Roll No. ________________ Code : 11201819M-A

Please check that this question paper contains 29 questions and 4 printed pages.

Class : XI
MATHEMATICS

Time Allowed : 3 Hours Maximum Marks : 100

General Instructions :

1. Question paper consists of 29 questions dividied into four sections A, B, C and D.
   Section A consists of 4 questions of 1 mark each.
   Section B consists of 8 questions of 2 marks each.
   Section C consists of 11 questions of 4 marks each.
   Section D consists of 6 questions of 6 marks each.
2. There is no overall choice. However, internal choices are provided in some questions. In these questions, you have to attempt one out of the given options.
3. Use of calculator is not allowed.

SECTION - A

1. If $\sin x = \frac{3}{5}$ where $0 < x < \frac{\pi}{4}$, then find $\cos 2x$. 1

2. Write the conjugate of complex number $(1 + i)^2$. 1

3. Find the equation of circle whose centre is at (0, 0) and of radius 5 cm. 1

4. Write the converse of the following statement : 1
   "If a number is even, then x^2 is also even."

OR

Write the contrapositive of the following statement
"If you are born in India, then you are a citizen of India"

SECTION - B

5. Given that $A = \{2x : x \in N, 1 \leq x < 4\}$ and 2
   $B = \{x+2 : x \in N, 2 \leq x < 6\}$
   Find B – A

6. Using properties of sets, prove that for all sets A and B 2
   $(A \cap B) \cup (A - B) = A$

OR

Show that $A \cup B = A \cap B$ implies $A = B$.

7. Let A = {1, 3, 5}. Define a relation R from A to A by 2
R = $\{(x, y) : x + y > 6; x, y \in A\}$
(i) Write R in roster form.
(ii) Write its domain and range.

8. Find the value of n if ${}^nP_5 = 20\,{}^nP_3$. 2

9. The centroid of a triangle ABC is at the point (0, 1, 2). If coordinates of A and B are (2, –3, 6) and (0, 8, –5) respectively. Find the coordinates of the point C. 2

OR

Show that the points P(–2, 3, 5), Q(1, 2, 3) and R(7, 0, –1) are collinear.

10. Find the derivative of $f(x) = \dfrac{x+2}{x}$, $x \neq 0$. w.r.t.x. 2

OR

Find the derivative of $g(x) = x \cos x$ w.r.t.x.

11. Identify the quantifier in the following statement and write the negation of the statement. 2
"There exist a number which is equal to its square."

12. A sports teacher wants to select a team of 3 chess players from 2 girls & 3 boys. What is the probability that team will have 1 girl and 2 boys? 2

SECTION - C

13. In a group of 50 students, 14 drink orange juice but not eat apple, 30 drink orange juice and each student like at least one of them. Find 4
(i) How many drink orange juice as well as eat apple?
(ii) How many eat apple but not drink orange juice?

14. Find the domain and range of the real function 4

$$f(x) = \frac{1}{4 - x^2}$$

15. Find the general solution of the equation 4
$\cos x + \cos 2x + \cos 3x = 0$.

16. Prove that : $\cos 6\theta = 32\cos^6\theta - 48\cos^4\theta + 18\cos^2\theta - 1$. 4

17. If $(x-iy)^{\frac{1}{3}} = a - ib$ where $x, y, a, b \in R$, show that 4

$$\frac{x}{a} - \frac{y}{b} = -2\left(a^2 + b^2\right)$$

18. A student wants to make words with or without meaning by using all letters of the word "ORIGIN" 4

(i) How many maximum number of words, student can make?

(ii) If these words are written as in dictionary. What will be the 181th word?

19. In the expansion of $(1 + x^2)^8$, find the difference between the coefficients of x^6 and x^4. 4

OR

If x is a real number and its middle term in the expansion of $\left(\frac{x}{3} - 3\right)^8$ is 1120. Find x.

20. The sum of two positive numbers is 4 times their geometric mean, show that numbers are in the ratio $(2 + \sqrt{3}) : (2 - \sqrt{3})$. 4

21. An arch is in the form of a semi-ellipse. It is 8*m* wide and 2*m* high at centre. Find the height of the arch at a point 1*m* from one end. 4

OR

Find the equation of the hyperbola whose foci are at $(0, \pm 3)$ and length of latus rectum is 16.

