Analytical Ability and Logical Reasoning

1. Each time we order 1, 2 or 3, one fruit is added to the basket but whenever we order 4, two fruits are removed from it.

∴ Number of fruits in the basket at the end of the given order sequence
= Number of 1s + Number 2s + Number of 3s – 2 × (Number of 4s)
= 6 + 6 + 7 – 2 × 4 = 19 – 8 = 11.
Ans. (C)

2. Each time we order 2, one orange is added to the basket but each time 4 is ordered, One is removed from it.

∴ Required number = Number of 2s – Number of 4s
= 6 – 4 = 2
Ans. (D)

Q. 3 to 6
(I) By statement I J lives on 6th floor
(II) Since one person is there between J & L
(III) O Lives below L (immediately) Hence O is on third floor.
(IV) From IVth & Vth statement one person is between O & P and O above P.
(V) Two persons are between K and Q and K is on even number floor except 2 so only 8th number floor which is even remains & Q is on the 5th floor.
(VIII) By last statement N lives above Q. So, N is on the 7th floor, Hence M is on the 2nd floor.

Floor	Person
8	K
7	N
6	J
5	Q
4	L
3	O
2	M
1	P

3. Ans. (A)
4. Ans. (B)
5. Ans. (C)
6. Ans. (D)

Note : Question (3 – 6) can also be solved direct by SHORTCUT

Question 7 to 9 :

(+) → Together, (×)→ Not together, (/) → or
one from each position must include in the team

Forward	Point Guards	Defenders
A	B	D
B	G	E
E	H	I
J		

Now by statements
(I) J + F (J & F are together)
(II) E/B (either E or B, but not both)
(III) G + F (if team include G, F will be included)
(IV) Exactly one among C, G and I
(V) C × F (C and F cannot be together)
(VI) D × H (D & H cannot be together)
(VII) Either A and D included or neither of them will be included

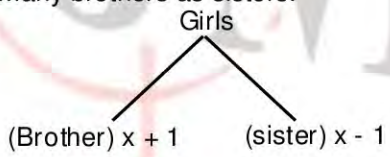
7. J + I, G, A, D, E/B is the largest team of six members.
Ans. (B)

8. If we included H, then A and D cannot be in the team so,
Six members team can't be possible from another combinations. So,
H can't be included.
Ans. (B)

9. It will be 6 (refer q. 7)
Ans. (C)

Note : Question (7 – 9) can also be solved direct by SHORTCUT

10. Let 1 boy has x brother and x sisters,
So, there will be total x + 1 brothers and x sisters.
Now,
Each girl has twice as many brothers as sisters.



i.e.
According to question,
$x + 1 = 2(x - 1)$
$x + 1 = 2x - 2$
$x = 3$
so, number of boys = $x + 1 = 4$
and girls = $x = 3$
Ans. (D)

11. From the given information :-
(I) 134 → good and tasty
(II) 478 → see good picture
(III) 729 → Pictures are faint
By (I) & (III) 4 → good
By (II) & (III) 7 → picture
Hence from II "8 is code for see"
Ans. (C)

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12. Given word's code
E → 05 → 0 + 5 = 5
X → 24 → 2 + 4 = 6
A → 01 → 0 + 1 = 1

Required word's code
G → 07 → 0 + 7 = 7
O → 15 → 1 + 5 = 6
V → 22 → 2 + 2 = 4

M → 13 → 1 + 3 = 4
I → 09 → 0 + 9 = 9
N → 14 → 1 + 4 = 5
A → 01 → 0 + 1 = 1
T → 10 → 1 + 0 = 2
I → 09 → 0 + 9 = 9
O → 15 → 1 + 5 = 6
N → 14 → 1 + 4 = 5

E → 05 → 0 + 5 = 5
R → 18 → 1 + 8 = 9
N → 14 → 1 + 4 = 5
M → 13 → 1 + 3 = 4
E → 05 → 0 + 5 = 5
N → 14 → 1 + 4 = 5
T → 20 → 2 + 0 = 2

Hence, GOVERNMENT" → 7645954552
Ans. (C)

Note : This Question can also be solved direct by SHORTCUT

13. None of the three statements is supported by the known facts.
Ans. (D)

14. Since there are 19 Numbers which have 6's as a one of the digit in 1 to 100 Number.
i.e.
6 16 26 36 46 56 60 61 62 63 64 65 66 67 68 69 76 86 96
Now, Replace all 6's by 9's we have
9 19 29 39 49 59 90 91 92 93 94 95 99 97 98 99 79 89 99
9 19 29 39 49 59 79 89 99
then $3 \times 9 = 27$ increase by
and from 60 to 69 increased by 30 except 66 which increased by
33 by replacing the 6's to 9's. i.e.
$30 \times 9 + 33 = 303$
So, total increment
$303 + 27 = 330$
Ans. (D)

Note : This Question can also be solved direct by SHORTCUT

15. Let the number of children be x
Then according to condition

$$x \times \frac{x}{5} = 405$$

$$x^2 = 405 \times 5$$

$x^2 = 2025$

$x = 45$

so, no. of children = 45

Ans. (A)

16. 17, 21, 25, ……, 817 and

16, 21, 26, ……, 851

No. of terms in

1st series $817 = 17 + (n - 1)\,4 \Rightarrow n = 201$

2nd series $851 = 16 + (n - 1)5 \Rightarrow n = 167$

$17 + (m - 1)4 = 16 + (n - 1)5$

$\Rightarrow$ $4m - 4 + 17 = 5n - 5 + 16$

$4m + 2 = 5n$

$m = 2$	$n = 2$
$m = 7$	$n = 6$
$m = 12$	$n = 10$

197 terms of first series equal to 2, 6, 10th

168 terms of the second series

No. of common terms $197 = 2 + (x - 1)\,5 \Rightarrow x = 40$

Ans. (c)

Note : This Question can also be solved direct by SHORTCUT

17. (A) ONGAER $\Rightarrow$ ORANGE

(B) NOONI $\Rightarrow$ ONION

(c) ALPEP $\Rightarrow$ APPLE

(D) AUVAG $\Rightarrow$ GUAVA

Hence ONION is different among four given option.

