



# INDIAN SCHOOL AL WADI AL KABIR

**Practice Paper** (2022-2023)-Assessment -I

Class: XI

Sub: Applied MATHEMATICS (**241**)

Max Marks: 80

Date:01-09-2022

Time: 3 hours

## General Instructions:

1. This question paper contains six sections- A, B, C, D, E and F. Each part is compulsory.
2. Section - A has 16 objective type questions of 1 mark each.
3. Section - B has 8 MCQ type questions of 1 mark each.
4. Section - C has 2 Case based questions.
5. Section - D has 8 short answer type (SA1) questions of 2 marks each.
6. Section - E has 4 short answer type (SA2) questions of 3 marks each.
7. Section - F has 4 long answer type questions (LA) of 5 marks each.
8. There is an internal choice in some of the questions.

## SECTION - A


1	Let $A = \{2, 3\}$ and $B = \{4, 5\}$ . Find number of subsets of $A \times B$	1
2	Find 'y' if $(x^2 - 4x, y^2 - y) = (-4, 6)$	1
3	If $X = \{1, 2, 3, 4\}$ , give an example on X which is reflexive and symmetric but not transitive.	1
4	In a class of 120 students numbered 1 to 120, all even numbered students opt for Physics, whose numbers are divisible by 5 opt for Chemistry and those whose numbers are divisible by 7 opt for Math. How many opt for none of the three subjects?	1
5	A market research group conducted a survey of 1000 consumers and reported that 720 consumers like product A and 450 consumers like product B, what is the least number that must have liked both products?	1
6	If $A = \{1, 2, 3, \dots, 14\}$ and a relation R is defined from A to A by $R = \{(x, y) : 3x - y = 0, x, y \in A\}$ Write R in roster form	1
7	Find the number of proper subsets of the set $\{a, b, c, d, e, f, g\}$	1
8	What is the sum of the median and mean of the following data? 56, 48, 68, 113, 180, 104, 124	1
9	Find the mean deviation about median for the given data 2, 7, 9, 11, 15, 16	1
10	For a certain frequency distribution, if mean is 180, median is 175 and standard deviation is 25 then find the Karl Pearson's coefficient of skewness	1
11	The mathematics test score of 10 students are given 13, 52, 42, 22, 44, 105, 45, 88, 88, 76. Find the percentile rank of score 88	1
12	The mean, mode and variance of a frequency distribution are 44, 52 and 16 respectively. Then find the Karl Pearson's coefficient of skewness	1
13	Convert the decimal number 569 to the binary number	1

14	Find the sum of the binary numbers 101001 and 110110 and hence find the equivalent decimal number of the sum	1
15	Simplify $\left\{ \left[ (625)^{\frac{-1}{2}} \right]^{\frac{-1}{4}} \right\}^2$	1
16	Solve the value of x if $\log_2(x^2 - 1) = 3$	1

SECTION - B

17	The set of intelligent students in a class is (A) A null set (B) A singleton set (C) A finite set (D) Not a well-defined collection	1
18	The value of $n[(A - B) \cup (B - A)] + n(A \cap B)$ is equal to (A) $n(A)$ (B) $n(B)$ (C) $n(A \cap B)$ (D) $n(A \cup B)$	1
19	If $X = \{8n - 7n - 1   n \in \mathbb{N}\}$ and $Y = \{49n - 49   n \in \mathbb{N}\}$ . Then (A) $X \subset Y$ (B) $Y \subset X$ (C) $X = Y$ (D) $X \cap Y = \emptyset$	1
20	Let $A = \{-2, -1, 0\}$ and $f(x) = 2x - 3$ then the range of f is (a) $\{7, -5, -3\}$ (b) $\{-7, 5, -3\}$ (c) $\{-7, -5, 3\}$ (d) $\{-7, -5, -3\}$	1
21	The coefficient of correlation between X and Y when $\text{Cov}(X, Y) = -2.25$ , $\text{Var}(X) = 6.25$ and $\text{Var}(Y) = 20.25$ is (A) 0.2 (B) 0.5 (C) -0.2 (D) -0.5	1
22	The correlation coefficient between X and Y when $\sum x = 125$ , $\sum y = 100$ , $\sum x^2 = 650$ , $\sum y^2 = 464$ , $\sum xy = 508$ and $n = 25$ is (A) 0.2 (B) 0.5 (C) 2 (D) None of these	1
23	The value of $\log_{\sqrt{2}} 8$ is (A) 2 (B) 4 (C) 6 (D) 8	1
24	$\log_6 72 - \log_6 2$ is (A) 2 (B) 4 (C) 6 (D) 8	1

