

11th

CBSE

MATHEMATICS

TOPIC WISE

TEST PAPER

“ A GOAL
WITHOUT
A PLAN
IS JUST
A WISH ”



PK RAI

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SETS

TEST PAPER -1

MAX MARKS(30)

- Draw appropriate Venn diagram for each of the following :
 - $(A \cup B)'$
 - $A' \cup B'$
 - $(A \cap B)'$
 - $A' \cup B'$
- In a class of 35 students, 24 like to play cricket and 16 like to play football. Also, each students likes to play at least one of the two games. How many students likes to play both cricket and football ?
- There are 200 individuals with a skin disorder, 120 had been exposed to the chemical C_1 , 50 to chemical C_2 and 30 to both the chemicals C_1 and C_2 . Find the number of individuals exposed to
 - Chemical C_1 but not chemical C_2
 - Chemical C_2 but not chemical C_1
 - Chemical C_1 or chemical C_2
- A college awarded 38 medals in football, 15 in basketball and 20 in cricket. If these medals went to a total of 58 men and only three men got medals in all the three sports, how many received medals in exactly two of the three sports
- In a group of students, 100 students know Hindi, 50 knows English and 25 knows both. Each of the students knows either Hindi or English. How many students are there in a group ?
- In a survey of 60 People, it was found that 25 people read newspaper H, 26 read newspaper T, 26 read newspaper I, 9 read both H and I, 11 read both H and T, 8 read both T and I, 3 read all three newspapers. Find
 - The number of people who read at least one of the newspapers.
 - The number of people who read exactly one newspaper.
- In a survey it was found that 21 people liked product A, 26 liked product B and 29 liked product C. If 14 people liked products A and B, 12 people liked products C and A, 14 people liked products B and C and 8 liked all three products. Find how many liked product C only.

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RELATION AND FUNCTION

TEST PAPER -1

MAX MARKS(40)

1. Let $A = \{ 1, 2, 3, \dots, 14 \}$. Define a relation R from R from A to A by $R = \{(x, y) : 3x - y = 0, \text{ where } x, y \in A\}$. Write down its domain, codomain and range.
2. $A = \{ 1, 2, 3, 5 \}$ and $B = \{ 4, 6, 9 \}$. Define a relation R from A to B by $R = \{(x, y) : \text{the difference between } x \text{ and } y \text{ is odd ; } x \in A, y \in B\}$. Write R in roster form.
3. Let $A = \{ 1, 2, 3, 4, 6 \}$. Let R be the relation on A defined by $\{(a, b) : a, b \in A, b \text{ is exactly divisible by } a\}$.
 - i. Write R in roster form
 - ii. Find the domain of R
 - iii. Find the range of R .
4. Determine the domain and range of the of the relation R defined by $R = \{(x, x + 5) : x \in \{ 0, 1, 2, 3, 4, 5 \}\}$.
5. Let $A = \{ x, y, z \}$ and $B = \{ 1, 2 \}$. Find the no of relations from A to B .
6. Find the domain and range of the following real functions :
 - i. $f(x) = -|x|$
 - ii. $f(x) = \sqrt{9 - x^2}$
7. Find the domain and range of real function f defined by $f(x) = \sqrt{x - 1}$.
8. Find the domain and range of real function f defined by $f(x) = |x - 1|$.
9. Let $f = \{(x, \frac{x^2}{1+x^2}) : x \in \mathbb{R}\}$ be a function from \mathbb{R} into \mathbb{R} . Determine the range of f .
10. Let $f = \{(1, 1), (2, 3), (0, -1), (-1, -3)\}$ be a function from \mathbb{Z} to \mathbb{Z} defined by $f(x) = ax + b$, for some integers a, b . Determine a, b .