Ans. (B)

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18. Let total no. of passengers at the depot be

Now, at a point A $\Rightarrow$ x/6 passengers leave & $\frac{X}{10}$ board

So, No. of passengers $(x - x/6 + 10) = \frac{5x}{6} + 10$

At a point B,

$\frac{1}{5}$ th passengers board and 3 board the bus

So, remaining passengers

$$\left[\frac{5x}{6}+10-\frac{1}{5}\left(\frac{5x}{6}+10\right)\right]+3$$

$$\left(\frac{5x}{6}+10\right)\left(\frac{4}{5}\right)+3$$

$$\left(\frac{x}{6}+2\right)4+3$$

$$\frac{4x}{6}+8+3$$

$$\frac{2x}{3}+11$$

Now, at a point c, 55 passengers alight the bus,

i.e.,

$$\frac{2x}{3}+11=55 \quad \frac{x}{3}=22$$

$$X = 66$$

Ans. (C)

19. Filtering by options,

Option D cannot be correct because if both of them are of type 'No', then the answer to the question asked by Kumar has to be 'No', which implies, none of them is of type 'No'. This contradicts our assumption.

Option C cannot be correct because again if Kumar is 'No', then the answer to the question asked by Kumar has to be 'No', which implies, none of them is of type 'No'. This contradicts our assumption.

Option B cannot be correct because, if both are yes, then the answer to the question asked by Kumar has to be 'Yes' , which implies, atleast one of them has to be of type 'No', which contradicts our assumption.

Option A is correct because, if Kumar is 'Yes', then the answer to the question asked by Kumar has to be 'Yes' , which implies, atleast one of them has to be of type 'No', and Kevin is 'No'. Hence, this is the correct option.

Ans.(A)

20. Raman's Birth date → 5th March, 1970

Laxman's birth date is 25 day before Raman's Birth day

i.e. Laxman was born on 8th February

Now, given that, On 25th January (Republic day) falls on Monday – 1970

So, 8th February fall on Sunday.

i.e. Laxman's Birth day → Sunday

Ans. (A)

21. Given that,
(1) P is true, Q is also true
(2) Q is true then R is true
(3) S is true, then atleast one of Q & R is false.

Now, from statement (1) & (2)
P is true then Q is true, then R is true
i.e. P is true then R is also true.
Now, from option
(A) If S is false it is not necessary that Q and R is false.
(B) If P is true, then s is false because if P is true then Q and R both are also true.

Hence, condition (3) is contradicted by it.
Ans. (C)

22. E is married to A or D. But B is married to D. Thus, E is married to A.
Thus, A, B, C, D, E are the four adults and C, F, G are the three children in the family.
B and D have a child G. A and E have two children. They are C and F Now. only F and G are girls.
So, C is a boy. Thus, C is A's or E's son.
Given 3 → Male & 4 → Female

Male	Female
Doctor A	F
D	G
C	E → Engineer

Ans. (B)

23. According to question :
Total hours from 5 a.m. on a day to 10 p.m. on 3rd day = 65 hours
Since clock looses 16 min in 24 hours
i.e. 23 hours 44 min of clock = 24 hours of correct clock.
i.e. 23 hours + 44/60 hours of clock = 24 hours of correct clock.
i.e. 356/15 hours of clock = 24 hours of correct clock.

So, 65 hours of clock = $\left(\frac{24\times15\times65}{356}\right)$ hours of correct clock

= 65.74 hours.
= 65 hours 44 minutes (approx..)
So correct time = 10.45 p.m. (approx..)
Ans. (B)

24. Since according to the question

Since, 4th day after Monday is Friday.

Today	Tomorrow	----------	----------
↓	↓	↓	↓
Tuesday	Wednesday	Thursday	Friday

By Given diagram today is Tuesday.
Ans. (B)

Question 25 to 27 :
By Statement No. 6
U, P, S are in same line
Hence, Remaining R, Q, T are in another line

(Red)	(Orange)	(White)
S	U	P
	Road	
T	Q	R
(Blue)	(Green)	(Yellow)

Now by statement 4, T is tallest
& last statement, P is taller than R
i.e. P > R
But P is shorter than S, Q
Hence, collusion will be T > S, Q > P > R > U
1 2063 4 5 last
(U will be shortest)
(& T will be tallest)

25. Ans. (D)

26. Ans. (B)

27. Ans. (B)

28. Given word → NECESSARY
There is only one pair NS which has as many letters between them as in Alphabets.
Ans. (A)

29. Given series 4, 7, 11, 18, 28, 47, ..., 123, 199
Since each term is sum of preceding two term

$4 \xrightarrow{4+7} 7 \xrightarrow{7+11} 11 \xrightarrow{11+18} 18 \xrightarrow{18+29} 29 \xrightarrow{29+47} 47 \xrightarrow{} 76$

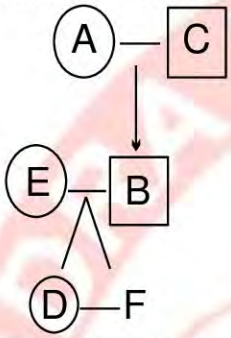
Ans. (A)

Question 30 to 32 :

Note :

Circle Indicates Male members

Square Indicates Female members



Now, D and F are lighter than B

i.e. B > D, F

By statement (4), B is lighter than E

i.e. E > B, so, E > B > D, F

By statement (6) E is lighter than C

i.e. C > E so, S > E > B > D, F

By last statement → grandfather i.e. A is heaviest in family

A > C > E > B > D, F

30. Ans. (D)

31. Ans. (A)

32. Ans. (A)

Note : Question (30 – 32) can also be solved direct by SHORTCUT

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Question 33 to 35

Step (1) By statement 2nd

C – DF

(2) By statement 3rd

E – A

(3) By statement 4th

J is neighbour of A & B & third to the left of G

E – AJ B_G

(4) By statement 5th

I _ _ HD

Hence by combining all statements

"E K A J B I G C H D F" will be correct order.