22. Evaluate : $\lim_{x \to 0} f(x)$ where $f(x) = \begin{cases} 3x+2, & x \le 0 \\ 2(x+1), & x > 0 \end{cases}$ 4

OR

Find the derivative of cos $2x$ w.r.t. x using first principle.

23. Two candidates Sunil and Ravi appeared in an interview. The probability that Sunil will qualify the interview is 0.04 and that Ravi will qualify the interview is 0.2. The probability that both will qualify the interview is 0.03. Find the probability that 4

(i) Both Sunil and Ravi will not qualify the interview.

(ii) Only one of them will qualify the interview.

SECTION - D

24. Prove that : $\sin 3x \cos^3 x + \cos 3x \sin^3 x = \frac{3}{4} \sin 4x$ 6

OR

Prove that :

$\sin^2\alpha + \sin^2(\alpha - \beta) - 2\sin\alpha.\cos\beta.\sin(\alpha - \beta) = \sin^2\beta.$

25. Using principle of mathematical induction, prove that 6

$3.2^2 + 3^2.2^3 + 3^3.2^4 + \ldots\ldots\ldots\ldots + 3^n.2^{n+1} = \frac{12(6^n - 1)}{5}$,

for all $n \in N$.

OR

Using principle of matematical induction, prove that $41^n - 14^n$ is a multiple of 27 for all $n \in N$.

26. Find the solution region for the following inequalities : 6

$2x + y \geq 2$

$y - x \geq -1$

$x + 2y \leq 8$

$x, y \geq 0$

Also find the coordinates of the vertices of the solution region.

27. Prove that : 6

$$\frac{3\times1^2 + 5\times2^2 + 7\times3^2 + \ldots\ldots\ldots\ldots + (2n+1)\times n^2}{1 + (1+2) + (1+2+3) + \ldots\ldots\ldots\ldots + (1+2+3+\ldots\ldots+n)} = \frac{3n^2 + 5n + 1}{n+2}$$

28. A line is such that its segment between the lines $4x + 3y - 21 = 0$ and $10x + y - 59 = 0$ is bisected at the point (4, 6). Find its equation. 6

OR

The image of a point with respect to the line $2x - y + 6 = 0$, assuming the line to be a mirror, is (6, 6). Find the point. Also find the equation of line joining this point and its image.

29. Find the mean deviation about mean for the following data : 6

Class	10-20	20-30	30-40	40-50	50-60	60-70	70-80
Frequency	4	5	12	7	13	6	3

Roll No. ________________

Code : 11201718MA-A

Please check that this question paper contains **29** questions and **7** printed pages.

CLASS–XI
SUBJECT–MATHEMATICS

Time allowed : 3 Hrs. **M.Marks : 100**

General Instructions :

1. *Question paper consists of 29 questions divided into four sections A, B, C and D.*

   Section A consists of 4 questions of 1 mark each.

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   Section C consists of 11 questions of 4 marks each.

   Section D consists of 6 questions of 6 marks each.

2. *There is no overall choice. However, internal choices are provided in three questions of 4 marks each and three questions of 6 marks each. In these questions, you have to attempt one out of the given options.*
3. *Use of calculator is not allowed.*

Section-A

1. Let $A = \{x : x \in N, \ x \leq 11\}$ and R be a relation from A to A defined by

   $R = \{(a, b) : |a - b| \text{ is a multiple of } 4\}$

   Find the set of all elements related to 2.

2. Write the number of distinct terms in the expansion of $(1 + 2x + x^2)^{10}$

3. Find the length of perpendicular drawn from the point P (1, 3, 5) on y-axis.

4. Identify and write the necessary condition and sufficient condition in the following statement :

   If you drive over 80 km per hour, then you will get a fine.

Section-B

5. For any three sets A, B and C, show that

   if $A \subset B$ then $C - B \subset C - A$.

6. If $\tan 35° = a$,

   find the value of $\dfrac{\tan 145° - \tan 125°}{1 + \tan 145° \tan 125°}$ in terms of a.

7. Find two real numbers x and y if $(x - iy)(3 + 5i)$ is the conjugate of $-6 - 24i$.

8. If the points P (– 4, 6, 10), Q (2, y, 6) and R (14, 0, – 2) are such that Q trisects the line segment PR and is nearer to P. Find the value of y.