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TRIGONOMETRIC FUNCTIONS

TEST PAPER -1

MAX MARKS (50)

1. The minute hand of a watch is 1.5 cm long. How far does its tip move in 40 minutes ?
2. In a circle of diameter 40 cm, the length of a chord is 20 cm. Find the length of minor arc of the chord.
3. Find the value of other five trigonometric functions if $\sec x = \frac{13}{5}$, x lies in fourth quadrant.
4. Find the value of trigonometric function if : $\tan \frac{19\pi}{3}$
5. Prove that $= \frac{\sin 5x - 2\sin 3x + \sin x}{\cos 5x - \cos x} = \tan x$.
6. Find the value of : $\tan 15^\circ$
7. Prove the equation : $\sin (n+1)x \cdot \sin (n+2)x + \cos (n+1)x \cdot \cos (n+2)x = \cos x$
8. Prove the equation : $\cot x \cdot \cot 2x - \cot 2x \cdot \cot 3x - \cot 3x \cdot \cot x = 1$
9. Solve $\sin 2x - \sin 4x + \sin 6x = 0$
10. Find the general solution for the equation : $\cos 4x = \cos 2x$
11. If $\tan x = \frac{3}{4}$, $\pi < x < \frac{3\pi}{2}$, find the value of $\sin \frac{x}{2}$, $\cos \frac{x}{2}$ and $\tan \frac{x}{2}$
12. Prove that $(\cos x + \cos y)^2 + (\sin x - \sin y)^2 = 4 \cos^2 \frac{x+y}{2}$

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TRIGONOMETRIC FUNCTIONS

TEST PAPER -2

MAX MARKS (50)

1. A wheel makes 360 revolutions in one minute. Through how many radians does it turn in one second?
2. Find the value of trigonometric function : cosec (-1410°)
3. Find the value of trigonometric function : cot $(-\frac{15\pi}{4})$
4. Prove the equation : $\cos(\frac{3\pi}{2} + x) \cos(2\pi + x) [\cot(\frac{3\pi}{2} - x) + \cot(2\pi + x)] = 1$
5. Prove the equation : $\frac{\cos 4x + \cos 3x + \cos 2x}{\sin 4x + \sin 3x + \sin 2x} = \cot 3x$
6. Prove the equation : $\cos 6x = 32 \cos^6 x - 48 \cos^4 x + 18 \cos^2 x - 1$
7. Solve $2 \cos^2 x + 3 \sin x = 0$
8. Find the general solution for the equations : $\cos 3x + \cos x - \cos 2x = 0$
9. Find the general solution for the equations : $\sin x + \sin 3x + \sin 5x = 0$
10. Find the value of $\tan \frac{\pi}{8}$
11. Prove that $\cos^2 x + \cos^2(x + \frac{\pi}{3}) + \cos^2(x - \frac{\pi}{3}) = \frac{3}{2}$

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

PRINCIPLE OF MATHEMATICAL INDUCTION

TEST PAPER - 1

MAX MARKS (40)

1. For all $n \geq 1$, prove that $1^2 + 2^2 + 3^2 + 4^2 + \dots + n^2 = \frac{n(n+1)(2n+1)}{6}$
2. Prove that $(1 + x)^n \geq (1 + nx)$, for all natural number n , where $x > -1$.
3. Prove that $2 \cdot 7^n + 3 \cdot 5^n - 5$ is divisible by 24, for all $n \in \mathbf{N}$.
4. Prove the following by using the principle of mathematical induction for all $n \in \mathbf{N}$
 - i. $1 + 3 + 3^2 + \dots + 3^{n-1} = \frac{(3^n - 1)}{2}$
 - ii. $1 \cdot 2 \cdot 3 + 2 \cdot 3 \cdot 4 + \dots + n(n+1)(n+2) = \frac{n(n+1)(n+2)(n+3)}{4}$
 - iii. $1 \cdot 2 + 2 \cdot 2^2 + 3 \cdot 2^2 + \dots + n \cdot 2^n = (n-1) 2^{n+1} + 2$
 - iv. $a + ar + ar^2 + \dots + ar^{n-1} = \frac{a(r^n - 1)}{r - 1}$
 - v. $1 + 2 + 3 + \dots + n < \frac{1}{8} (2n + 1)^2$
 - vi. $n(n + 1)(n + 5)$ is a multiple of 3.
 - vii. $(2n + 7) < (n + 3)^2$.

