



**NATIONAL TALENT SEARCH EXAMINATION  
(NTSE-2018) STAGE -1  
STATE : WEST BENGAL PAPER : MAT**

Date: 05/11/2017

Max. Marks: 50

**SOLUTIONS**

Time allowed: 45 mins

(Questions 1–10)

**DIRECTION :** Read the questions carefully and give answers by filling the circle of the letter denoting your select answer on the O.M.R. Answer-Sheet.

1. If the polynomial  $f(x) = 2x^3 + mx^2 + nx - 14$  has  $(x - 1)$  and  $(x + 2)$  as its factors, find the value of  $\frac{m}{n}$ .

- (a) 27                      (b)  $\frac{1}{3}$                       (c) 3                      (d)  $\frac{1}{27}$

**Ans. (c)**

**Sol.**  $f(1) = 0$

$$2 + m + n - 14 = 0$$

$$\Rightarrow (m + n) = 12 \quad \dots(1)$$

$$f(-2) = 0$$

$$-16 + 4m - 2n - 14 = 0$$

$$\Rightarrow 4m - 2n = 30$$

$$2m - n = 15 \quad \dots(2)$$

Solving (1) and (2)  $m = 9, n = 3$

2. In how many years the ratio of the principal and its interest at 4% per annum will be 5:2?

- (a) 10                      (b) 15                      (c) 20                      (d) None of the above

**Ans. (a)**

**Sol.**  $2n = \frac{5x \times 4 \times T}{100}$

$$\therefore T = 10 \text{ years}$$

3. If  $\frac{a^2 + 3ab^2}{3a^2b + b^3} = \frac{x^3 + 3xy^2}{3x^2y + y^3}$ , then

- (a)  $bx = ay$                       (b)  $by = ax$                       (c)  $b^2y = a^2x$                       (d)  $b^2x = a^2y$

**Ans. (a)**

4. The mean of  $x_1$  and  $x_2$  is  $M_1$  and that of  $x_1, x_2, x_3, x_4$  is  $M_2$  then the mean of  $ax_1, ax_2, \frac{x_3}{a}, \frac{x_4}{a}$  is

- (a)  $\frac{M_1 + M_2}{2}$  (b)  $\frac{aM_1 + \frac{M_2}{a}}{2}$   
 (c)  $\frac{1}{2a}[(a^2 - 1)M_1 + 2M_2]$  (d)  $\frac{1}{2a}[2(a^2 - 1)M_1 + M_2]$

**Ans. (c)**

**Sol.**  $x_1 + x_2 = 2m_1$

$$x_1 + x_2 + x_3 + x_4 = 4m_2$$

$$x_3 + x_4 = 4m_2 - 2m_1$$

$$\therefore \frac{ax_1 + ax_2 + \frac{x_3}{a} + \frac{x_4}{a}}{4} \Rightarrow \frac{1}{20}[(a^2 - 1)m_1 + 2m_2]$$

5. If  $f(x+1) = 3x-9$ , then what will be the value of  $f(x^2 - 1)$ ?

- (a)  $3x^2-9$  (b)  $3x^2-15$  (c)  $x^2 - 10$  (d)  $3x^2 - 10$

**Ans. (b)**

**Sol.**  $f(x + 1) = 3x - 9$

$$\therefore f(x) = 3x - 12$$

$$\therefore f(x^2 - 1) = 3x^2 - 15$$

6. The area of the whole surface of a certain cube is equal to the area of the curved surface of a certain sphere. The ratio of their volumes is

- (a)  $\pi : 6$  (b)  $\sqrt{\pi} : \sqrt{6}$  (c)  $\sqrt{6} : \sqrt{\pi}$  (d)  $6 : \pi$

**Ans. (b)**

**Sol.**  $6a^2 = 4\pi r^2$

$$\therefore r = \frac{\sqrt{3}a}{\sqrt{2\pi}}$$

$$\frac{V_c}{V_s} = \frac{a^3}{\frac{4}{3}\pi r^3} \Rightarrow \frac{\sqrt{\pi}}{\sqrt{6}}$$

7. If  $x \neq y$  and  $x, y$  are real numbers; and  $A = x^2 + y^2 - xy - x - y + 1$ , then

- (a)  $A > 0$  (b)  $A = 0$  (c)  $A < 0$  (d)  $0 < A < 1$

**Ans. (a)**

**Sol.** By putting value of  $x$  and  $y$

$$\therefore A > 0$$



12. 21,34,55,89, 144, ?

