

NTSE STAGE – I (DELHI STATE)
003–A (2020 – 21)
(For Class – X)
MENTAL ABILITY TEST (MAT)

FIITJEE ANSWER KEYS

| | | | | | | | |
|-----|-------|-----|---|-----|-------|------|---|
| 1. | Bonus | 2. | 1 | 3. | 3 | 4. | 2 |
| 5. | 3 | 6. | 4 | 7. | 1 | 8. | 2 |
| 9. | 4 | 10. | 2 | 11. | 2 | 12. | 4 |
| 13. | 1 | 14. | 4 | 15. | 1 | 16. | 3 |
| 17. | 4 | 18. | 2 | 19. | 4 | 20. | 1 |
| 21. | 4 | 22. | 3 | 23. | 4 | 24. | 4 |
| 25. | 3 | 26. | 2 | 27. | 1 | 28. | 1 |
| 29. | 3 | 30. | 4 | 31. | 4 | 32. | 2 |
| 33. | 1 | 34. | 3 | 35. | 2 | 36. | 1 |
| 37. | 3 | 38. | 4 | 39. | 1 | 40. | 3 |
| 41. | 1 | 42. | 4 | 43. | 1 | 44. | 2 |
| 45. | 3 | 46. | 2 | 47. | Bonus | 48. | 4 |
| 49. | 3 | 50. | 2 | 51. | 4 | 52. | 3 |
| 53. | 2 | 54. | 2 | 55. | 3 | 56. | 1 |
| 57. | 2 | 58. | 4 | 59. | 2 | 60. | 4 |
| 61. | 1 | 62. | 1 | 63. | 2 | 64. | 4 |
| 65. | 3 | 66. | 2 | 67. | 3 | 68. | 1 |
| 69. | 3 | 70. | 2 | 71. | 4 | 72. | 1 |
| 73. | 3 | 74. | 4 | 75. | 3 | 76. | 1 |
| 77. | Bonus | 78. | 2 | 79. | 4 | 80. | 4 |
| 81. | 3 | 82. | 3 | 83. | 4 | 84. | 4 |
| 85. | 2 | 86. | 3 | 87. | 3 | 88. | 2 |
| 89. | 3 | 90. | 3 | 91. | 1 | 92. | 4 |
| 93. | 4 | 94. | 3 | 95. | 2 | 96. | 2 |
| 97. | 3 | 98. | 4 | 99. | 2 | 100. | 4 |

NTSE STAGE – I (DELHI STATE)
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SOLUTIONS

1. Bonus

2. 1

20% of $x = y$

$$\left(\frac{20}{100}\right)x = y$$

y % of 20

$$\frac{y}{100} \times 20 = \left(\frac{20}{100}\right)x \times \frac{1}{100} \times 20$$

$$= \frac{4x}{100} = 4\% \text{ of } x$$

3. 3

3. $a_n = 3_n + 4$

Put $n = 1, 1, 3$ [series will be 7, 10, 13, ...]

$a = 7, d = 2, n = 12$

$$s_{12} = \frac{n}{2} [2a + (n-1)d]$$

$$= \frac{12}{2} [2(7) + (12-1)2]$$

$$= 6(14 + 39) = 282$$

4. 2

4. Time taken by slower train to pass the driver \Rightarrow distance would be 500 m.

$$\text{Time} = \frac{500}{45 + 30} \times \frac{18}{5} = 24 \text{ sec}$$

5. 3

5. $\sqrt{18}, \sqrt{50}, \sqrt{98}, \dots$

$$3\sqrt{2}, 5\sqrt{2}, 7\sqrt{2} \Rightarrow 9\sqrt{2} = \sqrt{162}$$

6. 4

6. $a_{p+q} = m$ $a_{p-q} = n$

$$a + (p+q-1)d = m \quad a + (p-q-1)d = n$$

Add both equations

$$2a + 2(p-1)d = m+n$$

$$P^{\text{th}} \text{ term } a + (p-1)d = \frac{m+n}{2}$$

7. 1
 7. Speed equation

$$\frac{600}{t} - \frac{600}{t + \frac{1}{2}} = 400$$

By hit and trial method
 T = 1 hour

8. 2
 8. Horizontal and vertical distance are same.