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COMPLEX NUMBERS AND QUADRATIC EQUATIONS

TEST PAPER -1

MAX MARKS (50)

1. Convert the complex number $\frac{-16}{1+i\sqrt{3}}$ into polar form.
2. Solve the following equation : $\sqrt{3x^2} - \sqrt{2x} + 3\sqrt{3} = 0$.
3. Solve the following equation : $x^2 + \frac{x}{\sqrt{2}} + 1 = 0$.
4. Find real θ such that $\frac{3+2i \sin\theta}{1-2i \sin\theta}$ is purely real.
5. Convert the following in the polar form $\frac{1+7i}{(2-i)^2}$.
6. Find the modulus and argument of the complex number $\frac{1+2i}{1-3i}$.
7. If $(x + iy)^3 = u + iv$, then show that $\frac{u}{x} + \frac{v}{y} = 4(x^2 - y^2)$
8. Convert the complex number $z = \frac{i-1}{\cos\frac{\pi}{3} + i \sin\frac{\pi}{3}}$ in the polar form.
9. For any complex numbers z_1 and z_2 , prove that $\operatorname{Re}(z_1 \cdot z_2) = \operatorname{Re} z_1 \operatorname{Re} z_2 - \operatorname{Im} z_1 \cdot \operatorname{Im} z_2$
10. If $x-iy = \sqrt{\frac{a-ib}{c-id}}$ prove that $(x^2+y^2) = \frac{a^2+b^2}{c^2+d^2}$

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11. If $a + ib = \frac{(x+i)^2}{2x^2+1}$, prove that $a^2 + b^2 = \frac{(x^2+1)^2}{(2x^2+1)^2}$.

12. If α and β are different complex numbers with $|\beta| = 1$, then find $|\frac{\beta-\alpha}{1-\bar{\alpha}\beta}|$.

LINEAR INEQUALITIES

TEST PAPER -1

MAX MARKS (40)

1. Solve the inequalities for real x : $\frac{x}{4} < \frac{(5x-2)}{3} - \frac{(7x-3)}{5}$
2. To receive Grade 'A' in a course, one must obtain an average of 90 marks or more in five examinations (each of 100 marks). If Sunita's marks in first four examinations are 87, 92, 94, and 95, find minimum marks that Sunita must obtain in fifth examination to get grade 'A' in the course.
3. Find all the pairs of consecutive odd positive integers both of which are smaller than 10 such that their sum is more than 11.
4. Solve the following system of inequalities graphically : $3x + 2y \leq 150, x + 4y \leq 80, x \leq 15, y \geq 0, x \geq 0$.
5. Solve the following system of inequalities graphically : $x + 2y \leq 10, x + y \geq 1, x - y \leq 0, x \geq 0, y \geq 0$.
6. Solve the following system of inequalities : $3x - 7 < 5 + x$ and $11 - 5x \leq 1$ and represent the solution on the number line.
7. A manufacturer has 600 litres of a 12% solution of acid. How many litres of a 30% acid solution must be added to it so that acid content in the resulting mixture will be more than 15% but less than 18%?
8. Solve the following system of inequalities : $5(2x - 7) - 3(2x + 3) \leq 0$, and $2x + 19 \leq 6x + 47$ and represent the solution on the number line.
9. A solution of 8% boric acid is to be diluted by adding a 2% boric acid solution to it. The resulting mixture is to be more than 4% but less than 6% boric acid. If we have

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640 litres of the 8% solution, how many litres of the 2% solution will have to be added?

10. How many litres of water will have to be added to 1125 litres of the 45% solution of acid so that the resulting mixture will contain more than 25% but less than 30% acid content?

PERMUTATIONS AND COMBINATIONS

TEST PAPER -1

MAX MARKS (50)

1. Find r , if ${}^5P_r = 6 {}^5P_{r-1}$
2. Find the number of different 8 letters arrangements that can be made from the letters of the word DAUGHTER so that
 - i. All vowels occur together
 - ii. All vowels do not occur together
3. Find the number of arrangements of the letters of the word INDEPENDENCE. In how many of these arrangements,
 - i. Do all the vowels always occur together
 - ii. Do the vowels never occur together
 - iii. Do the words begin with I and end in P?
4. In how many of the distinct permutations of the letters in MISSISSIPPI do the four I's not come together?
5. In how many ways can the letters of the word PERMUTATIONS be arranged if the
 - i. Word start with P and end with S,
 - ii. Vowels are all together,
 - iii. There are always 4 letters between P and S?
6. A bag contains 5 black and 6 red balls. Determine the number of ways in which 2 black and 3 red balls can be selected.
7. In how many ways can a student choose a programme of 5 courses if 9 courses are available and 2 specific courses are compulsory for every student?

