JAWAHAR NAVODAYA VIDYALAYA PATHANAMTHITTA

MODEL EXAM (2017-18)
SUBJECT: MATHEMATICS (041)

BLUE PRINT : CLASS XI

UNIT	Sl. No.	Name of the Chapter	VSA (1M)	SA (2 M)	LA – 1 (4 M)	LA – 2 (6 M)	TOTA L	Total of the Unit
I	1	SETS	1(1)	---	4 (1)**	6(1)	11(3)	29(8)
	2	RELATIONS & FUNCTIONS	---	2(1)	4(1)	---	6(2)	
	3	TRIGONOMETRIC FUNCTIONS	--	2(1)	4(1)*	6(1)*	12(3)	
II	4	PRINCIPLE OF MATHEMATICAL INDUCTION	---	---	---	6(1)	6(1)	
	5	COMPLEX NUMBERS & QUADRATIC EQUATIONS		2(1)	4(1)*	---	6(2)	37(10)
	6	LINEAR INEQUALITIES	---	---	---	**6(1)**	6(1)	
	7	PERMUATIONS AND COMBINATIONS	1(1)		4(1)	---	5(2)	
	8	BINOMIAL THEOREM	---	2(1)	4(1)	---	6(2)	
	9	SEQUENCE AND SERIES	---	2(1)	--	6(1)*	8(2)	
III	10	STRAIGHT LINES	1(1)	---	4(1)*	---	5(2)	13(4)
	11	CONIC SECTIONS	---	---	4(1)	---	4(1)	
	12	INTRODUCTION TO THREE DIMENSIONAL GEOMETRY	---	--	4(1)	---	4(1)	
IV	13	LIMITS AND DERIVATIVES	---	2(1)	4(1)	---	6(2)	6(2)
V	14	MATHEMATICAL REASONING	1(1)	2(1)	----	---	3(2)	3(2)
VI	15	STATISTICS	---	---	---	6(1)	6(1)	12(2)
	16	PROBABILITY	---	2(1)	4(1)		6(2)	
		TOTAL	4 (4)	16 (8)	44 (11)	36 (6)	100 (29)	100 (29)

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MODEL EXAM (2017-18)

SUBJECT: MATHEMATICS **MAX. MARKS: 100**

CLASS:XI **DURATION : 3HRS**

General Instructions:-

1. *All questions are compulsory*
2. *This question paper consists of 29 questions divided into four sections A, B,C and D. Section A comprises of 4 questions of one mark each, section B comprises of 8 questions of two marks each, and section C comprises of 11 questions of four marks each and section D comprises of 6 questions of six marks each*
3. *All questions in Section A are to be answered in one word, one sentence or as per the exact requirement of the question*
4. *There is no overall choice. However, internal choice has been provided in 03 questions of four marks each and 03 questions of six marks each. You have to attempt only one of the alternatives in all such questions.*
5. *Use of calculators is not permitted. You may ask for logarithmic tables, if required.*

SECTION A

1. Write the set in roaster form A = {x: x is a prime number which is divisor of 60}
2. Identify the quantifier in the given statement and write the negation of the statement : ***"There exists a number which is equal to its square".***
3. How many words, with or without meaning, can be formed using all the letters of the word **EQUATION,** using each letter exactly once?
4. Find the distance of the point (0, 0) from the line $3x + 4y + 15 = 0$.

SECTION B

5. Let A and B be two sets such that $n(A) = 3$ and $n(B) = 2$. If $(x, 1)$, $(y, 2)$, $(z, 1)$ are in AX B, find A and B, where x, y and zare distinct elements.
6. Find the angle in radian through which a pendulum swings if its length is 75 cm and the tip describes an arc of length 21cm.

7. Solve: $\sqrt{2}x^2 + x + \sqrt{2} = 0$

8. Find the third term in the expansion of $(\frac{2x^2}{3} - \frac{3}{2x})^4$

9. Find the 10th term of the G.P. 5, 25, 125 ……

10. $Evaluate \quad \lim_{x \to 0} \frac{sin3x+7x}{4x+\sin 2x}$

11. Write the converse and contra positive of the following statement.

"If n is an odd number,then (n+1) is even."

12. A letter is chosen at random from the word ***'ASSASSINATION'***. Find theprobability that letter is (i) a vowel (ii) a consonant.

SECTION C

13. If A = {1,2,3,4} $, B = \{4,5,6,7\}, and\ U = \{ 1,2,3,4,5,6,7,8,9 \}$

$verify\ that\ (A \cap B)' = A' \cup B'$ and $(A \cup B)' = A' \cap B'$

14. Let f(x) = x^2, g(x) = 2x + 1 be two real functions. Find (f + g)(x), (f – g)(x), (fg)(x), (f/g)(x).

15. Find the general solution of the equation $\sin 2x + \sin 4x + \sin 6x = 0$.

OR

Prove that: $(\cos x + \cos y)^2 + (\sin x + \sin y)^2 = 4\cos^2 \frac{x-y}{2}$.

16. Convert the complex number $\frac{-16}{1+i\sqrt{3}}$ in polar form.

(OR)

Find square root of $-5 + 12i$

17. Find the number of arrangements of the letters of the word **INDEPENDENCE**. In how many of these arrangements,

a) do the words start with P

b) do all the vowels always occur together

c) do the vowels never occur together

(OR)

A group consists of 4 girls and 7 boys. In how many ways can a team of 5 members be selected if the team has

(i) no girl ?

(ii) at least one boy and one girl ?

(iii) at least 3 girls ?

18. Find the middle term in the expansion of $\left(2ax - \frac{b}{x}\right)^{10}$

19. Find the image of the point (3, 8) with respect to the line $x + 3y = 7$ assuming the line to be a plane mirror.

20. 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, $\frac{x^2}{36} + \frac{y^2}{16} = 1$.

21. Find the ratio in which the line segment joining the points (4, 8, 10) and (6, 10, – 8) is divided by the YZ-plane.

22. a) Find the derivative of $\frac{x^5 - cosx}{sinx}$.

    b) Find the derivative of (x + cosx).(x – tanx).

23. In a class XI of a school 40 % of the students study Mathematics and 30 % study Biology, 10 % of the class study both Mathematics and Biology. If a student is selected at random from the class, find the probability that he will be studying Mathematics or Biology.

SECTION D

24. In a college out of 100 students 15 offered Mathematics only, 12 offered Statistics only, 8 offered only Physics, 40 offered Physics and Mathematics, 20 offered Physics and Statistics, 10 offered Mathematics and Statistics, 65 offered Physics. By drawing Venn diagram find the no: of students who

    a. offered Mathematics .
    b. offered Statistics.
    c. did not offer any of the above three subjects.

