10TH CLASS MATHEMATICS MATERIAL PAPER – 1

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Chapter - 01: Real Numbers

CONCEPTS

Types of Number Systems.

1. Natural numbers ($\mathbf{N}$) $= \{1, 2, 3 \ldots.\}$
2. Whole numbers ($\mathbf{W}$) $= \{0, 1, 2, 3, \ldots\ldots\ldots\ldots\ldots\}$
3. Integers (Z) $= \{\ldots\ldots -4, -3, -2, -1, 0, 1, 2, 3, 4, 5, 6, \ldots..\}$
4. Rational Numbers (Q) ={x/x=p/q where p, q$\in Z$,q$\neq 0$}. A number that can be written as a fraction. This includes whole numbers, fractions, and decimals that truncate (end) or repeat.
5. Irrational numbers ($\mathbf{Q'}$ **or** $\mathbf{S}$): A number that cannot be written as a fraction is called irrational number exe: $\sqrt{2}$, $\sqrt{5}$, $\pi \approx 3.14159$
6. Real numbers(R): The set of rational and irrational numbers are called real numbers.
7. All number systems up to real numbers can be represented on number line.

Special number systems

1. **Even number:** Any number that can be divided by 2 with no remainder. $\mathrm{E} = \{2, 4, 6, 8\ldots\ldots\ldots\ldots\ldots\}$
2. **Odd number:** Any number that has a remainder when divided by 2 is called odd number. $\mathrm{O} = \{1, 3, 5, 7\ldots.\}$
3. **Prime number:** A number which has only 2 factors is called prime number. $\mathrm{Exe} = \{2,3,5,7,11,13,17,19\ldots..\}$
4. **Composite number:** A number which has more than 2 factors is called composite number. $\mathrm{Exe} = \{4,6,8,9..\}$
   Note: 1 is neither prime nor composite.

Properties of the number systems.

I) Additive properties.

1. **Closure property (A_1):** If a, b ∈ Q and a+b ∈ Q then Q satisfies closure property in addition.
2. **Commutative property (A_2):** If a, b ∈ Q and $a + b = b + a$ then Q satisfies commutative property in addition.
3. **Associative property (A_3):** If a, b, c ∈ Q and $a + (b + c) = (a + b) + c$ then Q satisfies Associative property in addition.
4. **Identity property (A_4):** If a ∈ Q and if $\exists\ e \in Q$ such that a+ e = e +a = a then Q satisfies Identity property in addition, and e is called identity element in addition. Note: Identity element in addition is zero.
5. **Inverse property (A_5):** If a ∈ Q and if $\exists\ a' \in Q$ such that a+ a' = a' +a = e then Q satisfies Inverse property in addition, and a' is called additive inverse of a. Note: additive inverse of 5 is -5.

II) Multiplicative properties.

1. **Closure property (M_1):** If a, b ∈ Q and $a \times b \in Q$ then Q satisfies closure property in multiplication.
2. **Commutative property (M_2):** If a, b ∈ Q and $a \times b = b \times a$ then Q satisfies commutative property in multiplication.
3. **Associative property (M_3):** If a, b, c ∈ Q and $a \times (b \times c) = (a \times b) \times c$ then Q satisfies Associative property in multiplication.
4. **Identity property (M_4):** If a ∈ Q and if $\exists\ e \in Q$ such that $a \times e = e \times a = a$ then Q satisfies Identity property in multiplication, and e is called identity element in multiplication. Note: Identity element in multiplication is 1.
5. **Inverse property (M_5):** If a ∈ Q and if $\exists\ a' \in Q$ such that $a \times a' = a' \times a = e$ then Q satisfies Inverse property in multiplication, and a' is called multiplicative inverse of a. Note: multiplicative inverse of 5 is $\frac{1}{5}$.

III) Distributive property: $a \times (b + c) = (a \times b) + (a \times c)$ this property is called distributive property.

Properties Table

S.N	Property	N	W	Z	Q
1	**Additive properties**				
A_1	1. closure property	✓	✓	✓	✓
A_2	2. commutative property	✓	✓	✓	✓
A_3	3. associative property	✓	✓	✓	✓
A_4	4. Identity	×	✓	✓	✓
A_5	5. inverse	×	×	✓	✓
2	**Multiplicative properties**				
M_1	1. closure property	✓	✓	✓	✓
M_2	2. commutative property	✓	✓	✓	✓
M_3	3. associative property	✓	✓	✓	✓
M_4	4. Identity	✓	✓	✓	✓
M_5	5. inverse	×	×	×	✓ (except for zero)
M_6	6. distributive law	✓	✓	✓	✓

Theorem 1.1-(Fundamental Theorem of Arithmetic): Every composite number can be expressed (factorised) as a product of primes, and this factorization is unique, apart from the order in which the prime factors occur.

Rational numbers are of two kinds. 1) Terminating decimals, 2) Non terminating but repeating (recurring) decimals.

1) Terminating decimal: A rational number which has no repeating digits in its decimal form is called terminating decimal. Exe: 3.25

2) Non-terminating but repeating (recurring) decimals: A rational number which has repeating digits in the decimal part, in its decimal form are called non-terminating but repeating decimal. Exe: $1.\overline{25}$, $2.03\overline{45}$.

Period: The recurring part of the non-terminating but repeating decimal is called period. Exe: In $1.\overline{25}$ period is 25.

Periodicity: The number of repeating digits in the decimal part of non-terminating but repeating decimal is called periodicity. Exe (1): In $2.03\overline{45}$, periodicity is 2. Exe (2)): In $2.03\overline{415}$ periodicity is 3.

Theorem-1.2: Let x be a rational number whose decimal expansion terminates. Then x can be expressed in the form $\frac{p}{q}$, where p and q are coprime, and the prime factorization of q is of the form 2^n5^m, where n, m are non-negative integers.

Theorem 1.3: Let x = $\frac{p}{q}$ be a rational number, such that the prime factorization of q is of the form 2^n5^m, where n, m are non-negative integers. Then x has a decimal expansion which terminates.

Theorem 1.4: Let x = $\frac{p}{q}$ be a rational number, such that the prime factorization of q is not of the form 2^n5^m, where n, m are non-negative integers. Then x has a decimal expansion which is non-terminating repeating.