33. Ans. (D)

34. Ans. (C)

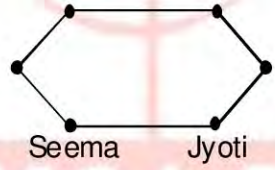
35. Ans. (B)

Note : Question (33 – 35) can also be solved direct by SHORTCUT

Question 36 to 39 :

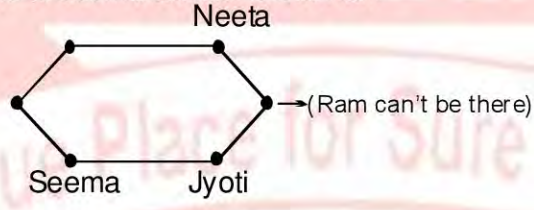
Step (1)

By statement (3)



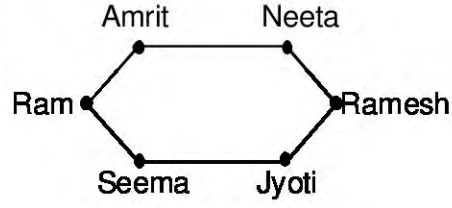
(2) By statement (4)

Neeta is sitting opposite to Seema but not next to Ram



(3) but by statement (I) Ram is opposite to Ramesh

Hence Ram will be two place next to Neeta because if Ram will Be immediate left of Neeta, he will be opposite to Jyoti which is Not possible.



36. Ans. (A)

37. Ans. (D)

38. Ans. (A)

39. Ans. (C)

Note : Question (36 – 39) can also be solved direct by SHORTCUT

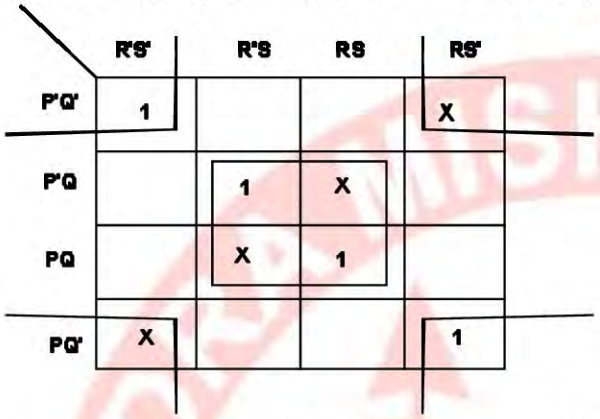
40. By option (D)
Let x be the no. of children in 1st row so, according to question
2nd row → (x – 3) children
3rd row → (x – 6) children
4th row → (x – 9) children and so on upto 6 row
∴ x + x – 3 + x – 6 + x – 9 + x – 12 + x – 15 = 630
⇒ 6x – 45 = 630
⇒ $x = \frac{670}{6} = 112.5$
But no. of children can't be fraction.
Ans. (D)

Note : This Question can also be solved direct by SHORTCUT

COMPUTER

41. 42797KB will take 85512 sectors (42797*1024 bytes / 512 bytes) Since there are 64 sectors per surface, 85512/64 = 1337.406 sectors are required, so we take 1338 sectors these sectors are distributed among 16 surfaces, so 1338/16 = 83.58 cylinders will be required. So the final ans will be 84+1200 = 1284. one more fact to be noted is that the file occupies 83.58 cylinders, but the 0.58 cannot be accommodated in the first one (the file storage starts from <1200,9,40>). Hence, the file will be extended to 194 (85594-85400) more bytes of cylinder 1284.
Ans. (A)

42. While putting the terms to K-map the 3rd and 4th columns are swapped so do 3rd and 4th rows. So, term 2 is going to (0,3) column instead of (0,2), 8 is going to (3,0) instead of (2,0) etc..



Solving this k-map gives B) as the answer. $QS + \bar{Q}\bar{S}$

Ans. (B)

43. Ans. (C)
44. Ans. (B)
45. Ans. (A)
46. $(.100)_{10}$ in binary system

    1100100

    Now two's complement = 1st complement + 1

    = 0011011 + 1

    = 0011100

    For (-100) will be 10011100

    Ans. (D)
47. Ans. (A)
48. Ans. (B)

49. The equation $(43)_x = (y3)_8$ where x and y are unknown. The number of possible solutions is

    3 + 4x = 3 + 8y where 0 <= y <= 7

and x >= 5 (because the number represented in base x is 34)

x = 2y and 0 <= y <= 7

The following are possible solutions
y = 3, 4, 5, 6, 7
x = 6, 8, 10, 12, 14
Hence the answer is 5
Ans. (C)

50. Taking 1's complement of 1010 = 0101
Adding this to 1101 gives 0010 with a carry 1.
Removing the carry and adding back to unit's place gives 0011
Ans. (D)

MATHEMATICS

51. According to question, condition becomes
⇒ 5 people are selected from 9 - 2 particular people already in the same group
⇒ ${}^{9}C_{5} - {}^{7}C_{3}$
⇒ $\frac{9\times8\times7\times6}{4\times3\times2} - \frac{7\times6\times5}{3\times2}$
⇒ 126 – 35
⇒ 91
Ans. (c)

Note : This question can also be solved direct by SHORTCUT

52. Check by option
Here (B), (C), (D) violates the conditions of logarithm
Because logarithm base become 1
Hence the appropriate answer $\left\{2^{-\sqrt{2}}, 2^{\sqrt{2}}\right\}$
Ans. (A)