9. Find the derivative of the function $\dfrac{\sqrt{a} + \sqrt{x}}{\sqrt{a} - \sqrt{x}}$ w.r.t. x

10. Three fair coins are tossed once. Write the sample space and find the probability of getting atleast 2 heads.

11. Write the contrapositive and converse of the following statement :

"If x is an even number then x is divisible by 4".

12. Draw the graph of

$$f(x) = |x + 3|, \quad -5 \leq x \leq 0$$

Section-C

13. Write the domain and range of the function

$f(x) = 2x^2 - 5$, then

(i) find $f(-3)$

(ii) find x, if $f(x) = 27$

14. In a group of students, half the number of students know Hindi; $\frac{2}{3}$ of them know English; 10 know both the languages and 6 students do not know either Hindi or English.

Find how many students are there in the group.

Write the importance of national language.

15. Prove that

$$\frac{\sin 5x - 2\sin 3x + \sin x}{\cos 5x - \cos x} = \tan x$$

16. Prove that

$$\sin^2 A + \sin^2\left(A + \frac{\pi}{3}\right) + \sin\left(A - \frac{\pi}{3}\right) = \frac{3}{2}$$

17. Convert the complex number $3\left(\cos\frac{5\pi}{3} - i\sin\frac{\pi}{6}\right)$ into polar form.

18. How many natural numbers less than 1000 can be formed with digits 1, 2, 3, 4, 5 if

(i) no digit is repeated ?

(ii) repetition of digits is allowed ?

OR

There are 12 points in a plane, no three of which are in the same straight line except 5 which are in the same line. Find–

(i) number of lines

(ii) number of triangles

which can be formed by joining them.

19. The ratio of sums of m and n terms of an A.P. is $m^2 : n^2$. Show that ratio of mth and nth term is $(2m - 1) : (2n - 1)$

20. If $\frac{2}{3} = \left(x - \frac{1}{y}\right) + \left(x^2 - \frac{1}{y^2}\right) + \left(x^3 - \frac{1}{y^3}\right) + ...$ upto ∞ where $xy = 2$ and $|x| < 1$,

calculate the value of x and y.

21. Evaluate :

$$\lim_{x \to 0} \frac{\cos^2 x - \sin^2 x - 1}{\sqrt{x^2 + 1} - 1}$$

OR

Find the derivative of tan $(ax + b)$ from the first principle.

22. Find the equation(s) of the circle(s) passing through the point (7, 3) having radius 3 units and whose centre lies on the line $y = x - 1$.

OR

Find the equation of the ellipse if its foci are $(\pm 2, 0)$ and the length of latus-rectum is $\frac{10}{3}$.

23. A, B, C are three mutually exclusive and exhaustive events associated with a random experiment

Find P (A) given that $P(B) = \frac{3}{2}P(A)$ and $P(C) = \frac{1}{2}P(B)$

Section-D

24. If $\tan x = \frac{3}{4}, \pi < x < \frac{3\pi}{2}$, find the value of tan $2x$, $\sin\frac{x}{2}$ and $\cos\frac{x}{2}$.

OR

If 3 tan x + cot x = 5 cosec x then find its general solution and hence find the value of x for $0 \leq x \leq 2\pi$.

25. The coefficients of the $(r - 1)^{th}$, r^{th} and $(r + 1)^{th}$ terms in the expansion of $(x + 1)^n$ are in the ratio 1 : 7 : 42. Find n.

OR

In the expansion of $\left(\sqrt[3]{2} + \frac{1}{\sqrt[3]{3}}\right)^n$, the ratio of 7^{th} term from beginning to 7^{th} term from end is 1 : 6. Find n.

26. Solve graphically the following system of inequalities :

$x + 2y \leq 10$

$x + 2y \geq 1$

$x - y \leq 0$

$x \geq 0, y \geq 0$

27. If one diagonal of a square is along the line $8x - 15y = 0$ and one of its vertex is at (1, 2) then find the equations of sides of square passing through this vertex.

28. Using Principle of Mathematical Induction prove that :

$x^{2n} - y^{2n}$ is divisible by $x + y$, where $n \in$ N.

OR

Using Principle of Mathematical Induction, prove that

$$1.3 + 2.3^2 + 3.3^3 + ... n.3^n = \frac{(2n-1)3^{n+1} + 3}{4}, \quad \text{where } n \in \mathrm{N}.$$

29. Calculate the mean deviation about median for the following data :

Class	0–10	10–20	20–30	30–40	40–50	50–60
Frequency	6	7	15	16	4	2

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Roll No. ________________ **Code : 112017-041-A**

Please check that this question paper contains **26** questions and **4** printed pages.

