NATIONAL TALENT SEARCH EXAMINATION (NTSE-2017) STAGE -1
WEST BENGAL STATE : MAT

Date: 13/11/2016

Max. Marks: 50 **Time allowed: 45 mins**

SOLUTIONS

(Question 1-10)

Direction : Read the questions carefully and give answer by filling the circle of the letter denoting your selected answer on the O.M.R. Answer Sheet.

1. If $(x + 7954 \times 7956)$ be a perfect square number, then the value of x is

(a) 7954 (b) 7956 (c) 1 (d) 0

Ans. ***(c)***

Sol. We know that, for any perfect square number

$x^2 = (x+1)(x-1) + 1$

So, in the given question

$(x+7954\times7956)$; if we put $x = 1$ then it is a perfect square of 7955.

So, $x = 1$

2. If m is any positive integer, then the last two digits in the expressions $(81)^m (121)^m - 1$ are

(a) 02 (b) 12 (c) 21 (d) 00

Ans. ***(d)***

Sol. Given expression

$(81)^m (121)^m - 1$

if we put $m = 1$

$81 \times 121 - 1 = 9801 - 1 = 9800$

If $m = 2$

$6561 \times 14641 = 96059601 - 1 = 96059600$

Now, we consider in all case of m, the last two digit in the expression is 00.

3. The remainder when 7^{10} is divided by 51 is

(a) 7 (b) 33 (c) 19 (d) None of the above

Ans. ***(c)***

Sol. $\frac{7^{10}}{51} = \frac{282475249}{51}$ = Remainder 19

4. The average age of two brothers is 9 years. It is increased by 9 years when their mother's age is also included then the age of mother is

(a) 35 years (b) 36 years (c) 37 years (d) 38 years

Ans. ***(b)***

Sol. $\frac{B_1 + B_2}{2} = 9 \Rightarrow B_1 + B_2 = 18$

$\frac{B_1 + B_2 + m}{3} = 18 \Rightarrow B_1 + B_2 + m = 54$

So, m = 36 years

5. The value of
$2^{32}-(2+1)(2^2+1)(2^4+1)(2^8+1)(2^{16}+1)$ is
(a) 0 (b) 1 (c) –1 (d) 2

Ans. ***(b)***

Sol. $2^{32} - (2 + 1)(2^2 + 1)(2^4 + 1)(2^8 + 1)(2^{16} + 1)$
Now, $2^2 - (2 + 1) = 4 - 3 = 1$
$2^4 - (2 + 1)(2^2 + 1) = 16 - 3 \times 5 = 16 - 15 = 1$
So, $2^n - (2 + 1)(2^2 + 1)(2^4 + 1) \ldots\ldots\ldots(2^{n/2} + 1) = 1$
Now, answer will be 1.

6. A page of a book is turn out and the sum of the other page number is found to be 15000. Find the page numbers of the page turn out.
(a) 24, 25 (b) 25, 26 (c) 26, 27 (d) 27, 28

Ans. ***(b)***

Sol. ATQ,
$\frac{n(n+1)}{2} - x - (x + 1) = 15000$
$\Rightarrow \frac{n(n+1)}{2} - (2x + 1) = 15000$
$\Rightarrow n^2 - n - 4x - 2 = 30000$
$\Rightarrow n(n + 1) = 30002 + 4x$
at $x = 25$
$n(n + 1) = 30102$
$n = 173$
So $x = 24$
and $x + 1 = 25$

7. If $(x - 4)$ is the common factor of $(x^2-px+20)$ and $\{x^2+(p-6)x-q\}$ then the value of q is
(a) 28 (b) 20 (c) 19 (d) 10

Ans. ***(a)***

Sol. Given $(x - 4)$ is the factor of $(x^2 - px + 20)$
So $P = 9$
and $\{x^2 + (p - 6)x - q\}$
again $(x - 4)$ is the factor of $(x^2 + 3x - q)$
So the value of $q = 28$

8. If a, b, c, d are four non-negative real numbers and $a + b + c + d = 1$, then the maximum value of $ab + bc + cd$ is
(a) $\frac{1}{2}$ (b) $\frac{1}{4}$ (c) 1 (d) 3

Ans. ***(b)***

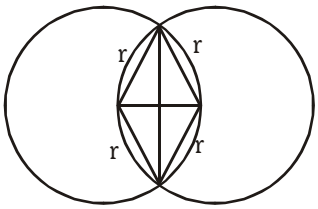
Sol. Given $a + b + c + d = 1$
for maximum value they must be equal. As we increase the values of b & c and decrease a & d, we get more the resulting values increases.
So, $a = d = 0$ (minimum) ; $b = c = 0.5$
Now, $ab + bc + cd = 0.25$
Max, value $= 0.25 = \frac{1}{4}$

