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Code Number 41/1/1



INDIAN SCHOOL MUSCAT FIRST ASSESSMENT

MATHEMATICS

CLASS: XI
10.09.2017

Sub. Code: 041

Time Allotted: 3 Hrs
Max. Marks: 100

General Instructions: This question paper consists of 29 questions divided into 4 sections. Section A contains 4 questions of one mark each, Section B has 8 questions of two marks each, Section C contains 11 questions of four marks each and Section D has 6 questions of six marks each.

| SECTION-A (4x1 = 4 marks) | |
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| 1. | If $n(A) = 90$, $n(A \cup B) = 145$, $n(A \cap B) = 30$, find $n(A - B)$. |
| 2. | Find the value of $\sin\left(-\frac{17\pi}{3}\right)$ |
| 3. | Find the 9 th term of the sequence defined by $a_n = (-1)^{n-1} n^3$ |
| 4. | Convert $40^\circ 20'$ into radian measure. |
| SECTION- B (8x2 = 16 marks) | |
| 5. | Solve $4x + 3 \leq 6x + 7$, when (i) x is an integer (ii) x is a real number. |
| 6. | Find the multiplicative inverse of $2 - 3i$. |
| 7. | The minute hand of a watch is 1.5 cm long. How far does its tip move in 40 minutes? (Use $\pi = 3.14$). |
| 8. | Express the following sets in roster form : (i) $A = \left\{ x : x = \frac{2n-1}{n+2}, \text{ where } n \text{ is a whole number and } n \leq 4 \right\}$ (ii) $B = \{ x : x = n^2, \text{ where } n \in N \}$ |
| 9. | Insert five numbers between 8 and 26 such that the resulting sequence is an A.P. |
| 10. | Solve the system of inequalities and represent the solution on the number line: $3x - 7 < 5 + x$, $11 - 5x \leq 1$ |
| 11. | How many terms of the G.P $3, 3^2, 3^3, \dots$ are needed to give the sum 120? |
| 12. | If $U = \{x : x \in N, x \leq 8\}$, $A = \{x : 8 < x^2 < 40\}$ and $B = \{x : x \text{ is an odd integer}\}$, then draw a Venn diagram to show the relationship between the given sets. |

| SECTION-C (11x4 = 44 marks) | |
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| 13. | <p>If $A = \{1,4,5,7,8\}$, $B = \{1,2,4,5,6\}$, $C = \{3,6\}$, verify (i) $B - (A \cup C) = (B - A) \cap (B - C)$ (ii) $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$ (OR) If A, B and C are finite sets, prove that : $n(A \cup B \cup C) = n(A) + n(B) + n(C) - n(A \cap B) - n(B \cap C) - n(A \cap C) + n(A \cap B \cap C)$</p> |
| 14. | Convert the complex number $\frac{-16}{1+i\sqrt{3}}$ into polar form. |
| 15. | Prove that $(\cos x - \cos y)^2 + (\sin x - \sin y)^2 = 4 \sin^2 \frac{x-y}{2}$ |
| 16. | <p>By using mathematical induction, prove for all $n \in N$: $\left(1 + \frac{3}{1}\right)\left(1 + \frac{5}{4}\right)\left(1 + \frac{7}{9}\right) \dots \dots \dots \left(1 + \frac{2n+1}{n^2}\right) = (n+1)^2$ (OR) By using mathematical induction, prove for all $n \in N$: $1 + 2 + 3 + 4 + \dots + n < \frac{1}{8}(2n+1)^2$</p> |
| 17. | The sum of three numbers in G.P is 56. If we subtract 1, 7, 21 from these numbers in that order, we obtain an A.P. Find the numbers. |
| 18. | <p>Find the general solution for the equation : $\sin x + \sin 3x + \sin 5x = 0$ (OR) Prove that $\tan 4x = \frac{4 \tan x(1 - \tan^2 x)}{1 - 6 \tan^2 x + \tan^4 x}$</p> |
| 19. | <p>Verify De'Morgan's laws :- $U = \{1,2,3,4,5,6,7,8,9,10\}$, $A = \{1,3,4,5,7,9,10\}$, $B = \{1,3,4,5,7,8,10\}$</p> |
| 20. | Prove by the principle of mathematical induction for all $n \in N$: $7^n - 3^n$ is divisible by 4. |
| 21. | The ratio of the sums of m and n terms of an A.P is $m^2 : n^2$. Show that the ratio of m^{th} and n^{th} terms is $(2m-1) : (2n-1)$. |
| 22. | <p>Solve the inequalities for real x : $\frac{(2x-1)}{3} \geq \frac{(3x-2)}{4} - \frac{(2-x)}{5}$ (OR) Find all pairs of consecutive odd natural numbers, both of which are larger than 10, such that their sum is less than 40.</p> |
| 23. | Find the square root of the complex number, $z = -5 + 12i$ |
| SECTION-D (6x6 = 36 marks) | |
| 24. | <p>If α and β are different complex numbers with $\beta = 1$, then find $\left \frac{\beta - \alpha}{1 - \bar{\alpha}\beta} \right$ (OR) Find the real values of x and y if $(3x - 2iy)(2 + i)^2$ is the conjugate of $10 - 10i$.</p> |

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| 25. | Prove that $\cos 2x \cos \frac{x}{2} - \cos 3x \cos \frac{9x}{2} = \sin 5x \sin \frac{5x}{2}$. |
| 26. | Find the sum of the following series up to n terms : $\frac{1^3}{1} + \frac{1^3 + 2^3}{1+3} + \frac{1^3 + 2^3 + 3^3}{1+3+5} + \dots$ <p style="text-align: center;">(OR)</p> Find the sum to first n terms of the series: $5 + 11 + 19 + 29 + 41 + \dots$ |
| 27. | If $\tan x = \frac{3}{4}$, x lies in the third quadrant, find the values of $\sin \frac{x}{2}$, $\cos \frac{x}{2}$ and $\tan \frac{x}{2}$. <p style="text-align: center;">(OR)</p> Prove that $\cos^2 x + \cos^2 \left(x + \frac{\pi}{3}\right) + \cos^2 \left(x - \frac{\pi}{3}\right) = \frac{3}{2}$ |
| 28. | In a survey of 100 students regarding watching T.V, it was found that 28 watch action movies, 30 watch comedy serials, 42 watch news channels, 8 watch action movies & comedy serials, 10 watch action movies & news channels, 5 watch comedy serials & news channels and 3 watch all the three programs. Draw a Venn diagram to illustrate this information and find : (i) How many watch news channels only? (ii) How many watch comedy serials & action movies but not news channels? (iii) How many do not watch any of the three programs? |
| 29. | Solve the system of inequalities graphically: $x + 2y \leq 8$, $2x + y \geq 8$, $x - y \leq 3$, $x \geq 0$, $y \geq 0$. |