25. Prove that: $\cos^2 x + \cos^2\left(x + \frac{\pi}{3}\right) + \cos^2\left(x - \frac{\pi}{3}\right) = \frac{3}{2}$

(OR)

Prove that: $\frac{sin7A + sin5A + sin9A + sin\,3A}{cos7A + cos5A + cos9A + cos9A} = tan6A$

26. Prove by using principle of mathematical induction that $2 \times 7^n + 3 \times 5^n - 5$ is divisible by 24, $\forall\, n \in N$.

(OR)

Prove by using principle of mathematical induction that:

$1\times3 + 3\times5 + 5\times 7 + \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots + (2n-1)(2n+1) = \frac{n(4n^2+6n-1)}{3}$,

$\forall\, n \in N.$

27. Solve the following system of inequalities graphically.

$$x + y \leq 5, \quad 4x + y \geq 4, \quad x + 5y \geq 5, \quad x \leq 4, \quad y \leq 3$$

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

$$2 \times 3 \times 4 + 4 \times 5 \times 6 + 6 \times 7 \times 8 + \cdots \ldots \ldots \ldots \ldots$$

(OR)

Find the sum of the first n terms of the series: 8 + 88 + 888 + 8888 +-----

29. Find the mean and variance for the following distribution.

Classes	0-10	10-20	20-30	30-40	40-50
Frequencies	5	8	15	16	6

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CBSE SAMPLE PAPER-01

CBSE Class – XI

MATHEMATICS

Time allowed: 3 hours,Maximum Marks: 100

General Instructions:

a) All questions are compulsory.

b) The question paper consists of 26 questions divided into three sections A, B and C. Section A comprises of 6 questions of one mark each, Section B comprises of 13 questions of four marks each and Section C comprises of 7 questions of six marks each.

c) All questions in Section A are to be answered in one word, one sentence or as per the exact requirement of the question.

d) Use of calculators is not permitted.

Section A

1. Find the number of subsets of a set A containing 10 elements.

Sol: Number of subsets

${}^{10}C_0 + {}^{10}C_1 + {}^{10}C_2 + {}^{10}C_3 + {}^{10}C_4 + {}^{10}C_5 + {}^{10}C_6 + {}^{10}C_7 + {}^{10}C_8 + {}^{10}C_9 + {}^{10}C_{10} = 2^{10}$

2. How many ways can you choose one or more students from 3 students?

Sol: ${}^{3}C_1 + {}^{3}C_2 + {}^{3}C_3 + = 2^3 - 1 = 7$

3. In How many ways can one choose 3 cards from a pack of 52 cards in succession (1) with replacement (2) without replacement?

Sol: (1)Each card can be drawn in 52 ways and so the total number of ways

$52 \times 52 \times 52 = 52^3$

(2)If there is no replacement the first card can be drawn in 52 ways, the second by 51 ways and the third by 50 ways. Hence the total number of ways is

$52 \times 51 \times 50 = 132600$

4. State the condition under which the product of two complex numbers is purely imaginary.

Sol: 1.None of the factors are zero

2.Factors must be of the form $(a+ib);k(b+ia)$ where k is a real number.

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5. In a circle of radius 1 unit what is the length of the arc that submits an angle of 2 radians at the centre.

Sol: Length of arc = $r\theta$

Hence length of arc==2units

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6. Is $\cos\theta$ positive or negative if $\theta = 500\, radians$.

Sol: 1 Full rotation is $2\pi radians$

500 radians = $\frac{500}{2\pi}$ rotations

$\frac{500}{2\pi} = 79.57 rotations$

79 full rotations and 0.57 of a rotation

$0.5 < 0.57 < 0.75$

The incomplete rotation is between $\frac{1}{2} and \frac{3}{4}$ of a rotation . Hence 500 radians is in third quadrant. So $\cos\theta$ is negative

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Section B

7. Prove by mathematical induction that $n(n+1)(2n+1)$ is divisible by 6 if n is a natural number.

Sol: Let $n = 1$

Then $n(n+1)(2n+1)$ = 6 and divisible by 6

Let it be divisible by 6 for $n = m$

Then $m(m+1)(2m+1) = 6k$ Where k is an integer

For $n = m+1$ the expression is

(m + 1)(m + 2)(2m + 2 + 1) = (m + 2)(m + 1)(2m + 1) + 2(m + 1)(m + 2)

=m(m + 1)(2m + 1) + 2(m + 1)(2m + 1) + 2(m + 1)(m + 2)

=m(m + 1)(2m + 1) + 2(m + 1)(3m + 3)

=m(m + 1)(2m + 1) + 6$(m + 1)^2$

=6k + 6$(m + 1)^2$, This is divisible by 6.

8. Solve $\cos 2x - 5\sin x - 3 = 0$.

Sol: $1 - 2\sin^2 x - 5\sin x - 3 = 0$

$2sin^2x + 5\sin x + 2 = 0$

Let $sinx = t$

Then, $2t^2 + 5t + 2 = 0$

Solving this quadratic

$2t(t+2) + (t+2) = 0$

$(2t+1)(t+2) = 0$

$t = -2, t = -\frac{1}{2}$

$\sin x = \frac{-1}{2}$

First value of t is rejected as $\sin x$ should lie between $(-1 \quad and \quad 1)$

General solution is $x = (-1)^{n+1}\frac{\pi}{6} + n\pi$

9. For what values of m^{2}x^2 + 2(m + 1)x + 4 = 0 will have exactly one zero.

Sol: When $m = 0$

The given equation reduces to a first degree and it will have only one solution

Also when the discriminant is zero it will have only one solution

Discriminant is

$4(m+1)^2 - 4m^2.4 = 0$

$4(m^2 + 1 + 2m) - 16m^2 = 0$

On simplifying and solving,

$(m-1)(3m+1) = 0$

$m = 1, m = -\frac{1}{3}$

Hence the three values of m for which the equation will have only one solution is

$m = 0, m = 1, m = -\frac{1}{3}$

10. Three numbers are in AP. Another 3 numbers are in GP. The sum of first term of the AP and the first term of the GP is 85, the sum of second term of AP and the second term of the GP is 76 and that of the 3rd term of AP and 3rd term of GP is 84. The sum of the AP is 126. Find each term of AP and GP.