CLASS-XI
MATHEMATICS

Time Allowed : 3 Hours **Maximum Marks : 100**

- *Please check that this question paper contains 4 printed pages and 26 questions.*
- *Write down the serial number of the question before attempting it.*
- *There is reading time for 15 minutes. Students will read the question paper during this time and will not write any answer on the answer script during this period.*

General Instructions :

1. *This question paper consists of 26 questions divided into three sections.*
   Section A consists of 6 questions of 1 mark each.
   Section B consists of 13 questions of 4 marks each.
   Section C consists of 7 questions of 6 marks each.
2. *There is no overall choice. However, internal choice is given in four questions of 4 marks each and two questions of 6 marks each.*
3. *Use of calculator is not permitted.*

Section–A

Question number 1 to 6 carry 1 mark each.

1. If ${}^5P_r = 2\,{}^6P_{r-1}$, find the value of r.
2. Find the modulus of $(1 - i)^{10}$.
3. Find the distance between the lines $mx + y = 1$ and $x + \frac{y}{m} = m$.
4. Write the Negation of the following statement :
   For every real number x, $x^2 > 0$
5. Identify and write the necessary condition and sufficient condition in the following statement :
   A natural number is even if it is divisible by 2
6. What does the equation $xy - x - y + 1 = 0$ become if origin is shifted to point (1, 1) ?

Section–B

Question number 7 to 19 carry 4 marks each.

7. In order to sensitize the students and people in the neighbourhood against "Eve teasing and crimes against women" the students of class XI of a DAV school organized various activities.

   Out of 100 students of class XI, 40 participated in a rally, 15 participated in street play, 20 participated in group song, 5 participated in both rally and street play, 3 participated in both street play and group song, 1 participated in rally and group song, none of them participated in all three activities. Find the number of students who did not participate in any of these activities.

   What values are shown by the students who participated in these activities ?

8. For any two sets A and B, Prove that $P(A) = P(B) \Rightarrow A = B$ where P(A) and P(B) denote power sets of A and B respectively.

   How many elements are there in $P(P(\phi))$?

9. Find the domain and range of $f(x) = \dfrac{3}{\sqrt{9 - x^2}}$.

OR

   A relation R is defined on set of non-negative integers as $R = \{(x, y) : x^2 + y^2 = 100\}$. Write R in roster form. Also write the domain and range of R.

10. In any ΔABC, prove that $\dfrac{\cos^2 B - \cos^2 C}{b + c} + \dfrac{\cos^2 C - \cos^2 A}{c + a} + \dfrac{\cos^2 A - \cos^2 B}{a + b} = 0$

11. How many words with or without meaning can be made using the letters of the word "FESTIVAL" taken all at a time ? In how many of them vowels occupy odd places ?

OR

   A group consits of 5 girls and 6 boys. In how many ways can a team of 4 members be selected if the team has

   (i) at least one boy and one girl (ii) at most 2 boys.

12. If $f(x)$ denotes the sum of infinite terms of series

$1 - \cos x + \cos^2 x - \cos^3 x + \cos^4 x - \ldots\ldots\ldots (x \neq n\pi)$ and

$g(x)$ denotes the sum of infinite terms of series :

$1 + \sin x + \sin^2 x + \sin^3 x + \ldots\ldots\ldots (x \neq (2n+1)\frac{\pi}{2}$

Find all possible values of x for which $f(x) = g(x)$.

OR

If a, b and c are in A.P and $ab + bc + ca \neq 0$ then prove that $a^2(b + c)$, $b^2(a + c)$, $c^2(a + b)$ are also in A.P.

13. If is given that $\sin 18° = \frac{\sqrt{5} - 1}{4}$, find the value of cos36° and sin72°.

14. A point P lies on line segment AB such that 3PA = 2PB, if coordinates of A and B are (– 2, – 3, 3) and (13, – 3, 13) respectively. Find the coordinates of P.

15. Find the equation of ellipse with centre at origin, eccentricity $\frac{\sqrt{3}}{2}$ coordinates of foci are (1, 0) and (– 1, 0).

