

O. P. JINDAL SCHOOL, SAVITRI NAGAR
Half Yearly Examination (2019 – 2020)

Class: XI
Subject: Mathematics

MM: 80
Time: 3Hrs.

(Fifteen Minutes Extra will be given for reading the Question Paper.)

General Instructions:

- i. All questions are compulsory
- ii. The question paper consists of 36 questions divided into 4 sections A, B, C and D. Section A comprises of 20 questions of 1 mark each, Section B comprises of 6 questions of 2 marks each, Section C comprises of 6 questions of 4 marks each, Section D comprises of 4 questions of 6 marks each.
- iii. There is no overall choice. However, internal choice has been provided.
- iv. Use of calculator is not permitted.

SECTION A

1. If $A \subset B$ and $A \neq B$, then
 - a) A is called a proper subset of B
 - b) A is called the super set of B
 - c) A is not a subset of B
 - d) B is a subset of A
2. The set $\{x: x^2 = x, x \in \mathbb{N}\}$ can be expressed in roaster form as
 - a) $\{0, 1\}$
 - b) $\{1\}$
 - c) $\{1\}$
 - d) $\{\}$
3. Let $n(A) = m$ and $n(B) = n$. Then, total number of relations that can be defined from A to B is
 - a) mn
 - b) n^m
 - c) m^n
 - d) 2^{mn}

OR

If $x \neq 1$ and $f(x) = \sin 2x + 3$ then range of $f(x)$ is

- a) $[-3, 3]$
 - b) $[2, 4]$
 - c) $[0, 3]$
 - d) $(1, 3]$
4. In a circle of radius 10cm, an arc of length 5cm subtend an angle of
- a) π radian
 - b) $\frac{\pi}{2}$ radian
 - c) $\frac{1}{2}$ radian
 - d) 1 radian

OR

Radian measure of 105° is equal to

- a) $\frac{2\pi}{3}$
 - b) $\frac{7\pi}{12}$
 - c) $\frac{\pi}{3}$
 - d) $\frac{3\pi}{8}$
5. The value of $\sin 75^\circ$ is equal to
- a) $\frac{\sqrt{3}+1}{\sqrt{3}-1}$
 - b) $\frac{\sqrt{3}-1}{\sqrt{3}+1}$
 - c) $\frac{\sqrt{3}-1}{2\sqrt{2}}$
 - d) $\frac{\sqrt{3}+1}{2\sqrt{2}}$
6. Value of i^{75} is equal to
- a) 1
 - b) -1
 - c) i
 - d) -i
7. $(-2 + i)(4 + 3i) = ?$
- a) $(11 + 2i)$
 - b) $(-11 + 2i)$
 - c) $(-11 - 2i)$
 - d) none of these
8. Solution set of the inequality $4x + 3 < 5x + 7$ is
- a) $(-4, \infty)$
 - b) $[-4, \infty)$
 - c) $(4, \infty)$
 - d) $[4, \infty)$

9. In how many ways letters of the word 'APPLE' be arranged?

- a) 6 b) 60 c) 90 d) 120

OR

In how many ways a team of 7 players be chosen out of 10 players ?

- a) 720 b) 70 c) 120 d) none of these

10. The coefficient of x^5 in $(x + 3)^8$ is

- a) 1512 b) 1624 c) 1816 d) 1256

11. If set $A = \{1, 2, 3\}$, then write $P(A)$.

12. Determine the domain and range of the relation R , defined by $R = \{(x, x+5) : x \in \{0, 1, 2, 3, 4, 5\}\}$.

13. Find the value of $\tan \frac{19\pi}{3}$.

14. Find the principal solution of $\cos x = \frac{1}{2}$.

OR

Express $\sin 6x - \sin 2x$ as the product.

15. What is the multiplicative inverse of $1 + i$?

16. If $z = (-3 + 5i)$, then find $z \bar{z}$.

OR

Find the argument of $z = (1 - i)$.

17. Represent the solution set $[-2, 5]$ on number line.

18. If ${}^nC_6 = {}^nC_8$, then find the value of n .

OR

Compute $\frac{10!}{6! \times 3!}$.

19. In how many ways 5 children stand in a queue ?

20. Find the general term in the expansion of $(3x + y)^{10}$.

OR

Expand $(x + 2y)^4$ using binomial theorem

SECTION B

21. Prove that $\frac{\tan 69^\circ + \tan 66^\circ}{1 - \tan 69^\circ \tan 66^\circ}$.

22. Express $\frac{5 + \sqrt{2}i}{1 - \sqrt{2}i}$ in the form of $a + ib$.

23. Solve the inequality $-3 \leq 4 - \frac{7x}{2} \leq 18$.

24. How many 3 - digits numbers can be formed by using the digits 1 to 9 if no digit is repeated ?

25. Determine the number of 5 cards combination out of a deck of 52 cards, if there is exactly one ace in each combination.

OR

If $(n + 3)! = 56 \times (n + 1)!$, then find n .

26. Evaluate $(96)^3$ using binomial theorem.

OR

Expand $(\sqrt{3} + 1)^4 + (\sqrt{3} - 1)^4$.

SECTION C

27. In a class of 60 students, 25 students play cricket, 20 students play Tennis and 10 students play both the games . Then , find the number of students who play neither games .

28. Prove that $\sin 10^\circ \sin 50^\circ \sin 60^\circ \sin 70^\circ = \frac{\sqrt{3}}{16}$.

OR

Find the general solution of the equation $\cos 3x + \cos x - \cos 2x = 0$.

29. Prove that $x^{2n} - y^{2n}$ is divisible by $x + y$.

30. Express $1 - \sqrt{3}i$ in polar form .

OR

If $(x + iy) = \frac{a+ib}{a-ib}$, prove that , $(x^2 + y^2) = 1$.

31. To receive Grade 'A' in a course, one must obtain an average of 90 marks or more in 5 examinations. If Sunita's marks in first four examinations are 87, 92, 94 and 95, find minimum marks Sunita must obtain in fifth examination to get grade 'A' in the course .

32. How many words, with or without meaning, can be formed using all the letters of the word 'EQUATION' at a time so that the vowels and consonants occur together.

SECTION D

33. Prove that $1 \times 2 \times 3 + 2 \times 3 \times 4 + \dots + n(n+1)(n+2) = \frac{n(n+1)(n+2)(n+3)}{4}$.

OR

$$1^2 + 3^2 + 5^2 + \dots + (2n-1)^2 = \frac{n(2n-1)(2n+1)}{3} .$$

34. Find the square root of $(-4 - 3i)$.

35. Solve the following system of equation graphically:

$$2x + y \geq 4, x + y \leq 3, 2x - 3y \leq 6 .$$

36. Show that $9^{n+1} - 8n - 9$ is divisible by 64, where n is positive integer.

OR

Find a, b and n in the expansion of $(a + b)^n$ if the first three terms of the expansion are 729, 7290 and 30375, respectively.