Sol:

A.P	a-d, a, a+d
G.P	b/g, b, bg

$$a - d + \frac{b}{g} = 85\ldots(1)$$
$$a + d + bg = 84\ldots(2)$$
$$2a + \frac{b}{g} + bg = 169$$
$$34g^2 - 85g + 34 = 0$$
$$g = \frac{85 \pm \sqrt{85^2 - 4 \times 34 \times 34}}{2 \times 34}$$
$$g = 2 \quad or \quad \frac{1}{2}$$

When g = 2

42 - d + $\frac{34}{2}$ = 85

d = - 26

a = 42, d = - 26, g = 2, b = 34

$$AP$$
$$68,\quad 42,\quad 16$$
$$GP$$
$$17,\quad 34,\quad 68$$

$m = 1, m = -\frac{1}{3}$

11. If $f(x) = 4^x$ find $f(x+1) - f(x)$ in terms of $f(x)$.

Sol: $f(x+1) = 4^{x+1}$

$f(x) = 4^x$

$f(x+1) - f(x)$

= $4^{x+1} - 4^x$

$= 4^x.4 - 4^x$

$= 4^x(3)$

$= 3f(x)$

12. If $f(x) = \log\frac{(1+x)}{(1-x)}$ Prove that

$$f\left(\frac{3x+x^3}{1+3x^2}\right)=3f(x)\ when\quad -1<x<1$$

$$f\left(\frac{3x+x^3}{1+3x^2}\right)=3f(x)$$

$when\quad -1<x<1$

Sol:

$$\log\frac{1+\frac{3x+x^3}{1+3x^2}}{1-\frac{3x+x^3}{1+3x^2}}$$

$$=\log\frac{1+3x^2+3x+x^3}{1+3x^2-3x-x^3}$$

$$=\log\frac{(1+x)^3}{(1-x)^3}$$

$$=3\log\frac{(1+x)}{(1-x)}$$

$$=3f(x)$$

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13. Find the value of $\sin 75 and \cos 75$.

Sol:

$$\sin(45+30)=\sin 45\cos 30+\cos 45\sin 30$$

$$=\frac{1}{\sqrt{2}}\times\frac{\sqrt{3}}{2}+\frac{1}{\sqrt{2}}\times\frac{1}{2}$$

$$=\frac{\sqrt{3}+1}{2\sqrt{2}}$$

$$=\frac{\sqrt{6}+\sqrt{2}}{4}$$

$$\cos(45+30)=\cos 45\cos 30-\sin 45\sin 30$$

$= \frac{1}{\sqrt{2}} \times \frac{\sqrt{3}}{2} - \frac{1}{\sqrt{2}} \times \frac{1}{2}$

$= \frac{\sqrt{3}-1}{2\sqrt{2}}$

$= \frac{\sqrt{6}-\sqrt{2}}{4}$

14. Prove that $\frac{sin3\theta}{\sin\theta} - \frac{\cos 3\theta}{\cos\theta} = 2$.

Sol:

$$\frac{sin3\theta}{\sin\theta} - \frac{\cos 3\theta}{\cos\theta} = \frac{\sin 3\theta\cos\theta - \cos 3\theta\sin\theta}{\sin\theta\cos\theta}$$
$$= \frac{\sin(3\theta - \theta)}{\sin\theta\cos\theta}$$
$$= \frac{2\sin 2\theta}{2\sin\theta\cos\theta}$$
$$= \frac{2\sin 2\theta}{\sin 2\theta} = 2$$

15. If the line $y = mx + 1$ is a tangent to the ellipse $x^2 + 4y^2 = 1$ then find the value of m^2.

Sol:

$$x^2 + 4(mx+1)^2 = 1$$
$$x^2 + 4(m^2x^2 + 2mx + 1) = 1$$
$$x^2 + 4m^2x^2 + 8mx + 4 = 1$$
$$x^2(1 + 4m^2) + 8mx + 3 = 0$$

The line being a tangent ,it touches the ellipse at two coincident points, and so Discriminant must be zero,

$(8m)^2 - 4(3)(1 + 4m^2) = 0$

$64m^2 - 12 - 48m^2 = 0$

$16m^2 = 12$

$m^2 = \frac{12}{16}$

$m^2 = \frac{3}{4}$

16. Reduce the equation $3x - 4y + 20 = 0$ in to normal form.

Sol: Divide the equation by $-\sqrt{3^2 + -4^2} = -5$

Hence, $-\frac{3}{5}x + \frac{4}{5}y - 4 = 0$

Where, cos $\alpha = \frac{-3}{5}$ and sin $\alpha = \frac{4}{5}$ and p=4

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17. Solve the inequality $\frac{x+3}{x-7} \leq 0$.

Sol: Multiply both numerator and denominator with $x - 7$.Then denominator becomes a perfect square and it is always positive

Now $(x + 3)(x - 7) \leq 0$

Critical points are $(-3, 7)$

Hence, $-3 \leq x < 7$

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18. Find $\lim_{x\to\infty} \frac{x^2 - ax + 4}{3x^2 - bx + 7}$

Sol:

$$\lim_{x\to\infty} \frac{x^2 - ax + 4}{3x^2 - bx + 7}$$

$$= \lim_{x\to\infty} \frac{x^2(1 - \frac{a}{x} + \frac{4}{x^2})}{x^2(3 - \frac{b}{x} + \frac{7}{x^2})}$$

= $\frac{1}{3}$

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19. Find $\lim_{x\to 0} \frac{\tan x}{\sin 3x}$

Sol:

$$\lim_{x\to 0} \frac{\tan x}{\sin 3x}$$

$$= \lim_{x\to 0} \frac{\sin x}{x} \times \frac{1}{cosx} \times \frac{1}{\frac{3sin3x}{3x}}$$

$= 1 \times 1 \times \frac{1}{3} = \frac{1}{3}$

Section C

20. Evaluate $x^3 + x^2 - 4x + 13$ when $x = 1 + i$ and when $x = 1 - i$

Sol: Form a quadratic equation whose roots are $1+i \quad and \quad 1-i$

The equation is $x^2 - 2x + 2 = 0$

The given expression

$x^3 + x^2 - 4x + 13 = x(x^2 - 2x + 2) + 3(x^2 - 2x + 2) + 7$

$x^3 + x^2 - 4x + 13 = x(0) + (0) + 7$

$x^3 + x^2 - 4x + 13 = 7$

21. Prove that the roots of the equation $(x-\alpha)(x-\beta) = k^2$ is always real.

Sol: $x^2 - (\alpha+\beta)x + \alpha\beta - k^2 = 0$

Discriminant of the above quadratic is $\{(\alpha+\beta)\}^2 - 4(\alpha\beta - k^2)$

= $(\alpha-\beta)^2 + k^2$ is always positive and hence the roots are real.