(a) 169

(b) 213

(c) 223

(d) 233

Ans. (d)

Sol.  $21 + 34 = 55,$

$34 + 55 = 89,$

$55 + 89 = 144$

13. 225, 100,36,9, 1, ?

(a) - 7

(b) - 6

(c) 0

(d) -1

Ans. (c)

Sol. 225, 100, 36, 9, 1, 0

$$\begin{array}{cccccc} 15^2, & 10^2, & 6^2, & 3^2, & 1^2, & 0 \\ \underbrace{\hspace{1.5em}}_{-5} & \underbrace{\hspace{1.5em}}_{-4} & \underbrace{\hspace{1.5em}}_{-3} & \underbrace{\hspace{1.5em}}_{-2} & \underbrace{\hspace{1.5em}}_{-1} & \end{array}$$

14. 2, 15,41,80, ?

(a) 111

(b) 120

(c) 121

(d) 132

Ans. (d)

Sol. Difference are multiple of 13.

15. 462,420, 380, ?, 306

(a) 322

(b) 332

(c) 342

(d) 352

Ans. (c)

Sol. 462, 420, 380, ~~342~~, 306

$$\begin{array}{cccc} \underbrace{\hspace{2em}}_{-42} & \underbrace{\hspace{2em}}_{-40} & \underbrace{\hspace{2em}}_{-38} & \underbrace{\hspace{2em}}_{-36} \end{array}$$

16. 4, 18, ?, 100,180, 294

(a) 32

(b) 36

(c) 48

(d) 40

Ans. (c)

Sol. 4, 18, 48, 100, 180, 294

$2^3-2^2, 3^3-3^2, 4^3-4^2, \dots$

17. (11,13), ?, (23; 29), (31,37), (41,47)

(a) (13, 17)

(b) (19,21)

(c) (17,19)

(d) (13, 18)

Ans. (c)

Sol. Pair of prime numbers

18.  $\frac{1}{\sqrt{3}}, \frac{2}{3}, ?, \frac{4}{9}, \frac{5}{9\sqrt{3}}$

(a)  $\frac{3}{3\sqrt{3}}$

(b)  $\frac{3}{\sqrt{3}}$

(c)  $\frac{1}{2\sqrt{3}}$

(d)  $\frac{1}{3}$

Ans. (a)

Sol. Multiply  $\frac{2}{\sqrt{3}}$

19. 121, 126, 141, 166, 201, ?

- (a) 206 (b) 212 (c) 230 (d) 246

Ans. (d)

Sol.  $\begin{array}{cccccc} 121, & 126, & 141, & 166, & 201, & \underline{246} \\ \underbrace{\hspace{1.5em}}_{+5} & \underbrace{\hspace{1.5em}}_{+15} & \underbrace{\hspace{1.5em}}_{+25} & \underbrace{\hspace{1.5em}}_{+35} & \underbrace{\hspace{1.5em}}_{+45} & \end{array}$

20. 0, 6, 24, 60, ?, 210

- (a) 117 (b) 119 (c) 120 (d) 126

Ans. (c)

Sol. 0, 6, 24, 60, 120, 210

$1^3-1, 2^2-2, 3^3-2, 4^3-4, \dots$

**(Questions 21—30)**

**DIRECTION :** In each of the questions 21 to 30 there are four items, three 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) Jagadish Chandra Bose (b) Debendra Mohan Bose  
(c) Satyendra Nath Basu (d) Prafulla Chandra Roy

Ans. (d)

Sol. All are physicist except Prafulla Chandra roy

22. (a) Raman Research Institute (b) Indian Institute of Science  
(c) Indian Institute of Chemical Biology (d) International Centre for Theoretical Science

Ans. (c)

Sol. All are physics research institutes.

23. (a) Blade (b) Axe (c) Scissors (d) Needle

Ans. (d)

Sol. All except needle are used for cutting.

24. (a) India Today (b) The Hindu (c) The Hindustan Times (d) Times of India

Ans. (a)

Sol. All are news paper except India Today

25. (a) Terrence Tao (b) Maryam Mirzakhari (c) Rene Thom (d) Michael Atiyah

Ans. (b)

Sol. All are mathematician except margam mirzakhari

26. (a) Patna (b) Kolkata (c) Baranasi (d) Cuttack

Ans. (d)

Sol. Ganga does not pass through cuttack.