1. The sum of the two irrational numbers need not to be irrational.
2. The product of the two irrational numbers need not to be irrational.
3. $\text{HCF} \times \text{LCM} = \text{Product of two numbers.}$
4. Let p be a prime number. If p divides a^2, where a is a positive integer, then p divides a.
5. The beginning of logarithms is attributed to John Napier (1550−1617).
6. John Napier prepared logarithm tables.
7. Logarithmic form of $a^n = x$ is $\log_a x = n$ where a and x are positive numbers and $a \neq 1$.
8. Logarithmic form of $2^3 = 8$ is $log_2 8 = 3$.
9. In $log_a b$, "a" is called base.
10. Exponential form of $log_3 81 = 4$ is $3^4 = 81$.
11. The logarithms of same number to different bases are different.
12. Most commonly used bases are base 10 and base e.
13. 'e' is called the exponential constant. This is an irrational number.
14. $e \approx 2.718281.$
15. Logarithms to base 10 are called common logarithms.
16. Logarithms to base e are called natural logarithms.
17. $log_{10} 2 \approx 0.3010.$
18. $log_{10} 3 \approx 0.4771.$
19. $log_e 2 = ln2 \approx 0.6931.$
20. $log_e 3 = ln2 \approx 1.0986.$
21. The logarithm of unity to any non-zero base is zero. That is $log_a 1 = 0,\ (a \neq 0);\ log_{10} 1 = 0.$
22. The logarithm of any non-zero positive number to the same base is unity. That is $log_a a = 1.$

Laws of Logarithms:

1. $log_a xy = log_a x + log_a y$ (First law).
2. $log_a \frac{x}{y} = log_a x - log_a y$ (Second law).
3. $log_a x^m = m\, log_a x$ (Third law).
4. $a^{log_a \text{N}} = \text{N}.$
5. $\frac{log_x a}{log_y a} = log_x y.$
6. $\frac{log_a y}{log_a x} = log_x y.$
7. $log \frac{y^m}{x^n} = \frac{m}{n} log_x y.$
8. $log_a \text{N} = log_b \text{N} \times log_a b.$
9. $log \frac{ab}{c} = log\, a + log\, b - log\, c.$
10. $log \frac{ab}{cd} = log\, a + log\, b - log\, c - log\, d.$
11. $log\, a^p.b^q = p\, log\, a + q\, log\, b.$
12. $log \frac{a^p.b^q}{c^r.d^s} = p\, log\, a + q\, log\, b - r\, log\, c - s\, log\, d.$
13. **Characteristic: -** the integral part of the logarithm of a number is called Characteristic.

14. The characteristic of n digit number is $n-1$.
15. The characteristic of 786 is 2.
16. If a decimal fraction has n zero's after the decimal point and before the significant number, then the characteristic of that logarithm is $\overline{(n+1)}$
17. The characteristic of 0.000786 is $\bar{4}$.
18. **Mantissa: -**The decimal part of the logarithm of a number is called mantissa. It is non-negative and less than 1.

MULTIPLE CHOICE QUESTIONS

1). Which of the following rational number is terminating? ( )
A) $\frac{2}{5}$ B) $\frac{17}{18}$ C) $\frac{9}{11}$ D) $\frac{10}{15}$

2). Which of the following rational number is non-terminating repeating? ( )
A) $\frac{2}{5}$ B) $\frac{17}{18}$ C) $\frac{7}{40}$ D) $\frac{15}{16}$

3). Which of the following number is rational number? ( )
A) $2^{\frac{1}{2}}$ B) $\sqrt{24}$ C) $\sqrt{30}$ D) $8^{\frac{1}{3}}$

4). Which of the following number is irrational number? ( )
A) $2\frac{1}{2}$ B) $\sqrt{24}$ C) $-\sqrt{81}$ D) $\sqrt{\frac{4}{9}}$

5). The value of $\log_{10} 0.01$ is..... ( )
A) 0.01 B) 2 C) -2 D) $\frac{1}{2}$

6). The prime factorization of 216 is..... ( )
A) $2^2 \times 3^2$ B) $2^3 \times 3^2$ C) $2^3 \times 3^3$ D) $2^4 \times 3^2$

7). $a, b, \in R\ a+b=b+a$. This is..... property. ( )
A) Closure B) Commutative C) Associative D) Identity

8). $log_a xy =$..... ( )
A) $log_a x \times log_a y$ B) $log_x a + log_y a$ C) $log_a a + log_x y$ D) $log_a x + log_a y$

9). $log_{10} 10 =$..... ( )
A) 0 B) 1 C) 10 D) 20

10). $log\ 15 =$..... ( )
A) $\log 3 \times \log 5$ B) $\log 3 + \log 5$ C) $1 + \log 3 - \log 2$ D) both B and C

MATCH THE FOLLOWING

1.	$\frac{3}{4}$	( )	A.	0.796875
2.	$\frac{7}{25}$	( )	B.	0.128
3.	$\frac{51}{64}$	( )	C.	0.375
4.	$\frac{3}{8}$	( )	D.	0.75
5.	$\frac{16}{125}$	( )	E.	0.28

1.	$a+b=b+a$	( )	A.	$distributive$
2.	$a+(b+c)=(a+b)+c)$	( )	B.	$identity$
3.	$a+0=0+a=a$	( )	C.	$Commutative$
4.	$a+(-a)=(-a)+a=0$	( )	D.	$associative$
5.	$a(b+c)=ab+ac$	( )	E.	$inverse$

Fill in the blanks

1). The HCF of 105 and 175 is……
2). The LCM of 12 and 18 is……
3). The logarithmic form of $a^x = b$ is……
4). The logarithmic form of $10^{-3} = 0.001$ is……
5). The exponential form of $\log_4 64 = 3$ is……
6). The value of $\log_3 9$ is……
7). The base used in common logarithm is……
8). The base used in Natural logarithm is……
9). $\log_a a$ =……
10). $\log_a 1$ =……

Very short answer questions (1 Mark Questions)

1). Is there any value of n for which 4^n ends with the digit zero?
2). Express 7429 as a product of its prime factors.
3). Find the LCM of 12, 15 and 21 by the prime factorization method.
4). Find the HCF of 8, 9, and 25 by the prime factorization method.
5). Write 15.265 in the form of $\frac{p}{q}, q \neq 0$ and p, q are co − primes.
6). Write the decimal expansion of $\frac{7}{8}$ without actual division.
7). Write $64 = 8^2$ in logarithmic form.
8). Write $(0.1)^2 = 0.01$ in logarithmic form.
9). Write the exponential form of $\log_5 25 = 2$.
10). Write the exponential form of $\log_2 2 = 1$.
11). Determine the value of $\log_8 2$.
12). Determine the value of $\log_{81} 3$.
13). Expand $\log 15$.
14). Determine the value of $\log_x \sqrt{x}$.
15). Determine the value of $\log_3 243$.