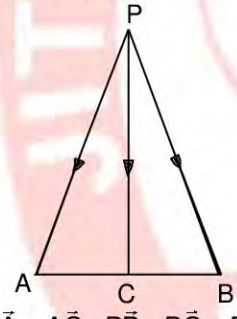
53. If twelve sided regular polygon is inscribed in a circle of radius 3 centimeter
It is clear that side of polygon must be less than 3
Here option (A), (C), (D) are greater than 3

Only, option (B) is less than 3 so, Answer will be $(18-9\sqrt{3})$

Ans. (B)

54. Using triangle law of addition of vector in triangles PAC and PBC, we have

$\vec{PA}+\vec{AC}=\vec{PC}$ and $\vec{PB}+\vec{BC}=\vec{PC}$



$\Rightarrow \vec{PA}+\vec{AC}+\vec{PB}+\vec{BC}=\vec{PC}+\vec{PC}$

$\Rightarrow \vec{PA}+\vec{PB}(\vec{AC}+\vec{BC})=2\vec{PC}$

$\Rightarrow \vec{PA}+\vec{PB}(\vec{AC}-\vec{AC})=2\vec{PC}$

$\Rightarrow \vec{PA}+\vec{PB}=2\vec{PC}$

Ans. (A)

55. Let n_1 and n_2 be the number of boys and girls respectively in the calss,

We have, $\bar{X}_1=52, \bar{X}_2=42$ and $\bar{X}=50$

$\therefore \quad \bar{X}=\dfrac{n_1\bar{X}_1+n_2\bar{X}_2}{n_1+n_2}$

$\Rightarrow \quad 50=\dfrac{52n_1+42n_2}{n_1+n_2} \Rightarrow 8n_2=2n_1 \Rightarrow n_1=4n_2$

$\therefore$ Percentage of boys $=\dfrac{n_1}{n_1+n_2}\times 100=\dfrac{4n_2}{5n_2}\times 100=80$

Ans. (A)

Note : This question can also be solved direct by SHORTCUT

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56. Total number of case are

⇒ Selection of four caps

Among 2 blue caps, 4 red caps, 5 green and 1 yellow cap

⇒ $^{12}C_4$

Favorable cases ⇒ None of them is green cap i.e. $^{7}C_4$

Required Probability $= \frac{^{7}C_4}{^{12}C_4}$

$= \frac{7}{99}$

Ans. (A)

57. The equation of line is $3x + 5y = k$

Comparing with $lx + my + n = 0$ we get

$l = 3, m = 5, n = -k$

The equation of ellipse is $16x^2 + 25y^2 = 400$

Standard form $\Rightarrow \frac{x^2}{25} + \frac{y^2}{16} = 1$

Here $a = 5, b = 4$

Then, condition of tangency

$n^2 = a^2l^2 + m^2b^2$

$(-k^2) = 25 \times 3^2 + 5^2 \times 16$

$k^2 = 625$

$k = \pm 25$

Ans. (C)

Note : This question can also be solved direct by SHORTCUT

58. We have,

$$\begin{aligned} 4^n - 3n - 1 &= (1+3)^n - 3n - 1 \\ &= (^nC_0 + ^nC_1 \times 3 + ^nC_2 \times 3 + \ldots + ^nC_n 3^n) - (3n+1) \\ &= 3^2 (^nC_0 + ^nC_3 \times 3 + \ldots + ^nC_n 3^{n-2}) \end{aligned}$$

$\therefore$ X contains some multiples of 9

Clearly, y contains all multiple of 9 including 0

$\therefore$ $X \cup Y$ equal to Y

Ans. (A)

Note : This question can also be solved direct by SHORTCUT

59. We have,

$$I = \int \left\{ \frac{(\log x - 1)}{1 + (\log x)^2} \right\}^2 dx$$

$$\Rightarrow I = \int e^t \frac{(t-1)^2}{(t^2+t)^2} dt, \text{ where } t = \log x$$

$$\Rightarrow I = \int e^t \frac{t^2 + 1 - 2t}{(t^2+1)^2} dt,$$

$$\Rightarrow I = \int e^t \left\{ \underset{f}{\frac{1}{t^2+1}} + \underset{f}{\frac{-2t}{(t^2+1)^2}} \right\} dt$$

$$\Rightarrow I = \frac{e^t}{t^2+1} + C = \frac{x}{(\log x)^2 + 1} + C$$

Ans. (B)

Note : This question can also be solved direct by SHORTCUT

60. Required volume = u. (v × w)

i.e. $\left| \begin{vmatrix} 1 & 2 & -1 \\ -2 & 0 & 3 \\ 0 & 7 & -4 \end{vmatrix} \right|$

$= |-21 - 2(8) - 1(-14)|$

$= |-23|$

But volume cannot be negative quantity so,

Required volume = 23
Ans. (C)

61. The vector perpendicular to plane is
= AB × AC
Here point A(1, –1, 0), B(2, 1, –1), C(–1, 1, 2)

$\vec{AB} = (1, 2, -1)$, $\vec{AC} = (-2, 2, 2)$

So, $\vec{AB} \times \vec{AC} = \begin{vmatrix} i & j & k \\ 1 & 2 & -1 \\ -2 & 2 & 2 \end{vmatrix}$

$= 6i + 6k$
Ans. (A)

62. Given equation of diameter are
$2x - 3y + 12 = 0$ ....(1)
$x + 4y - 5 = 0$ ....(2)
After solving above equation, we get
$x = -3$, and $y = 2$
Hence, co-ordinate of centre are (–3, 2)
Also given that area of circle = 154 sq. unit
$\pi R^2 = 154$
$\frac{22}{7} \times R^2 = 154$
$R = 7$
Here we have centre (- 3, 2) and radius = 7
Then required equation of circle is
$\Rightarrow (x + 3)^2 + (y - 2)^2 = 7^2$
$\Rightarrow x^2 + y^2 + 6x - 4y - 36 = 0$
Ans. (B)

