THE ASSOCIATION OF MATHEMATICS TEACHERS OF INDIA

Screening Test - GAUSS Contest

NMTC at PRIMARY LEVEL - V & VI Standards

Saturday, 31 August, 2019

Note:

1. Fill in the response sheet with your Name, Class and the institution through which you appear in the specified places.

2. Diagrams are only visual aids; they are NOT drawn to scale.

3. You are free to do rough work on separate sheets.

4. Duration of the test: **2 hours.**

PART—A

Note

- Only one of the choices A, B, C, D is correct for each question. Shade the alphabet of your choice in the response sheet. If you have any doubt in the method of answering; seek the guidance of the supervisor.
- For each correct response you get 1 mark. **For each incorrect response you lose $\frac{1}{2}$ mark.**

1. How many glasses of 120 millilitres can you fill from a 3 litre can of juice ?

(A) 20 (B) 24 (C) 25

(D) 60 ml is left in the can after filling as many glasses as possible

Sol. **(C)**

1 Lt.= 1000 ml

3 Lt. = 3000 ml

$\therefore$ Required no of glasses = $\frac{3000}{120} = 25$

2. The sum of 2211 + 2213 + 2215 + 2217 + 2219 + 2221 + 2223 + 2225 + 2227 + 2229 is

(A) 22200 (B) 22225 (C) 22250 (D) 22275

Sol. **(A)**

Required Sum to = 22200

3. If a number is first multiplied by $\frac{4}{7}$ and then divided by $\frac{12}{7}$ then it is equivalent to which of the following operations on the number ?

(A) multiplying by $\frac{1}{3}$ (B) dividing by $\frac{1}{3}$ (C) multiplying by 3 (D) dividing by $\frac{2}{3}$

Sol. **(A)**

Let the no. be = x

Then $\frac{4}{7}x \div \frac{12}{7} = \left(\frac{4}{7}x\right) \times \left(\frac{7}{12}\right) = \frac{x}{3}$

$\Rightarrow \quad x \times \frac{1}{3}$

4. X is a 5 digit number. Let Y be the sum of the digits of X. Let Z be the sum of the digits of Y. Then the maximum possible value that Z can have is

(A) 9 (B) 8 (C) 10 (D) 12

Sol. **(D)**

Let $x = 99993$

$y = 9 \times 4 + 3 = 39$

$z = 3 + 9 = 12$

5. A square is constructed on a graph paper which has a square grid of 1 cm width. Ram paints all the squares which cross the two diagonals of the square and finds that there are 19 of them. Then the side of the square is

(A) 20 (B) 19 (C) 10 (D) 9

Sol. **BONUS**

6. Look at the set of numbers {2, 3, 5, 7, 8, 10, 12}. Four numbers are selected from this and made into two pairs. The pairs are added and the resulting two numbers are multiplied. The smallest such product is

(A) 72 (B) 60 (C) 54 (D) 64

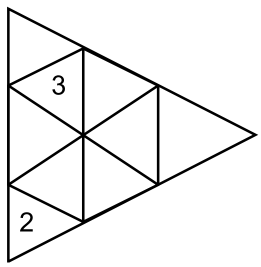
Sol. **(B)**

Let the four no. selected are {2,3,5,7}

Then: (2 + 3), (5+ 7) = {5,12}

Product = $5 \times 12 = 60$

7. Anita wants to enter a number into each small triangular cell of the triangular table. The sum of the numbers in any two such cells with a common side must be the same. She has already entered two numbers. What is the sum of all the numbers in the table ?



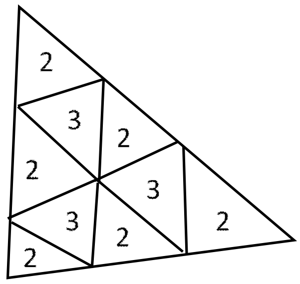
(A) 19 (B) 20 (C) 21 (D) 22

Sol. **(C)**

$\therefore$ Sum of the no. in the triangle

$\Rightarrow$ $2 \times 6 + 3 \times 3$

$\Rightarrow$ $12 + 9 = 21$



8. If $\begin{array}{r} A\ B\ C \\ +\ \ C\ B\ A \\ \hline DE\,D\ D \end{array}$ where A, B, C, D, E are distinct digits satisfying this addition fact, then E is

(A) 3 (B) 5 (C) 2 (D) 4

Sol. **(C)**

$$\begin{array}{cccc} & A & B & C \\ + & C & B & A \\ \hline D & E & D & D \\ \hline \end{array}$$

D must be 1.