22. If the roots of the equation $lx^2 + nx + n = 0$ are in the ratio $p : q$ then prove that

$$\frac{\sqrt{p}}{\sqrt{q}} + \frac{\sqrt{q}}{\sqrt{p}} + \frac{\sqrt{n}}{\sqrt{l}} = 0\cdot$$

Sol: Let the roots be $p\alpha \quad and \quad q\beta$

Then $p\alpha + q\alpha = -\frac{n}{l} \ldots (1)$

$pq\alpha^2 = \frac{n}{l}$

$\alpha = \frac{\sqrt{n}}{\sqrt{l}} \times \frac{1}{\sqrt{pq}} \ldots (2)$

Hence substituting equation 2 in equation 1

$(p+q)\frac{\sqrt{n}}{\sqrt{l}} \times \frac{1}{\sqrt{pq}} + \frac{n}{l} = 0$

On simplifying ,

$\frac{\sqrt{p}}{\sqrt{q}} + \frac{\sqrt{q}}{\sqrt{p}} + \frac{\sqrt{n}}{\sqrt{l}} = 0$

23. Find $\lim_{x\to\pi} (\pi - x) \tan\frac{x}{2}$.

Sol:

$$= \lim_{\frac{x-\pi}{2} \to 0} 2 \frac{\cos\frac{\pi - x}{2}}{\frac{\sin\frac{\pi - x}{2}}{\frac{\pi - x}{2}}}$$

$$= \lim_{\frac{x-\pi}{2} \to 0} 2 \frac{\cos\frac{x-\pi}{2}}{\frac{\sin\frac{x-\pi}{2}}{\frac{x-\pi}{2}}} = 2$$

since the limit of $\frac{\sin\frac{x-\pi}{2}}{\frac{x-\pi}{2}}$ = 1

24. If a, b, c are 3 consecutive integers prove that (a - i)(a + i)(c + i)(c - i) = b^4 + 1.

Sol: Let $a = x - 1$

$b = x$
$c = x + 1$
Then $(x-1-i)((x-1+i)(x+1+i)(x+1-i)$
$= \{(x-1)^2 - i^2\}\{(x+1)^2 - i^2\}$
$= \{(x-1)^2 + 1\}\{(x+1)^2 + 1\}$
$= \{(x-1)(x+1)\}^2 + (x-1)^2 + (x+1)^2 + 1$
$= (x^2-1)^2 + (x-1)^2 + (x+1)^2 + 1$
$= x^4 + 1$
$= b^4 + 1$

25. Prove that $\frac{(1+i)^n}{(1-i)^{n-2}} = 2\, i^{n-1}$.

Sol: Multiply both Numerator and denominator with $(1-i)^2$. Then

$\frac{(1+i)^n}{(1-i)^{n-2}} = \frac{(1+i)^n(1-i)^2}{(1-i)^n}$

multiplying both Numerator & denominator with $(1+i)^n$

$= \frac{(1+i)^n(-2i)(1+i)^n}{(1-i)^n(1+i)^n}$

Simplifying

$= \frac{\{(1+i)^2\}^n(-2i)}{(1-i^2)^n}$
On expanding and simplifying
$= \frac{2^n i^n(-2)i}{2^n}$
$= -2i^{n+1}$
$= \frac{2(i)^{n+1}}{i^2}$
$= 2i^{n-1}$

26. Determine the coordinates of a point which is equidistant from the point $(1, 2) and (3, 4)$ and the shortest distance from the line joining the points $(1, 2) and (3, 4)$ to the required point is $\sqrt{2}$.

Sol: Let the point be A(1, 2) and B(3, 4)

The mid-point of the line joining A and B is $C(2, 3)$

Slope of line AB = $\frac{4-2}{3-1} = 1$

Let the required point be $D(\alpha, \beta)$

Then D must be a point on the line perpendicular to the line AB and passing through point C

$\therefore$ Slope of CD = - 1

Equation of CD

y - 3 = - 1(x - 2)

x + y = 5

Equation of AB

y - 2 = 1(x - 1)

x - y + 1 = 0

The point $D(\alpha, \beta)$ must satisfy the equation

x + y = 5

$\therefore \alpha + \beta = 5 \ldots (1)$

The perpendicular distance from (α, β) to AB is

$\frac{\alpha-\beta+1}{\sqrt{2}} = \sqrt{2}$

$\alpha - \beta = 1 \ldots (2)$

Solving equations 1 and 2

$\alpha = 3, \beta = 2$

CBSE Class 11 Mathematics

Sample Papers 06

Time: 3 hours Maximum Marks: 100

General Instructions:

1. All questions are compulsory.
2. The question paper consists of 29 questions divided into four sections A, B and C. D Section. A comprises of 4 questions of one mark each, section B comprises of 8 questions of 2 marks each and section C comprises of 11 questions of 4 marks each. And Section D comprises of 6 questions of six marks each.
3. All questions in section A are to be answered in one Word, one sentence or as per the exact requirement of the question.
4. There is no overall choice. However internal choice has been provided in 4 questions of four marks each and 2 questions of six marks each. You have to attempt only one of the alternatives in all such questions.
5. Use of calculator is not permitted.

SECTION A

1. Find the argument of complex number $z = \sin\frac{\pi}{6} + i\cos\frac{\pi}{6}$
2. Evaluate: $\lim\limits_{x\to 0}\frac{\sin\frac{1}{x}}{\frac{1}{x}}$
3. Find the number of terms in the expansion of $(3x + y)^8 - (3x - y)^8$
4. Write the domain of the function $f(x) = \frac{x}{x^2-5x+6}$

SECTION-B

5. Two finite set have m and n element. The total number of subsets of the first set is 56 more than the total number of subsets of the second set. Find the values of m and n.
6. Let f: R → R be a function given by $f(x) = x^2 + 1$. Find $f^{-1}(-5)$.
7. If $\frac{a+ib}{c+id} = x + iy$ prove that $\frac{a+ib}{c+id} = x - iy$.
8. If (n + 1)! = 12 (n - 1) !, find n.

9. Find hte middle term in hte expansion of $\left(\frac{x}{3}+9y\right)^{10}$
10. Find the sum of first 24 terms of the A.P.

    a_1, a_2, a_3. ...... if it is known that

    $a_1 + a_5 + a_{10} + a_{15} + a_{20} + a_{24} = 225$.
11. Find the equation of the perpendicular bisector of the line segment joining the points A(2, 3) and B(6, -5).
12. Find hte derivative of sin x. Cos x w.r.t. 'x'

SECTION-C

13. Show that $\sqrt{3}\cos ec\ 20^\circ - \sec 20^\circ = 4$
14. Solve (x + iy) (2 - 3i) = 4 + i. where x and y are seal
15. Let P be the solution set of 3x + 1 > x - 3 and is Q be the solution set of 5x + 2 $\leqslant$ 3(x + 2), $x \in n$. Find the set $P \cap Q$
16. If there are six periods in each working day of a school, in how many ways can one arrange 5 subjects such that each subject is allowed at least on period?
17. Find the term in dependent of x in $\left(2x^2-\frac{1}{3x^3}\right)^{10}$
18. Divide 63 into three parts such that they are in G.P. and the product of the first and the second term is $\frac{3}{4}$ of the third term.
19. The hypotenuse of a right angled triangle has its ends at the points ((1, 3)) and (-4, 1). Find the equation of the legs of the triangle.
20. Find the equation of parabola whose focus at (-1, -2) and directrix is x - 2y + 3 = 0.
21. Evaluate: $\lim\limits_{x \to \sqrt{3}} \frac{x^2-3}{x^2+3\sqrt{3}x-12}$
22. In a single throw of three dice, determine the probability of getting total of at most 5.
23. Let f be defined by f(x) = x - 4 and g be defined by

    $g(x) = \begin{cases} \frac{x^2-16}{x+4}, & x \neq -4 \\ k, & x = -4 \end{cases}$

    Find k such that f(x) = g(x) for all x.

