MATRIX
HIGH SCHOOL

NTSE STAGE II
CODE: 13 – 15 (2019 – 2020)
MENTAL ABILITY TEST (MAT)
Held on: February 14, 2021

HINTS & SOLUTIONS

1.	**3**	2.	**3**	3.	**1**	4.	**3**
5.	**No option correct.**			6.	**2**	7.	**4**
8.	**4**						
9.	**2**	10.	**1**	11.	**2**	12.	**2**
13.	**4**	14.	**2 or 3**	15.	**1**	16.	**1**
17.	**No option correct.**			18.	**1**	19.	**3**
20.	**4**						
21.	**2**	22.	**2**	23.	**3**	24.	**3**
25.	**3**	26.	**2**	27.	**3**	28.	**3**
29.	**2**	30.	**1**	31.	**3**		
32.	**2**	33.	**2**	34.	**1 & 3 both**		
35.	**2**	36.	**3**	37.	**3**	38.	**2**
39.	**1**	40.	**2**	41.	**2**	42.	**2**
43.	**4**	44.	**4**	45.	**4**	46.	**1**
47.	**4**	48.	**4**	49.	**4**	50.	**1**
51.	**4**	52.	**4**	53.	**4**	54.	**2**
55.	**3**	56.	**3**	57.	**4**	58.	**2**
59.	**No option correct.**			60.	**3**	61.	**3**
62.	**3**	63.	**3**	64.	**2**	65.	**4**
66.	**4**	67.	**1**	68.	**1**	69.	**1**
70.	**1**	71.	**2**	72.	**4**	73.	**1**
74.	**4**	75.	**2**	76.	**1**	77.	**3**
78.	**3**	79.	**4.**	80.	**3**	81.	**1**
82.	**2**	83.	**1.**	84.	**3**	85.	**4**
86.	**2**	87.	**4.**	88.	**2**	89.	**3**
90.	**1**	91.	**3**	92.	**1.**	93.	**4**
94.	**2**	95.	**2**	96.	**2**	97.	**4**
98.	**3**	99.	**1**	100.	**1**		

1.   3
Sol. (Sum of position number of letters present in that word) x (number of letters present in that word)

2.   3
Sol. $1^2 + 2^2 + 4^2 = 21$

$3^2 + 8^2 + 5^2 = 98$

Similarly, $\boxed{7}^2 + 6^2 + 3^2 = 94$

3.   1
Sol.
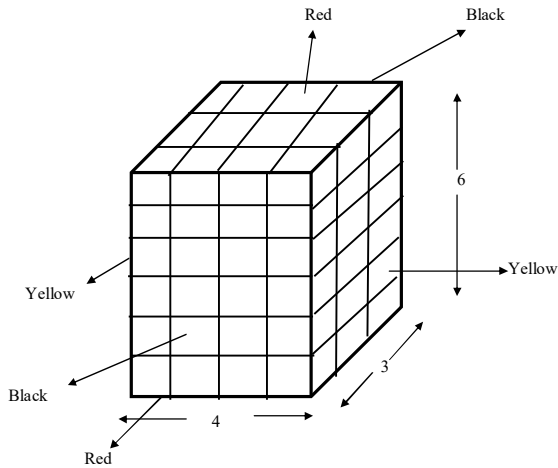
Total number of cubes = 3 x 4 x 6 = 72

All inner central cubes (after removing 2 faces of 4 x 6, 2 faces of 4 x 3 and 2 faces of 3 x 6 cubes)

4.   3
Sol. 4 edges each common to red and yellow faces having 3 cubes each.

5.   **No option correct.**
Sol. Since given statement is 'project work' which means 34, now from statement I and given statement it is clear that 3 is 'project' so 4 is 'work' and from statement II and given statement it is clear that 4 is 'work' so 3 is 'project' so we can determine answer from both the statements individually.
      So, no such option matches.

6.   2
Sol. From the given statements it is clear that tortoise who like to fly will also like to jump as all tortoise like to jump.