Short answer questions (2 Marks Questions)

1). Find any rational number between $3\frac{1}{3}$ and $3\frac{2}{3}$.
2). Find the HCF and LCM of 12 and 18 by the prime factorization method.
3). Explain why $7 \times 11 \times 13 + 13$ and $7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1 + 5$ are composite numbers.
4). How will you show that $(17 \times 11 \times 2) + (17 \times 11 \times 5)$ is a composite number? Explain.
5). Without actual division state whether $\frac{64}{455}$ will have a terminating decimal or a non-terminating, repeating decimal form.
6). Write the decimal expansion of $\frac{7218}{3^2.5^2}$ using fundamental theorem of arithmetic.
7). Show that $5 - \sqrt{3}$ is irrational.
8). Show that $\sqrt{2} + \sqrt{3}$ is irrational.
9). Expand $\log\frac{343}{25}$.
10). Expand $\log\frac{p^2q^3}{r}$.
11). Write $\log_3 \frac{1}{27} = y$ in exponential form.
12). Determine the value of $\log_{\frac{2}{3}}\left(\frac{8}{27}\right)$.

Essay type questions (4 Marks Questions)

1). Let p be a prime number. If p divides a^2 where a is a positive integer, then prove that p divides a.
2). Prove that $\sqrt{2}$ is irrational.
3). Prove that $\sqrt{p} + \sqrt{q}$ is irrational, where p, q are primes.
4). Write $2\log 3 + 3\log 5 - 5\log 2$ as a single logarithm.

5). Write $\log 10 + 2\log 3 - \log 2$ as a single logarithm.

6). Expand $\log \sqrt{\frac{x^3}{y^2}}$.

7). The magnitude of an earthquake was defined in 1935 by Charles Richer with the expression $M = \log \frac{I}{S}$; where I is the intensity of the earthquake tremor and S is the intensity of a "threshold earthquake".
   a) If the intensity of an earthquake is 10 times the intensity of a threshold earthquake, then what is its magnitude?
   b) If the magnitude of an earthquake registers 10 on the Richter scale, how many times is the intensity of this earthquake higher than that of a threshold earthquake?

8). The formula for calculating pH is $pH = -\log_{10}[H+]$ where pH is the acidity of the solution and $[H+]$ is the hydrogen ion concentration.
   i) If Shankar's Grandma's Lux Soap has a hydrogen ion concentration of $9.2 \times 10^{(-12)}$. What is its pH?
   ii) If the pH of a tomato is 4.2, what is its hydrogen ion concentration?

9). If $x^2 + y^2 = 6xy$, prove that $2\log(x + y) = \log x + \log y + 3\log 2$.

10). Find the number of digits in 4^{2013}, if $\log_{10} 2 = 0.3010$.

Chapter -02: SETS

CONCEPTS

1. Set: A well-defined collection of objects is called a set.
2. Sets are denoted by upper case letters like, A, B, C, D, ……
3. Every object in the set is called an element.
4. George Cantor (1845-1948) developed the set theory.
5. Some symbols used in sets.

S.N	Symbol	Read as
1.	:, /, ∋	such that
2.	∈	belongs to
3.	∉	doesn't belongs to
4.	∅, { }	phi (or) empty set, null set
5.	μ (mu)	universal set
6.	⊂	proper subset of
7.	⊆	sub set of
8.	⊇	super set of
9.	⊃	proper super set of
10.	⊄	not a sub set of
11.	~, ↔	equivalent
12.	∪	union
13.	∩	intersection
14.	$n(A)$	cardinal number of A

6. Left side of the symbol $\in$ *or* $\notin$ contains elements and right side of the symbol contains the set.
7. Sets can be expressed in 3 ways 1) sentence form 2) set builder form 3) roster form.
8. In sentence form set is expressed in a simple sentence.
9. In roster form, all the elements of the set are written, separated by commas, within curly brackets.
10. The roster form of the set of all vowels in the English alphabet is V=$\{a, e, i, o, u\}$.
11. In roster form, the order in which the elements are listed is immaterial and the element should not be repeated.
12. In set builder form, we write characteristic property possessed by the elements of the set within curly brackets.