Note : This question can also be solved direct by SHORTCUT

63. Here, $I = \int \frac{x^2 - 1}{x^3\sqrt{2x^4 - 2x^2 + 1}} dx$

Divide numerator and Denominator by x^5

We get, $I = \int \frac{\frac{1}{x^3} - \frac{1}{x^5}}{\sqrt{2 - \frac{2}{x^2} + \frac{1}{x^4}}} dx$

Put $2 - \frac{2}{x^2} + \frac{1}{x^4} = t \Rightarrow \left(\frac{4}{x^3} - \frac{4}{x^5}\right) dx = dt$

We get

$\Rightarrow \frac{1}{4}\int \frac{dt}{\sqrt{t}}$

$= \frac{1}{2}\sqrt{t} + C$ [Here C is integrand coefficient]

Substitute value of t we get

$I = \frac{1}{2}\sqrt{2 + \frac{2}{x^2} + \frac{1}{x^4}} + C$

$= \frac{\sqrt{2x^4 - 2x^2 + 1}}{2x^2} + C$

Ans. (D)

Note : This question can also be solved direct by SHORTCUT

64. Given that $|\vec{a}| = |\vec{b}| = |\vec{a} + \vec{b}| = \alpha$

We know that

$|\vec{a} + \vec{b}|^2 = |\vec{a}|^2 + |\vec{b}|^2 + 2\vec{a}.\vec{b}$

$\alpha^2 = \alpha^2 + \alpha^2 + 2\vec{a}.\vec{b}$

$\vec{a}.\vec{b} = \frac{-\alpha^2}{2}$

Then, $|\vec{a} - \vec{b}|^2 = |\vec{a}|^2 + |\vec{b}|^2 - 2\vec{a}.\vec{b}$

$= \alpha^2 + \alpha^2 - 2\frac{(-\alpha^2)}{2}$

$= \alpha^2 + \alpha^2 + \alpha^2$

$= 3a^2$

So, $|\vec{a} - \vec{b}|^2 = \sqrt{3}\alpha$

Ans. (B)

65. Ans. (C)

66. We have, $2x^2 + 7xy + 3y^2 + 8x + 14y + d = 0$

This will represent a pair of straight line

If $abc + 2fgh - af^2 - bg^2 - ch^2 = 0$

$\Rightarrow$ a = 2, b = 3, c = λ, h = 7/2, g = 4, f = 7

Put this value in above condition we get,

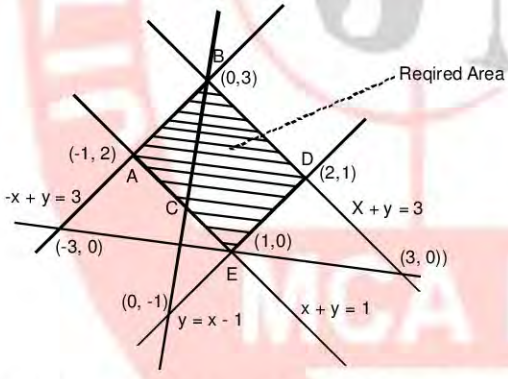
= $2 \times 3 \times \lambda - 2 \times 7 \times 4 \times 7/2 - 2 \times 7^2 - 3 \times 4^2 - \times (7/2)^2$

$\Rightarrow$ λ = 8

Ans. (D)

67. $y = |x-1| = \begin{cases} x-1 & : \ x \geq 1 \\ 1-x & : \ x < 1 \end{cases}$ .....(i)

and $y = 3 - |x| = \begin{cases} 3-x & : \ x \geq 0 \\ 3+x & : \ x < 0 \end{cases}$ .....(ii)



Clearly the two curves meet at (-1, 2) and (2, 1),

Required Area = $\int_{-1}^{0}(y_2 - y_1)dx + \int_{0}^{1}(y_2 - y_1)dx + \int_{1}^{2}(y_2 - y_1)dx =$

$\int_{-1}^{0}[3+x-(1-x)dx] + \int_{0}^{1}[(3-x)-(1-x)]dx + \int_{1}^{2}[(3-x)-(x-1)]dx = 4$

Ans. (B)

Note : This question can also be solved direct by SHORTCUT

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68. We have, a = 4, b = 3 and A = 60°

$\therefore \quad \cos A = \dfrac{b^2 + c^2 - a^2}{2bc}$

$\Rightarrow \quad \cos 60^\circ = \dfrac{9 + c^2 - 16}{6c} \Rightarrow c^2 - 3c - 7 = 0$

Correct answer is $c^2 - 3c - 7 = 0$ which is not given in any of the four option.
Ans. (wrong)

69. Given $\cos\theta = \frac{5}{13}, \frac{3\pi}{2} < \theta < 2\pi$

We know than $\tan 2\theta = \frac{2\tan\theta}{1-\tan^2\theta}$

Here $\cos\theta = \frac{5}{13}$ [$3\pi < 2\theta < 4\pi$ obviously θ belong to IV quadrants]

So, $\tan\theta = \frac{-12}{5}$

$\therefore \quad \tan 2\theta = \frac{2\times\left(\frac{-12}{5}\right)}{1-\left(\frac{-12}{5}\right)^2}$

$= \frac{-24\times 25}{5(-119)}$

$= \frac{120}{119}$

Ans. (D)

70. We have, $P(A) = \frac{4}{10} = \frac{2}{5}$

Suppose B has n outcomes, Then, $P(B) = \frac{n}{10}$, $0 < n < 10$

Since A and B are independent events.