7. 4
Sol.   To form 9^0 between 3 pm & 4 pm (minute hand ahead of hour hand), minute hand has to travel 99^0 from 3 pm.

i.e, $\dfrac{99}{5.5} = 18$
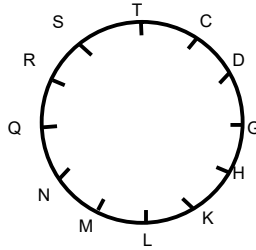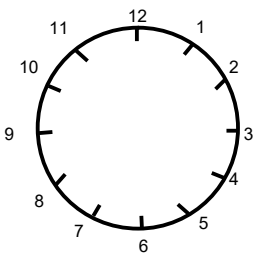
∴ Exact time = 3 hrs 18 min

8. 4
Sol.   Position number of inner letter is written on outer side and position number of outer letter is written in opposite side (in square)

9. 2
Sol.

Not included letters → (A, B), (E, F), (I, J), (O, P), (U, V)

Start time →   N : T
                8:00

End time →   S : K
                11:25

Total time → 3 hrs 25 min
Number of period = 5
Break time = 7 min, 9 min, 11 min, 13 min
= 40 min (total)

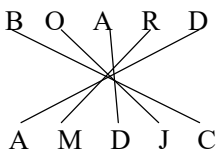∴ Duration of each period = $\dfrac{180 + 25 - 40}{5}$ = 33 min

10. 1
Sol.
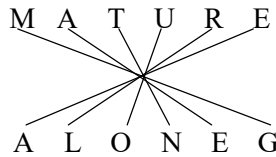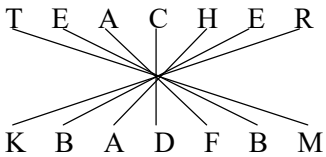
Similarly,

Either sum or difference of position number of corresponding letters = total number of letters present in that word.

11. 2
Sol.

	M	P	B	K	L	V
Dancing	√	√				
Acting	√	√				
Singing		√	√	√		√
Playing tabla	√		√	√	√	
Playing guitar		√				√

12. 2
Sol. Squares formed from 2 figures = 24
Squares formed from 4 figures = 16
Squares formed from 8 figures = 13
Squares formed from 16 figures = 9
Squares formed from 18 figures = 4
Square formed from 32 figures = 1
Squares formed from 36 figures = 4
Squares formed from 64 figures = 1
∴ Total squares = 72

13. 4
Sol. Since, 25 – 10 + 4 = 16
$\Rightarrow + \rightarrow -$
$\times \rightarrow +$
and 10 × 3 ÷ 3 = 1
$\Rightarrow \div \rightarrow \times$
$- \rightarrow \div$
∴ 16 × 5 + 40 – 10 × 2
= 16 + 5 – 40 ÷ 10 × 2
= 16 + 5 – 4 × 2
= 21 – 8
= 13

14. 2 or 3
Sol. Since '>' occur 4 times. There is no symbol on the ninth number after '>', so if we consider cyclic order then correct answer is @.
If in place of symbol its written character then answer should be S.

15. 1
Sol. 1 to 9 all numbers are written horizontally, vertically and diagonally.

16.   1

Sol. $\$ \rightarrow \geq$

      © $\rightarrow <$

      $\# \rightarrow >$

      $\% \rightarrow \leq$

      $@ \rightarrow =$

      T%R, R\$M, M@D, D©H

      $\Rightarrow T \leq R \geq M = D < H$

    1.   D % R

          $D \leq R$, holds true

    2.   H # R

          $H > R$

    3.   T © M

          $T < M$

    4.   T % D

          $T \leq D$

17.   **No option correct.**

Sol. $\$ \rightarrow \geq$

      © $\rightarrow <$

      $\# \rightarrow >$

      $\% \rightarrow \leq$

      $@ \rightarrow =$

      M@B, B#N, N\$R, R©K

      $M = B > N \geq R < K$

    1.   K © R

          $K < R$

    2.   R © B

          $R < B$, holds true

    3.   M \$ R

          $M \geq R$

    4.   N © M

          $N < M$, holds true

18.   1

Sol.   Area common to bigger rectangle, bigger triangle and smaller rectangle.