13. The set builder form of the set of all vowels in the English alphabet is V=$\{x: x$ is a vowel letter in the English alphabet$\}$.
14. **Empty set or Null set or Void set:** A set which does not contain any elements is called an empty set or Null set or Void set. It is denoted by { } or ∅. Exe: A= $\{x: x$ is natural number smaller than $1\}$.
15. ∅ and $\{0\}$ are two different sets.
16. **Singleton set:** A set contains only one element is called a singleton set.
17. **Finite set:** If the number of elements in the set are countable then the set is called finite set.
18. **Infinite set:** If the number of elements in the set are uncountable then the set is called infinite set.
19. Equal sets: Two sets A and B are equal if and only if every element in A belongs to B and every element in B belongs to A.
20. Cardinal number: The number of elements in a set is called the cardinal of the set.
21. Cardinal number of a set A is denoted by $n(\mathrm{A})$.
22. Cardinal number of empty set $n(\emptyset) = 0$.
23. An empty set is a finite set.
24. Equivalent sets: If the cardinal number of two sets is equal then they are called equivalent sets.
25. **Subset:** If every element of A is also an element of B then A is a subset of B. $(\mathrm{A} \subseteq \mathrm{B})$.
26. Proper subset: if $\mathrm{A} \subseteq \mathrm{B}$ and $\mathrm{A} \neq \mathrm{B}$ then A is proper subset of B.
27. Every set is a subset of itself.
28. The empty set (ϕ) is subset of every set.
29. Power set: The set consisting of all the subsets of a set is called the power set of the given set.
30. If a set A contains n elements then its power set $n(P(A))$ contains 2^n elements.
31. If a set contains n elements then the number of proper subsets of that set are 2^n - 1.
32. Universal set: The set which contains all the subsets of given problem is called universal set (μ)
33. Union of sets: The set which contains the elements of either A or B are both is called union set of A and B. It is denoted by$\mathrm{A} \cup \mathrm{B}$.
34. $\mathrm{A} \cup \mathrm{B} = \{x \,/ x \in \mathrm{A}\ or\ x \in \mathrm{B}\}$.
35. Intersection of sets: The set which contains the common elements of both A and B is called intersection set of A and B. It is denoted by$A \cap B$.
36. $\mathrm{A} \cap \mathrm{B} = \{x \,/ x \in \mathrm{A}\ and\ x \in \mathrm{B}\}$.
37. Disjoint sets: If two sets have no common elements then they are called disjoint sets.
38. If $\mathrm{A} \cap \mathrm{B} = \phi$ then A and B are called disjoint sets.
39. If $n(\mathrm{A} \cap \mathrm{B}) = 0$ then A and B are called disjoint sets.
40. $n(\mathrm{A} \cup \mathrm{B}) = n(\mathrm{A}) + n(\mathrm{B}) - n(\mathrm{A} \cap \mathrm{B})$.
41. $n(A \cap B) = n(\mathrm{A}) + n(\mathrm{B}) - n(\mathrm{A} \cup \mathrm{B})$.
42. Difference of two sets: The set elements which are in A and not in B is called difference set of A and B. It is denoted by $\mathrm{A} - \mathrm{B}$.
43. $\mathrm{A} - \mathrm{B} = \{x / x \in \mathrm{A}\ and\ x \notin \mathrm{B}\},\ \mathrm{B} - \mathrm{A} = \{x / x \in \mathrm{B}\ and\ x \notin \mathrm{A}\}$.
44. $\mathrm{A} - \mathrm{B}, \mathrm{B} - \mathrm{A}$ and $\mathrm{A} \cap \mathrm{B}$ are disjoint sets.

MULTIPLE CHOICE QUESTIONS

1). State which of the following is a set? ( )
A) All even numbers B) Stars in the sky C) good boys in the class D) fair girls in the class

2). A is the set of factors of 12. Which one of the following is not a member of A? ( )
A) 1 B) 4 C) 5 D) 12

3). $\mathrm{P} = \{x: x$ is a whole number between 3.5 and $6.7\}, \mathrm{P} =$..... ( )
A) $\{3,4,5,6\}$ B) $\{4,5,6\}$ C) $\{3,4,5\}$ D) $\{3,4,5,6,7\}$

4). The symbol for null set is..... ( )
A) $\{\emptyset\}$ B) ∅ C) ∈ D) ∪

5). Two sets A and B are said to be disjoint if..... ( )

A) $A \cup B = \emptyset$ B) $A \cap B = \emptyset$ C) $A - B = \emptyset$ D) $B - A = \emptyset$

6). If $A - B = \emptyset$ then..... ( )

A) $A \subset B$ B) $B \subset A$ C) $B - A = \emptyset$ D) $B = \emptyset$

7). Which of the following is infinite set? ( )

A) $\{x: x \in N \text{ and } (x-1)(x-2) = 0\}$ B) $\{x: x \in N \text{ and } x^2 - 4\}$

C) $\{x: x \in N \text{ and } 2x - 2 = 0\}$ D)(iv) $\{x: x \in N \text{ and } x \text{ is prime}\}$

8). Which of the following is disjoint set? ( )

A) $\{2,3,4,5\}$ *and* $\{3,6\}$ B) $\{a,e,i,o,u\},\{a,b,c,d\}$ C) $\{2,6,10,11\},\{3,7,11\}$ D) $\{2,6,10\},\{3,7,11\}$

9). Which of the following is a subset of $\{b,c,d\}$? ( )

A) $\{\}$ B) $\{a\}$ C) $\{c,d,e\}$ D) $\{a,b,c\}$

10). How many subsets does the set $\{a,b,c,d,e\}$ have? ( )

A) 4 B) 5 C) 16 D) 32

MATCH THE FOLLOWING

1.	$\{P, R, I, N, C, AL\}$	( )	A.	$\{x: x$ is a positive integer and is a divisor of $18\}$
2.	$\{0\}$	( )	B.	$\{x: x$ is an integer and $x^2 - 9 = 0\}$
3.	$\{1,2,3,6,9,18\}$	( )	C.	$\{x: x$ is an integer and $x + 1 = 1\}$
4.	$\{3, -3\}$	( )	D.	$\{x: x$ is a letter of word PRINCIPAL$\}$
5.	$\{2,3,5,7,11\}$	( )	E.	$\{x: x$ a prime number less than $13\}$

1.	$\{3,6,9,12\}$	( )	A.	$\{x: x = 5^n, n \in N \text{ and } 1 \leq n \leq 4\}$
2.	$\{2,4,8,16,32\}$	( )	B.	$\{x: x = 2n, n \in N \text{ and } 1 \leq n \leq 4\}$
3.	$\{5,25,125,625\}$	( )	C.	$\{x: x = 2^n, n \in N \text{ and } 1 \leq n \leq 5\}$
4.	$\{1,4,9,25, \ldots 100\}$	( )	D.	$\{x: x = 3n, n \in N \text{ and } 1 \leq n \leq 4\}$
5.	$\{2,4,6,8\}$	( )	E.	$\{x: x = n^2, n \in N \text{ and } 1 \leq n \leq 10\}$

1.	$\{1,2,3,6\}$	( )	A.	$\{x: x$ is a prime number and is a divisor of $6\}$
2.	$\{2,3\}$	( )	B.	$\{x: x$ is an odd natural number less than $10\}$
3.	$\{1,2,3,4,5\}$	( )	C.	$\{x: x$ is a natural number and divisor of $6\}$
4.	$\{1,3,5,7,9\}$	( )	D.	$\{x: x$ is a whole number less than $6\}$
5.	$\{0,1,2,3,4,5\}$	( )	E.	$\{x: x$ is a natural number less than $6\}$

Fill in the blanks

1). Roaster form of vowel letter in English alphabet is.....

2). Roaster form of all letters in the word "SCHOOL" is.....

3). Roster form of all letters in the word "INDIA" is.....