SECTION-D

24. Calculate the mean deviation from the median of following data.

Wages per week (in Rs)	10-20	20-30	30-40	40-50	50-60	60-70	70-80

No.of workers	4	6	10	20	10	6	4

25. If p and p' be the perpendiculars from the origin upon the straight lines $x \sec\ \theta - y \cos ec\ \theta = a$ and $x \cos \theta + y \sin \theta = a \cos\ 2\theta$ prove that 4p^2 + p^2 = a^2.
26. sum the series $\frac{I^3}{1} + \frac{1^3+2^3}{2} + \frac{1^3+2^3+3^3}{3} + \ldots$to n terms.
27. For any two sets A and B, prove that P(A) = P(B) $\Rightarrow$ A = B
28. Prove that $\cos 20^\circ \cos 40^\circ \cos 60^\circ \cos 80^\circ = \frac{1}{16}$
29. By the principle of mathematical induction, prove that $(1+x)^n \geqslant 1+nx$ for all n $\in$ N and x > -1.

CBSE Class 11 Mathematics

Sample Papers 06

Answer

1. $Z=\sin\frac{\pi}{6}+i\cos\frac{\pi}{6}$
   $\Rightarrow Z=\cos\frac{\pi}{3}+i\sin\frac{\pi}{3}$
   So, $\arg(z)=\frac{\pi}{3}$
2. $\lim\limits_{x\to 0}\frac{\sin\frac{1}{x}}{\frac{1}{x}} let \frac{1}{x}=y$
   $=\lim\limits_{y\to\infty}\frac{\sin y}{y}=0$
3. 4 terms
4. $f(x)\frac{x}{x^2-5x+6}=\frac{x}{(x-3)(x-2)}$
   For Domain (f) = R - {3, 2}
5. Let A and B are two sets having m and n elements.

   A.T.O.

   $2^n - 2^n = 56$

   $\Rightarrow 2^n(2^{m-n}-1)=8\times 7$

   $\Rightarrow 2^n\left(2^{m-n}-1\right)=2^3\times\left(2^3-1\right)$

   AS comparing, n = 3; m - n = 3

   $\Rightarrow m=6$

   Thus, m = 6; n = 3.

6. let $f^{-1}(-5) = x \Rightarrow f(x) = -5$

   $\Rightarrow x^2 + 1 = -5$

   $\Rightarrow x^2 = - 6$

   $\Rightarrow$ x = no real value.

   So, $f^{-1}(-5)=\phi$
7. $\Theta\frac{a+ib}{c+id}=x+iy$ (Given)
   $\Rightarrow \overline{\left(\frac{a+ib}{c+id}\right)}=\overline{x+iy}\quad [If\, z_1=z_2\Rightarrow\bar{z}_1=\bar{z}_2]$
   $\Rightarrow\frac{(\overline{a+ib})}{(\overline{c+id})}=x-iy\left[Q\overline{\left(\frac{z_1}{z_2}\right)}=\frac{\bar{z}_1}{\bar{z}_2}\right]$
   $\Rightarrow\frac{a-ib}{c-id}=x-iy$
8. (n + 1)! = 12 (n - 1)!

$\Rightarrow (n+1).n.(n-1)! = 12(n-1)!$

$\Rightarrow$ (n + 1) n = 12

$\Rightarrow$ (n + 1) n = 4 $\times$ 3

$\Rightarrow$ n = 3

9. In the expansion of $\left(\frac{x}{3}+9y\right)^{10}$, the middle term is T_6.

$T_6 = 10_{C_5}\left(\frac{x}{3}\right)^5(9y)^5$

$= \frac{\underline{|10}}{\underline{|5}\,\underline{|5}}\frac{x^5}{3^5}\times 9^5y^5$

= 252 $\times$ 3^5 x^5 y^5

= 61236 x^5 y^5.

10. Θ $a_1 + a_5 + a_{10} + a_{15} + a_{20} = 225$

$\Rightarrow$ $(a_1 + a_{24}) + (a_5 + a_{20}) + (a_{10} + a_{20}) = 225$

$\Rightarrow$ $3(a_1 + a_{24}) = 225$ [Q $a_1 + a_n = a_2 + a_{n-1} = a_3 + a_{n-2} = \ldots$ in an A.P.]

$\Rightarrow$ $a_1 + a_{24} = 75$

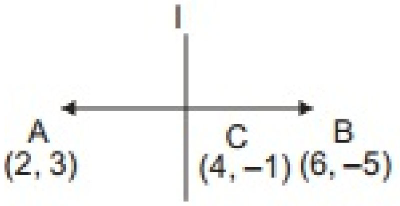
Now, $S_{24} = \frac{24}{2}(a_1 + a_{24})$

= 12 $\times$ 75 = 900.

11. Slope of $AB = \frac{-5-3}{6-2} = \frac{-8}{4} = -2$

$\Theta I \perp AB$,

So, slope of line I is $m = \frac{1}{2}$



equation of line I is

$y+1 = \frac{1}{2}(x-4)$

$\Rightarrow$ x - 2y - 6 = 0.

12. y = sin x cos x

Diffr w.r.t 'x'....

$\frac{dy}{dx} = \sin x\frac{d}{dx}(\cos x) + \cos x\frac{d}{dx}(\sin x)$

= sin x(-sin x) + cos x. cos x

= -$\sin^2$ x + $\cos^2$ x

= cos 2x.

13. $LHS = \sqrt{3}\cos ec\, 20^\circ - \sec 20^\circ$
$= \frac{\sqrt{3}}{\sin 20^\circ} - \frac{1}{\cos 20^\circ} = \frac{\sqrt{3}\cos 20^\circ - \sin 20^\circ}{\sin 20^\circ \cos 20^\circ}$
$= \frac{2\left(\frac{\sqrt{3}}{2}\cos 20^\circ - \frac{1}{2}\sin 20^\circ\right)}{\sin 20^\circ \cos 20^\circ} = \frac{2(\sin 60^\circ \cos 20^\circ - \cos 60^\circ \sin 20^\circ}{\sin 20^\circ \cos 20^\circ}$
$= \frac{2\sin\left(60 - 20^0\right)}{\sin 20^\circ \cos 20^\circ} = \frac{2\sin 40^\circ}{\sin 20 \cos 20^\circ} = \frac{4\sin 40}{2\sin 20^\circ \cos 20^\circ}$
$= \frac{4\sin 40^\circ}{\sin 40^\circ} = 4$

14. (x + iy) (2 - 3i) = 4 + i
$\Rightarrow x + iy = \frac{4+i}{2-3i} = \frac{(4+i)}{(2-3i)} \times \frac{(2+3i)}{(2+3i)}$
$= \frac{5+14i}{13} = \frac{5}{13} + \frac{14}{13}i$
So, $x = \frac{5}{13}$ and $y = \frac{14}{13}$

15. Six periods can be arranged for 5 subject in 6/5 ways. = 720 ways.

One periods is left, which can be arranged for any of the five subject, one left period can be arranged in 5 ways.