19.   3

Sol.   Area common to vertical rectangle and circle.

20.   4

Sol.   Area common to circle and bigger rectangle but not both triangles.

21.   2

Sol.   23rd April   13th June

      Monday   ?

Number of days between these 2 dates = 7 + 31 + 13 = 51 days
51 days = 2 odd days
∴ 13th June same year will be Monday + 2 = Wednesday

22.   2
Sol.

	M	T	W	T	F	S	S
9 – 10	S		S	S			
10 – 12	DS		S	DS	D		D
12 – 12:30	DS	A	S	ADS	D		AD
12:30 - 2	D	A		AD	D		AD
2 - 4		A		A	S	S	AS

All doctors are available on Thursday for ½ hrs.

23.   3
Sol.   Dr Ashutosh and Dr Shehnaz are available on Thursday for ½ hrs and on Sunday for 2 hrs.

24.   3

Sol.   Dr. Dhanwantri and Dr. Shehnaz are available on Monday for $2\frac{1}{2}$ hrs and on Thursday for

$2\frac{1}{2}$ hrs.

25.   3
Sol.   Total number of students who are not qualified in atleast 1 subject are
(30 + 10 + 75 + 5 + 12 + 8 + 50) = 190
∴ 38% of total students = 190
Total students = 500
Candidates not qualified in atleast 2 subjects = 10 + 5 + 12 + 8 = 35
∴ % of such candidates = $\dfrac{35}{500}\times100$ = 7%

26.   2
Sol.
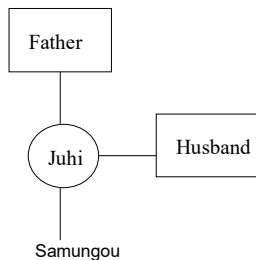
From figure we can say he is the father of Samungou.

27.   3
Sol.

17   21   12   8

33   29   38   42

41   37   ?   50
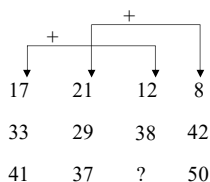
Sum of number of 1st and 3rd column is equal to 2nd and 4th column.

28. 3
Sol. $(13 - 4) \times 5 + 4 = 49$
$(17 - 11) \times 7 + 6 = 48$
$(19 - 13) \times 6 + 8 = 44$
So, answer is option 3.

29. 2
Sol. Book = 108^0
Not book = 36^0
School fee = 72^0
Mess charges = 18^0
Travel and accommodation = 126^0

30. 1
Sol. $\dfrac{A}{D} = \dfrac{2 \times 36}{5 \times 36}$
A = 72
B = 180
A + D = 252
If x is the number of total student
30 of x = 252
$x = \dfrac{252 \times 100}{30} = 840$

31. 3
Sol. Since some of the competitors are toppers and all topper are marked with green. So, some competitors (those were toppers) are definitely marked with green.

32. 2
Sol.

2,   3,   5,   7,   11,   13,   17,   19

   1,   2,   2,   4,   2,   4,   2

33. 2
Sol. As per observation.

34. 1 & 3 both
Sol. Option 1 and 3 are same.

35. 2
Sol. Through options.

36. 3
Sol. Atleast 2 clubs = (14 + 11 + 8 + 36 + 12 + 24 + 10 + 15 + 16) = 146

37. 3
Sol. $\dfrac{B}{G} = \dfrac{1}{1}$

2017 – 18

$$\frac{B}{G} = 1.4 = \frac{1\!\!/4}{1\!\!/0} \frac{\not7}{\not5} \frac{14}{10}$$

So, in 2017 − 18

$$\frac{B}{G} = \frac{5}{5}$$

∴ Boys = $\dfrac{(17-18)}{(16-17)} = \dfrac{14}{5}$

38. 2

Sol. $27 + 22(2.7 + 0.27 + ...)$

$27 + 2 \times 2.7(1 + 0.1 + 0.01)$
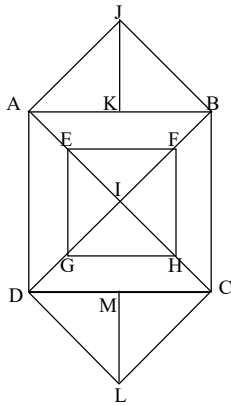
$27 + 2 \times \dfrac{2\!\!/7}{0.\!\!/5} = 3$

