THE VILLAGE
INTERNATIONAL SCHOOL
"We Nurture Dreams"

Date:03/08/23 **MONTHLY TEST -02 (2023-24)** **Max marks: 20**
Grade : XII **MATHEMATICS** **Time: 50min**

General Instructions:

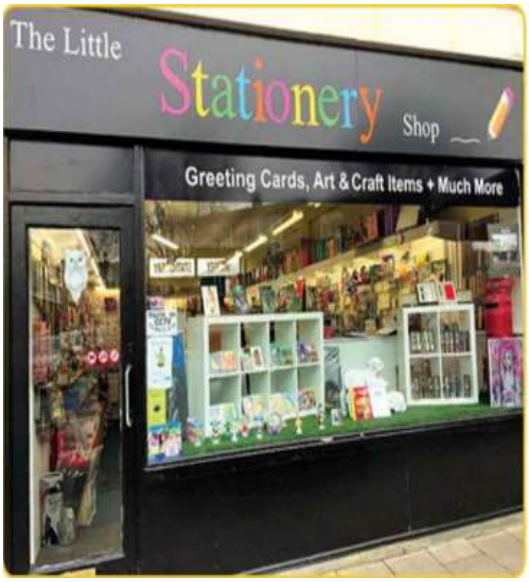
1) Questions 1 to 4 carries 1 mark each.
2) Questions 5 to 8 carries 2 marks each.
3) Questions 9 and 10 carries 4 marks each.
4) All questions are compulsory.

Q. No	SECTION A	Marks
1	Find the value of $\tan^{-1}(1) + \cos^{-1}\left(-\frac{1}{2}\right) + \sin^{-1}\left(\frac{1}{2}\right)$	1
2	A is a matrix of order 3x3 , such that $\|A\| = 12$. Find $\|A \,.\, adjA\|$. a) 144 b) 1728 c) 12 d) 1	1
3	Find x , if $\begin{bmatrix} 5-x & x+1 \\ 2 & 4 \end{bmatrix}$ is singular a) x= 0 b) x= -3 c) x = 3 d) x = 5 or -1	1
4	Find the value of $\cos^{-1}\cos\left(\frac{5\pi}{4}\right)$.	1
	SECTION B	
5	Find the domain of $\cos^{-1}(2x-1)$	2
6	Let f : **N** →**N** be defined by $f(n) = \begin{cases} \frac{n+1}{2} \; if \; n \; is \; odd \\ \frac{n}{2} \; if \; n \; is \; even \end{cases}$ for all $n \in$ **N,** State whether the function f is bijective.	2

7	Prove the relation R on the set N x N defined by (a , b) R (c , d) $\Leftrightarrow a+d=b+c$, for all (a , b) (c , d) $\in$ N x N is an equivalence relation.	2
8	Solve the following using matrix method:- $x - y + z = 4$; $2x + y - 3z = 0$; $x + y + z = 2$	
	SECTION C	
9.	Students of grade 9 , planned to plant saplings along straight lines, parallel to each other to one side of the playground ensuring that they have enough area.Let us assume that they planted one of the rows of the saplings along the line $y = x - 4$ .Let L be the set of all lines which are parallel on the ground and R be the relation on L. 	4

1) Let relation R be defined by R = { (L_1 , L_2) : L_1 is parallel to L_2 Where L_1 , $L_2 \in$ L } then R is ------- relation
   a) Equivalence
   b) Only reflexive
   c) Not reflexive
   d) Symmetric but not transitive
2) Let relation R be defined by R = { (L_1 , L_2) : L_1 is perpendicular to L_2 Where L_1 , $L_2 \in$ L }, which of the following is true?
   a) R is symmetric but neither reflexive nor transitive.
   b) R is reflexive and transitive but not symmetric.
   c) R is reflexive but neither symmetric nor transitive.
   d) R is an equivalence relation.
3) The function f: R $\rightarrow$ R defined by f(x) = x – 4 is
   a) Bijective
   b) Surjective but not Injective
   c)Injective but not Surjective
   d) Neither Surjective nor Injective.
4) Let relation R be defined by R = { (L_1 , L_2) : L_1 is parallel to L_2
   Where L_1 , $L_2 \in$ L & y = x - 4 } then which of the following can be taken as L_2 .
   a) 2x – 2y + 5 = 0
   b) 2x + y = 5
   c) 2x + 2y + 7 = 0
   d) x + y = 7

10.	Read the following and answer any four A manufacturer produces three stationery products Pencil, Eraser and sharpener which he sells in two markets. Annual sales are indicated below	4



Market	Products in Numbers		
	Pencil	Eraser	Sharpener
A	10,000	2,000	18,000
B	6,000	20,000	8,000

If the unit sale price of Pencil, Eraser and Sharpener are Rs 2.50, Rs 1.50 and Rs 1.00 respectively , and unit cost of the above three commodities are Rs 2.00 , Rs 1.00 and Rs 0.50 respectively, then

1) Total revenue of market A
   a) RS 64000 b) RS 60400 c) RS 46000 d)RS 40600
2) Cost incurred in market B
   a) RS 35000 b) RS 53000 c) RS 50300 d) Rs30500
3) Profit in market A and B respectively
   a) RS15000,RS17000 b) RS 17000, RS 15000
   c)RS 51000, RS 71000 d) RS 10000 , RS 20000
4) Gross Profit in both market is
   a) RS 23000 b) RS 20300 c)RS32000 d) RS30200

ANSWERS

1)$13\frac{\pi}{12}$ 2)1728 3)x = 3 4)$3\frac{\pi}{4}$ 5)[0 , 1]

6)

$f(1) = \frac{1+1}{2} = \frac{2}{2} = 1$ *(Since 1 is odd)*

$f(2) = \frac{2}{2} = 1$ *(Since 2 is even)*

Since, f(1) = f(2) but $1 \neq 2$ Therefore, f is not one-one

When n is odd	**When n is even**
$y = \frac{n+1}{2}$	$y = \frac{n}{2}$
$2y = n + 1$	$2y = n$
$2y - 1 = n$	$n = 2y$
$n = 2y - 1$	
Hence, for y is a natural number , n = 2y – 1 is also a natural number	Hence for y is a natural number n = 2y is also a natural number

Therefore , f is onto.

7)

8)x =2, y =-1 , z= 1

R is an equivalance relation if R is reflexive,symmetric and transitive.

a)checking if it is reflexive;

Given R in A × A and (a, b) R (c, d) such that a + d = b + c

For reflexive,consider (a, b) R (a, b) (a, b) ∈ A

and applying given condition⇒ a + b = b + a;which is true for all A

∴ R is reflexive.

b)checking if it is symmetric;

given(a, b) R (c, d) such that a + d = b + c

consider (c, d) R (a, b) on A × A

applying given condition⇒ c + b = d + a which satisfies given condition

Hence R is symmetric.

c)checking if it is transitive;

Let (a, b) R (c, d) and (c, d) R (e, f)

and (a, b) , (c, d) , (e, f) ∈ A × A

applying given condition:⇒ a + d = b + c → 1 and c + f = d + e → 2

equation 1⇒ a − c = b − d

now add equation 1 and 2;

⇒ a − c + c + f = b − d + d + e

⇒ a + f = b + e

9)1.a 2.a 3.a 4. A 10)1.c 2.b 3.a 4.c

(a,b)R(e,f)also satisfies the condition.

Hence R is transitive.Therefore R is an equivalence relation.