$$\tan \theta = 1 = \frac{\text{perpendicular}}{\text{base}}$$

$$\theta = 45^\circ$$

9. 4
 9. Girls (those who wear spectacles)

$$= 1400 \times \frac{25}{100} \times \frac{5}{7} = 250$$

10. 2
 10. P Q R
 65x6 : 84x5 : 100x3
 13 : 14 : 10

P takes 5% i.e., $\frac{5}{100} \times 7400 = 370$

Balance = 7400 - 370 = 7030

Q's share = $\frac{14}{37} \times 7030 = 2660$

11. 2
 11. Distance = $\frac{\text{Product of speed}}{\text{Diff. of speed}} \times (\text{Diff. between arrival time})$

$$= \frac{10 \times 15}{5} \times \frac{12}{60} = 6 \text{ km}$$

12. 4
 12. $\tan \theta = \frac{24}{7}$ $\cos \theta = \frac{7}{25}$
 $14 \tan \theta - 75 \cos \theta - 7 \sec \theta$
 $= 14 \times \frac{24}{7} - 75 \times \frac{7}{25} - 7 \times \frac{25}{7}$
 $= 48 - 21 - 25 = 2$

13. 1
 13. $\sqrt{\left(x^2 + \frac{1}{x^2} + 2\right)} = \sqrt{98 + 2}$
 $x + \frac{1}{x} = 10$

$$x^3 + \frac{1}{x^3} = \left(x + \frac{1}{x}\right)^3 - 3\left(x + \frac{1}{x}\right)$$

$$= 10^3 - 3 \times 10$$

$$= 1000 - 30 = 970$$

14. 4
 14. d. maximum
 b. minimum
 b. monk
 a. music

option (4) d, c, b, a

15. 1
 15. Let present age of father and son be $7x$ and $3x$.
 After 10 years it will be
 $(7x + 10)$ and $(3x + 10)$

According to question

$$\frac{7x + 10}{3x + 10} = \frac{2}{1}$$

$$7x + 10 = 6x + 20$$

$$x = 10$$

\Rightarrow present age of father is $7x$ i.e., $7 \times 10 = 70$ years

16. 3
 16. Sum of students in 2017
 $= 32 + 24 + 17 + 24 + 23 = 120$
 Sum of students in 2018
 $= 18 + 16 + 29 + 11 + 21 = 95$
 Difference $= 120 - 95 = 25$

17. 4
 17. Sum of students in class III.
 $= 39 + 33 + 52 + 17 + 29 = 170$
 Sum of students in class I.
 $= 22 + 28 + 26 + 32 + 18 = 126$
 Require answer $= \frac{170}{126} \times 100 = 134.92$
 Approx $= 135$

18. 2
 18. Sum of students in 2018
 $= 18 + 16 + 29 + 11 + 21 = 95$
 Square $= (95)^2 = 9025$

19. 4
 19. Student in class I in 2017 $= 32$
 Student in class II in 2017 $= 24$
 Require answer $= \frac{32 - 24}{24} \times 100$
 $= \frac{8}{24} \times 100 = 33.33\%$

20. 1
 20. Cube is 3 – d form of square similarly cuboid is 3 – d form of rectangle.

21. 4
 21. $82 : 9$
 $\Rightarrow 9^2 + 1 = 82$
 Similarly option (4)
 $5^2 + 1 = 26$

22. 3
 22. $A = 1 \times 2 = 2$
 $T = 20 \times 2 = 40$
 1 and 20 are respective position of A and T is in alphabet.
 Similarly $ACT = 2 + 6 + 40 = 48$
 $TAKE = 40 + 2 + 22 + 10 = 74$

23. 4
 23.
-

24. 4
 24.
-

25. 3
 25.
-

26. 2
 26.
-

27. 1
 27.
-

28. 1

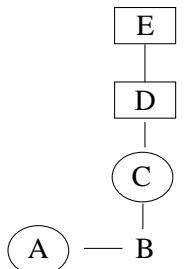
28. Transition and change are synonyms similarly, immobility and stillness are synonyms.

29. 3

29. Stock is collection of grains. Bundle is collection of sticks.

30. 4

30.