27 + 6 = 33

39. 1

Sol. $\sqrt{9} = 3, \sqrt{25} = 5$
So, 3 x 5 = 15
3 + 5 = 8 = 8^2 = 64
(5 - 3) = 2
Similarly,
$\sqrt{49} = 7, \sqrt{100} = 10$
7 x 10 = 70
7 + 10 = 17
10 − 7 = 3

40. 2

Sol. 002 B, 009 I, 028 J, ___, 126I
$1^3 + 1,\ 2^3 + 1,\ 3^3 + 1,\ 4^3 + 1$
B I J K I
(They are obtained by adding the digit)

41. 2

Sol.

ΔIEF, ΔIHF, ΔIGH, ΔGEI, ΔEFM, ΔEGH, ΔEGF, ΔGFH, ΔABI, ΔBIC, ΔDIC, ΔDAI, ΔABC, ΔADC, ΔADB, ΔDBC, ΔAJK, ΔJKB, ΔAJB, ΔDML, ΔLMC, ΔDCL

42. 2

Sol. 60 → total students
Girls = 24, boys = 36
Kartik's rank is17 in which 9 are girls rest are boys that is 7
Ratio of girls and boys after Kartik's is

$$\frac{24-9}{36-8} = \frac{15}{28}$$

43. 4

Sol. Sum of the digit is 3

44. 4

Sol. As per observation.

45. 4

Sol. From 1 and 2   L = 2
From 1 and 3   □ = 8
From above equation and 4   ⬠ = 16
So, clearly 23 = 16 + 5 + 2
= ⬠ + (△ ╱) + L
= L △ ╱ ⬠

46. 1

Sol. As per observation.

47. 4

Sol. As per observation.

48. 4

Sol. As per observation.

49. 4

Sol. As per observation.

50. 1

Sol. As per observation.
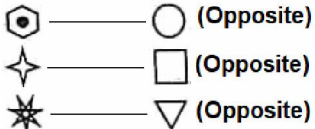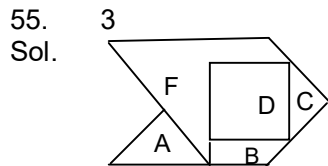
51. 4

Sol. As per observation

52. 4

Sol.

53. 4

Sol. As per observation

⬡ ——— ◯ (Opposite)

✦ ——— ▢ (Opposite)
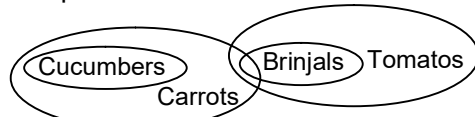
✳ ——— ▽ (Opposite)
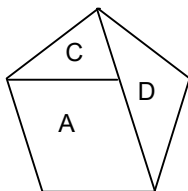
54. 2

Sol. As per observation

55. 3

Sol.

56. 3

Sol. By using option 3 = $x^3 + \dfrac{3x}{2}$

If we put n = 4

Then = $4^2 + \dfrac{3 \times 4}{2} = 64 + \dfrac{12}{2} = 70$

57. 4

Sol. $C_1 = 9 + 16 = 12 + 13$

$C_2 = x + 63 = 53 + 50 \rightarrow x = 40$

$C_3 = 102 + y = 140 + 118 \rightarrow y = 156$

58. 2

Sol. First row $\rightarrow \dfrac{6+17+11+4}{2} = 19$ (Middle No.)

Second row $\rightarrow \dfrac{7+\mathbf{3}+14+10+5+9}{2} = 24$ (Middle No.)

Third row $\rightarrow \dfrac{1+6+8+18+\mathbf{16}+9+7+3}{2} = 34$ (Middle No.)

Fourth row $\rightarrow \dfrac{5+2+13+15+2+5}{2} = 21$ (Middle No.)