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8. Find the number of the words with or without meaning which can be made using all the letters of the word AGAIN. If these words are written as in a dictionary, what will be the 50th word?
9. How many numbers greater than 1000000 can be formed by using the digits 1, 2, 0, 2, 4, 2, 4?
10. How many words, with or without meaning, each of 2 vowels and 3 consonants can be formed from the letters of the word DAUGHTER?
11. The English alphabet has 5 vowels and 21 consonants. How many words with two different vowels and 2 different consonants can be formed from the alphabet?
12. In how many ways can the letters of the word ASSASSINATION be arranged so that all the S's are together?

BINOMIAL THEOREM

TEST PAPER -1

MAX MARKS (50)

1. Expand the expression : $(\frac{2}{x} - \frac{x}{2})^5$
2. Find $(a + b)^4 - (a - b)^4$. Hence, evaluate $(\sqrt{3} + \sqrt{2})^4 - (\sqrt{3} - \sqrt{2})^4$.
3. Prove that $\sum_{r=0}^n 3^r {}^n C_r = 4^n$.
4. Show that the middle term in the expansion of $(1 + x)^{2n}$ is $\frac{1.3.5.....(2n-1)}{n!} 2^n x^n$, where n is a positive integer.
5. The second, third and fourth terms in the binomial expansion $(x + a)^n$ are 240, 720, and 1080, respectively. Find x, a and n.
6. The coefficient of three consecutive terms in the expansion of $(1 + a)^n$ are in the ratio 1:7:42. Find n.
7. 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 1:3:5. Find n and r.
8. Find the term independent of x in the expansion of $[\frac{3}{2}x^2 - \frac{1}{3x}]^6$.
9. Find the coefficient of a^4 in the product $(1 + 2a)^4(2 - a)^5$ using binomial theorem.

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10. If the coefficients of $(r - 5)^{th}$ and $(2r - 1)^{th}$ terms of the expansion of $(1 + x)^{34}$ are equal, find r.
11. Find a if the coefficients of x^2 and x^3 in the expansion of $(3 + ax)^9$ are equal.
12. Find n, if the ratio of the fifth term from the beginning to the fifth term from the end in the expansion of $[\sqrt[4]{2} + \frac{1}{\sqrt[4]{3}}]^n$ is $\sqrt{6} : 1$

SEQUENCES AND SERIES

TEST PAPER -1

MAX MARKS (50)

1. The sums of n terms of two arithmetic progressions are in the ratio $5n + 4 : 9n + 6$. Find the ratio of their 18th terms.
2. Insert five numbers between 8 and 26 such that the resulting sequence is an A.P.
3. The difference between any two consecutive interior angles of a polygon is 5° . If the smallest angle is 120° , find the number of the sides of the polygon.
4. The sum of two numbers is 6 times their geometric mean, show that the numbers are in the ratio $(3 + 2\sqrt{2}) : (3 - 2\sqrt{2})$.
5. Find the sum to n terms of the series : $1 \times 2 \times 3 + 2 \times 3 \times 4 + 3 \times 4 \times 5 + \dots$
6. Find the sum to n terms of the series : $\frac{1}{1 \times 2} + \frac{1}{2 \times 3} + \frac{1}{3 \times 4} + \dots$
7. 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.
8. If a and b are the roots of $x^2 - 3x + p = 0$ and c, d are the roots of $x^2 - 12x + q = 0$, where a, b, c, d form a G.P. Prove that $(q + p) : (q - p) = 17 : 15$

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9. If p, q, r are in G.P and the equations, $px^2 + 2qx + r = 0$ and $dx^2 + 2ex + f = 0$ have a common root, then show that $\frac{d}{p}, \frac{e}{q}, \frac{f}{r}$ are in A.P.
10. The sum of some terms of G.P is 315 whose first term and the common ratio are 5 and 2, respectively. Find the last term and the number of terms.
11. If a, b, c are in the A.P ; b, c, d are in G.P and $\frac{1}{c}, \frac{1}{d}, \frac{1}{e}$ are in A.P prove that a, c, e are in G.P.
12. Find the sum of the following series up to n terms : $\frac{1^3}{1} + \frac{1^3+2^3}{1+3} + \frac{1^3+2^3+3^3}{1+3+5} \dots\dots\dots$

SEQUENCES AND SERIES

TEST PAPER -2

MAX MARKS (50)

