

NTSE STAGE – I
(2016- 17) 02/2016-17
MENTAL ABILITY TEST
SOLUTIONS

1. $z + y + z = 0$
 $\therefore \frac{(x+y)(y+z)(z+x)}{xyz} + 11$
 $= \frac{-z \times -x \times -y}{xyz} + 11$
 $= -1 + 11 = 10$

2. $\sin A + \cos A = \sqrt{2} \cos A$
 $\sin A = (\sqrt{2} - 1) \cos A$
 $\tan A = \sqrt{2} - 1$
 $(\sqrt{2} + 1) \tan A = 1$

3. $\sqrt{(k-5)^2 + (2+2)^2} = \sqrt{(k-1)^2 + (2+2)^2}$
 $\Rightarrow (k-5)^2 - (k-1)^2 = 0$
 $\Rightarrow (k-5)^2 = (k-1)^2$
 $\Rightarrow k-5 = |k-1|$
 $\Rightarrow k-5 = -k+1$
 $\Rightarrow k = \pm 3$
 $\Rightarrow k^2 + 7 = 16$

4. $s = x \Rightarrow SA = 6x^2$
 $s_1 = 1.4x \Rightarrow SA_1 = 6(1.4x)^2 = 6(1.96x^2)$
 $\therefore \text{increase \%} = \frac{6x^2(1.96-1)}{6x^2} \times 100$
 $= 96\%$

5. $\alpha + \beta = 6$
 $\alpha^2 + \beta^2 = 10$
 $\alpha\beta = \frac{(\alpha + \beta)^2 - (\alpha^2 + \beta^2)}{2}$
 $= \frac{36 - 10}{2}$
 $= 13$
 $p = 13$

6. $54 \text{ km/hr} = \left(54 \times \frac{5}{18}\right) \text{ m/s} = 15 \text{ m/s}$
 \therefore Length of train = $(15 \times 12) \text{ m}$
 $= 180 \text{ m}$

7. $x + y = 9$
 $(10x + y) - (10y + x) = 45$
 $9(x - y) = 45$
 $x - y = 5$
 $\therefore x = 7, y = 2$
 $\therefore 72$ is the number

8. All multiples of 8 from 16 to 88.
 \therefore Total 10 numbers

9. $3 = x + \frac{1}{1 + \frac{1}{5 + \frac{1}{3}}}$
 $\Rightarrow 3 = x + \frac{1}{1 + \frac{3}{16}}$
 $\Rightarrow 3 = x + \frac{16}{19}$
 $\Rightarrow x = 3 - \frac{16}{19}$
 $\Rightarrow x = \frac{41}{19}$

10. $\frac{x+1}{x-1} + \frac{x-1}{x+1} - \frac{(2x^2-2)}{x^2+1}$
 $= \frac{(x+1)^2(x^2+1) + (x-1)^2(x^2+1) - 2(x^2-1)^2}{(x^2+1)(x^2-1)}$
 $= \frac{(x^2+1)((x+1)^2 + (x-1)^2) - 2(x^2-1)^2}{(x^2+1)(x^2-1)}$
 $= \frac{(x^2+1)(2x^2+2) - 2(x^2-1)^2}{(x^2+1)(x^2-1)}$
 $= \frac{2((x^2+1)^2 - (x^2-1)^2)}{(x^2+1)(x^2-1)}$
 $= \frac{2[2x^2][2]}{x^4-1}$
 $= \frac{8x^2}{x^4-1}$