Granddaughter

31. 4

31. Crusade, Campaign, Expedition are related to land, where as cruise is related to water.

32. 2

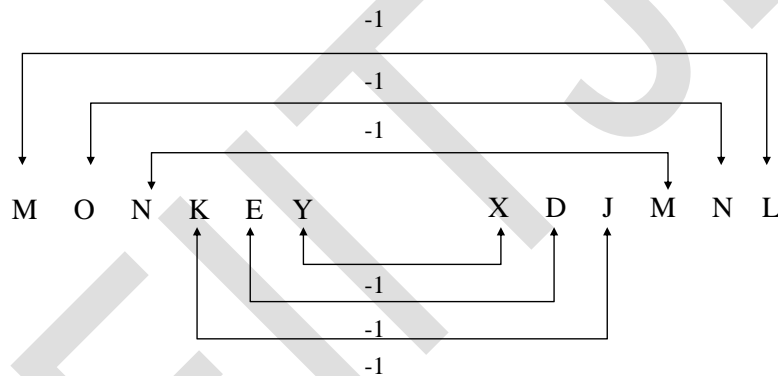
32. Apricot is a dry fruit and all others are spices.

33. 1

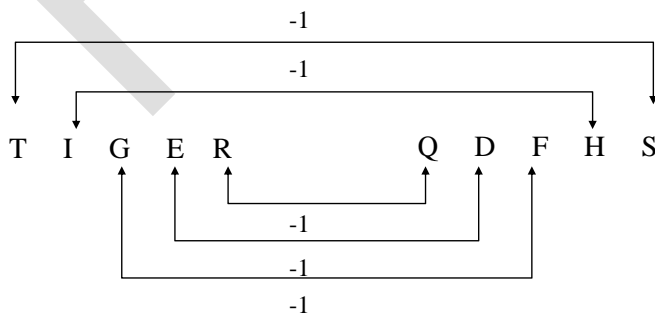
33. Mile, yard and meter are unit for measurement of distance. Acre used for measurement of land.

34. 3

34.




Similarly,



35. 2
35.

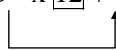
Column one

$$1 \times 2 + 1 = 3$$


Column one

$$7 \times 14 + 7 = 105$$

Column one

$$9 \times \boxed{12} + 9 = 117$$


36. 1

36. $(42 \div 6) - (15 \div 3) = 2$

$$(36 \div 9) - (9 \div 3) = 1$$

$$(38 \div 19) - (20 \div 10) = 0$$

37. 3

37. Mon - K

Tue - N

Wed - L

Thr - O

Fri - M

38. 4

38. Let number of people who read Hindu, TOI and IE all is = x

So, only Hindu is = $285 - 20 - 29 - x = 236 - x$

So, only TOI is = $127 - 20 - 35 - x = 72 - x$

So, only IE is = $212 - 35 - 29 - x = 148 - x$

Now, $236 - x + 72 - x + 148 - x + 20 + 29 + 35 + x + 50 = 500$

$$590 - 2x = 500$$

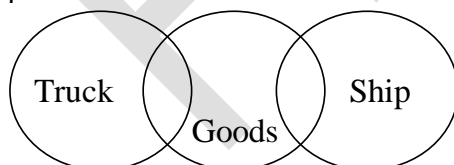
So, $x = 45$ this is the value who read all the 3 newspapers.

So, number of people who read only one paper is

$$= 236 - 45 + 72 - 45 + 148 - 45 = 191 + 27 + 103 = 321$$

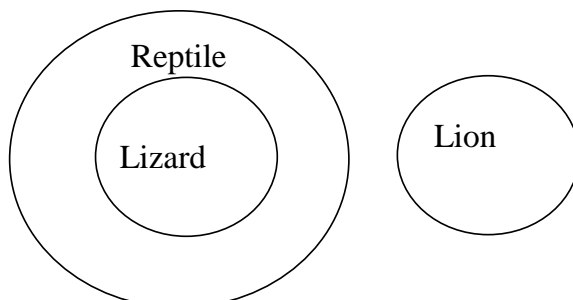
39. 1

39.



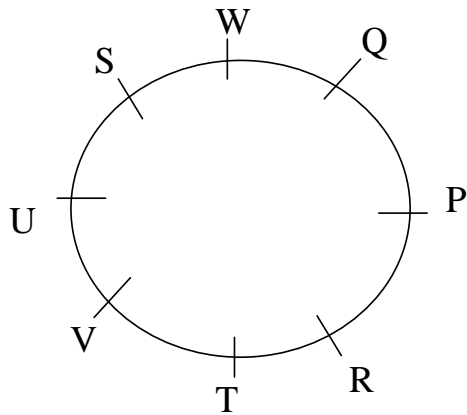
40. 3

40.



41. 1
 41. $40 - 10 + 5 \div 4 \times 5 = 21$
 After changing signs
 $40 \div 10 \times 5 - 4 + 5 = 21$
 $20 - 4 + 5 = 21$
 $21 = 21$

42. 4
 42.