1. Sum of the first $p, q,$ and r terms of an A.P are $a, b,$ and $c,$ respectively. Prove that $\frac{a}{p}(q - r) + \frac{b}{q}(r - p) + \frac{c}{r}(p - q) = 0$
2. Between 1 and 31, m numbers have been inserted in such a way that the resulting sequence is an A.P. and ratio of 7th and $(m-1)$ th numbers is 5 : 9. Find the value of m .
3. Find the value of n so that $\frac{a^{n+1}+b^{n+1}}{a^n+b^n}$ may be the geometric mean between a and b .
4. If A and G be the A.M. and G.M., respectively between two positive numbers, prove that the numbers are $A \pm \sqrt{(A + G)(A - G)}$.
5. Find the sum to n terms of the series : $5^2 + 6^2 + 7^2 + \dots\dots\dots + 20^2$
6. If f is a function satisfying $f(x + y) = f(x) f(y)$ for all $x, y \in \mathbb{N}$ such that $f(1) = 3$ and $\sum_{x=1}^n f(x) = 120$, find the value of n .
7. The first term of a G.P is 1. The sum of the third term and fifth term is 90. Find the common ratio of G.P.
8. The sum of the first four terms of an A.P is 56. The sum of the last four terms is 112. If its first term is 11, then find the number of terms.

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9. The ratio of the A.M and G.M of two positive numbers a and b, is m : n. Show that a : b = $(m + \sqrt{m^2 - n^2}) : (m - \sqrt{m^2 - n^2})$
10. Find the sum of the following series up to n terms : 5 + 55 + 555 +
11. Find the sum of the following series up to n terms : .6 + .66 + .666 +
12. Show that $\frac{1*2^2+2*3^2+\dots+n*(n+1)^2}{1^2*2+2^2*3+\dots+n^2*(n+1)} = \frac{3n+5}{3n+1}$

STRAIGHT LINES

TEST PAPER -1

MAX MARKS (40)

1. The slope of a line is double of the slope of another line. If tangent of the angle between them is $\frac{1}{3}$, find the slopes of the lines.
2. The equation of the line passing through the point (2, 2) and cutting off intercepts on the axes whose sum is 9.
3. Point R (h, k) divides a line segment between the axes in the ratio 1 : 2. Find the equation of the line.
4. The perpendicular from the origin to the line $y = mx + c$ meets it at the point (-1, 2). Find the values of m and c.
5. If p is the length of the perpendicular from the origin to the line whose intercepts on the axes are a and b, then show that $\frac{1}{p^2} = \frac{1}{a^2} + \frac{1}{b^2}$
6. Show that the area of the triangle formed by the lines $y = m_1x + c_1$, $y = m_2x + c_2$ and $x = 0$ is $\frac{(c_1 - c_2)^2}{2|m_1 - m_2|}$
7. Find the equation of the line drawn perpendicular to the line $\frac{x}{4} + \frac{y}{6} = 1$ through the point, where it meets the y-axis.

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8. Find the equation of the line passing through the point of intersection of the lines $4x + 7y - 3 = 0$ and $2x - 3y + 1 = 0$ that has equal intercepts on the axes.
9. If sum of the perpendicular distance of a variable point P (x, y) from the lines $x + y - 5 = 0$ and $3x - 2y + 7 = 0$ is always 10. Show that P must move on a line.
10. Prove that the product of the length of the perpendicular drawn from the points $(\sqrt{a^2 - b^2}, 0)$ and $(-\sqrt{a^2 - b^2}, 0)$ to the line $\frac{x}{a} \cos\theta + \frac{y}{b} \sin\theta = 1$ is b^2

STRAIGHT LINES

TEST PAPER -2

MAX MARKS (40)

1. If three points (h, 0), (a, b), and (0, k) lies on a line, show that $\frac{a}{h} + \frac{b}{k} = 1$.
2. P (a, b) is the mid-point of a line segment between axes. Show that equation of the line is $\frac{x}{a} + \frac{y}{b} = 2$.
3. Find the coordinates of the foot of perpendicular from the point (-1, 3) to the line $3x - 4y - 16 = 0$.
4. If p and q are the length of the perpendiculars from the origin to the lines $x \cos\theta - y \sin\theta = k \cos 2\theta$ and $x \sec\theta + y \operatorname{cosec}\theta = k$, respectively, prove that $p^2 + 4q^2 = k^2$.
5. If the lines $2x + y - 3 = 0$, $5x + ky - 3 = 0$, and $3x - y - 2 = 0$ are concurrent, find the value of k.
6. A line is such that its segment between the lines $5x - y + 4 = 0$ and $3x + 4y - 4 = 0$ bisected at the point (1, 5). Obtain its equation.
7. Find the equation of the lines through the point (3, 2) which make an angle of 45° with the line $x - 2y = 3$.