9. Two equal circles, each of radius r, intersect each other such that each circle pases through the centre of the other. The length of the common chord of the circles is

(a) 2r (b) $\sqrt{2}$ r (c) $\sqrt{3}$ r (d) $\frac{\sqrt{3}}{2}$r

Ans. ***(c)***

Sol. $2\left(\sqrt{r^2 - \frac{r^2}{4}}\right)$



$= 2\left(\sqrt{\frac{3r^2}{4}}\right)$

$= 2 \times \frac{\sqrt{3}r}{2}$

$= \sqrt{3}r$

10. If the angles of a triangle are in the ratio 1 : 1 : 2, then their sides will be in the ratio

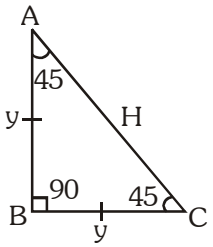
(a) 2 : 1 : 1 (b) 1 : 2 : $\sqrt{2}$ (c) 1 : $\sqrt{2}$: 1 (d) $\sqrt{2}$: 1 : $\sqrt{2}$

Ans. ***(c)***

Sol. x + x + 2x = 180°

4x = 180°

Angles are 45°, 45° and 90°



$\sin 45° = \frac{AB}{AC} = \frac{y}{H}$

$\Rightarrow \frac{1}{\sqrt{2}} = \frac{y}{H}$

$\Rightarrow H = \sqrt{2}\ y$

Ratio of Sides = $y : \sqrt{2}\ y : y$

$= 1 : \sqrt{2} : 1$

(Question 11–20)

Direction : In each question 11 to 20 below, there is a number series with one term missing shown by '?'. The term is given as one of the alternatives among four numbers given below it. Find the term and indicate your answer by filling the circle of the corresponding letter of alternatives in the O.M.R. Answer-Sheet.

11. 10, 19, 40, 77, 158, ?

(a) 311 (b) 307 (c) 301 (d) 299

Ans. ***(a)***

Sol. Pattern × 2–1, ×2 + 2, × 2 – 3, × 2 + 4, × 2 – 5

12. 4, 18, 48, ?, 180, 294

(a) 96 (b) 100 (c) 120 (d) 160

Ans. ***(b)***

Sol. Pattern $n^2 \times (n - 1)$

13. $\frac{90}{7}, \frac{45}{3}, ?, \frac{45}{2}, 30, 45$

(a) 20 (b) 22 (c) 24 (d) 18

Ans. ***(d)***

Sol. Pattern 90 divide by 7, 6, 5, 4, 3, 2, 1.

14. 1296, 648, 216, ?, 36, 18, 6, 3

(a) 112 (b) 106 (c) 108 (d) 110

Ans. ***(c)***

Sol. Pattern ÷ 2, ÷ 3, ÷ 2, ÷ 3 .....

15. 34, 36.8, ?, 42.4, 45.2, 48

(a) 36 (b) 39.4 (c) 39.6 (d) 40.2

Ans. ***(c)***

Sol. Pattern +2.8, + 2.8, +2.8 .....

16. 9, 28, 65, 126, ?, 344

(a) 210 (b) 217 (c) 215 (d) 225

Ans. ***(b)***

Sol. Pattern $n^3 + 1$

17. 888, 454, 237, ?, 74.25. 47.125

(a) 128.5 (b) 126.5 (c) 127.5 (d) 129.5

Ans. ***(a)***

Sol. Pattern ÷ 2 + 10

18. $-\frac{1}{4}, -\frac{1}{8}, ?, \frac{1}{256}, -\frac{1}{4096}$

(a) $-\frac{1}{16}$ (b) $\frac{1}{32}$ (c) $-\frac{1}{64}$ (d) $\frac{1}{81}$

Ans. ***(b)***

Sol. Pattern in denominator ×2, ×4, ×8, ×16

19. 13, ?, 2, –11, –29, –52

(a) 10 (b) –10 (c) 8 (d) –7

Ans. ***(a)***

Sol. Pattern –3, –8, –13, –18, –23.

20. (1, 6), (5, 2), (3, 4), (0, 7), (–1, 8), ?

(a) (4, 4) (b) (–2, 7) (c) (7, 7) (d) (2, 5)

Ans. ***(d)***

Sol. Sum is 7

(Questions 21-30)

Direction : In each of the questions 21 to 30, there are four items of which are alike by some means or other while one is out of the class. Find out the odd item and indicate your answer by filling the circle of the corresponding letter on the O.M.R. Answer-Sheet.