Required no, of arrangements = 720 x 5 = 3600.

16. Six periods can be arranged for 5 subject in 6/5 ways.

= 720 ways.

One periods is left, which can be arranged for any of the five subject, one left period can be arranged in 5 ways.

Required no, of arrangements = 720 × 5 = 3600

17. General term, $T_{r+1} = 10_{C_r}\left(2x^2\right)^{10-r}\left(-\frac{1}{3x^3}\right)^r$
$= 10_{C_r} 2^{10-r}\left(-\frac{1}{3}\right)^r x^{20-5r}$

it will be independent of x if 20 - 5r = 0, i.e. if r = 4

so, $T_5 = 10_{C_4} \cdot 2^6\left(-\frac{1}{2}\right)^4 = \frac{4480}{27}$.

18. Let the three numbers be a, ar, ar^2.

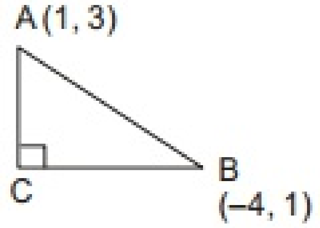
Given a + art ar^2 = 63 ...(1) and a, $ar = \frac{3}{4}ar^2$
$\Rightarrow a = \frac{3}{4}r$ ...... (2)
From (1) and (2) are get
$\frac{3}{4}r + \frac{3}{4}r^2 + \frac{3}{4}r^3 = 63$
$\Rightarrow r^3 + r^2 + r - 84 = 0$
$\Rightarrow (r-4)(r^2 + 5r + 21) = 0$
$\Rightarrow r = 4, \frac{-5\pm\sqrt{25-84}}{2}$

Real value of r is 4. So, a = 3.

$\therefore$, Three numbers are 3, 12, 48,

19. Let ABC be the right angled triangle such that $\angle c = 90^\circ$

Let m be the slope of the line AC then hte slope of BC $= -\frac{1}{m}$.



Equation of AC is : y - 3 = m(x - 1) and equation of BC is

$y = -1 - \frac{1}{m}(x+4)$

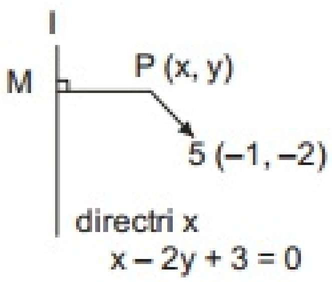
or $x - 1 = \frac{1}{m}(y-3)$

For m = 0, these lines are x + 4 = 0, y - 3 = 0

For , the $m = \infty$ lines are x - 1 = 0, y - 1 = 0.

20. Let P(x, y) be any point on the parabola is using focus directrix property of the parabola, SP = PM

$\therefore \sqrt{(x+1)^2 + (y+2)^2} = \frac{|x-2y+3|}{\sqrt{1^2+(-2)}}$



$\Rightarrow (x+1)^2 + (y+2)^2 = \frac{(x-2y+3)^2}{5}$

$\Rightarrow$ 5x^2 + 5 + 10x + 5y^2 + 20 - 20y = x^2 + 4y^2 + 9 - 4xy - 12y + 6x

$\Rightarrow$ 4x^2 + 4xy + y^2 + 4x + 32y + 16 = 0. This is required equation of parabola.

21. $\lim\limits_{x \to \sqrt{3}} \frac{x^2-3}{x^2+3\sqrt{3}x-12} = \lim\limits_{x \to \sqrt{3}} \frac{(x-\sqrt{3})(x+\sqrt{3})}{x^2+4\sqrt{3}x-\sqrt{3}x-12}$

$= \lim\limits_{x \to \sqrt{3}} \frac{(x-\sqrt{3})(x+\sqrt{3})}{(x+4\sqrt{3})(x-\sqrt{3})} = \lim\limits_{x \to \sqrt{3}} \frac{(x+\sqrt{3})}{(x+4\sqrt{3})}$

$= \frac{2\sqrt{2}}{5\sqrt{3}} = \frac{2}{5}$

22. Number of exhaustive cases in a single throw of three dice = 6 x 6 x 6 = 216. (favorable number of cases = 10{i.e. (1, 1, 1), (1, 1, 2), (1, 2, 1), (2, 1, 1), (1, 2, 2), (2, 1, 2), (2, 2, 1), (1, 1, 3), (1, 3, 1), (3,1,1)}

So, required Probability $= \frac{10}{216} = \frac{5}{108}$

23. We have f(-4) = -4 -4 = -8 and g(-4) = k.

But f(x) = g(x) $\forall$ x.

$\therefore$, -8 = ki.e. k = -8 Ans.

24.

Wages per Week in Rs	Mid value xi	Frequency f_i	Cumulative frequency	Deviation $\|d_i\| = \|x_i - 45\|$	$f_i\|d_i\|$
10-20	15	4	4	30	120
20-30	25	6	10	20	120
30-40	35	10	20	10	100
40-50	45	20	40	0	0
50-60	55	10	50	10	100
60-70	65	6	56	20	120
70-80	75	4	60	30	120
		$N = \sum f_i = 60$			$\sum f_i\|di\| = 680$

Here n = 60, so, $\frac{N}{2} = 30$; Median $= l + \left(\frac{\frac{n}{2} - f_c}{f_m}\right) \times h$

$= 40 + \left(\frac{30+20}{20}\right) \times 10 = 45$

Mean definition from median $= \frac{\sum f_i|di|}{N} = \frac{680}{60} = 11.33\ Ans.$

25. one line is $x \sec\theta - y \cos ec\ \theta - a = 0$ .... (1)

P = length of perpendicular from the origin (0, 0) on (1)

$$\left|\frac{-a}{\sqrt{\sec^2\theta + \cos ec^2\theta}}\right| = \left|\frac{-a}{\sqrt{\frac{1}{\cos^2\theta} + \frac{1}{\sin^2\theta}}}\right| = \left|\frac{-a}{\sin\theta\cos\theta}\right|$$

$\Rightarrow p = a\ \sin\theta\cos\theta$ ... (2)