4). List of the elements of $P = \{x: x$ is a letter in the word MADAM$\}$ *is* .....

5). $A = \{x: x$ is a natural number smaller than $1\}$. A =.....

6). The set builder from of $A = \{2,4,6,8,10\}$ is.....

7). The set builder from of $A = \{1,3,5,7,9\}$ is.....

8). The set of even prime numbers is a .....set.

9). $A = \{1, 2, 4\}, n(A) =$.....

10). $n(\emptyset) =$ .....

11). .....is a subset of every set.

12). .....is a subset of itself.

13). Universal set is usually represented by a.....

14). If A and B are disjoint sets then $A \cap B =$.....

15). If $A \cap B = \emptyset$ then A and B are ..... sets.

16). If $A \cap B = \emptyset$ then $A - B =$.....

17). If $A \cap B = \emptyset$ then $B - A =$.....

18). If $A \subset B$, then $A \cup B =$.....

19). If $A \subset B$, then $A \cap B =$.....

20). If $A \cap B = \emptyset$ then, $n(A \cup B) =$ .....

21). .....is the Identity set of union.

22). .....is the Identity set of intersection.

23). $n(A) = 20, n(B) = 17, n(A \cap B) = 10$ then $n(A \cup B) =$ .....

24). $n(A) = 70, n(A) = 60, n(A \cup B) = 90$ then $n(A \cap B) =$ .....

25). $n(A \cup B) = 50, n(A) = 30, n(A \cap B) = 12$ then$n\ n(B) =$ .....

Very short answer questions (1 Mark Questions)

1). Write 2 examples of 'sets' from your daily life.
2). List the elements of the set $G =$ all the factors of 20.
3). Write the list of elements of the set X, which contain colours of the rainbow.
4). Write the roaster of "P is the set of all prime numbers less than 10".
5). Write roaster form of $C = \{x: x$ is a two $-$ digit natural number such that the sum of its digits is $8\}$.
6). If $A = \{1, 2, 3\};\ B = \{a, b, c\}$ then find $n(A)$ and $n(B)$.
7). An empty set is a finite set. Is this statement true or false? Why?
8). Let $A = \{2, 5, 6, 8\}$ and $B = \{5, 7, 9, 1\}$. Find $A \cup B$.
9). Find $A \cap B$ when $A = \{5, 6, 7, 8\}$ and $B = \{7, 8, 9, 10\}$.
10). Let $A = \{1, 2, 3, 4, 5\};\ B = \{4, 5, 6, 7\}$. Find $A - B$.

Short answer questions (2 Marks Questions)

1). Write the roster and set builder forms of "The set of natural numbers which are less than 10".
2). List the elements of the set $F =$ the multiples of 4 between 17 and 61 which are divisible by 7.
3). Is "The set of all triangles in a plane having the sum of their three angles less than 180" an empty set? Justify your answer.
4). Let A be the set of prime numbers less than 6 and P the set of prime factors of 30. Check if A and P are equal.
5). Show that the sets A and B are equal, where $A = \{x:\ x$ is a letter in the word 'ASSASSINATION'$\}$, $B = \{x:\ x$ is a letter in the word 'STATION'$\}$.
6). List all the subsets of $C = \{x, y, z\}$.
7). List all the subsets of $E = \{1,4,9,16\}$.
8). Illustrate $A \cup B$ in Venn-diagrams where $A = \{1, 2, 3, 4\}$ and $B = \{2, 4, 6, 8\}$ and find $A \cup B$.
9). Illustrate $A \cap B$ in Venn-diagrams where $A = \{1, 2, 3\}$ and $B = \{3, 4, 5\}$.
10). If $A = \{4, 5, 6\};\ B = \{7, 8\}$ then show that $A \cup B = B \cup A$.
11). If $A = \{1, 2, 3, 4\};\ B = \{1, 2, 3, 4, 5, 6, 7, 8\}$ then find $A \cup B, A \cap B$. What do you notice about the result?
12). $A = \{0, 2, 4\}$, Find $A \cap \emptyset$ and $A \cap A$. Comment.

13). If $A = \{2, 4, 6, 8, 10\}$ and $B = \{3, 6, 9, 12, 15\}$, find $A - B$ and $B - A$.

Essay type questions (4 Marks Questions)

1). State which of the following sets are finite or infinite with reason.
   i) $\{x: x \in N \text{ and } (x-1)(x-2) = 0\}$
   ii) $\{x: x \in N \text{ and } x^2 - 4\}$
   iii) $\{x: x \in N \text{ and } 2x - 2 = 0\}$
   iv) $(iv)\{x: x \in N \text{ and } x \text{ is prime}\}$
   v) $\{x: x \in N \text{ and } x \text{ is odd}\}$.

2). $\mu = \{1, 2, 3, \ldots, 10\}$ is the universal set of which, $A = \{2, 4, 6, 8, 10\}$ and $B = \{4, 6\}$ illustrate these sets with a Venn diagram.

3). $A = \{3, 4, 5, 6, 7\}, B = \{1, 6, 7, 8, 9\}$ find
   i) $n(A \cup B)$
   ii) $n(A) + n(B) - n(A \cap B)$. What do you notice?

4). State whether each of the following statement is true or false. Justify you answers.
   i) $\{2, 3, 4, 5\}$ and $\{3, 6\}$ are disjoint sets.
   ii) $\{a, e, i, o, u\}$ and $\{a, b, c, d\}$ are disjoint sets.
   iii) $\{2, 6, 10, 14\}$ and $\{3, 7, 11, 15\}$ are disjoint sets.
   iv) $\{2, 6, 10\}$ and $\{3, 7, 11\}$ are disjoint sets.