T is sitting opposite to W.

43. 1
 43. 7.20 5.70
 6.30
 0.6 0.9

6:9 OR 2:3

44. 2
 44. Let there be x pupils in the class.
 Total increase in marks = $\left(x \times \frac{1}{2}\right) = \frac{x}{2}$
 So, $\frac{x}{2} = (83 - 63)$
 $\frac{x}{2} = 20$ then $x = 40$

45. 3
 45. Time from 7 am to 4:15 pm = 9 hrs 15 min = $\frac{37}{4}$ hrs
 3 min 5 sec of this clock = 3 min of the correct clock.
 $\frac{37}{720}$ hrs of this clock = $\frac{1}{20}$ hrs of the correct clock.
 $\frac{37}{4}$ hrs of this clock = $\left(\frac{1}{20} \times \frac{720}{37} \times \frac{37}{4}\right)$ hrs of the correct clock
 = 9 hrs of the correct clock.

So, the correct time is 9 hrs after 7 am i.e., 4 pm.

46. 2

46. Let number is 100.

$$\text{Actual multiplication} = \left(100 \times \frac{5}{3}\right) = \frac{500}{3}$$

$$\text{Student multiplication} = \left(100 \times \frac{3}{5}\right) = \frac{300}{5}$$

$$\text{Error} \Rightarrow \left(\frac{500}{3} - \frac{300}{5}\right) \rightarrow \frac{1600}{15}$$

$$\% \text{ Error} \Rightarrow \frac{1600 \times 100 \times 3}{15 \times 500} = 64\%$$

47. Bonus

47. Relative speed = $(42 - 36) = 6 \text{ km/h}$

$$= 6 \times \frac{5}{18} = \frac{30}{18} = \frac{5}{3} \text{ m/s}$$

$$\text{So, required time} = 390 \times \frac{3}{5} = 234 \text{ seconds}$$

$$\text{So, } \frac{234}{60} = 3.9 \text{ min}$$

48. 4

$$48. \text{ Quantity of Guava at shop B} = 1000 \times \frac{16}{100} = 160 \text{ kg}$$

$$\text{Quantity of Guava at shop A} = 1200 \times \frac{12}{100} = 144 \text{ kg}$$

$$\text{So, difference} = 160 - 144 = 16 \text{ kg}$$

49. 3

$$49. \text{ Quantity of Mango at shop A} = 1200 \times \frac{24}{100} = 288 \text{ kg}$$

$$\text{Quantity of Mango at shop B} = 1000 \times \frac{24}{10} = 240 \text{ kg}$$

$$\text{So, } \% \rightarrow \frac{240}{288} \times 100 = 83.33\%$$

50. 2

50. Shop A

$$\text{Mango} = 1200 \times \frac{24}{100} = 288 \text{ kg}$$

$$\text{So, cost of Mango} = 288 \times 30 = 8640 \text{ Rs}$$

$$\text{Apple} = 1200 \times \frac{14}{100} = 168 \text{ kg}$$

$$\text{So, cost of Apple} = 168 \times 40 = 6720 \text{ Rs}$$

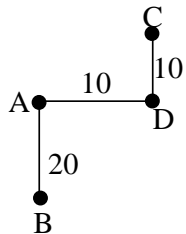
$$\text{Orange} = 1200 \times \frac{20}{100} = 240 \text{ kg}$$

So, cost of Orange = $240 \times 20 = 4800 \text{ Rs}$

So, Ratio = $8640 : 6720 : 4800$ OR $9:7:5$

51. 4
51. Variety is antonyms of Monotony. Similarly refinement is antonyms of crudeness.

52. 3
52.

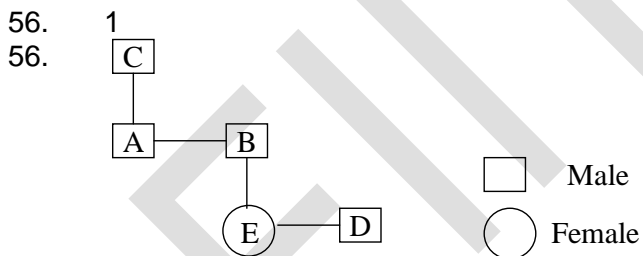


B is in south – west direction with respect to C.

53. 2
53. Students who passed the examination = $(16 + 29) - 1 = 44$
So, total number of students in the class = $44 + 6 + 5 = 55$

54. 2
54. Geeta > Kusum > Arti > Ananya > Shruti
So, Shruti is the youngest.