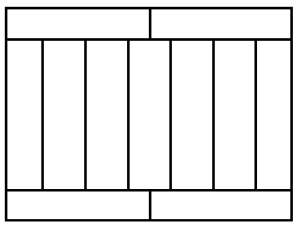
$\Rightarrow$ C + A = 1 or 11

So possible value of B is 0 or 5. But if we take B '0' so there is no carry & sum of A & C will not get different digit from D. So D must be 5.

$$\begin{array}{cccc} & A & 5 & C \\ + & C & 5 & A \\ \hline 1 & 2 & 1 & 1 \\ \hline \end{array}$$

$\therefore$ E = 2

9. A large rectangle is made up of eleven identical rectangles whose longer sides are 21 cm long. The perimeter of the large rectangle in cm is



(A) 150 (B) 126 (C) 108 (D) 96

Sol. **(A)**

Given longer side of rectangle = 21 cm

Let the shorter side be = x cm

$\therefore$ 7x = 42

x = 6

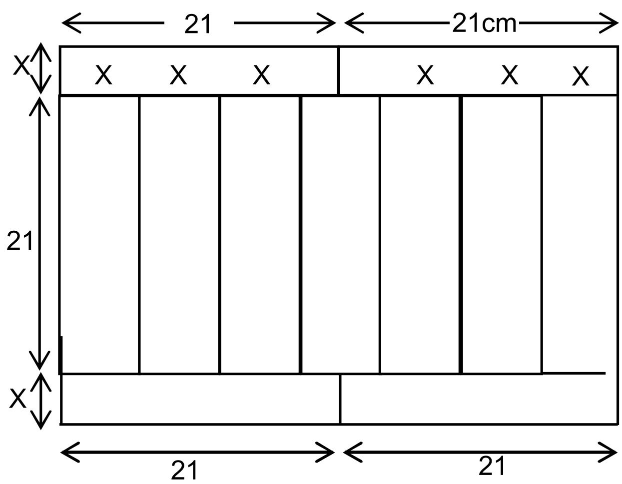
$\therefore$ Length of large rectangle = 21 + 21 = 42

breadth = 21 + x + x = 21 + 2x

P = 2 (42 + 21 + 2x)

= 2 (63 + 2x)

= 126 + 4x = 126 + 4 × 6 = 126 + 24 = 150 cm



10. Sum of the odd numbers from 1 to 2019 both inclusive, is divisible by

(A) only 100 (B) only 101

(C) both 100 and 101 (D) neither by 100 nor by 101

Sol. **(C)**

Sum of odd no. = 1, 3 ………. 2019

Total no. = 1010

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

$= \frac{1010}{2}[2 \times 1 + 1009 \times 2]$

= 505 [2 + 2018]

= 1020100

$\therefore$ Sum is divisible by 100 and 101

11. The circumference of a circle is numerically greater than the area of the circle. Then the maximum length of the radius cannot be greater than

(A) 2 (B) $\frac{7}{4}$ (C) $\frac{9}{5}$ (D) $\frac{11}{6}$

Sol. **(A)**

Circumference of circle = $2\pi r$

Area of circle = πr^2

$2\pi r > \pi r^2$

$\Rightarrow$ $2 > r$

$\Rightarrow$ $r < 2$

12. A calendar for 2019 is made using 4 sheets, each sheet having 3 months. The total number of days shown in each of the four sheets (1^{st}, 2^{nd}, 3^{red}, 4^{th}) respectively is

(A) (90, 91, 92, 92) (B) (90, 92, 91, 92) (C) (90, 92, 91, 92) (D) (90, 92, 92, 91)

Sol. **(A)**

For first sheet = {Jan, feb, Mar}

= {31,28, 31} = 90

For second sheet = {April, May, June}

= {30,31,30} = 91

For third sheet = {July, Aug. Sep}

= {31,31,30} = 92

For fourth sheet = {oct, Nov. Dec}

= {31,30,31} = 92

13. Triples of odd numbers (a, b, c) with a < b < c, with a, b, c from 1 to 10 are generated such that a + b + c is prime number. The number of such triple is

(A) 5 (B) 6 (C) 7 (D) 3

Sol. **(B)**

a, b & c are from = 1,3,5,7 & 9

So possible pairs

1 + 3 + 7 = 11 (Prime)

1 + 3 + 9 = 13 (Prime)

3 + 5 + 9 = 17 (Prime)

So 6 triples are there 1 + 7 + 9 = 17

3 + 7 + 9 = 19

1 + 5 + 7 = 13

14. A number leaves a remainder 2 when divided by 6. Then the possible remainder(s) when the same number is divided by 9 is

(A) {1, 4, 7} (B) {2, 5, 8} (C) {5, 8} (D) {2, 5}

Sol. **(B)**

Given that N = 6q + 2

$\therefore$ Such no. are 2, 8, 14, 20, 26 …………

$\therefore$ Such no. gives remainder (2,5,8) when divided by 9.

15. A box of dimension 40 × 35 × 28 units is used to keep smaller cuboidal boxes so that no space is left between the boxes. If the box is packed with 100 such smaller boxes of the same size, then dimension of the smaller box is

(A) 7 × 8 × 7 (B) 8 × 7 × 7 (C) 7 × 7 × 8 (D) 20 × 7 × 7

Sol. **(B)**

Dimension of bigger box = 40 × 35 × 28

No. of smaller box = 100

Volume of smaller box = $\frac{40 \times 35 \times 28}{100} = 8 \times 7 \times 7$

PART - B

Note :

- Write the correct answer in the space provided in the response sheet
- For each correct response you get 1 mark. For each incorrect response you lose $\frac{1}{4}$ marks.