Chapter -03: POLYNOMIALS

CONCEPTS

1. Algebraic expression: An expression consisting of arithmetic numbers, letters (used as symbols) and operation signs is called an Algebraic Expression. Exe: x^2, $2x^2 - \frac{3}{x}$, ...
2. Polynomial: An algebraic expression of the form $a + bx + cx^2 + dx^3 + \ldots\ldots\ldots\ldots$ in which a, b, c, d are constants (numbers) and x is a variable, having non-negative integral exponents is called a polynomial in x.
   The numbers $a, b, c, d \ldots\ldots$ are also called coefficients (therefore constants as they are numbers that do not change like variable x)
3. **Constant:** Algebraic symbols that have a fixed value and do not change like variables (which are used as place holders) are called Constants *Examples:* In $2x + 3y + 4$, 4 is a **constant**.
4. **Variable** A symbol in Algebra that can be plugged in with different numerical values (numbers) is called a variable. In $5p + 6q + r$, the letters (**symbols**) p, q are called **Variables**.
5. **Terms of an expression:** The parts in an algebraic expression connected by the operation signs + or — are called Terms. Exe: In $2y + 3$, $2y$ is one term and 3 is another term.
6. **Types of polynomials according to the number of terms.**
   i. **Monomials:** A Polynomial containing only one term is called a Monomial. Monomials are also called simple expressions. $2x, 5x^2, pq$ are examples of monomials.
   ii. **Binomial**: A Polynomial that contains two terms is called a Binomial. $2x + 3y$, $2p^2 + 9y^3$ are some examples of Binomials.
   iii. **Trinomial**: A Polynomial that has three terms is called a Trinomial. $3x + 4y + 5z$, $ax^2 + bx + c$ are examples of Trinomials.
   iv. **Multinomial**: An algebraic express with more than 3 terms is called a multinomial. $3x + 4y + 5z + ax^2 + c$ is an examples of multinomial.
   v. **Every polynomial is a multinomial but every multinomial need not be a polynomial.**
7. **Factor:** Symbols or Numbers in multiplication are called factors. Example: In $pq, p \text{ and } q$ are factors.
8. In the product xy, x and y are the factors and xy is called the product of $x \text{ and } y$. $x \text{ and } y$ are called **Literal Factors.**
9. **Coefficients:** Coefficients is of two types.
   i. Numerical coefficient.
   ii. Literal coefficient.
10. **Numbers** form Numerical coefficients and **symbols** form literal coefficients.

11. In $2xy$, 2 is the number or the Numerical coefficient while xy, the symbol, is the Literal Coefficient.
12. In the Monomial y, the Numerical coefficient is 1 and the literal coefficient is y.
13. **Degree of a polynomial**: The degree of the term in the polynomial that has the highest degree is called the degree of a polynomial.
14. **Value of a polynomial:** If $p(x)$ is a polynomial in x, and if kis a real number, then the value obtained by replacing x by k in $p(x)$, is called the value of $p(x)$ at $x = k$, and is denoted by $p(k)$.
15. **Zero of a polynomial (Root of a polynomial):** The value of the variable which makes the polynomial zero is known as the zero of the polynomial. Exe: Zero of the polynomial $p(x) = x + 1$ is -1.
16. Zero of the polynomial of $x + a$ is $-a$.
17. Zero of the polynomial of $x - a$ is a.
18. Zero of the polynomial of $ax + b$ is $-\frac{b}{a}$.
19. Zero of the polynomial of $ax - b$ is $\frac{b}{a}$.
20. Types of Polynomials according to their degree:
    i. Zero Polynomial: 0 is called a Zero Polynomial. Its degree is not defined.
    ii. Constant Polynomial: A polynomial of degree 0 is called a Constant polynomial. Exe: $3, -5, 6$.
    iii. Linear Polynomial: A polynomial of degree 1 is called a linear polynomial. Exe: $3x, 5y + 6, 9p + q$.
        a) General form of linear polynomial in one variable is $ax + b$.
        b) A linear polynomial in one variable has only one zero.
        c) The graph of linear polynomial is a straight line.
        d) General form of linear polynomial in two variables is $ax + by + c$.
    iv. Quadratic Polynomial: A polynomial of degree 2 is called a quadratic polynomial. Exe: In $ax^2 + bx + c$, the degree is 2.
        a) General form of Quadratic Polynomial in one variable is $ax^2 + bx + c$.
        b) A Quadratic Polynomial in one variable has two zeroes.
        c) The graph of quadratic polynomial is a parabola.
        d) A Quadratic Polynomial can have either two distinct zeroes or two equal zeroes or no zero.
        e) A polynomial of degree 2 has at most two zeroes.
        f) General form of Quadratic Polynomial in two variables is $ax^2 + bxy + cy^2$.
    v. Cubic Polynomial: A polynomial of degree 3 is called a cubic polynomial. Example: $a^3 + b^3 + 3a^2b + 3ab^2$.
    vi. General form of cubic polynomial in one variable is $ax^3 + bx^2 + cx + d$.
    vii. Cubic polynomial in one variable have at most three zeroes.
    viii. n^{th} degree polynomial: A polynomial of degree n is called n^{th} degree polynomial.
21. A polynomial $p(x)$ of degree n has at most n zeroes.
22. **Like Terms**: Two or more terms that have the same literal coefficients are called Like Terms. Like terms can have different Numerical Coefficients, but not literal coefficients. Exe: 4pq and 100pq are like terms as the literal coefficients are same in the two terms. Two more like terms can be added are subtracted.
23. **Unlike Terms:** Terms that are not like terms are unlike Terms. Exe: $4xy\ and\ 100x$. Two more unlike terms neither be added nor subtracted.
24. Sum of zeroes of a quadratic polynomial$= \alpha + \beta = \frac{-b}{a} = \frac{-(coefficient\ of\ x)}{coefficient\ of\ x^2}$.
25. Product of zeroes of a quadratic polynomial$= \alpha\beta = \frac{c}{a} = \frac{constant}{coefficient\ of\ x^2}$.
26. Quadratic polynomial whose zeroes are α, β is $k(x - \alpha)(x - \beta) = k(x^2 - (\alpha + \beta)x + \alpha\beta)$
27. Sum of zeroes of a cubic polynomial$= \alpha + \beta + \gamma = \frac{-b}{a} = \frac{-(coefficient\ of\ x^2)}{coefficient\ of\ x^3}$.
28. $\alpha\beta + \beta\gamma + \gamma\alpha = \frac{c}{a} = \frac{coefficient\ of\ x}{coefficient\ of\ x^3}$.
29. Product of zeroes of a cubic polynomial$= \alpha\beta\gamma = \frac{-d}{a} = \frac{constant}{coefficient\ of\ x^3}$.
30. If α, β, γ are zeroes, then the polynomial is $(x - \alpha)(x - \beta)(x - \gamma) = (x^3 - x^2(\alpha + \beta + \gamma) + x(\alpha\beta + \beta\gamma + \gamma\alpha) - \alpha\beta\gamma)$
31. **Division Fact:** $\text{Dividend} = (\text{Divisor X Quotient}) + \text{Remainder}$.
32. **Division Algorithm for polynomials:** If $p(x)$ and $q(x)$ are any two polynomials with $g(x) \neq 0$, then we can find polynomials $q(x)$ and $r(x)$ such that $p(x) = g(x) \times q(x) + r(x)$
33. **Remainder Theorem**: If $p(x)$ is a polynomial of degree greater than or equal to 1 and if $p(x)$ is divided by a linear polynomial $(x - a)$, then the remainder is $p(a)$.
34. **Factor Theorem:** $(x - a)$is a factor of $p(x)$ if $p(a) = 0$.
35. **If** $(x - a)$is a factor of $p(x)$ then $p(a) = 0$.