11. $c + h = 29$
 $4c + 2h = 92$
 $\therefore 2c = 34$
 $c = 17$

$$h = 12$$

$$12. \quad \frac{16}{d} + \frac{8}{u} = 6 \Rightarrow 8x + 4y = 3$$

$$\frac{6}{u} + \frac{24}{d} = 6 \Rightarrow 4x + y = 1$$

$$\left[\frac{1}{d} = x, \frac{1}{u} = y \right]$$

Solving, we get, $y = \frac{1}{2}$, $x = \frac{1}{8}$

$\Rightarrow b + s = 8$ {b represents Parth's speed}

$b - s = 2$ {s represents speed of stream}

$\Rightarrow b = 5$ km/hr

$$13. \quad \log \frac{75}{16} - \log \frac{25}{81} + \log \frac{32}{243}$$

$$= \log \left[\frac{75}{16} \times \frac{32}{243} \times \frac{81}{25} \right]$$

$$= \log 2$$

$$14. \quad \text{At 4:15, angle between hands} = |(4 \times 30) - (5.5 \times 15)|$$

$$= |120 - 82.5|$$

$$= 37.5^\circ$$

$$15. \quad 3\sqrt{5} + 5\sqrt{5} = 17.88$$

$$8\sqrt{5} = 17.88$$

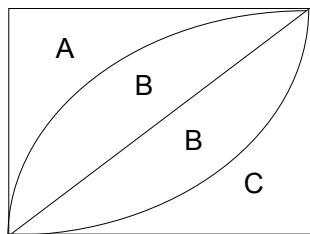
$$\sqrt{5} = 2.235$$

$$\sqrt{80} + 6\sqrt{5} = 10\sqrt{5} = 22.35$$

16. LCM of 30 sec, 1 min, 45 sec and 75 sec = 15 min
 \therefore at 9:15 AM, they will simultaneously change again.

$$17. \quad \frac{A}{D} = \frac{A}{B} \times \frac{B}{C} \times \frac{C}{D} = \frac{2}{3} \times \frac{2}{4} \times \frac{2}{5} = \frac{2}{15}$$

18.



$$2B + C = \frac{1}{4} \times \frac{22}{7} \times 7^2$$

$$= \frac{77}{2}$$

$$B + C = \frac{1}{2} \times 7^2 = \frac{49}{2}$$

$$\therefore B = \frac{28}{2} = 14 \Rightarrow \text{Shaded area} = 28 \text{ cm}^2$$

19. $l = x$

$$h = \frac{3}{2}x$$

$$w = \frac{1}{2} \cdot \frac{3}{2}x$$

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

$$\therefore \text{Area of floor} = \frac{3}{4}x^2$$

$$4 \times \frac{3}{4}x^2 = 432$$

$$x^2 = 144$$

$$x = 12$$

$$\therefore \text{height} = \frac{3}{2}x = 18$$

20. $3^{15} + 3^{16} + 3^{17}$

$$= 3^{15}(1 + 3 + 9)$$

$$= 13 \times 3^{15} \Rightarrow \text{Divisible by 13}$$

21. $CI = 6000 \left(1 + \frac{5}{100}\right)^2 - 6000$

$$= 6000 \times \frac{441}{400} - 6000$$

$$= 615$$

$$SI = \frac{6000 \times 5 \times 2}{100} = 600$$

$$\therefore \text{difference} = \text{Rs } 15$$

22. $(3.5)^3 - (2.5)^3 = 27.25$

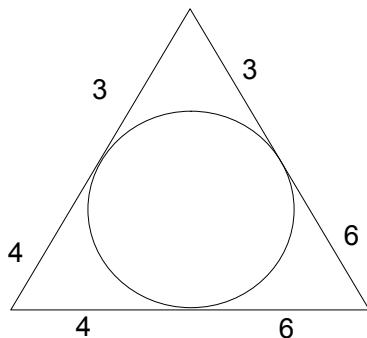
23. $\sqrt{13 - x\sqrt{10}} = \sqrt{8} + \sqrt{5}$

$$\Rightarrow 13 - x\sqrt{10} = 8 + 5 + 2\sqrt{8}\sqrt{5}$$

$$\Rightarrow -x\sqrt{10} = 4\sqrt{10}$$

$$\Rightarrow x = -4$$

24.



$$\Rightarrow BC = 10 \text{ cm (Tangents from a point to the circle are of equal length)}$$