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8. If the lines $y = 3x + 1$ and $2y = x + 3$ are equally inclined to the line $y = mx + 4$, find the value of m .
9. Find the equation of the line which is equidistant from parallel lines $9x + 6y - 7 = 0$ and $3x + 2y + 6 = 0$.
10. A person standing at the junction (crossing) of two straight paths represented by the equations $2x - 3y + 4 = 0$ and $3x + 4y - 5 = 0$ wants to reach the path whose equation is $6x - 7y + 8 = 0$ in the least time. Find equation of the path that he should follow.

CONIC SECTIONS

TEST PAPER -1

MAX MARKS (40)

1. Find the equation of the circle with centre $(\frac{1}{2}, \frac{1}{4})$ and radius $\frac{1}{12}$.
2. Find the equation of the circle passing through the points $(4, 1)$ and $(6, 5)$ and whose centre is on the line $4x + y = 16$.
3. Find the coordinates of the focus, axis of the parabola, the equation of the directrix and the length of the latus rectum : $y^2 = 10x$.
4. Find the equation of the parabola that satisfies the given conditions : Vertex $(0, 0)$ passing through $(2, 3)$ and axis is along x-axis.
5. Find the coordinates of the foci, the vertices, the length of major axis, the minor axis, the eccentricity and the length of the latus rectum of the ellipse. $\frac{x^2}{25} + \frac{y^2}{100} = 1$
6. Find the equation for the ellipse that satisfies the given conditions : Ends of major axis $(\pm 3, 0)$, ends of minor axis $(0, \pm 2)$.
7. Centre at $(0, 0)$, major axis on the y-axis and passes through the points $(3, 2)$ and $(1, 6)$.

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8. Find the equation of the hyperbola satisfying the given conditions : Foci $(0, \pm 13)$, the conjugate axis is of length 24.
9. The cable of a uniformly loaded suspension bridge hangs in the form of parabola. The roadway which is horizontal and 100 m long is supported by vertical wires attached to the cable, the longest wire being 30 m and the shortest being 6 m. Find the length of a supporting wire attached to the roadway 18 m from the middle.
10. A man running a racecourse notes that the sum of distances from the two flag posts from him is always 10 m and the distance between the flag posts is 8 m. Find the equation of the posts traced by the man.

CONIC SECTIONS

TEST PAPER -2

MAX MARKS (40)

1. Find the equation of the circle with centre $(1, 1)$ and radius $\sqrt{2}$.
2. Find the equation of the circle passing through the points $(2, 3)$ and $(-1, 1)$ and whose centre is on the line $x - 3y - 11 = 0$.
3. Find the coordinates of the focus, axis of the parabola, the equation of the directrix and the length of the latus rectum : $x^2 = -9x$.
4. Find the equation of the parabola that satisfies the given conditions : Vertex $(0, 0)$ passing through $(5, 2)$ and symmetric with respect to y-axis.
5. Find the coordinates of the foci, the vertices, the length of major axis, the minor axis, the eccentricity and the length of the latus rectum of the ellipse. $\frac{x^2}{49} + \frac{y^2}{36} = 1$
6. Find the equation for the ellipse that satisfies the given conditions : Length of minor axis 16, foci $(0, \pm 6)$
7. Major axis on the x-axis and passes through the points $(4, 3)$ and $(6, 2)$.

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8. Find the equation of the hyperbola satisfying the given conditions : Foci $(0, \pm\sqrt{10})$, passing through $(2, 3)$.
9. The rod of length 12 cm moves with its ends always touching the coordinates axes. Determine the equation of the locus of a point P on the rod, which is 3 cm from the end in contact with the x-axis.
10. An equilateral triangle is inscribed in the parabola $y^2 = 4ax$, where one vertex is at the vertex of the parabola. Find the length of the side of the triangle.