16. Find the derivative of $\cos x^2$ by first principle.

OR

If $f(x) = \frac{\sec x - 1}{\sec x + 1}$, prove that $\frac{f(x)}{f'(x)} = \frac{\sin x}{2}$.

17. A and B are two mutually exclusive and exhaustive events of a random experiment such that $P(A) = 6[P(B)]^2$ where P(A) and P(B) denotes probabilities of A and B respectively. Find P(A) and P(B).

18. Find the square root of $Z = \frac{-22 + 19i}{2 + i}$.

19. Evaluate $\lim_{x \to 0} \frac{\cos 2x - \cos 3x}{\cos 4x - 1}$.

Section–C

Question number 20 to 26 carry 6 marks each.

20. The hypotenuse of isosceles right triangle lies along the line $2x - y = 4$ and vertex opposite to hypotenuse is (1, 5). Obtain the equations of other two sides.

21. Prove that $\dfrac{\cos 8A \cos 5A - \cos 12A \cos 9A}{\sin 8A \cos 5A + \cos 12A \sin 9A} = \tan 4A$.

OR

Find the general solution of following trigonometric equation :

$\cos^2 x \operatorname{cosec} x + 3\sin x + 3 = 0$

22. The coefficients of 2^{nd}, 3^{rd} and 4^{th} terms in the expansion of $(1 + x)^{2n}$ are in A.P. Find the value of n.

OR

Find the seventh term from the end in the expansion of $(x^{\frac{1}{3}} + y^{\frac{1}{2}})^n$, if the coefficient of third term is 45.

23. Solve the following system of in-equations graphically :

$x + 2y \leq 8,\ \ 2x + y \geq 2,\ \ x - y \leq 1,\ \ x \geq 0,\ \ y \geq 0$

24. Find the sum of first 20 terms of the series :

$$1 + \frac{1+2}{2} + \frac{1+2+3}{3} + \frac{1+2+3+4}{4} + \ldots\ldots\ldots\ldots\ldots$$

25. Using principle of mathematical induction, prove that

$(1 + x)^n \geq 1 + nx$ where $n \in N$ and $x > -1$.

26. Calculate the mean deviation about mean for the following data :

Class	0–10	10–20	20–30	30–40	40–50	50–60	60–70
Frequency	2	3	8	14	8	3	2

Roll No. ________________ **Code : 112016-041-A**

Please check that this question paper contains **26** questions and **4** printed pages.

CLASS-XI
MATHEMATICS

Time Allowed : 3 Hrs. **Maximum Marks : 100**

- *Please check that this question paper contains 4 printed pages.*
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2. *There is no overall choice. However, internal choice is given in four questions of 4 marks each and two questions of 6 marks each.*
3. *Use of calculator is not permitted.*

Section-A

1. Evaluate : $i^{141} + i^{142} + i^{143} + i^{144}$

2. Solve $-8 \leq 5x - 3 < 7$ where $x \in Z$.

3. Find the distance between the lines
$4x - 3y + 5 = 0$ and $8x - 6y + 7 = 0$

4. Find the equation of the parabola with focus $(0, -3)$ and directrix $y = 3$.

5. Write the contrapositive of the statement
"'If it is hot outside, then you feel thirsty".

6. State whether the 'or' used in the statement is inclusive or exclusive. Give reason for your answer :

"Two lines intersect at a point or are parallel."

Section–B

7. Let A and B be sets. If $A \cap X = B \cap X = \phi$ and $A \cup X = B \cup X$ for some set X, show that A = B.

8. From amongst the 100 literate individuals of a city, 50 read newspaper A, 45 read newspaper B and 25 neither A nor B. How many individuals read both the newspapers A and B ?

9. Find the domain and range of the real function $f(x) = \sqrt{25 - x^2}$

10. Find the general solution of $3 \tan x + \cot x = 5 \operatorname{cosec} x$, $x \neq n\pi$.

OR

Prove that $\cos 20° \cos 40° \cos 60° \cos 80° = \frac{1}{16}$

11. α is divided into two parts such that the ratio of the tangents of parts is k. If x be the difference of two parts, prove that $\sin x = \frac{k-1}{k+1} \cdot \sin \alpha$

12. Convert the complex number $2 - 2i$ in the polar form. Also write its argument.

OR

Find the square root of the complex number $4 - 4\sqrt{3}\, i$

13. Solve the following system of inequalities graphically :

$x - 2y \leq 3;$ $3x + 4y \geq 12;$ $x \geq 0;$ $x - y \geq 1$

14. Find n such that $\frac{a^{n+1} + b^{n+1}}{a^n + b^n}$ may be the A.M. between a and b.

OR

The product of the first three terms of a G.P. is 1000. If we add 6 to its second term and 7 to its third term, the resulting three terms form an A.P. Find the terms of the G.P.