Fifth row $\rightarrow \dfrac{5+16+12+\mathbf{7}}{2} = 20$ (Middle No.)

59. No option correct.

Sol.

I. ✓
II. X
III. X
IV. X

Only conclusion I follows.

60. 3

Sol. Let the present age of Aman = x, Ayaz = y and Ashwinder = z

Its given x = y + 6,

y = z + 8

x + y = (z − 4) × 5,

x + y = 5z − 20,

x + y − 5z = − 20

z + 14 + z + 8 − 5z = − 20 [∵ x = z + 8 + 6, x = z + 14]

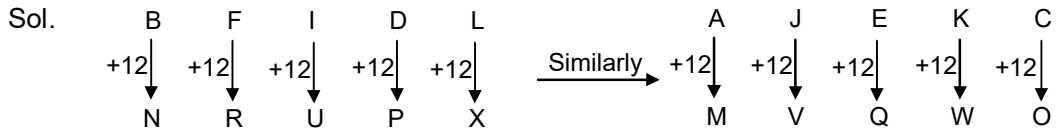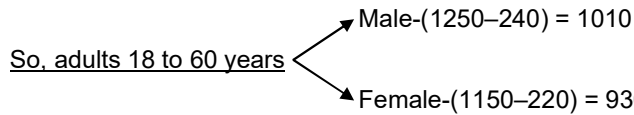22 − 3z = − 20

−3z = −20 − 22

3z = 42, Z = 14

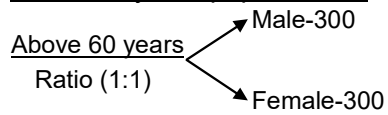So, Ashwinder = 14, Ayaz = 14 + 8 = 22 and Aman = 22 + 6 = 28

61. 3

Sol.

B	F	I	D	L		A	J	E	K	C
+12	+12	+12	+12	+12	Similarly	+12	+12	+12	+12	+12
N	R	U	P	X		M	V	Q	W	O

62. 3

Sol.

Below 18 years → Boys-240, Girls-220

Below 60 years → Male-1250, Female-1150

So, adults 18 to 60 years → Male-(1250–240) = 1010, Female-(1150–220) = 930
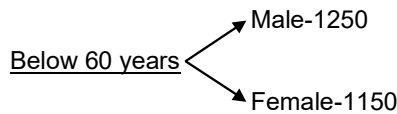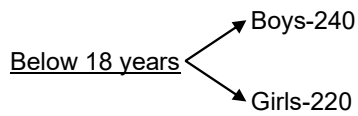
Above 60 years population = 3000 − (1250 + 1150) = 600

Above 60 years Ratio (1:1) → Male-300, Female-300

So, the difference → 930 − 300 = 630

63. 3

Sol. 484 → 4 + 8 + 4 = 16

529 → 5 + 2 + 9 = 16

961 → 9 + 6 + 1 = 16

Similarly

784 → 7 + 8 + 4 = 19

676 → 6 + 7 + 6 = 19

289 → 2 + 8 + 9 = 19

64. 2

Sol. First figure →

$3 \times 2 + 1 = 7$

$7 \times 3 - 2 = 19$

$19 \times 4 + 1 = 77$

$77 \times 5 - 2 = 383$

Similarly, in figure 3 →

$\underline{4} \times 2 + 1 = 9$

$9 \times 3 - 2 = 25$

$$25 \times 4 + 1 = \textbf{101}$$
$$101 \times 5 - 2 = 503$$

65. 4
Sol. As per observation

66. 4
Sol. As per observation

67. 1
Sol.

Monday	Tuesday	Wednesday	Thursday	Friday
Violet	Yellow	Indigo	Red	Green

68. 1
Sol.