16. The number of two digit numbers which are divisible by the sum of their digits is

Sol. **(23)**

No. of two digits no. which are divisible by sum of their digits are

{10,12,18,20,21,24,27,30,36,40,42,45,48,50,54,60,63,70,72,80,81,84,90}

17. Given below is the triangular form of AMTI.

A
A M A
A M T M A
A M T I T M A

The number of ways you can spell AMTI, top to bottom, right to left or left to right or a combination of these is ___________.

Sol. **(15)**

			(1) A			
		(2) A	(3) M	(4) A		
	(5) A	(6) M	(7) T	(8) M	(9) A	
(10) A	(11) M	(12) T	(13) I	(14) T	(15) M	(16) A

(10,11,12,13)	(16,15,14,13)	(1,3,7,13)	
(5,11,12,13)	(2,6,12,13)	(9,15,14,13)	(4,8,14,13)
(2,6,7,13)	(4,8,7,13)	(2,3,7,13)	(4,3,7,13)
(5,6,7,13)	(9,8,7,13)	(5,6,12,13)	(9,8,14,13)

18. The number of odd prime numbers less than 100 which can be written as the sum of two squares is __________.

Sol. **(11)**

$5 = 2^2 + 1$
$13 = 3^2 + 2^2$
$17 = 4^2 + 1^2$
$29 = 5^2 + 2^2$
$37 = 6^2 + 1^2$
$41 = 5^2 + 4^2$
$53 = 7^2 + 2^2$
$61 = 5^2 + 6^2$
$73 = 8^2 + 3^2$
$89 = 8^2 + 5^2$
$97 = 9^2 + 4^2$

$\therefore$ There are 11 such prime No.

19. If 4921 × D = ABBBD, then B is __________.

Sol. **(4)**

4921 × 1 = 4921
4921 × 2 = 9842
4921 × 3 = 14,763
4921 × 4 = 19,684
4921 × 5 = 24,605
4921 × 6 = 29,526

$\boxed{4921 \times 7 = 34{,}447}$

$$\begin{array}{r} 4\ \ 9\ \ 2\ \ 1 \\ \times\ \ 7 \\ \hline 34,\ 4\ \ 4\ \ 7 \\ \hline \end{array}$$

$\therefore$ B = 4

20. 36 children took a math talent test. For a contestant Anu the number of students who scored above her was 1.5 times the number who scored below her. Her rank when the scores are put in decreasing order is ___________ .

Sol. **(22)**

Let the no. of students below Anu = x
Then no. of students above Anu = 1.5 x
Then $1{\cdot}5x + x + 1 = 36$
$2{\cdot}5\,x = 35$
$x = 14$

$\therefore$ There are 1.5 × 14 = 21 students above anu
$\therefore$ Anu's Rank = 22

21. Small rectangular sheets of length $\frac{2}{3}$ units and breadth $\frac{3}{5}$ units are available. These sheets are assembled and pasted in a big cardboard sheet, edge to edge and made into a square. The minimum number of such sheet required is ___________.

Sol. **(90)**

$$\text{L.C.M}\left(\frac{2}{3},\frac{3}{5}\right) = \frac{\text{L.C.M.}(2,3)}{\text{H.C.F}(3,5)} = 6$$

Area of square = 6 × 6

$$\text{No. of rectangle} = \frac{\text{Area of Square}}{\text{Area of rectangle}} = \frac{6\times6}{\frac{2}{3}\times\frac{3}{5}} = \frac{6\times6}{2}\times5 = 15\times6 = 90$$

22. Ramanujan's number is 1729. The number of composite divisors of 1729 less than 1729 is _____.

Sol. **(3)**

$\therefore$ $1729 = 7 \times 13 \times 19$

No. of composite divisions of 1729 less than

1729 are (7×13), (7×19), (13×19)

$\Rightarrow$ 91, 133, 247

23. N is an 100000 digit number with no zero digit and the sum of the digits of N is 100001, then the number of such N's is __________.

Sol. **1,00,000**

No. of digits = 100,000

Sum of digits = 100001

Therefore are sum of No. are 1111 ……….. (99999 times) 2

$\therefore$ 1,00,000 such no. are possible

24. Peter 8 years old asked his mother how old she was. She said, "when you are as old as I am now, I will be 54 years old". Peter's mother's current age is _________.

Sol. **(31)**

The present age of peter = 8 years

Let the present age of mother = x years

Peter will as old as his mother after

$(x - 8)$ years

Then, Mother's, age $x + (x - 8) = 54$

$2x = 54 + 8$

$2x = 62$

$x = 31$

$\therefore$ Peter's mother's current age = 31 years

25. A string of beads has a recurring pattern as follows : 5 blue, 4 black, 4 white, 5 blue, 4 black, 4 white .... and so on. The colour of the 321^{st} bead is _________.

Sol. **(Black)**

Given pattern is 5 blue, 4 black, 4 white

$\Rightarrow$ $5 + 4 + 4 = 13$ beads

Such pattern is repeated after 13 beads

Therefore $321 = 13 \times 24 + 9$

321^{st} bead = 9^{th} bead

$\therefore$ Colour of 321st bead is black