27. (a) Metre (b) Litre (c) Nautical mile (d) Light year

Ans. (b)

Sol. Unit of measurement of liquid

28. (a) May Day (b) Republic Day  
(c) Gandhi Jayanti Day (d) Rabindra Jayanti Day

**Ans. (d)**

**Sol.** Rabindra Jayanti Day is not a day.

29. (a) The Mahabharat (b) The Geeta (c) The Koran (d) The Bible

**Ans. (a)**

**Sol.** All are holy books except the mahabharat.

30. (a) Atal Behari Bajpaee (b) Dr. Manmohan Singh  
(c) Dr. A.P.J. Abdul Kalam (d) Morarji Desai

**Ans. (c)**

**Sol.** All are prime minister except Dr. A.P.J. Abdul Kalam.

**Direction (Q.31 to Q.40) :** 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. Prashanta Chandra  
Mahalanobis : Indian Statistical Institute  
Dr. Mahendralal  
Sarkar : ?  
(a) Calcutta University (b) Rajabazar Science College  
(c) Indian Association for the Cultivation of Science (d) Indian Institute of Science

**Ans. (c)**

**Sol.** Dr Mahendra Lal Sarkar is the founder of Indian Association for the cultivation of science.

32. Calendar : Dates  
Dictionary : ?  
(a) Sentences (b) Language (c) Words (d) Books

**Ans. (c)**

**Sol.** Dictionary is the collection of words.

33. 1729 : Ramanujan  
6174 : ?  
(a) Sir Asutosh Mukhopadhyay (b) Mahan Maharaj  
(c) S. Chandrasekhar (d) D.R. Kaprekar

**Ans. (d)**

**Sol.** 6171 is D.R. Kaprekar number

34. 15th August : India  
? : Pakistan  
(a) 21st February (b) 16th December (c) 16th August (d) 14th August

**Ans. (d)**

**Sol.** 14th August is the independence day of Pakistan.

35. Coconut : Shell

Letter : ?

- (a) Letter-box                      (b) Envelope                      (c) Stamp                      (d) Mail

**Ans. (b)**

**Sol.** coconut is inside shell, letter is inside envelope.

36. Rabishankar : Sitar

Amjad Ali Khan : ?

- (a) Sitar                      (b) Sarod                      (c) Flute                      (d) Guiter

**Ans. (b)**

**Sol.** Amjadali Khan plays Sarod.

37. Prof. Amarthya Sen : Economics

Prof. Ashoke Sen : ?

- (a) Economics                      (b) Physics                      (c) Chemistry                      (d) Biology

**Ans. (b)**

**Sol.** Ashok sen is famous for physics.

38. The Ganges : India

The Nile : ?

- (a) Pakistan                      (b) China                      (c) Egypt                      (d) Nairobi

**Ans. (c)**

**Sol.** The Nile is in egypt

39. Virat Kohli : Cricket

Pankaj Advani : ?

- (a) Basket ball                      (b) Billiard                      (c) Snooker                      (d) Chess

**Ans. (b)**

**Sol.** Pankaj advani plays billiard.

40. Apparel : Cloth

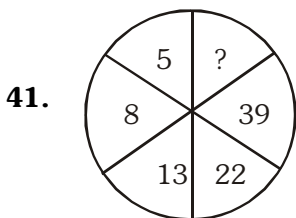
Footwear : ?

- (a) Material                      (b) Leather                      (c) Cobbler                      (d) Shoes

**Ans. (b)**

**Sol.** Footwear is made from leather.

Direction (Q.41 to Q.50) : In questions 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.



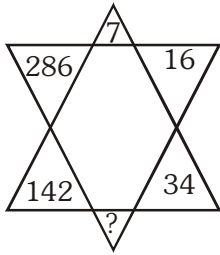
- (a) 66                      (b) 72                      (c) 71                      (d) 78

**Ans. (b)**

**Sol.** In gaping  $\times 2 - 1$  follows

$\therefore 39 + 34 \Rightarrow 72$

42.



(a) 38

(b) 66

(c) 68

(d) 70

**Ans. (d)**

**Sol.**  $7 \times 2 + 2 = 16$

$\therefore \times 2 = 2$  follow

43.