$\therefore \quad P(A \cap B) = P(A)\,P(B)$

$\Rightarrow \quad P(A \cap B) = \frac{2}{5}\times\frac{n}{10} = \frac{2n/5}{10}$

$\Rightarrow \quad \frac{2n}{5}$ is an integer between 0 and 10

$\Rightarrow \quad \frac{n}{5}$ is an integer between 0 and 5

$\Rightarrow \quad N = 5, 10$

Ans. (D)

71. It is given that $\vec{a}+3\vec{b}$ is collinear with $\vec{c}$ and $\vec{b}+2\vec{c}$ is collinear with $\vec{a}$. Therefore,

$\vec{a}+3\vec{b}=\lambda\vec{c}$ and $\vec{a}+\vec{b}+2\vec{c}=\mu\vec{a}$ for some λ, μ.

$\Rightarrow \vec{a}+3(\mu\vec{a}-2\vec{c})=\lambda\vec{c}$ [On eliminating] $\vec{b}$

$\Rightarrow (1+3\mu)\vec{a}-(\lambda+6)\vec{c}=\vec{0}$

$\Rightarrow 1+3\lambda=0$ and $\lambda+6=0$ [$\because$ $\vec{a}$ and $\vec{c}$ are non-collinear]

$\therefore \lambda = -6$ and $\mu=-\frac{1}{3}$

$\Rightarrow \vec{a}+3\vec{b}=\lambda\vec{c} \Rightarrow \vec{a}+3\vec{b}+6\vec{c}=\vec{0}$

Ans. (D)

72. Let α, β be the roots of the given equation. Then,

$\alpha+\beta = a-2$ and $\alpha\beta = -(a+1)$.

$\Rightarrow \alpha+\beta = (\alpha+\beta)^2 - 2\alpha\beta = (a-2)^2 + 2(a+1)$

$\Rightarrow \alpha^2+\beta^2 = a^2 - 2a + 6 = (a-1)^2 + 5$

Clearly, $\alpha^2+\beta^2 \geq 5$. So, the minimum value of $\alpha^2+\beta^2$ is 5 which it attains at $a = 1$.

Ans. (D)

73. Given

$P(A \cup B) = 0.6$

$P(A \cap B) = 0.3$

Then by probability law we have

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

$0.6 = P(A) + P(B) - 0.3$

$\Rightarrow P(A) + P(B) = 0.9$

$\Rightarrow 1 - P(A) + 1 - P(B) = 2 - 0.9$ [Adding 2 both side]

$\Rightarrow P(\bar{A}) + P(\bar{B}) = 1.1$

Ans. (C)

74. Total number of subset in set A = 2^m
Total number of subset in set B = 2^n
Then according to given condition

$\Rightarrow 2^m = 2^n + 56 \quad \Rightarrow 2^m - 2^n = 56$

$\Rightarrow 2^n(2^{m-n} - 1) = 8 \times 7 \quad \Rightarrow 2^n(2^{m-n} - 1) = 2^3(2^3 - 1)$

Comparing both side

$n = 3$

$m - n = 3$

$\Rightarrow m = 6$

Ans. (B)

Note : This question can also be solved direct by SHORTCUT

75. Given that

$$P(A) = \frac{4}{5},\ P(\bar{A}) = \frac{1}{5}$$

$$P(B) = \frac{3}{4},\ P(\bar{B}) = \frac{1}{4}$$

Then probability that they contradict each other
When,

$\Rightarrow P(A).P(\bar{B}) + P(B).P(\bar{A})$

$\Rightarrow \frac{4}{5} \times \frac{1}{4} + \frac{3}{4} \times \frac{1}{5}$

$= \frac{7}{20}$

Ans. (C)

Note : This question can also be solved direct by SHORTCUT

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76. Let $S = \frac{1}{\sqrt{1}+\sqrt{2}} + \frac{1}{\sqrt{2}+\sqrt{3}} + \frac{1}{\sqrt{3}+\sqrt{4}} + ... + \frac{1}{\sqrt{80}+\sqrt{81}}$

= Rationalize each term we get

$$S = \frac{\sqrt{2}-\sqrt{1}}{2-1} + \frac{\sqrt{3}-\sqrt{2}}{3-2} + ... + \frac{\sqrt{81}-\sqrt{80}}{81-80}$$

$S = \sqrt{2} - 1 + \sqrt{3} - \sqrt{2} + ... + \sqrt{81}$

$S = 9 - 1$

$S = 8$

Ans. (B)

Note : This question can also be solved direct by SHORTCUT

77. Given $f(x) = \begin{cases} x^2 - 1 & x < 3 \\ 2ax & x \geq 3 \end{cases}$

If f is continuous at x = 3 then

$F(3) = \lim_{h \to 0} f(3+h) = \lim_{h \to 0} (3-h)$

$\Rightarrow \lim_{h \to 0} 2a(3+h) = \lim_{h \to 0} (3-h)^2 - 1$

$\Rightarrow 6a = 8$

$\Rightarrow a = \frac{4}{3}$

Ans. (D)

78. Each person can apply for any house. Therefore, total number of way in which Three persons can apply for three houses in 3 × 3 × 3 = 27 ways

Since three persons can apply for house 1 or house 2 or house 3.

So, three persons can apply for the same house in 3 ways.

$\Rightarrow$ Favorable number of ways = 3

So, required probability = $\frac{3}{27} = \frac{1}{9}$

Ans. (D)

79. We have,

Required probability = 1 – Probability that none of the selected horses is a winning horse.

