

APPEJAY INTERNATIONAL SCHOOL, GREATER NOIDA(2015-16)
HALF YEARLY EXAM- MATHEMATICS
CLASS - XI(SET-A)

TIME:3hrs

M.M:100

Note:-

- (i) The question paper consists of 26 questions divided into three sections A, B and C. Section A comprised of 6 questions of one mark each, Section B comprises of 13 questions of 4 marks each, Section C comprises of 7 questions of six marks each.
- (ii) All questions are compulsory.

SECTION-A

1. Write all the possible subset of $A = \{-1, 0, 1\}$.
2. Find a and b, when $(2a+b, 11) = (1, a-3b)$.
3. Evaluate: $(i^{37} + \frac{1}{i^{67}})$.
4. Solve: $\frac{5x-8}{3} \geq \frac{4x-7}{2}, x \in \mathbb{R}$.
5. Find n, if $(n+1)! = 12 \times (n-1)!$.
6. Which term of the AP $19, 18\frac{1}{5}, 18\frac{2}{5}, \dots$ is the first negative term?

SECTION- B

7. In AP, if pth term is $\frac{1}{q}$ and qth term is $\frac{1}{p}$, prove that the sum of first pq term is $\frac{1}{2}(pq + 1)$, where $p \neq q$.
8. The sum of first three terms of a G.P. is $\frac{13}{12}$ and their product is -1. Find the common ratio and the terms.
9. Find the sum to n terms of $1 \times 2 \times 3 + 2 \times 3 \times 4 + 3 \times 4 \times 5 + \dots$
10. Find the term independent of x in the expression of $(\sqrt[3]{x} + \frac{1}{2\sqrt[3]{x}})^{18}, x > 0$.
11. The coefficients of the (r-1)th, rth and (r+1)th terms in the expansion of $(x+1)^n$ are in the ratio 1:3:5. Find n and r.
12. Show that the middle term in the expansion of $(1+x)^{2n}$ is $\frac{1.3.5 \dots (2n-1)}{n} 2^n x^n$, where n is a positive integer.
13. Show that $9^{n+1} - 8n - 9$ is divisible by 64, whenever n is a positive integer.
14. In how many of the distinct permutations of the letters in MISSISSIPPI do the four I's not come together?
15. How many 3-digits odd numbers can be formed by using the digits 1,2,3,4,5,6 when
 - (i). The repetition of the digits is not allowed?
 - (ii) the repetition of digits is allowed?
16. If $P(56, r+6) : P(54, r+3) = (30800:1)$, find r.
17. If ${}^n P_r = n P_r$, prove that $C(n,r) + C(n,r+1) = C(n+1,r+1)$.

18. A committee of 5 is to be formed out of 6 men and 4 ladies. In how many ways can this be done, when
- at least 2 ladies are included;
 - at most 2 ladies are included?

19. Prove that :
$$\frac{(\sin 7x + \sin 5x)(\sin 9x + \sin 3x)}{(\cos 7x + \cos 5x)(\cos 9x + \cos 3x)} = \tan 6x$$

SECTION - C

20. Prove the $41^n - 14^n$ is a multiple of 27 by using the principle of mathematical induction for all $n \in \mathbb{N}$.

21. Convert the complex number $z = \frac{i-1}{\cos \frac{\pi}{3} + i \sin \frac{\pi}{3}}$ in the polar form.

22. Solve the following system of inequalities graphically:

$$x+2y \leq 10, x+y \geq 1, x-y \leq 0, x \leq 0, x \geq 0, y \geq 0$$

23. The ratio of the A.M. And G.M of two positive numbers a and b is m:n. Show that

$$a : b = (m + \sqrt{m^2 - n^2}) : (m - \sqrt{m^2 - n^2})$$

24. There are 200 individuals with skin disorder, 120 had been exposed to the chemical C1, 50 to chemical C2 and 30 to both the chemical C1 and C2 ~~or chemical~~. find the number of the individuals, exposed to

- chemical C1 but not chemical C2.
- chemical C1 or chemical C2.
- chemical C2 but not chemical C1.

25. If $\frac{a+ib}{c+id} = (p+iq)$ then prove that

$$(i) (p-iq) = \frac{a-ib}{c-id} \text{ and } (ii) (p^2+q^2) = \frac{a^2+b^2}{c^2+d^2}$$

26. Show that $\cot 2x \cot 2x - \cot 3x \cot 2x - \cot 3x \cot x = 1$

(OR)

- Solve $2 \cos^2 x + 3 \sin x = 0$
- Solve $\sin 2x - \sin 4x + \sin 6x = 0$