4C	2B	3A
28A	?	45B
7C	8A	15B

(a) 16C

(b) 12C

(c) 13C

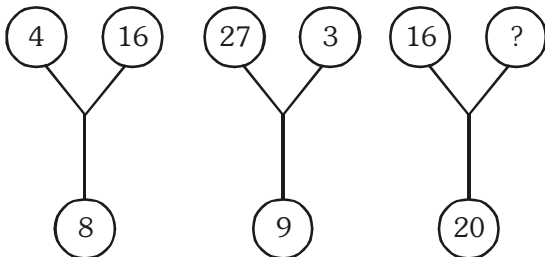
(d) 7C

**Ans. (a)**

**Sol.** 1st row  $\times$  3rd row = 2nd row.

$\therefore 2 \times 8 \Rightarrow 16$

44.



(a) 60

(b) 50

(c) 25

(d) 40

**Ans. (c)**

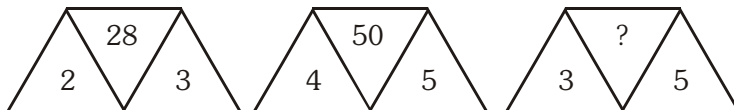
**Sol.**  $16 \times 4 = 64$

$\Rightarrow \sqrt{64} = 8$

$\therefore 16 \times x = 400$

$\therefore x = 25$

45.



(a) 35

(b) 40

(c) 49

(d) 53

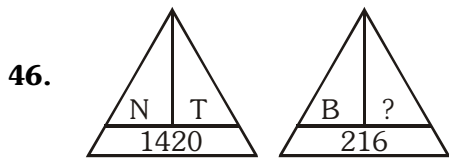
**Ans. (b)**

**Sol.**  $23 + 5 = 28$

$45 + 5 = 50$

$35 + 5 = 40$





(a) P

(b) H

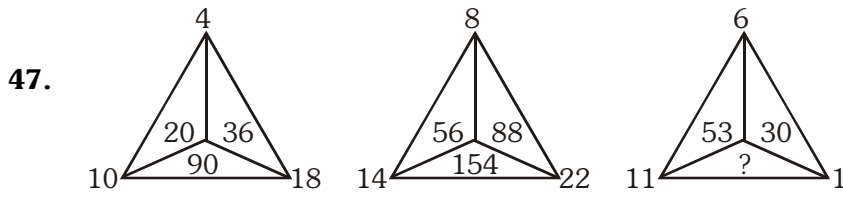
(c) M

(d) L

Ans. (a)

Sol. 2 16

(B) (P)



(a) 110

(b) 1

(c) 55

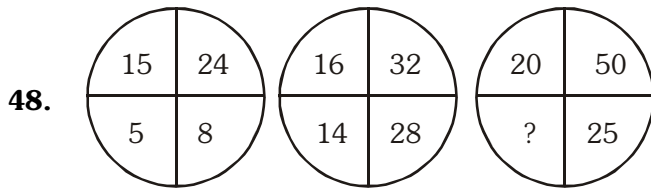
(d) 441

Ans. (c)

Sol.  $\frac{11 \times 6}{2} = 33$  instead of 53 it should be 33.

$$\frac{6 \times 10}{2} = 30$$

$$\therefore \frac{11 \times 10}{2} = 55$$



(a) 100

(b) 10

(c) 200

(d) 9

Ans. (b)

Sol.  $\frac{15}{5} = \frac{24}{8} \Rightarrow 3$

$$\frac{16}{14} = \frac{32}{28} \Rightarrow \frac{3}{2}$$

$$\therefore \frac{20}{10} = \frac{50}{25} \Rightarrow 2$$

49.

3	5	7	9	15	13
8	26	48	82	?	170

(a) 121

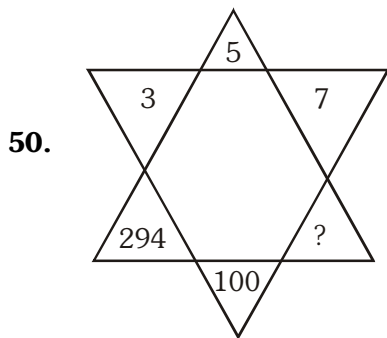
(b) 224

(c) 120

(d) 225

Ans. (b)

Sol.  $3^2 - 1, 5^2 + 1, 7^2 - 1, 9^2 + 1, 15^2 - 1$   
 $\downarrow$   
 224



(a) 18

(b) 9

(c) 10

(d) 20

Ans. (a)

Sol.  $5^2 \times (5 - 1) = 100$   
 $7^2 \times (7 - 1) = 294$   
 $\therefore 3^2 \times (3 - 1) = 18$

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