$= 1 - \left(\frac{4}{5} \times \frac{3}{4}\right) = 1 - \frac{3}{5} = \frac{2}{5}$

Ans. (C)

80. Given $3^x = 4^x - 1$

Taking logarithm both side

$x \log 3 = (x - 1) \log 4$ [by property $\log m^n = n \log m$]

$x (\log 3 - \log 4) = - \log 4$

$$x = \frac{\log 4}{\log 4 - \log 3}$$

$$x = \frac{2\log 2}{2\log 2 - \log 3}$$

$$x = \frac{2\log_3 2}{2\log_3 2 - 1}$$ [divided by log 3]

Correct answer is $\frac{2\log_3 2}{2\log_3 2 - 1}$ which is not given in any of the four option.

Ans. (wrong)

81. Given $[A]_{x \times (x+5)}$ here x = number of rows,
x + 5 = number of column

also,
$[B]_{y \times (11-y)}$ y = number of rows
11 – y = number of column

Hence, AB exist if

$\Rightarrow$ Number of column of A = number of row of B

$\Rightarrow$ $x + 5 = y$ .....(1)

Also,
BA exist if

$\Rightarrow$ Number of column of B = number of row of A

$\Rightarrow$ $11 - y = x$ .....(2)

Solving equation (1) and (2) we get

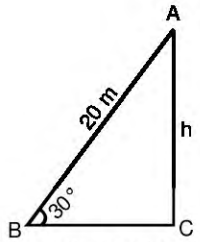
$x = 3$

$y = 8$

Ans. (C)

Note : This question can also be solved direct by SHORTCUT

82. In given question we have,



By sine rule height of pole AC will be

$$\sin 30° = \frac{AC}{AB}$$

$$\Rightarrow \quad \frac{1}{2} = \frac{h}{20}$$

$\Rightarrow$ h = 10

Ans. (A)

83. There are n equally spaced points 1, 2, ……, n
Given 15 is directly opposite to the point 49
So, other point will be 49 – 15 = 34
But two points must be excluded
So, there are 32 points which opposite
Then, total number of points are
$32 \times 2 + 2$
$= 66$
Ans. (C)

84. Direct by option.
Ans. (D)

85. We have, $4^x - 3(2^{x+3}) + 128 = 0$ …… (1)
Put $2^x = y$, Equation (1) becomes
$y^2 - 3(8y) + 128 = 0$
$\Rightarrow \quad y^2 - 24y + 128 = 0$
$\Rightarrow \quad (y - 8)(y - 16) = 0$
$\Rightarrow \quad y = 16, 8$
$\Rightarrow \quad 2^x = 16, 8$
$\Rightarrow \quad x = 4, 3$
$\therefore$ Sum of the root is 7.
Ans. (C)

86. let m_1 and m_2 be the slope of the lines
Given by $x^2 - 2cxy - 7y^2 = 0$

Then $m_1 + m_2 = \frac{-2h}{b} \Rightarrow \frac{-2c}{7}$

$m_1 \ m_2 = \frac{a}{b} \Rightarrow \frac{-1}{7}$

then given that

$\Rightarrow \quad m_1 + m_2 = 4\, m_1 m_2$

$\Rightarrow \quad \frac{-2c}{7} = 4 \times \left(\frac{-1}{7}\right)$

$\Rightarrow \quad c = 2$

Ans. (D)

87. Given system of equations

$x + y + 2z = a$

$x + z = b$

$2x + y + 3z = c$

by matrix method we get, Augmented matrix

$$\left[\begin{array}{ccc;c} 1 & 1 & 2 & a \\ 1 & 0 & 1 & b \\ 2 & 1 & 3 & c \end{array}\right]$$

Apply operation

$R_2 \to R_1 - R_2$

$R_3 \to 2R_1 - R_3$

$$\left[\begin{array}{ccc;c} 1 & 1 & 2 & a \\ 0 & 1 & 1 & a-b \\ 0 & 1 & 1 & 2a-c \end{array}\right]$$

Again apply operation

$R_3 \to R_3 - R_2$

$$\left[\begin{array}{ccc;c} 1 & 1 & 2 & a \\ 0 & 1 & 1 & a-b \\ 0 & 0 & 0 & a+b-c \end{array}\right]$$

If solution exist then

$a + b - c = 0$

$a + b = c$

Ans. (B)

Note : This question can also be solved direct by SHORTCUT

88. Give $f(x) = x^2 - bx + c$

Let 2 and 11 be prime root of above equation

Then $(x-2)(x-11)=0$

$x^2-13x+22=0$

which satisfies

$b=13$ i.e. odd positive integer

$c=22$

Now $b+c=35$

Global minimum $f'(x)=0$ $f''(x)>0$

$2x-13=0$

$x=\frac{13}{2}$

$f''\left(\frac{13}{2}\right)>0$

So, $f\left(\frac{13}{2}\right)=\frac{-81}{4}$

Ans. (C)

89. Given focus (-1, 1)

Directrix $4x+3y-24=0$

Then equation of axis which is perpendicular to directrix

$3x-4y+c=0$

Point (-1, 1) lie on above equation

$-3-4+c=0$

$C=7$

Then equation of axis is $3x-4y+7=0$

Now vertex lie on given axis

Here only option (D) satisfy the above equation

Hence vertex will be $\left(1,\frac{5}{2}\right)$

Ans. (D)

Note : This question can also be solved direct by SHORTCUT

90. Given equation $x^2-x\sin x-\cos x=0$

For any root + in $(-\infty,\infty)$ we have

$f'(x)=2x-\sin x-x\cos x+\sin x=0$

$\Rightarrow 2x-x\cos x=0$

$\Rightarrow x(2-\cos x)=0$

$\cos x=2$

which is not possible so,

number of root will be zero.

Ans. (D)

91. Total number of arrangement will be

= $\lfloor 4 \lfloor 5 \lfloor 3$

= 17280

Ans. (A)

92. It is given that each of the two population has 100 observations which are 100 consecutive integers. So, sum of the squares of deviations from their respective mean are same.

