sub>	M <sub>3</sub>	M <sub>4</sub>	M <sub>5</sub>
302	304	303	305	301
1	4	1	2	1

Hence minimum preference ranking =  $1 + 4 + 1 + 2 + 1 = 9$

Hence, **option 5**.

- 90.** Let members be represented by points, and friendships by lines between two points.  
Consider a person X who has two friends A<sub>1</sub> and A<sub>2</sub>. By condition 2, A<sub>1</sub> and A<sub>2</sub> cannot be friends.  
By condition 3, there has to be one more member so that we get a quadrilateral that satisfies all conditions.  
∴ 4 can be the minimum possible number of members. But we know that the number of members ≥ 5.  
Now, let X have m friends A<sub>1</sub>, A<sub>2</sub>, A<sub>3</sub>, ..., A<sub>m</sub>.  
Extending the logic above, we can say that no two of A<sub>1</sub>, A<sub>2</sub>, A<sub>3</sub>, A<sub>4</sub>, ..., A<sub>m</sub> can be friends. Also, there have to be members B<sub>12</sub>, B<sub>13</sub>, ..., B<sub>ij</sub>. (There are  ${}^m C_2$  such members.) Note that no other A<sub>i</sub> can join B<sub>ij</sub>, else condition 3 is violated. Now, by condition 3, every member is either X's friend or X's friend's friend.  
It is important to note that X is an arbitrary person and any other person is as good as X and hence will himself have exactly m friends.

So there are 3 kinds of members:

1. X
2. A<sub>i</sub>'s, who are X's friends and are m in number
3. B<sub>ij</sub>'s, who are X's friends' friends and are  ${}^m C_2$  in number

$$\therefore \text{No. of members } n = 1 + m + \frac{m(m-1)}{2}$$

We know that the minimum value of n is 4, for m = 2

For m = 3,  $n = 1 + 3 + 3 = 7$

In that case the members are X, A<sub>1</sub>, A<sub>2</sub>, A<sub>3</sub>, B<sub>12</sub>, B<sub>13</sub> and B<sub>23</sub>.

A<sub>3</sub> cannot be B<sub>12</sub>'s friend as condition 3 is violated with respect to X and B<sub>12</sub>.

$B_{23}$  cannot be  $B_{12}$ 's friend as  $A_2, B_{12}$  and  $B_{23}$  form a triangle, thereby violating condition 2. So  $B_{12}$  can have only 2 friends, which contradicts the fact that every person has exactly  $m (= 3)$  friends. So  $n = 7$  is not valid.

For  $m = 4, n = 1 + 4 + 6 = 11$

The members are  $X, A_1, A_2, A_3, A_4, B_{12}, B_{13}, B_{14}, B_{23}, B_{24}$  and  $B_{34}$ .

$B_{12}$ 's friends are  $A_1, A_2, B_{34}$ . Considering any other person as his friend violates condition 2 or 3 as in the above case. So he has only 3 friends and not 4.

So,  $n = 11$  is not valid.

For  $m = 5, n = 16$

To evaluate this case we construct the following table indicating persons who can be friends.

X																
A <sub>1</sub>	✓															
A <sub>2</sub>	✓	x														
A <sub>3</sub>	✓	x	x													
A <sub>4</sub>	✓	x	x	x												
A <sub>5</sub>	✓	x	x	x	x											
B <sub>12</sub>	x	✓	✓	x	x	x										
B <sub>13</sub>	x	✓	x	✓	x	x	x									
B <sub>14</sub>	x	✓	x	x	✓	x	x	x								
B <sub>15</sub>	x	✓	x	x	x	✓	x	x	x							
B <sub>23</sub>	x	x	✓	✓	x	x	x	x	✓	✓						
B <sub>24</sub>	x	x	✓	x	✓	x	x	✓	x	✓	x					
B <sub>25</sub>	x	x	✓	x	x	✓	x	✓	✓	x	x	x				
B <sub>34</sub>	x	x	x	✓	✓	x	✓	x	x	✓	x	x	✓			
B <sub>35</sub>	x	x	x	✓	x	✓	✓	x	✓	x	x	✓	x	x		
B <sub>45</sub>	x	x	x	x	✓	✓	✓	✓	x	x	✓	x	x	x	x	
	X	A <sub>1</sub>	A <sub>2</sub>	A <sub>3</sub>	A <sub>4</sub>	A <sub>5</sub>	B <sub>12</sub>	B <sub>13</sub>	B <sub>14</sub>	B <sub>15</sub>	B <sub>23</sub>	B <sub>24</sub>	B <sub>25</sub>	B <sub>34</sub>	B <sub>35</sub>	B <sub>45</sub>

The table should be read as follows:  $B_{13}$ 's friends are the number of ticks in the row labeled  $B_{13}$  and column labeled  $B_{13}$ .