Monday	Tuesday	Wednesday	Thursday	Friday
Violet	Yellow	Indigo	Red	Green

69. 1
Sol. $BC \to 2,3 \xrightarrow{\text{Reverse}} 32$ (Upper side)

$B \to 2 \longrightarrow$ (Down side)

$EG \to 5,7 \xrightarrow{\text{Reverse}} 75$ (Upper side)

$C \to 3 \longrightarrow$ (Down side)

$K\textbf{M} \to 11,13 \longrightarrow 1311$ (Upper side)

$O \to \textbf{15} \longrightarrow$ (Down side)

70. 1
Sol. Option 1 – 24 ∗ 3 ∗ 10 ∗ 120 ∗ 2
After putting values
$24 \times 3 - 10 = 120 \div 2$
$72 - 10 = 60$
$62 \neq 0$

71. 2
Sol.

Here 'R' is the grand-daughter of M.

72. 4
Sol. In all other pairs except (86, 99). The ratio of the two numbers is 8 : 9.

73. 1
Sol. As per observation.

74. 4
Sol. As per observation.

75. 2
Sol.

Second eldest among the five cousins is △

76   1
Sol.   ⬭ > △ > ◯ > ▢ > ⊗

□ and ⊗ is younger than ◯

77.   3
Sol.   + 45 minutes → 3:15, 4:00, 4:45, 5:30, (6:15)
        + 35 minutes → 7:20, 7:55, 8:30, (9:05), 9:40

78.   3
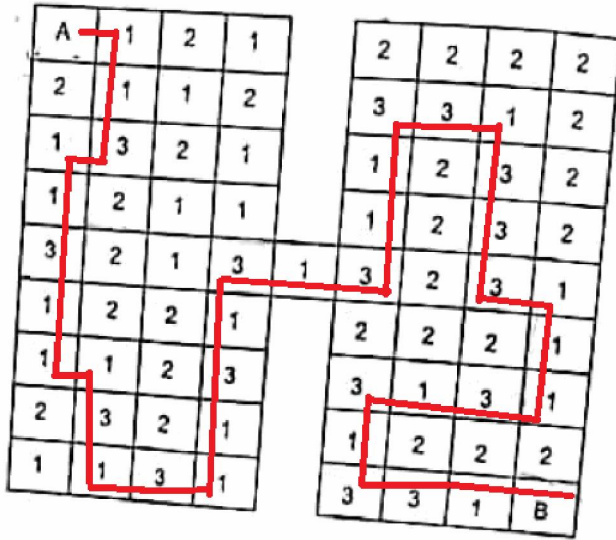Sol.   All angles form in figures A, B and D are same except figure C.

79.   4.
Sol.

80.   3
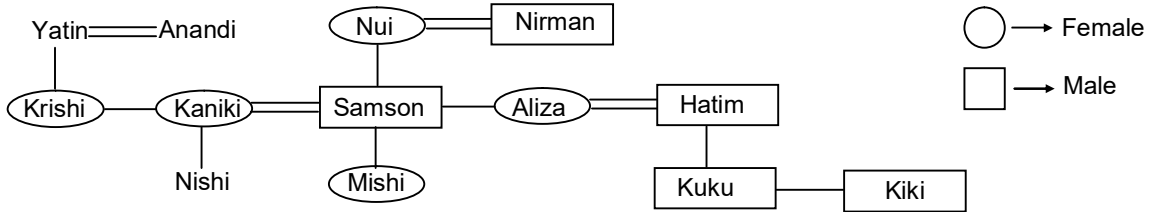Sol.   7. Srinivas
        6. Yaima
        5. Jeet
        4. Ranjan
        3. Aloka
        2. Danial
        1. Barisha
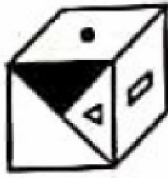
81.   1
Sol.

With 3 females and 2 males answer is 1.

82.   2
Sol.   Bottom box upside down on top with two remaining boxes combined together.

83. 1.
Sol.   As per observation

84. 3
Sol.

	Fine Arts	Social Science	Chemistry	Physics	Biology
A		✓	✓	✓	
B	✓	✓	✓		
C			✓	✓	✓
D	✓		✓		✓
E	✓	✓			✓

85. 4
Sol.

	Fine Arts	Social Science	Chemistry	Physics	Biology
A		✓	✓	✓	
B	✓	✓	✓		
C			✓	✓	✓
D	✓		✓		✓
E	✓	✓			✓

86. 2
Sol.