36. If $p(x)$ and $q(x)$ are any two polynomials with $g(x) \neq 0$, and if we can find polynomials $q(x)$ and $r(x)$ such that $p(x) = g(x) \times q(x) + r(x)$ then
   i) If $q(x)$ is linear polynomial then $r(x) =$ r is a constant.
   ii) If degree of $q(x) = 1$, then degree of $p(x) = 1 +$ degree of $g(x)$.
   iii) If $p(x)$ is divided by $(x - a)$, then the remainder is $p(a)$.
   iv) If $r = 0$, we say $q(x)$ divides $p(x)$ exactly or $q(x)$ is a factor of $p(x)$.

MULTIPLE CHOICE QUESTIONS

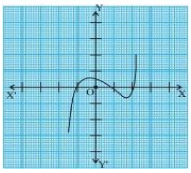
1). State which of the following is not a polynomial? ( )
   A) $2x^3$ B) $\frac{1}{x-1}$ C) $4z^2 + \frac{1}{7}$ D) $m^2 - \sqrt{2}m + 2$

2). State which of the following is a polynomial? ( )
   A) $\frac{1}{x-1}$ B) $\frac{1}{x^2}$ C) $\frac{1}{\sqrt{2x}}$ D) $2x^2 + 3x - \frac{1}{2}$

3). $p(x) = x^2 - 2x - 3$, $p(-1) =$..... ( )
   A) -4 B) -3 C) 0 D) -5

4). The zeroes of $p(x) = x^2 - 2x - 3$ is..... ( )
   A) $1, 3$ B) $1, -3$ C) $-1, 3$ D) $-1, -3$

5). The zero of the linear polynomial $ax + b$ is..... ( )
   A) $\frac{-b}{a}$ B) $\frac{b}{a}$ C) $\frac{a}{b}$ D) $\frac{-a}{b}$

6).  The number of zeros of the adjacent graph are..... ( )
   A) 1 B) 2 C) 3 D) 4

7). The zero of the polynomial $p(x) = x^2 - 3$ are..... ( )
   A) $3, -3$ B) $\sqrt{3}, -\sqrt{3}$ C) $2, -2$ D) $\sqrt{2}, -\sqrt{2}$

8). The zeroes of the polynomial $x^3 - 5x^2 + 6x$ are..... ( )
   A) $1, 2, 3$ B) $0, 1, 2$ C) $0, 1, 3$ D) $0, 2, 3$

9). Sum of zeros of the polynomial $x^2 + 7x + 10$ are.....
   A) -7 B) 7 C) 10 D) -10

10). The product of zeroes of the polynomial $2x^3 - 5x^2 - 14x + 8$ is..... ( )
   A) -1 B) -2 C) -3 D) -4

11). The shape of the graph is $x^2 + 3x + 2$ is ..... ( )
   A) Straight line B) Parabola C) Eclipse D) Triangle

MATCH THE FOLLOWING

	Polynomial		Order
1.	$5x^3 - 4x^2 + x + 1$	( )	A. 2
2.	$7u^6 - 1$	( )	B. 3
3.	$2 - x^4$	( )	C. 4
4.	$y^2 - y$	( )	D. 5
5.	$4x^5 + 2x^2 - 1$	( )	E. 6

1. $zero\ of\ ax + c$ is ( ) A. $\frac{-b}{a}$
2. $zero\ of\ ax - b$ is ( ) B. $\frac{c}{a}$
3. $\alpha + \beta + \gamma =$ ( ) C. $\frac{-d}{a}$
4. $\alpha\beta + \beta\gamma + \gamma\alpha =$ ( ) D. $\frac{b}{a}$
5. $\alpha\beta\gamma =$ ( ) E. $\frac{-c}{a}$

Fill in the blanks

1). $p(x) = x^2 - 5x - 6,\ p(3) =$.....
2). If $p(x) = 5x^7 - 6x^5 + 7x - 6$ then the coefficient of x^5 is.....
3). The degree of constant term is.....
4). The point of intersection on $x - axis$ of $y = 2x$ is.....
5). The point of intersection on $x - axis$ of $y = 2x + 5$ is.....
6). The shape of the graph $y = ax^2 + bx + c$ is.....
7). Any polynomial of degree 2 can have at most.....zeroes.
8). Any polynomial of degree 3 can have at most.....zeroes.
9). The degree of constant term in a polynomial is.....
10). The general form of a quadratic polynomial in variable x is.....
11). The general form of a cubic polynomial in variable x is.....
12). $p(x) = x^2 - 5x - 6$If then $p(2)$.....
13). If $p(m) = m^2 - 3m + 1$ then $p(-1)$.....
14). If $p(x) = x^2 - 4x + 3$ then $p(-3)$.....
15). The graph of $y = ax + b$ intersects the x axis at.....
16). The shape of the graph of $y = ax^2 + bx + c$ is $a > 0$ is.....
17). The shape of the graph of $y = ax^2 + bx + c$ is $a < 0$ is.....
18). The zero of the polynomial $p(x) = x^2 - 6x + 9$ is.....
19). The sum of zeroes of is .....
20). The sum of zeroes of $p(x) = x^2 - 4$ is .....
21). The product of zeroes of $p(x) = x^2 - 4x + 3$ is.....
22). The product of zeroes of $p(x) = x^2 + 2x + 1$ is.....
23). If α, β are zeroes of $p(x) = x^2 + 2x + 3$ then $\frac{1}{\alpha} + \frac{1}{\beta}$ is.....
24). The quadratic polynomial whose zeroes are -2 and $\frac{1}{3}$, is.....
25). The quadratic polynomial whose sum and product of zeroes are -3 and 2, respectively is.....
26). If $p(x) = 3x^3 - 5x^2 - 11x - 3$ then $\alpha + \beta + \gamma =$.....
27). If $p(x) = 2x^3 - 5x^2 - 14x + 9$ then the sum of zeroes is.....
28). If $p(x) = 3x^3 - 5x^2 - 11x - 3$ then $\alpha\beta + \beta\gamma + \gamma\alpha =$.....
29). If $p(x) = 3x^3 - 5x^2 - 11x - 3$ then $\alpha\beta\gamma =$.....