55. 3
55. Geeta > Kusum > Arti > Ananya > Shruti
So, Arti is in the middle with respect to the age.



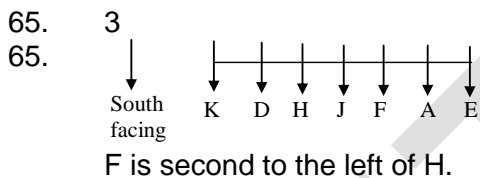
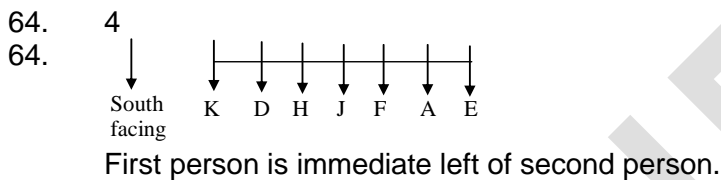
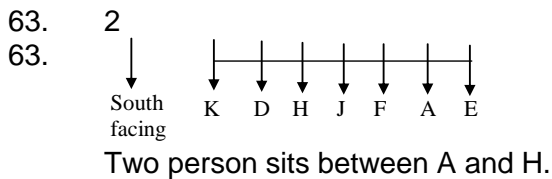
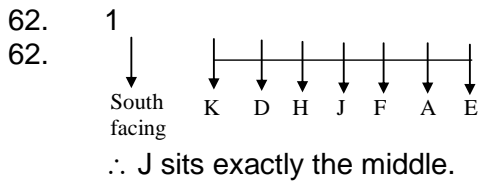
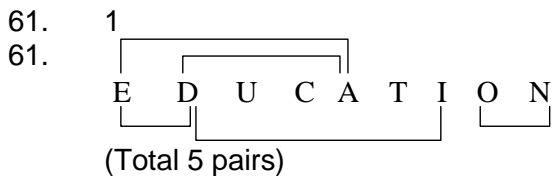
A is uncle of D

57. 2
57. According to the given dice 1 is opposite to 6 and 3 is adjacent to 4. So, 2 or 5 is opposite to 4.

58. 4
58. 3 opposite 4
2 opposite 1
6 opposite 5

59. 2
59. Youth who are in service but not literate = 7

60. 4
60.
- | | | | | | | | |
|---|---|---|---|---|---|---|---|
| 5 | 9 | 1 | 6 | 4 | 8 | 2 | 3 |
| 9 | 8 | 6 | 5 | 4 | 3 | 2 | 1 |



66. 2

The logic is $(7 \times 2) + 4 = 18$
 $(18 \times 2) + 4 = 40$
 $(40 \times 2) + 4 = 84$
 $(84 \times 2) + 4 = 172$
 $(172 \times 2) + 4 = 348$

67. 3

$9 \times 6 \times 5 - 10 = 260$
 $8 \times 7 \times 4 - 8 = 216$
 $7 \times 8 \times 6 - 6 = 330$

68. 1







The logic is $(4 - 3)^3 - 1 = 0$
 $(9 - 6)^3 - 1 = 26$
 $(10 - 12)^3 - 1 = 7$

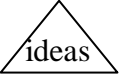







69. 3




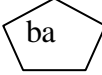

69. a_caa_bcc_aabbb_cc





bbac

70. 2
70.

always  create  new  ideas →  ba  ri sh  qi







 ideas  and  new  thought →  fa  gi  ma  ri

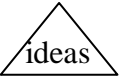







 create  thought  and insights → ma jo  ba  fa




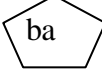

 new  and better solution → ki  ri to  fa





idea – qi
idea is coded as qi.

71. 4
71.

always  create  new  ideas →  ba  ri sh  qi

 ideas  and  new  thought →  fa  gi  ma  ri

 create  thought  and insights → ma jo  ba  fa

 new  and better solution → ki  ri to  fa

fa – and
fa is coded as and.

72. 1
72. As per observation.

73. 3
73. As per observation.

74. 4
74. As per observation.

75. 3
75. As per observation.

76. 1
76. As per observation.

77. Bonus
77. As per observation.

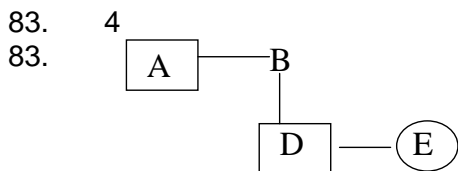
78. 2
78. As per observation.