$\therefore \quad V_A = V_B \Rightarrow \frac{V_A}{V_B} = 1$

Ans. (C)

93. From given relation we get

$\Rightarrow$ $a + b = 2i + 3j + 4k$ [by vector property]

$\Rightarrow$ $(a + b) \cdot (-7i + 2j + 3k)$

= $(2i + 3j + 4k) \cdot (-7i + 2j + 3k)$

= $-14 + 6 + 12$

= 4

Ans. (C)

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94. By variance condition

$$\frac{\Sigma x^2}{n} \geq \frac{(\Sigma x)^2}{n^2}$$

$$\Rightarrow \quad \frac{400}{n} \geq \frac{80 \times 80}{n^2}$$

$n \geq 16$

So, n can be 20

Ans. (C)

95. For greatest area sides of rectangle will be, $a\sqrt{2}, b\sqrt{2}$

Then are = $a\sqrt{2} \times b\sqrt{2}$

= 2ab (standard fact)

Ans. (B)

96. The equation of any tangent to $y^2 = 8ax$ is

$$y = mx + \frac{2a}{m} \qquad \ldots\ldots(i)$$

If it touches $x^2 + y^2 = 2a^2$, then

$$\left(\frac{2a}{m}\right)^2 = 2a^2(1+m^2) \qquad [\text{Using } c^2 = a^2(1+m^2)]$$

$\Rightarrow$ $2 = m^2(m^2 + 1)$

$\Rightarrow$ $m^4 + m^2 - 2 = 0$

$\Rightarrow$ $(m^2 + 2)(m^2 - 1) = 0 \Rightarrow m^2 - 1 = 0 \Rightarrow m = \pm 1$

Putting the value of m in (i), we get

$\Rightarrow$ $y = \pm (x + 2a)$ as the equations common tangent.

Ans. (B)

Note : This question can also be solved direct by SHORTCUT

97. Let us consider on A.P. whose term will be

$a_1 = 0, a_2 = 1, a_3 = 2, a_4 = 3, a_5 = 4$

Let n = 4

Then, $\left(\frac{a_3}{a_2} + \frac{a_2}{a_3}\right) - a_2\left(\frac{1}{a_2}\right)$ [for n = 4 only this term exist]

Put above value

$$\left[\frac{2}{1} + \frac{3}{2}\right] - 1$$

$$= \frac{3}{2} + 1$$

$$= \frac{5}{2}$$

Now only $(n-2) + \frac{1}{n-2} \Rightarrow 2 + \frac{1}{2} = \frac{5}{2}$ satisfied.

Only option (A) will be true

Ans. (A)

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98. $\cos 20° + \cos 100° + \cos 140°$

$\Rightarrow$ $(\cos 20° + \cos 100°) + \cos 140°$

Now by $\cos C + \cos D = 2\cos\frac{C+D}{2}\cos\frac{C-D}{2}$

$\Rightarrow \quad 2\cos\frac{(20+100)}{2}\cos\frac{(100-20)}{2}+\cos 140$

$\Rightarrow \quad 2\cos 60°\cos 40°+\cos 140°$

$\Rightarrow \quad 2\times\frac{1}{2}\cos 40°+\cos 140°$

$\Rightarrow \quad \cos 40°+\cos 140°$

$\Rightarrow \quad 2\cos\left(\frac{140+40}{2}\right)\cos\left(\frac{140-40}{2}\right)$

$\Rightarrow \quad 2\cos 90°.\cos 50°$

$0 \qquad [\because \cos 90° = 0]$

Ans. (A)

Note : This question can also be solved direct by SHORTCUT

99. By General inspection, of all the given options (A), (B), (C) are different from given order of word. Only option (D) is correct.
Ans. (D)

100. Foci of the ellipse are $\left(\pm\sqrt{16-b^2},0\right)$

and of the hyperbola are $\left(\pm\sqrt{\left(\frac{12}{5}\right)^2+\left(\frac{9}{5}\right)^2},0\right)$

If they coincide $16 - b^2 = \frac{144+81}{25} \Rightarrow b^2 = 7$

Ans. (B)

GENERAL ENGLISH

101. The word 'basic' in the above passage signifies which is very much necessary and important. Word opposite in meaning will be 'Unimportant'.
Ans. (B)

102. The price of the cement is going up because of the deliberate attempt made by the manufacturers to create a lack in the quantity in their own self interest.
Ans. (D)

103. As evident from the passage, the artificial scarcity causes increase in the cement price which is the crisis faced by cement tile manufacturers.
Ans. (A)

104.In the above passage, artificial signifies deliberate since it is done in their own self interest.
Ans. (A)

105.A person who makes money by starting or running business is called an Entrepreneur.
Ans. (D)

106.Group of insects is termed as swarm of insects
Ans. (B)

107.Ans.(C)

108. Theatrical means behaving or done in a way that is meant to attract attention and that is often not genuine or sincere.
Similarly, histrionic means deliberate display of emotion for effect.
Ans. (B)

109.B,C,D all are related to something which cannot be relied upon or is suspected. Contrary to this , option A means something which cannot be denied or challenged.
Ans. (A)

110. Similar to scale which consists of series of tones of varying value, spectrum also consists of series of color of varying value.
Ans. (C)

111.Ans. (D)

112.The correct preposition is 'out on'.
Ans. (B)

113.Since darkest starts with a consonant, and is definite in context, hence, the appropriate article is 'The'.
Ans. (C)

114.Steak when cold and tough cannot be eaten, hence the correct word is 'inedible'.
Ans. (D)

115.Since, there is no definite time specified, hence 'for' is the correct word.

Ans. (B)

116. Ans. (B)

117. The question and the answer tag are always complementary to each other in sentence formation and modal phrase used is 'should', hence the correct option is D
Ans. (D)

118. The statement in active voice is in simple past, hence the correct passive voice form will be option A
Ans. (A)

119. Ans. (B)

120. Ans. (C)

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