15. Find the equation of the circle passing through the point (6, 1) and having its centre on the mid point of the line segment joining the centres of the circles

$$(x - 2)^2 + (y - 4)^2 = 65$$

and $$(x - 4)^2 + (y - 6)^2 = 64$$

OR

An equilateral triangle is inscribed in the parabola $y^2 = 4ax$, whose one vertex is at the vertex of the parabola. Find the length of a side of the triangle.

16. Using section formula, prove that the three points

A (– 2, 3, 5), B (1, 2, 3) and C (7, 0, – 1) are collinear. Also find the ratio in which point C divides the line segment AB.

17. Find the derivative of tan $(2x + 3)$ by first principle method.

18. Find the non-zero value of k, if

$$\lim_{x \to 1} \frac{x^4 - 1}{x - 1} = \lim_{x \to k} \frac{x^3 - k^3}{x^2 - k^2}$$

19. A box contains 10 bulbs, of which three are defective. If a random sample of 5 bulbs is drawn, find the probabilities that the sample contains

(i) exactly two defective bulbs

(ii) at the most one defective bulb.

Section–C

20. By the principle of Mathematical Induction, prove that the sum of cubes of three consecutive natural numbers is divisible by 9.

OR

Using principle of Mathematical Induction, prove that

$$\frac{1}{2.5} + \frac{1}{5.8} + \frac{1}{8.11} + ... + \frac{1}{(3n-1)(3n+2)} = \frac{n}{6n+4}, \; n \in \mathrm{N}$$

21. Find the sum of the following series upto n terms :

$$\frac{1^3}{1} + \frac{1^3 + 2^3}{1 + 3} + \frac{1^3 + 2^3 + 3^3}{1 + 3 + 5} + ...$$

22. Show that the coefficient of the middle term in the expansion of $(1 + x)^{2n}$ is equal to the sum of the coefficients of two middle terms in the expansion of $(1 + x)^{2n-1}$.

23. The mean and variance of 7 observations are 8 and 16 respectively. If 5 of the observations are 2, 4, 10, 12 and 14, find the remaining two observations.

24. One side of a rectangle lies along the line $4x + 7y + 5 = 0$. Two of its opposite vertices are $(-3, 1)$ and $(1, 1)$. Find the equations of the other three sides.

OR

The line $2x - 3y - 4 = 0$ is the perpendicular bisector of the line AB and co-ordinates of A are $(-3, 1)$. Find the co-ordinates of B.

25. In any Δ ABC, prove that : $\frac{\cos A}{a} + \frac{\cos B}{b} + \frac{\cos C}{c} = \frac{a^2 + b^2 + c^2}{2abc}$

26. Find the number of arrangements of the letters of the word 'REPUBLIC'. In how many of these arrangements :

(i) does the word start with a vowel

(ii) all the vowels occur together

(iii) What is the significance of 'Republic Day' in our life ?

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Roll No. ________________ **Code : 112015-041-A**

Please check that this question paper contains **26** questions and **4** printed pages.

CLASS-XI
MATHEMATICS

Time Allowed : 3 Hrs. **Maximum Marks : 100**

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3. *Use of calculator is not permitted.*

Section-A

1. Write the principal argument of $Z = 3 + i\sqrt{3}$

2. An arc of length R units subtends an angle θ at the centre of circle of radius R. Find the value of θ.

3. Solve the following in-equation for x, where x is a natural number : $5x - 2 < 3x + 3$

4. Evaluate : $\lim_{x \to 0} \frac{\sqrt{1 + x} - 1}{x}$ $x \neq 0, x > -1$

5. Find the derivative of $f(x) = \cos x - \sin x$ at $x = \frac{2\pi}{3}$

6. If 10^{th} is the only middle term in the expansion of $(1 + x)^n$, $n \in N$. Write its last term.

Section–B

7. In an examination, 80% students passed in mathematics, 70% passed in science and 15% failed in both subjects. If 390 students passed in both subjects then find the total number of students who appeared in the examination.