79. 4
79. As per observation.

80. 4
80. Cubes which do not have any of their surface coloured
 $= (n-2)^3$
Here $n = 4$ so $(4-2)^3 = 2^3 = 8$

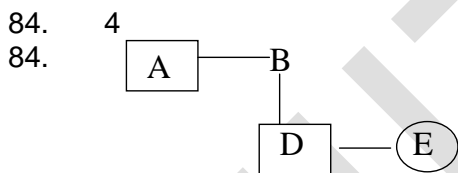
81. 3
81. There is no such cubes.

82. 3
82. If B is 9th from the right and 4th to the left at B is C. So, C position from right is 13th and 28th from left. So, there is 14 children between A and C.



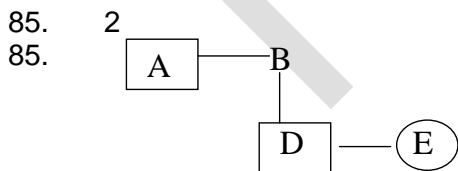
C can be A's son or son or brother of A and B, F can be son of any child of B

It cannot be determined.



C can be A's son or son or brother of A and B, F can be son of any child of B

Clearly, A is the uncle of D.



C can be A's son or son or brother of A and B, F can be son of any child of B

E is the aunt of F.

86. 3
86. In 12 hrs, hands of clock make right angle 22 times.

87. 3
87. The difference of square of number given on the corners of triangle
First figure

$$(10 - 4)^2 = 6^2 = 36$$

$$(18 - 10) = 8^2 = 64$$

$$(18 - 4)^2 = 14^2 = 196$$

Similarly,

$$(11 - 5)^2 = 6^2 = 36$$

$$(15 - 11)^2 = 4^2 = 16$$

$$(15 - 5)^2 = 10^2 = 100$$

88. 2

$$7^2 - 4^2 + 5 = 38$$

$$9^2 - 36 + 10 = 55$$

$$7^2 - 1^2 + 15 = 63$$

89. 3

$$(4 \times 6) + (2 + 2) = 28$$

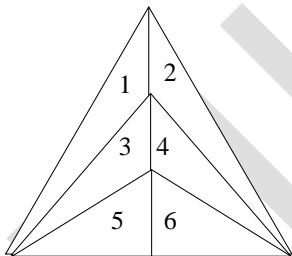
$$(14 \times 4) + (6 + 4) = 10$$

$$(13 \times 2) + (2 + 7) = 35$$

90. 3

91. 1

91.



1 number triangle: 1, 2, 3, 4, 5, 6 = 6 triangle

2 number triangle : (1, 3) (3, 5) (2, 4) (4, 6) (5, 6) = 5 triangles

3 number triangle: (1, 3, 5) (2, 4, 6) = 2 triangles

4 number triangle: (3, 4, 5, 6) = 1 triangle

6 number triangle: (1, 2, 3, 4, 5, 6) = 1 triangle

So total triangle = 6 + 5 + 2 + 1 + 1 = 15

92. 4

$$(2 \times 2) = 4, 4^2 = 16$$

$$2 \times 3 = 6, 6^2 = 36$$

$$2 \times 4 = 8, 8^2 = 64$$

$$2 \times 6 = 12, 12^2 = 144$$

93. 4

$$93. \sqrt{10\sqrt{25 + \sqrt{108 + \sqrt{154 + \sqrt{225}}}}}$$

$$\sqrt{10 + \sqrt{25 + \sqrt{108 + \sqrt{154 + 15}}}}$$

$$\sqrt{10 + \sqrt{25 + \sqrt{108 + \sqrt{169}}}}$$

$$\sqrt{10 + \sqrt{25 + \sqrt{108 + 13}}}$$

$$\sqrt{10 + \sqrt{25 + \sqrt{121}}}$$

$$\sqrt{10 + \sqrt{25 + 11}}$$

$$\sqrt{10 + \sqrt{36}}$$

$$\sqrt{10 + 6} = \sqrt{16} = 4$$

94. 3
94. As per observation.
95. 2
95. The number opposite to 3 is 6 as other numbers are adjacent.
96. 2
96. As per observation.
97. 3
97. As per observation
98. 4
98. $(20 + 17 + 15 + 30 + 40) = 122$
99. 2
99. As per observation
100. 4
100. As per observation.