SECTION - C

25	<p><b>CASE-BASED/DATA-BASED</b></p> <p>In a University, out of 100 students 15 offered Mathematics only; 12 offered statistics only; 8 offered only physics; 40 offered Physics and Mathematics; 20 offered Physics and statistics; 10 offered Mathematics and Statistics; 65 offered Physics. Based on the above information answer the following questions</p> <div style="text-align: center;">  <p style="color: red; font-weight: bold; margin: 0;">UNIVERSITY ADMISSION</p> </div>	
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i)	The number of students who offered Mathematics and Statistics but not Physics (a) 7                      (b) 6                      (c) 5                      (d) 4	2
ii)	The number of students who did not offer any of the above three subjects (a) 4                      (b) 1                      (c) 5                      (d) 3	2
26	Let $x_1, x_2, x_3, \dots, x_n$ be $n$ observations. If each observation is increased, decreased, multiplied or divided by a non-zero constant $a$ , then mean is also increased, decreased, multiplied or divided the same non-zero constant $a$ . In case of variance, if each observation is increased or decreased by a non-zero constant $a$ , then the variance remains unchanged. But on multiplying or dividing each observation by same non-zero constant $a$ , then the variance $\sigma^2$ becomes $a^2\sigma^2$ or $\frac{\sigma^2}{a^2}$ respectively. So, we can say that variance is independent of change of origin but not of scale. Based on the above information answer the following questions.	
i)	The mean of 10 observations is 18, if each observation is increased by 2, then the new mean is (a) 20                      (b) 38                      (c) 16                      (d) 12	1
ii)	The mean of 7 observations is 25, if each observation is decreased by 3, then the new mean is (a) 21                      (b) 22                      (c) 23                      (d) 28	1
iii)	The mean of $n$ observations is $\bar{x}$ , if each observation is multiplied by the same non-zero constant $k$ , then the new mean is (a) $\bar{x} + k$ (b) $\bar{x} - k$ (c) $k\bar{x}$ (d) $\frac{\bar{x}}{k}$	1
iv)	The variance of 20 observations is 6.5, if each observation is increased by 4, then the new variance is (a) 10.5                      (b) 2.5                      (c) 6.5                      (d) 26	1

**SECTION - D (Each question carries 2 marks)**

27	Two finite sets have 'm' and 'n' elements. The total number of subsets of the first set is 56 more than the total number of subsets of the second set. Find the values of 'm' and 'n'.	2												
28	Show that the relation R in the set Z of integers given by $R = \{(a, b) : 5 \text{ divides } a - b\}$ is an equivalence relation.	2												
29	Suppose a class of 25 students conducted a quiz and grades obtained are given in the following table. find the mean deviation about the mean of the data given.	2												
<table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <tr> <td style="width: 15%;">Grade</td> <td style="width: 15%;">5</td> <td style="width: 15%;">10</td> <td style="width: 15%;">15</td> <td style="width: 15%;">20</td> <td style="width: 15%;">25</td> </tr> <tr> <td>Number of students</td> <td>7</td> <td>4</td> <td>6</td> <td>3</td> <td>5</td> </tr> </table>			Grade	5	10	15	20	25	Number of students	7	4	6	3	5
Grade	5	10	15	20	25									
Number of students	7	4	6	3	5									
30	Simplify $\frac{5^{n+2} - 6 \cdot 5^{n+1}}{13 \cdot 5^n - 2 \cdot 5^{n+1}}$	2												
31	For two sets A and B, given $n(A \times B) = 6$ and three elements of $A \times B$ are (2, 5), (4, 6) and (8, 6). Then find the remaining elements													