We see that each person has exactly 5 friends. Also, we can verify that conditions 2 and 3 are satisfied.

So,  $m = 5$  and  $n = 16$  is valid.

For values of  $m \geq 6, n \geq 22$ , which violates condition 4.

∴ There are 16 members in the club.

Hence, **option 4**.

**Note:** This question was based on an old olympiad.

91. From the answer to the first question of this set, each person has exactly 5 friends.

Hence, **option 3**.

92. Option 2 has the best offer-explanation combination as the main restriction in all the other offers is that if one does not need the free ticket, he cannot transfer it to someone else who does. Cozy\_Travel does not put forth any such restrictions.

Option 1 mentions that the customers will get twice the number of flights but the offer of giving free tickets

is also available with other offers. The highlight of the offer- transferability of the tickets (which is not available in other offers and which has a potential to attract customers) is not mentioned as the reason in the option.

Option 3 is not the best offer-explanation combination as the feature it illustrates is something which is already being offered in other airlines. Although the ticket has been mentioned to be absolutely free (meaning without even charging the customers fees and surcharges), in the eyes of the customer, all the

offers provide free tickets and it is more likely than not that the customers will equate all the offers of free tickets.

Option 4 is not the best offer-explanation combination as the offer itself is up to the 28<sup>th</sup> of February. It indicates that the Unique Selling Point of the offer is not mentioned.

Option 5 is not the best offer-explanation combination as other offers have similar benefits and it mentions no unique benefit to the customer.

Hence, the correct answer is **option 2**.

- 93.** As the offer from Cool\_Yatra has become popular, it indicates that most people prefer having no restrictions in the airline for which they get a free ticket. It also indicates that most people prefer just one ticket as the tickets can't be cancelled or refunded-some people may have no use for them. The restrictions for date by Cool\_Yatra is comparatively less.

Option 1 loses out to option 3 on two counts - 'tickets can be booked only in GagaAir'. And there is indication of doing away with date restrictions.

Option 2 will not be very successful in gaining the attention of the customers as there is nothing new which is being added but something which is just an extension of the old offer.

Option 4 is not the ideal recommendation which may turn the odds in favour of Easy\_Travel. The problem with the offer of Easy\_Travel is the time restriction and the offer needs to be altered in that aspect.

Option 5 will not be attractive for the customer- the highlight of the offer (transferability of the ticket) will be removed hence proving counter productive.

Taking into account the various points the best recommendation would be option 3.

Hence, the correct answer is **option 3**.

- 94.** Option 1 is not viable for Jagan due to date restrictions. Jagan has his exam on the 2<sup>nd</sup> and the offer starts from the 11. Jagan will not be able to avail the offer. Options 2, 3 and 5 are not viable as the website has a condition that the free ticket has to be booked 21 days in advance. Jagan will only come to know whether he has to go 15 days before the day of travel. Option 4 is a practical option as Jagan will get a free ticket and the booking for the free ticket needs to be made within 15 days of booking the original ticket. This gives him time to avail of the free ticket.

Hence, the correct answer is **option 4**.

- 95.** Option 1 is not viable due to date restrictions.

Among Options 2, 3 and 4

Janaki will save Gs. 800 if she opts for option 2 and bring her cost down to Gs.4200 (As the maximum cash back amount cannot exceed Gs. 400 per person per ticket and if she purchases two tickets for coming and going she will get a cash back of Gs.400 on each ticket making it a total of Gs. 800)

In option 4 She is getting a free ticket which will effectively bring her cost down to Gs. 3800 (The cost of first ticket which will be Gs.2500 and the fees and surcharges on the second ticket which will come up to Gs. 1300 )

In option 3, she will get 2 free tickets even if she uses only one ticket. Her cost will effectively be the same as in option 4 but along with the added advantage of having an extra ticket. Since this ticket can be transferred it can be given to someone she knows or sold to the person who needs a ticket.

In option 2 she will not get any benefits or offers and will need to pay the entire cost of tickets without any discounts or refunds.

Hence, the correct answer is **option 3**

- 96.** There are 3 teachers, 2 engineers and 1 doctor.

Now, from third statement, we get that the traveller from Kolkata and the one who gets down at Mughal Sarai are Teachers.

Travellers from Bengaluru and Chennai are engineers and those from Kolkata and Kochi are teachers. The doctor does not belong to Mumbai, Hence the doctor must be from Hyderabad. The teacher who got down at Mughal Sarai must be from Mumbai.

Hence, by statement 4 we get that the youngest traveller, who is the doctor, gets down at Kanpur.