8. Write the domain of $f(x) = x^2 + 1$ and draw its graph. Also find the value of x for which $f(x) = f(x + 1)$

OR

Draw the graph of $f(x) = \begin{cases} 1 - x, & x < 0 \\ 1, & x = 0 \\ 1 + x, & x > 0 \end{cases}$. Also write its range.

9. If in triangle ABC, $\frac{\cos A}{a} = \frac{\cos B}{b}$, prove that triangle is an isosceles triangle.

OR

In any triangle ABC, prove that $2(a \sin^2 \frac{C}{2} + c \sin^2 \frac{A}{2}) = c + a - b$

10. Find the general solution of $3 \tan x + \cot x = 5 \operatorname{cosec} x$, $x \neq n\pi, (2n + 1)\frac{\pi}{2}$ where $n \in Z$.

11. If $a + ib = \frac{c + i}{c - i}$, $a, b, c \in R$, $a \neq 0$, $c \neq \pm 1$. Prove that $a^2 + b^2 = 1$ and $\frac{b}{a} = \frac{c}{c^2 - 1}$

OR

Find the square root of $Z = 6 - 8i$

12. If the coefficient of $(r - 5)^{th}$ term and $(2r - 1)^{th}$ term in the expansion of $(1 + x)^{34}$ are equal. Find the value of r.

13. If the first term of G.P. is 'a' and nth term is 'b' and P denotes the product of first n terms. Prove that $P^2 = (ab)^n$.

OR

If the sum of n terms of two A.P.'s are in the ratio $3n + 8 : 7_n + 15$, find the ratio of their 12^{th} terms.

14. Solve the following system of in-equations graphically :

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

15. Find the equation of ellipse whose foci are (0, ±6) and length of minor axis is 16 units. Also find the coordinates of the points where the ellipse cut y axis and its latus rectum.

16. Find the ratio in which line segment joining the points A (– 2, 4, 7) and B (3, – 5, 8) is divided by YZ plane. Also find the coordinates of point of division.

17. Find the derivative of cos $(5x + 2)$ w.r.t. x by first principle.

18. Write the converse and contra positive of following statement :

If two lines are parallel then they do not intersect in the same plane.

19. Two dice are thrown simultaneously. Let E_1 denote getting a doublet, E_2 denote getting sum of the numbers appearing on the dice to be at least 10.

(i) Find P E_2 or E_2 (ii) Are E_1 and E_2 mutually exclusive ?

Section–C

20. Let $U = \{x : x \leq 10, x \in N\}$, $A = \{x : x \text{ is a prime number} < 10\}$, $B = \{3x : x \in N, x < 4\}$ Verify that $(A \cup B)' = A' \cap B'$

Represent the $(A \cup B)'$ with the help of Venn diagram.

21. If $x + y = z$ and $\tan x = k \tan y$, prove that $\sin z = \frac{k+1}{k-1}\sin(x - y)$

OR

Prove that $\sin^2 x + \sin^2(x + \frac{\pi}{3}) + \sin^2(x - \frac{\pi}{3}) = \frac{3}{2}$

22. Using principle of Mathematical Induction, prove that

$$1 \times 3 + 2 \times 3^2 + 3 \times 3^3 + \ldots\ldots\ldots\ldots\ldots + n \times 3^n = \frac{(2n-1)3^{n+1} + 3}{4},\ \forall\, n \in N$$

23. How many words with or without meaning can be formed using the letters of the word "DAUGHTER", if

(i) All vowels are never together

(ii) Vowels occupy odd places

OR

A polygon has 44 diagonals. If n denotes the number of vertices of polygon, find the value of n. Hence find the number of triangles that can be formed by joining these n points.

24. Two lines passing through point (2, 3) are inclined at an angle of 45° to each other. If the slope of one of the line is 2, find the slope and equation of the other line.

25. Find the sum of n terms of the series :

3 + 5 + 9 + 15 + 23 + -------------------- n terms

26. ABC is an educational organization which has 140 schools. It instructed the principals to organize 'BLOOD DONATION CAMP' in their respective schools. Following are the details of number of schools collecting the number of units of blood.

No. of units	0–10	10–20	20–30	30–40	40–50	50–60	60–70
No. of schools	9	17	32	23	40	18	1

Find the mean and variance of the above data.

What values are shown by the persons who donated blood ?

❒❒❒