THREE DIMENSIONAL GEOMETRY

TEST PAPER -1

MAX MARKS (40)

1. Find the coordinates of the point which divides the line segment joining the points $(1, -2, 3)$ and $(3, 4, -5)$ in the ratio 2 : 3 internally and externally.
2. Using the section formula, prove that the three points $(-4, 6, 10)$, $(2, 4, 6)$ and $(14, 0, -2)$ are collinear.
3. Find the in which the line segment joining the points $(4, 8, 10)$ and $(6, 10, -8)$ is divided by the YZ- plane.
4. Find the ratio in which the YZ- plane divides the line segment formed by joining the points $(-2, 4, 7)$ and $(3, -5, 8)$.
5. Using section formula, show that the points A $(2, -3, 4)$, B $(-1, 2, 1)$ and C $(0, \frac{1}{3}, 2)$ are collinear.
6. Find the coordinates of the points which trisect the line segment joining the points P $(4, 2, -6)$ and Q $(10, -16, 6)$.

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7. Three vertices of a parallelogram ABCD are A (3, -1, 2), B (1, 2, -4) and C (-1, 1, 2). Find the coordinates of the fourth vertex.
8. Find the length of the medians of the triangle with vertices A (0, 0, 6), B (0, 4, 0) and (6, 0, 0).
9. Find the coordinates of a point on y-axis which are at a distance of $5\sqrt{2}$ from the point P (3, -2, 5).
10. A point R with x-coordinate 4 lies on the line segment joining the points P (2, -3, 4) and Q (8, 0, 10). Find the coordinates of the point R.

LIMITS

TEST PAPER -1

MAX MARKS (50)

1. $\lim_{x \rightarrow 2} \left(\frac{x^2 - 4}{x^2 - 4x^2 + 4x} \right)$

2. $\lim_{x \rightarrow 1} \left(\frac{x-2}{x^2-x} - \frac{1}{x^3-3x^2+2x} \right)$

3. $\lim_{x \rightarrow 0} \left(\frac{\sqrt{1+x}-1}{x} \right)$

4. $\lim_{x \rightarrow 2} \left(\frac{3x^2-x-10}{x^2-4} \right)$

5. $\lim_{x \rightarrow 3} \left(\frac{x^4-81}{2x^2-5x-3} \right)$

6. $\lim_{x \rightarrow 0} \left(\frac{ax + x \cos x}{b \sin x} \right)$

7. $\lim_{x \rightarrow \frac{\pi}{2}} \left(\frac{\tan 2x}{x - \frac{\pi}{2}} \right)$

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8. Find $\lim_{x \rightarrow 1} f(x)$ where $f(x) = \begin{cases} x^2 - 1, & x \leq 1 \\ -x^2 - 1, & x > 1 \end{cases}$
9. Find $\lim_{x \rightarrow 0} f(x)$, where $f(x) = \begin{cases} \frac{|x|}{x}, & x \neq 0 \\ 0, & x = 0 \end{cases}$
10. Suppose $f(x) = \begin{cases} a + bx, & x < 1 \\ 4, & x = 1 \\ b - ax, & x > 1 \end{cases}$
11. If $f(x) = \begin{cases} |x| + 1 & x < 0 \\ 0, & x = 0 \\ |x| - 1, & x > 0 \end{cases}$
12. If the function $f(x)$ satisfies $\lim_{x \rightarrow 1} \left(\frac{f(x)-2}{x^2-1} = \pi \right)$, evaluate $\lim_{x \rightarrow 1} f(x)$.

DERIVATIVES

TEST PAPER -1

MAX MARKS (50)

1. Find the derivative of the following functions from first principle $(x - 1)(x - 2)$.
2. Find the derivative of the following functions from first principle $\frac{x+1}{x-1}$
3. Find the derivative of f from the first principle, where f is given by $f(x) = \frac{2x+3}{x-2}$
4. Find the derivative of f from the first principle, where f is given by $f(x) = x + \frac{1}{x}$
5. Find the derivative of $f(x)$ from the first principle, where $f(x)$ is $x \sin x$
6. Find the derivative of $(ax + b)(cx + d)$.
7. Find the derivative of $\frac{\sin x + \cos x}{\sin x - \cos x}$
8. Find the derivative of $\frac{a + b \sin x}{c + d \cos x}$
9. Find the derivative of $(x^2 + 1) \cos x$