Now, the teacher from Kochi, who is 35 years old, is as old as the engineer from Chennai.

Now among the persons from Bengaluru, Chennai, Hyderabad and Mumbai, the person from Bengaluru is the eldest.

Hence, we get the following table.

Name	Age	Profession	Belongs to	Destination
Z	31	Doctor	Hyderabad	Kanpur
	>35	Teacher	Kolkata	
Y	31-34	Teacher	Mumbai	Mughal Sarai
	35	Teacher	Kochi	
	> 35	Engineer		Koderma
	35	Engineer		New Delhi

Now from the given options, only option E is true.  
Hence, **option 5**.

97. The present ages of persons who are fresh graduates must be less than 35 years and more than 31 years.  
Hence, **option 5**.

98. As W is neither the youngest nor the oldest among the travelers from her profession, she must be a teacher.  
Hence, from the previous table, W is a teacher from Kochi and she is 35 years old.  
Only option D is correct.  
Hence, **option 4**.

99.

$n_4$	$c$	$n_3$
$d$		$b$
$n_1$	$a$	$n_2$

Ground floor

$n_4'$	$c'$	$n_3'$
$d'$		$b'$
$n_1'$	$a'$	$n_2'$

First floor

Let  $a + b + c + d = A$ ,

$a' + b' + c' + d' = A'$

$n_1 + n_2 + n_3 + n_4 = N$ ,

$n_1' + n_2' + n_3' + n_4' = N'$

$\therefore A + N = 2(A' + N')$

$\therefore$  Total number of students =  $3(A' + N')$

Now,

$A + A' + 2(N + N') = 44$

As, each room must be occupied,

$A + A' \geq 8$  and  $N + N' \geq 8$

Hence, Mrs. Sharma can expect at most 36 students when  $N + N' = 8$  and  $A + A' = 28$

Now, if number of students = 36, then

Number of students on first floor and ground floor are, 24 and 12 respectively.

As,  $N' = 4$ , hence  $A' = 20$

But 20 students cannot be placed in four rooms. Hence, 36 is not possible.

If  $N + N' = 11$  and  $A + A' = 22$ , the number of students = 33

Number of students on first floor and ground floor are, 22 and 11 respectively.

Now, max  $N' = 7$ , hence minimum  $A' = 22 - 7 = 15$

Still 15 students cannot be placed in four rooms.

Hence, 33 students are not possible.

Now if number of students = 30. Then  $N + N' = 14$  and  $A + A' = 16$

and the number of students on first floor and ground floor are, 20 and 10 respectively.

Now, valid combination is possible without violating any rule.

Hence, 30 is possible.

Similarly if number of students is 27 then the ground floor and first floor have 18 and 9 students respectively.

In this case  $N + N' = 17$

Now, if  $N' = 12$ , and  $N = 5$  then a valid distribution is possible.

Hence 27 is possible.

Now, if Number of students is 24 then  $N + N' = 20$  and number of students on first floor and ground floor is 16 and 8 respectively.

Hence each room on the ground floor has only 1 student.

Hence  $N = 4$ ,

$\therefore N' = 16$

This is not possible.

Hence, possible number of students must be 30 or 27.

Hence 27 students turned up for renting the rooms.

Hence, **option 2**.

100. From the previous answer, total number of students = 27

$N + N' = 17$ ,  $N' = 12$  and  $N = 5$

And  $A = 9 - 5 = 4$

Hence all rooms on ground floor, except one, are occupied by only one student.

As  $N' = 12$  hence all corner rooms on first floor are occupied by exactly 3 students each.

$A' = 16 - 12 = 4$

Hence, all middle rooms on the first floor are occupied by exactly one student.

Hence, the number of students in north-west corner room of first floor and middle room in first floor of east wing are 3 and 1 respectively.

Hence, **option 2**.

101. When the number of students is 30,  $N + N' = 14$  and  $A + A' = 16$

Also,  $N + A = 10$

As the minimum value of  $A$  is 4, the maximum value of  $N$  is 6. Also, the minimum value of  $N$  is 4.

We look at the possible values of the four variables:

$N$	$N'$	$A$	$A'$
4	10	6	10
5	9	5	11
6	8	4	12

For the first combination of values in the table, we get multiple possibilities, two of which are as below.

Case (i)

1	2	1
2		1
1	1	1

Ground Floor

1	3	3
3		2
3	2	3

First Floor

Here the required number of students are 1 and 2 respectively

Case (ii)

1	1	1
1		3
1	1	1

Ground Floor

3	3	2
3		1
2	3	3

First Floor

Here the required number of students are 3 and 1 respectively.

∴ Multiple options are correct.