21. (a) Ramanujan (b) Kaprekar (c) Harish Chandra (d) C.V. Raman

Ans. All except C.V. Raman is a mathematician.

Sol. ***(d)***

22. (a) Arithmetic (b) Algebra (c) Equation (d) Trigonometry

Ans. ***(c)***

Sol. All except equation is branch of mathematics.

23. (a) Bose Institute (b) Chennai Mathematical Institute

(c) Indian Statistical Institute (d) Saha Institute of Nuclear Physics

Ans. ***(b)***

Sol. All except chennai mathematical institute is situated in Kolkata.

24. (a) Dengue (b) Malaria (c) Chikangunia (d) Typhoid

Ans. All except Typhoid caused by Mosquito.

Sol. ***(d)***

25. (a) Ant (b) Bee (c) Spider (d) Butterfly

Ans. ***(c)***

Sol. All except spider is insect.

26. (a) Phi (b) Gamma (c) Delta (d) Peso

Ans. ***(d)***

Sol. All except Peso is mathematical symbol.

27. (a) Newton (b) Farad (c) Pascal (d) Einstein

Ans. ***(d)***

Sol. All except Einstein is unit

28. (a) MORV (b) CEHL (c) CENT (d) JLOS

Ans. ***(c)***

Sol. All except CENT difference is +2, + 3, +4

29. (a) 126 (b) 217 (c) 345 (d) 513

Ans. ***(c)***

Sol. All except 345 is $n^3 + 1$.

30. (a) Maradona (b) Djokovic (c) Federer (d) Nadal

Ans. ***(a)***

Sol. All except Maradona is tennis player.

(Questions 31-40)

Direction : In each question below there are two words separated by ':' in the upper row. Below that there are some words on each side of the symbol ':'. Find the relation between two upper words and select one word from the right side of ':' below which have the same relation as above. Fill the circle of the letter denoting your selected answer on the O.M.R. Answer Sheet.

31. Australia : Kangaroo
Siberia : ?
(a) Reindeer (b) Yak (c) Bear (d) Yeti

Ans. ***(c)***

Sol. Acc. to relation it's bear

32. Earthquake : Richter Scale
Pressure : ?
(a) Air (b) Calorimeter (c) Barometer (d) Atmosphere

Ans. ***(c)***

Sol. Acc. to relation it's barometer.

33. Rectangle : Cylinder
Triangle : ?
(a) Cone (b) Sphere (c) Prism (d) Cylinder

Ans. ***(a)***

Sol. Ace. to relation it's cone.

34. Pitch : Cricket
Arena : ?
(a) Tennis (b) Gymnastic (c) Badminton (d) Wrestling

Ans. ***(d)***

Sol. Acc to relation it's wrestling

35. Heart : Pericardium
Brain : ?
(a) Meninges (b) Head (c) Skull (d) Cranium

Ans. ***(a)***

Sol. Acc to relation it's meninges

36. Dawn : Morning
Dusk : ?
(a) Light (b) Sun (c) 6 a.m. to 12 noon (d) Evening

Ans. ***(d)***

Sol. Acc. to relation it's Evening

37. Money : Transaction
Language : ?
(a) Idea (b) Learn (c) Translation (d) Conversation

Ans. ***(d)***

Sol. Acc. to relation it's Conversation

38. Atom : Molecule
Cell : ?
(a) Organism (b) Nucleus (c) Matter (d) Battery

Ans. ***(a)***

Sol. Acc to relation it's Organism

39. Palaeography : Writings
Ichthyology : ?
(a) Fishes (b) Whales (c) Oysters (d) Mammals

Ans. ***(a)***

Sol. Acc. to relation it's Fishes

40. Race : Fatigue
Fast : ?
(a) Food (b) Appetite (c) Hunger (d) Weakness

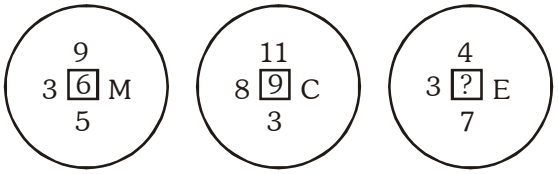
Ans. ***(d)***

Sol. Acc. to relation it's weakness.

(Questions 41-50)

Direction : In questions 41-50, numbers are placed in figures on the basis of some rules. One place in the figure is indicated by the interrogation sign (?). Find out the correct alternative to replace the question mark and indicate your answer by filling the circle of the corresponding letter of alternatives in the O.M.R. Answer-Sheet.

41.



(a) 13 (b) 9 (c) 12 (d) 8

Ans. ***(a)***

Sol. $(9 \times 5) - 3 \times 13$ (M) $\Rightarrow 45 - 39 = 6$

42.