	Fine Arts	Social Science	Chemistry	Physics	Biology
A		✓	✓	✓	
B	✓	✓	✓		
C			✓	✓	✓
D	✓		✓		✓
E	✓	✓			✓

87. 4.
Sol. $2^1 + 1$, $4^2 + 2$, $6^3 + 3$, $8^4 + 4$, $10^5 + 5$

88. 2
Sol.   Cubes with no paint $\rightarrow (n{-}2)^3$
    Here n = 4 $\Rightarrow (4 - 2)^3 = 8$
    Cubes with pain on two faces = $(n - 2) \times 12$
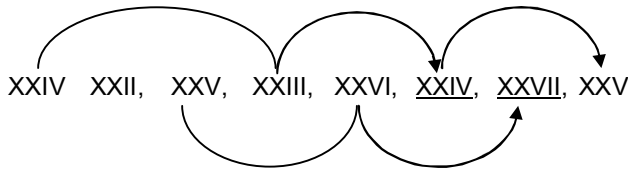   = 24
    Ratio = 8 : 24
    = 1 : 3

89. 3

Sol.

Final point

6 m

Initial point

20 m

26 m

30 m

8 m

22 m
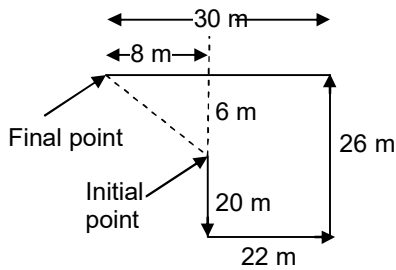
Distance = $\sqrt{8^2 + 6^2}$

$= \sqrt{100} = 10$ m

90. 1

Sol.

XXIV   XXII,   XXV,   XXIII,   XXVI,   XXIV,   XXVII,   XXV

Dual series

Series 1 → 14, 15, 16, **17**

Series 2 → 12, 13, **14**, 15

91. 3

Sol.   2 3 1 4 6 5 7 satisfies all the given conditions.

92. 1.

Sol.   Only I satisfies the fact as Mani is an island so it must be surrounded by water.

We can't say anything about all island formation or all volcanoes.
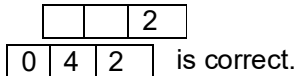
93. 4

Sol.
a	e	i	o	u
01	05	09	15	21
10	50	90	51	12 → revered (sum = 213)

Angle of u → $\dfrac{360}{213} \times 12 = 20.281$

94. 2

Sol.   From A and B → 6 X

From D → 7, 1, 8 X

So 2 is at right place in A

		2

From options only (2)

| 0 | 4 | 2 | is correct.
|---|---|---|

95. 2

Sol.

F   E

G

H

A   B

C

D
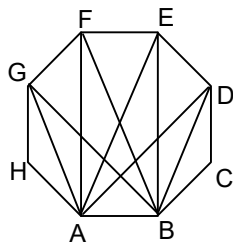
On every side 4 triangles can b formed.

For example → for side AB

AGB, AFB, AEB, ADB

For 8 sides → 8 × 4 = 32

96.   2

Sol.   3 Seerat 2 Shaurya 6 Ruhani 14

Total = 28

97.   4

Sol.

$$\diamond + \bigcirc + \square = 35$$

$$2\diamond + \bigcirc = 40 \qquad \ldots(i)$$

$$(\diamond + 2\bigcirc = 35) \times 2$$

$$2\diamond + 4\bigcirc = 70 \qquad \ldots(ii)$$

From (i) and (ii)

$$3\bigcirc = 30 \Rightarrow \bigcirc = 10$$

Only in option (4)

$$\bigcirc = 10$$

98.   3

Sol.

1	2	3	4	5
E	B	C	F	D

E → Speaker

C → Moderator

B → Time Keeper

99.   1

Sol.

1	2	3	4	5
E	B	C	F	D

E → Speaker

C → Moderator

B → Time Keeper

100.   1

Sol.

1	2	3	4	5
E	B	C	F	D

E → Speaker

C → Moderator

B → Time Keeper