32	Find the mean deviation of the data 3, 10, 10, 4, 7, 10, 5 from the mean	
33	Find the quartile deviation of the observations 15, 20, 22, 28, 35, 27, 44, 48, 50, 55, and 60	
34	If $a = b^{2x}$ , $b = c^{2y}$ and $c = a^{2z}$ , then find the value of $xyz$	

**SECTION - E (Each question carries 3 marks)**

35	In a certain town, 25% of the families own a phone. 15% own a car and, 65% families own neither a phone nor a car. 2000 families own both a car and a phone. Find how much percentage of families own either a car or a phone. Also, find how many families live in the town.	3																						
36	Calculate the Karl Pearson's coefficient of skewness for the following data <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <tr> <td><math>x_i</math></td> <td>92</td> <td>93</td> <td>97</td> <td>98</td> <td>102</td> <td>104</td> <td>109</td> </tr> <tr> <td><math>f_i</math></td> <td>3</td> <td>2</td> <td>3</td> <td>2</td> <td>6</td> <td>3</td> <td>3</td> </tr> </table>	$x_i$	92	93	97	98	102	104	109	$f_i$	3	2	3	2	6	3	3	3						
$x_i$	92	93	97	98	102	104	109																	
$f_i$	3	2	3	2	6	3	3																	
37	Calculate the covariance for the following bivariate data <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <tr> <td>X</td> <td>11</td> <td>12</td> <td>13</td> <td>14</td> <td>15</td> <td>17</td> <td>18</td> <td>19</td> <td>20</td> <td>21</td> </tr> <tr> <td>Y</td> <td>14</td> <td>8</td> <td>12</td> <td>21</td> <td>19</td> <td>19</td> <td>23</td> <td>22</td> <td>17</td> <td>25</td> </tr> </table>	X	11	12	13	14	15	17	18	19	20	21	Y	14	8	12	21	19	19	23	22	17	25	3
X	11	12	13	14	15	17	18	19	20	21														
Y	14	8	12	21	19	19	23	22	17	25														
38	If $abc = 1$ show that $\frac{1}{1+a+b^{-1}} + \frac{1}{1+b+c^{-1}} + \frac{1}{1+c+a^{-1}} = 1$	3																						

**SECTION - F (Each question carries 5 marks)**

39	In a survey of 25 students, it was found that 12 have taken Physics 11 have taken Chemistry and 15 have taken Mathematics 4 have taken Physics & chemistry and 9 have taken Physics and Mathematics 5 have taken Chemistry and Mathematics while 3 have taken all the three subjects. Find the numbers of students who have taken. (i) Physics and Chemistry but not Mathematics. (ii) Physics and Mathematics but not Chemistry. (iii) Only one of the subjects. (iv) At least one of the three subjects. (v) None of the three subjects	5																								
40	Check whether the relation R in $\mathbf{R}$ defined by $R = \{(a, b) : a \leq b^3\}$ is reflexive, symmetric or transitive.	5																								
41	Calculate the coefficient of correlation from the following data <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <tr> <td>X</td> <td>12</td> <td>13</td> <td>14</td> <td>15</td> <td>16</td> <td>17</td> <td>18</td> </tr> <tr> <td>Y</td> <td>14</td> <td>17</td> <td>18</td> <td>19</td> <td>20</td> <td>24</td> <td>28</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </table>	X	12	13	14	15	16	17	18	Y	14	17	18	19	20	24	28									5
X	12	13	14	15	16	17	18																			
Y	14	17	18	19	20	24	28																			
42	If $3\log \sqrt{m} + 2\log \sqrt[3]{n} - 1 = 0$ , then find the value of $m^9 n^4$	5																								