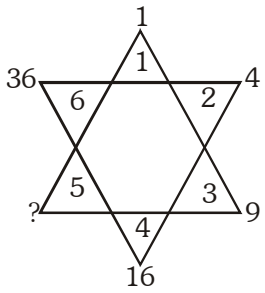
1	1	2	3	5	8	13	21	34	55	?

(a) 85 (b) 89 (c) 99 (d) 98

Ans. ***(b)***

Sol. Fibonacci series

43.

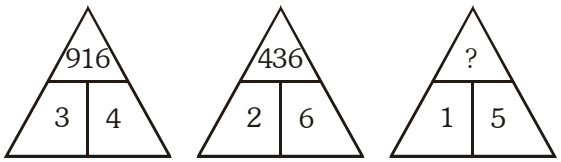


(a) 81 (b) 25 (c) 49 (d) None of the above

Ans. ***(b)***

Sol. Number with it's square

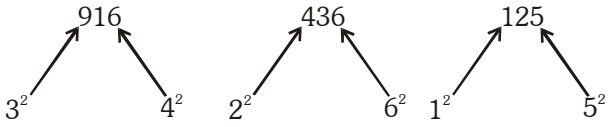
44.



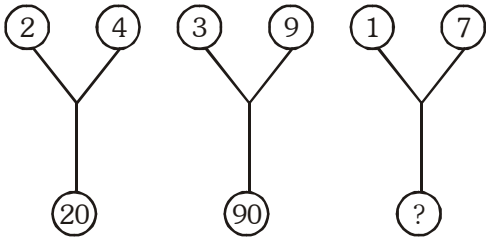
(a) 625 (b) 255 (c) 225 (d) 125

Ans. ***(d)***

Sol.



45.

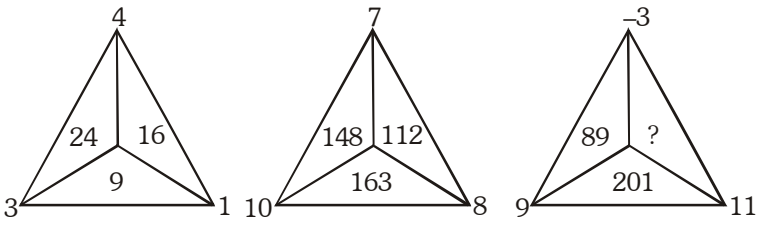


(a) 20 (b) 25 (c) 50 (d) 55

Ans. ***(c)***

Sol. $2^2 + 4^2 = 20$

46.

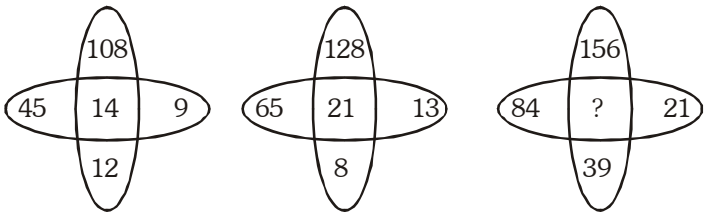


(a) 129 (b) 127 (c) 128 (d) 130

Ans. ***(a)***

Sol. Vertex number's square sum –1

47.



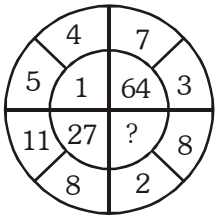
(a) 11 (b) 8 (c) 28 (d) 18

Ans. ***(b)***

Sol. $\frac{108}{12} + \frac{45}{9} = 9+5 = 14$

$\frac{156}{39} + \frac{84}{21} = 4 + 4 = 8$

48.



(a) 125 (b) 8 (c) 216 (d) 0

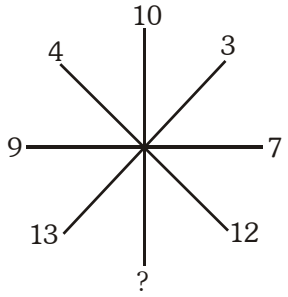
Ans. ***(c)***

Sol. $(5-4)^3 = 1$

$(7-3)^3 = 64$

$(8-2)^3 = 216$

49.



(a) 9 (b) 7 (c) 8 (d) 6

Ans. ***(d)***

Sol. Facing numbers sum is 16.

50.

84	96	105
6	4	5
5	3	8
19	27	?

(a) 31 (b) 29 (c) 35 (d) 23

Ans. ***(b)***

Sol. $\frac{84}{6} + 5 = 14 + 5 = 19$

$\frac{96}{4} + 3 = 24 + 3 = 27$

$\frac{105}{5} + 8 = 21 + 8 = 29$