The other line is $x\cos\theta + y\sin\theta - a\ \cos 2\theta = 0$.... (3)

P' = length of perpendicular from origin (0, 0) on (3) is

$= \left|\frac{-a\ \cos 2\theta}{\sqrt{\cos^2\theta + \sin^2\theta}}\right| = a\ \cos 2\theta$

$\therefore, 4p^2 + p'^2 = 4a^2\cos^2\theta\sin^2\theta + a^2\cos^2 2\theta$

$= a^2(2\cos\theta\sin\theta)^2 + a^2\cos^2 2\theta$
$= a^2\sin^2 2\theta + a^2\cos^2 2\theta$
$= a^2(\sin^2 2\theta + \cos^2 2\theta)$

= a^2

Hence $4p^2 + p'^2 = a^2$

26. Here

$t_n = \frac{1^3+2^3+3.^3+...+n^3}{n} = \frac{\sum_{k=1}^{n} k^3}{n} = \frac{n^2(n+1)^2}{4n}$
$= \frac{n}{4}(n^2+2n+1) = \frac{1}{4}n^3 + \frac{1}{2}n^2 + \frac{1}{4}n$
$S_n = \frac{1}{4}\sum_{k=1}^{n} k^3 + \frac{1}{2}\sum_{k=1}^{n} k^2 + \frac{1}{4}\sum_{k=1}^{n} k$
$= \frac{1}{4}\cdot\frac{n^2(n+1)^2}{4} + \frac{1}{2}\cdot\frac{n(n+1)(2n+1)}{6} + \frac{1}{4}\cdot\frac{n(n+1)}{2}$
$= \frac{n(n+1)}{48}[3n(n+1) + 4(2n+1) + 6]$
$= \frac{n(n+1)}{48}(3n^2 + 1(1n+10) = \frac{n(n+1)(n+2)(3n+5)}{48}$

27. Let x be an arbitrary element of A. Then, there exists a subset, say X, of set A such that x ∈ X. Now,

$X \subset A \Rightarrow X \in P(A)$
$\Rightarrow X \in P(B)\ [\Theta P(A) = P(B)]$
$\Rightarrow X \subset (B)$
$\Rightarrow x \in B\,[\Theta x \in X\ and\ X \subset B\ \therefore x \in B]$
Thus, $x \in A \Rightarrow x \in B$
$\therefore A \subseteq B$

Now, let y be an arbitrary element o B. Then, there exists a subset, say Y, of set B such that y ∈ Y.

Now, $y \subset B \Rightarrow Y \in P(B)$
$\Rightarrow Y \in P(A)\ [\Theta P(A) = P(B)]$
$\Rightarrow Y \subset A$
$\Rightarrow y \in A$
Thus, $y \in B \Rightarrow y \in A$
$\therefore\ B \subseteq A$

... (2)

From (1) and (2), we obtain A = B.

28. $L.H.S = \cos 20^\circ \cos 40^\circ \cos 60^\circ \cos 80^\circ$

$= \frac{1}{2}\cos 20^\circ \cos 40^\circ \cos 80^\circ \ \left[Q \cos 60^\circ = \frac{1}{2}\right]$
$= \frac{1}{4}(2\cos 20^\circ \cos 40^\circ)\cos 80^\circ$
$= \frac{1}{4}[\cos(20^\circ + 40^\circ)\cos(20^\circ - 40^\circ)]\cos 80^\circ$
[Θ 2 cos A cos B = cos (A + B) + cos (A - B)]
$= \frac{1}{4}(\cos 60^\circ + \cos 20^\circ)\cos 80^\circ \ [\Theta \cos(-20^\circ) = \cos 20^\circ]$
$= \frac{1}{4}\left(\frac{1}{2}\cos 80^\circ + \cos 20^\circ \cos 80^\circ\right)$
$= \frac{1}{8}(\cos 80^\circ + 2\cos 20^\circ \cos 80^\circ)$
$= \frac{1}{8}[\cos 80^\circ + 2\cos 20^\circ \cos 80^\circ)$
[Θ 2 cos A cos B = cos (A + B) + cos (A - B)]
$= \frac{1}{8}[\cos 80^\circ + \cos 100^\circ + \cos(-60^\circ) = \frac{1}{8}\left(\cos 80^\circ - \cos 80^\circ + \frac{1}{2}\right)$
$= \frac{1}{8} \times \frac{1}{2} = \frac{1}{16} = R.H.S$
$\left[Q \cos 100^\circ = \cos(180^\circ - 80^\circ) = -\cos 80^\circ and \cos(-60^\circ) = \cos 60^\circ = \frac{1}{2}\right]$

29. Let $P(n) : (1+x)^n \geqslant 1 + nx$, for x > -1, n ∈ Nbe the given statement. For n = 1, P(1): (1 + x)^1 ⩾ 1 + x, which is true, P(1) is true. Assume that P(k)(1+ x)^k ⩾ 1 + kx holds. We shall prove that

P(k+1): (1 + x)$^{k+1}$ ⩾ 1 + (k+1)x

Since x > -1 ⇒ 1 + x > 0

Multiplying both sides of (1) by 1 + x, we get

(1+x)$^{k+1}$ ⩾ (1 + kx) (1 + x) = 1 + kx + x + kx^2 ⩾ 1 + (k+1)x

$[\Theta k \in N,\ x^2 \geqslant 0 \Rightarrow kx^2 \geqslant 0$ for all $x \in R$

$\therefore (1+x)^{k+1} \geqslant 1 + (k+1)x \Rightarrow P(k+1)$ is also true. Hence by mathematical induction, P(n) holds for all $n \in N$.

CBSE Class 11 Mathematics

Sample Papers 05

Time: 3 hours Maximum Marks: 100

General Instructions:

i. All questions are compulsory.
ii. The question paper consists of 29 questions divided into four sections A, B and C. D Section. A comprises of 4 questions of one mark each, section B comprises of 8 questions of 2 marks each and section C comprises of 11 questions of 4 marks each. And Section D comprises of 6 questions of six marks each.
iii. All questions in section A are to be answered in one Word, one sentence or as per the exact requirement of the question.
iv. There is no overall choice. However internal choice has been provided in 4 questions of four marks each and 2 questions of six marks each. You have to attempt only one of the alternatives in all such questions.
v. Use of calculator is not permitted.

SECTION A

1. Write the interval [6, 12] in the set builder form
2. Find the 6^{th} term in the expansions of $(2x - y)^{12}$
3. Find the length of lat us rectum ellipse $\frac{x^2}{49} + \frac{y^2}{36} = 1$
4. A coin is tossed twice what is the probability that at least one head occurs?