25. SP of 5 = CP of 3

Let CP of 1 be Re 1

SP of 5 = 3

CP of 5 = 5

⇒ Loss of 5 = 2

⇒ Loss % = $\frac{2}{5} \times 100 = 40\%$ loss

26. The required sequence is:
MLKJIHG FEDCB AZYXWV U T SRQPON

27. THREAT → RHTTAE
⇒ PEARLY → AEPYLR
Logic : First half is reversed, then second half of reversed.

28. The pattern is: $\times 2 - 2, \times 3 - 2, \times 4 - 2, \times 5 - 2$
So, next term is $308 \times 6 - 2 = 1846$

29. The arrangement is:
Kamal, Rashi, Vinita, Preeti, Leela
∴ 3rd in order of height is Vinita.

30. Figure (1) is the best illustration.

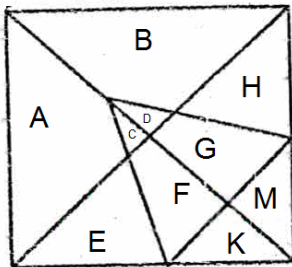
31. From Venn Diagram

32. From Venn Diagram

33. From Venn Diagram

34. 1. $-7 \div 7 \times 7 + 7 = 0$
2. $(7 + 7 \times 7) \div 7 - 7 = 1$
3. $7 - 7 \times 7 \div 7 + 7 = 7$
4. $7 - (7 \div 7 \times 7 + 7) = -7$

35.



The triangles are represented by C, D, E, H, K, M, AC, CD, BD, CF, DG, KM, EGK, CFK, DGM, MGH, ABCD, CDFG, ACFKE, EFKGHM and DGMBH.

So, 21 triangles.

Total number of triangles = 21

36. Lateral inversion.

37. $20 \div 10 = 2$ [T is 20, J is 10]
⇒ $24 \div 8 = 3$ [X is 24, H is 8]

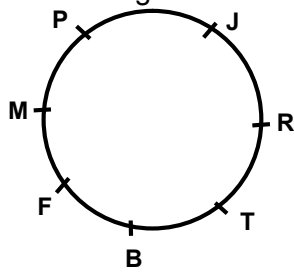
38. $\frac{15 \times 6 \times 4}{10} = 36$

$$\frac{6 \times 7 \times 5}{10} = 21$$

$$\frac{50 \times 10 \times 10}{10} = 500$$

Solutions 39 – 41

The arrangement is:



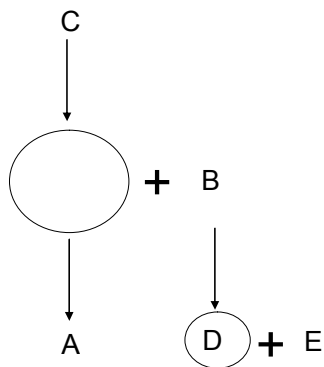
- 39. no correct option*. R is fourth to the right of M.
- 40. F is second to the left of T.
- 41. F is third to the left of R and fourth to the right of R.

42. Final movement = 45° ACW
 \therefore Answer = West

43. you \rightarrow ke, come \rightarrow se
 \Rightarrow here \rightarrow ne

44. $4^2 + 2^2 + 1^2 = 21$
 and $5^2 + 3^2 + 8^2 = 98$
 $\Rightarrow 6^2 + 7^2 + 3^2 = 94$

45.



\therefore C is grandfather or grandmother.

46. $6 R 8 S I R 3 Q 5 P 7 Q 4 P 2$
 $= 6 \times 8 \div 1 \times 3 - 5 + 7 - 4 + 2$
 $= 144$

47. 1. 659 AND 837
 2. 837 AND 485
 3. 976 AND 659
 4. 976 AND 936
 \therefore Highest is 976 and 936.

48. 12:00 – 9:30
 $= 2:30$.

49. A \longleftrightarrow D, C \longleftrightarrow E, B \longleftrightarrow F
 \therefore (2) will be formed.

50. By observation.