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10. Find the derivative of $(x + \cos x)(x - \tan x)$

11. Find the derivative of $\frac{x}{1+\tan x}$

12. Find the derivative of $\frac{4x+5 \sin x}{3x+7 \cos x}$

STATISTICS

TEST PAPER -1

MAX MARKS (40)

1. Find the mean deviation about the mean for the following data :

Marks obtained	10-20	20-30	30-40	40-50	50-60	60-70	70-80
No of students	2	3	8	14	8	3	2

2. Find 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

3. Find the mean deviation about median for the following data :

Marks	0 - 10	10 - 20	20 - 30	30 - 40	40 - 50	50 - 60
No of girls	6	8	14	16	4	2

4. Find the mean, variance, and standard deviation for the following distribution :

Class	30-40	40-50	50-60	60-70	70-80	80-90	90-100
Frequency	3	7	12	15	8	3	2

5. The variance of 20 observations is 5. If each observation is multiplied by 2, find the new variance of the resulting observations.

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6. Find the mean of 5 observations is 4.4 and their variance is 8.24. If three of the observations are 1, 2 and 6, find the other two observations.

PROBABILITY

TEST PAPER -1

MAX MARKS (40)

1. An experiment consists of tossing a coin and then throwing it second time, if a head occurs. If a tail occurs on the first toss, then a die is rolled once. Find the sample space.
2. A coin is tossed. If the outcome is head, a die thrown. If the shows up an even number, the die is thrown again. What is the sample space for the experiment?
3. A die is thrown. Describe the following events;
 - i. A: a number less than 7
 - ii. B: a number greater than 7
 - iii. C: a multiple of 3
 - iv. D: a number less than 4
 - v. E: an even number greater than 4
 - vi. F: a number not less than 3Also find $A \cup B$, $A \cap B$, $B \cup C$, $E \cap F$, $D \cap E$, $A - C$, $D - E$, $E \cap F'$, F'
4. Two dice is thrown. The events A, B and C are as follows;
 - i. A: getting an even number on the first die.
 - ii. B: getting an odd number on the first die.

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- iii. C: getting the sum of the numbers on the dice ≤ 3 .
Describe the events
- A'
 - Not B
 - A or B
 - A and B
 - A but not C
 - B or C
 - B and C
 - $A \cap B' \cap C'$
5. A bag contains 9 discs of which 4 are red, 3 are blue and 2 are yellow. The discs are similar in shape and size. A disc is drawn at random from the bag. Calculate the probability that it will be
- Red
 - Yellow
 - Blue
 - Not Blue
 - Either Red or Blue
6. Two students Anil and Ashima appeared in an examination. The probability that Anil will qualify the examination is 0.05 and that Ashima will qualify the examination is 0.10. The probability that both will qualify the examination is 0.02. Find the probability that
- Both Anil and Ashima will not qualify the examination.
 - Atleast one of them will not qualify the examination and,
 - Only one of them will qualify the examination.
7. A committee of two persons is selected from two men and two men. What is the probability that the committee will have
- No man
 - One man
 - Two men
8. The probability that a student will pass the final examination in Both English and Hindi is 0.5 and the probability of passing neither is 0.1. If the probability of passing the English examination is 0.75, what is the probability of passing the Hindi examination?
9. In a class of 60 students, 30 opted for NCC, 32 opted for NSS and 24 opted for both NCC and NSS. If one of these students is selected at random, find the probability that
- The student opted for NCC or NSS.
 - The student has opted neither NCC nor NSS.
 - The student has opted NSS but not NCC.
10. Find the probability that when a hand of 7 cards is drawn from a well shuffled deck of 52 cards, it contains

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- i. All Kings
 - ii. 3 Kings
 - iii. Atleast 3 kings
11. In a certain lottery 10,000 tickets are sold and ten equal prizes are awarded. What is the probability of not getting a prize if you buy
- i. One Ticket
 - ii. Two Tickets
 - iii. 10 Tickets
12. The number lock of a suitcase has 4 wheels, each labelled with ten digits i.e., from 0 to 9. The lock opens with a sequence of four digits with no repeats. What is the probability of a person getting the right sequence to open the suitcase?

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