SECTION-B

5. Solve the following trigonometric equation: tan 20 = J3
6. Prove that : cos 4x = 1 - 8 $\sin^2$ x Cos^2 x.
7. Reduce the following equation into intercept form and find the intercepts on the axes: 4x - 3y = 6
8. Find the equation of the line passing through the point (3,0) and perpendicular to the line x - 7y + 5 = 0.

9. Find the equation of the line whose perpendicular distance from the origin is 5 units and angle mode by the perpendicular with positive axis is 30^{o}.
10. Find the multiplicative inverse of following complex number : 4 - 3i.
11. Write the contrapositive of the following statements:
    i. If x is prime number, then x is odd.
    ii. If the two lines are parallel then they do not intersect in the same plane.
12. Write the negation of the following statements:
    i. π is not a rational number.
    ii. Zero is a positive number.

SECTION-C

13. Find the equation of the hyperbola whose foci are $\left(\pm 3\sqrt{5}, 0\right)$ and length of lat us rectum is 8.

    OR

    Find the equation of the circle with radius 5 whose centre lies on x-axis s and passes through the point (2, 3).
14. Find the derivative of cot x with respect to x from first principle.

    OR

    Evaluate: $\lim\limits_{x \to 0} f(x)$, when $f(x) = \begin{cases} \dfrac{|x|}{x}, x \neq 0. \\ 0, x = 0. \end{cases}$.
15. Find the co-ordinates of a point on y-axis which is at a distance of $5\sqrt{2}$ from the point R(3,-2, 5)
16. Find the square root of -15 - 8i.

    OR

    Convent the complex number $\frac{1+3i}{1+2i}$, in polar form.
17. In how many of the distinct permutations of the letters in MISSISSIPPI do four I's not come together?

    OR

    How many words or without meaning can be formed with letters of the Word EQUATION at a time so that vowels and Consonants occur together ?
18. In an examination, a question paper consists of 12 questions divided into two parts i.e., Part and Part II containing 5 and 7 questions respectively A student is required to attempt

8 questions all, selecting at least 3 from each part. In how many ways can a student select the questions? Write one importance of examination.

19. In the binomial expansion of $(1 + x)^n$. the coefficient of the 5th, 6th, and 7^{th} terms are in A.P. Find all the value of n for which this can happen.
20. Find the domain and range of the real function $f(x)=\frac{1}{1-x^2}$
21. The function f is defined by $f(x)\begin{cases}1-x & x<0\\ 1, & x=0\\ x+1 & x>0\end{cases}$ Draw the graph of f(x).
22. lf tan A- tan B = X, cot B - cot A = y Prove that: $\cot(A-B)=\frac{1}{x}+\frac{1}{y}$
23. In a class of 60 students, 30 opted of 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
    i. the student opted for NCC or NSS.
    ii. the student has opted NSS but not NCC.

SECTION D

24. Prove the following by using the principle of mathematical induction for all $n \in N$
    3^{2n+2} - 8n - 9 is divisible by 8.
25. Solve the following system of inequalities graphically:
    $x+y \leqslant 4, y \leqslant 3, x+5y \geqslant 4, 6x+2y \geqslant 8, x \geqslant 0, y \geqslant 0$
26. The ratio of the A.M and G. M of two positive numbers a and b be m: n(m > n). Show that
    $a:b=\left(m+\sqrt{m^2-n^2}\right):\left(m-\sqrt{m^2-n^2}\right)$
27. Prove that: $\cos^2 A+\cos^2\left(A+\frac{2\pi}{3}\right)+\cos^2\left(A-\frac{2\pi}{3}\right)=3$
    Prove that: $\left(1+\cos\frac{\pi}{8}\right)\left(1+\cos\frac{3\pi}{8}\right)\left(1+\cos\frac{5\pi}{8}\right)\left(1+\cos\frac{7\pi}{8}\right)=\frac{1}{8}+.$
28. In a survey it was found that 21 people like product A, 26 people like product B and 29 like product C. If 14 people like product A and B. 15 people like product B and C. 12 people like product C and A and 8 people like all three products, find:
    i. How many people like a least one of the products?
    ii. How many people like product C only?
29. Find the mean variance and standard deviation for the following data

C.I.	0-10	10-20	20-30	30-40	40-50
Frequency	5	8	15	16	6

CBSE Class 11 Mathematics

Sample Papers 05

Answer

1. $\{x : 6 \leqslant x \leqslant 12,\ x \in R\}$
2. T_6 = -101376 x^7y^5
3. $\frac{72}{7} units$
4. $\frac{3}{4}$
5. $\theta = \frac{n\pi}{2} + \frac{\pi}{6}$
6. cos 4x =2(cos 2x)^2 - 1

   = 2 (2 cos^{2}x - 1)^2 - 1

   $= \ 2 \ \left[(2cos \ x)^2 \ + \ (1)^2 \ - \ 2 \ (cos2x) \ \ \times 1\right] \ - \ 1$

   = 2 (4cos^{4}x + 1 - 4 cos^{2}x) - 1

   $= 2 \times 4\cos^4 x + 2 \times 1 - 2 \times 4\cos^2 x - 1$

   = 8cos^{4}x + 2 - 8cos^{2}x - 1

   = 8cos^{4}x - 8 cos^{2}x + 2 - 1

   = 8cos^{4}x - 8cos^{2}x + 1

   = 8cos^{2}x (cos^{2}x - 1) + 1

   = 8cos^{2}x [-(1 - cos^{2}x)] + 1

   = -8cos^{2}x [(1 - cos^{2}x)] + 1

   = -8cos^{2}x sin^{2}x + 1

   = 1 - 8cos^{2}x sin^{2}x = R.H.S.

   Hence R.H.S. = L.H.S.

   Hence proved
7. $\frac{x}{\left(\frac{3}{2}\right)} + \frac{y}{(-2)} = 1;$ x- intercept is $\frac{3}{2}$ and Y-intercept is -2.
8. 7x + y = 21
9. $\sqrt{3}x + y = +10$
10. $z^{-1} = \frac{4+3i}{25}$
11.

    i. If x is not odd then x is not prime.

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

12.

i. π iis a rational number

ii. Zero is not a positive number.

13. $\frac{x^2}{25}-\frac{y^2}{20}=1$

14. -cosec^{2}x

OR

LHL = -1; RHL = 1 so, $\lim\limits_{x\to 0} f(x)$ does not exist.

15. (0, 2, 0) or (0, -6, 0)

16. $\pm(1-4i)$

OR

$\sqrt{2}\left(\cos\frac{3\pi}{4}+i\sin\frac{3\pi}{4}\right)$

17. 33810

OR

1440

18. 36750

19. n = 7, 14

20. D(f) = R - {-1, 1}; Range (f)$=(-\infty,0)\cup[1,\infty]$

21.

i. $\frac{19}{30}$

ii. $\frac{2}{15}$

22.

23.

24.

25.

26.

27.

28.

i. 43

ii. 10

29.