30). If $p(x) = x^3 - 3x^2 + 5x - 3$ then the product of zeros is.....

Very short answer questions (1 mark questions)

1). Write the general form of a first degree polynomial in one variable x.
2). If $p(x) = x^2 - 5x - 6$, find the value of $p(-3)$.
3). Check whether -3 and 3 are the zeroes of the polynomial $x^2 - 9$.
4). Write one polynomial that has one zero.
5). If $p(x) = 5x^7 - 6x^5 + 7x - 6$, find the coefficient of x^5 and degree of $p(x)$.
6). Find the sum and product of zeroes of the polynomial $x^2 - 2x - 8$.
7). What is the quadratic polynomial whose sum of zeroes is $\frac{-3}{2}$ and the product of zeroes is -1.
8). Divide $2x^2 + 3x + 1$ by $x + 2$.
9). Find the quadratic polynomial, for the zeroes $\sqrt{3}, -\sqrt{3}$.
10). Write the Euclid's division algorithm for polynomials.

Short answer questions (2 marks questions)

1). Write the general form of quadratic polynomial and a cubic polynomial in variable x.
2). Let $p(x) = x^2 - 4x + 3$. Find the value of $p(0), p(1), p(2), p(3)$ and obtain zeroes of the polynomial $p(x)$.
3). Check whether -2 and 2 are the zeroes of the polynomials of $x^4 - 16$.
4). Write three polynomials that have 2 zeros each.
5). Draw the graph of $y = 2x + 5$ and find the point of intersection on $x -$ axis.
6). Find the zeroes of the polynomial $p(x) = x^2 + 5x + 6$.
7). Find a quadratic polynomial, the sum and product of whose zeroes are -3 and 2, respectively.
8). Find a quadratic polynomial, the sum and product of whose zeroes are $\sqrt{2}$ and $\frac{1}{3}$, respectively.
9). What is the quadratic polynomial whose sum of zeroes is $\frac{1}{4}$ and the product of zeroes is -1.
10). Divide $3x^3 + x^2 + 2x + 5$ by $1 + 2x + x^2$.
11). Divide the polynomial $p(x) = x^3 - 3x^2 + 5x - 3$ by the polynomial $g(x) = x^2 - 2$ and find the quotient and remainder.

Essay type questions (4 marks questions)

1). Find the zeroes of the given polynomials.
   i) $p(x) = 3x$
   ii) $p(x) = x^2 + 5x + 6$
   iii) $p(x) = (x + 2)(x + 3)$
   iv) $p(x) = x^4 - 16$.
2). Draw the graphs of the polynomials $p(x) = x^2 - x - 12$ and find the zeroes. Justify the answers.
3). Why are and $\frac{1}{4}$ and -1 zeroes of the polynomial $p(x) = 4x^2 + 3x - 1$?
4). Find the zeroes of the quadratic polynomial $x^2 + 7x + 10$, and verify the relationship between the zeroes and the coefficients.
5). Find the zeroes of the quadratic polynomial $t^2 - 15$, and verify the relationship between the zeroes and the coefficients.
6). Verify that $3, -1, -\frac{1}{3}$ are the zeroes of the cubic polynomial $p(x) = 3x^3 - 5x^2 - 11x - 3$, and then verify the relationship between the zeroes and the coefficients.
7). Verify that $1, -1, -3$ are the zeroes of the cubic polynomial $p(x) = x^3 + 3x^2 - x - 3$, and check the relationship between the zeroes and the coefficients.
8). Divide $3x^2 - x^3 - 3x + 5$ by $x - 1 - x^2$, and verify the division algorithm.
9). Find all the zeroes of $2x^4 - 3x^3 - 3x^2 + 6x - 2$, if you know that two of its zeroes are $\sqrt{2}$ and $-\sqrt{2}$.
10). Obtain all the zeroes of $3x^4 + 6x^3 - 2x^2 - 10x - 5$, if two of its zeroes are $\sqrt{\frac{5}{3}}$ and $-\sqrt{\frac{5}{3}}$.
11). Give examples of polynomials $p(x), g(x), q(x)$ and $r(x)$, which satisfy the division algorithm and $\deg p(x) = \deg q(x)$.
12). Find a cubic polynomial with the sum, sum of the product of its zeroes taken two at a time, and the product of its zeroes as $2, -7, -14$ respectively.

13). If the zeroes of the polynomial $x^3 - 3x^2 + x + 1$ are $a - b, a, a + b$. Find a and b.
14). If two zeroes of the polynomial $x^4 - 6x^3 - 26x^2 + 138x - 35$ are $2 \pm \sqrt{3}$, find other zeroes.
15). If the polynomial $x^4 - 6x^3 - 16x^2 + 25x + 10$ is divided by another polynomial $x^2 - 2x + k$, the remainder comes out to be $x + a$, find k and a.

Chapter -04: PAIR OF LINEAR EQUATIONS IN TWO VARIABLES

CONCEPTS

1. **Linear equation:** An equation of the form $ax + by + c = 0$, where a, b, c are real numbers where at least one of a or b is not zero is called a linear equation in two variables x and y.
2. A linear equation in two variables has infinitive many solutions.
3. The geometrical representation of a linear equation in two variables is a straight line.
4. **Pair of Linear equations:** Collection of two linear equations involving the same set of variables is called pair of linear equations.
5. **General form of pair of linear equations in two variables:** The general form for a pair of linear equations in two variables x and y is $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$, Where $a_1, b_1, c_1,\ \ a_2, b_2, c_2$ are all real numbers and ${a_1}^2 + {b_1}^2 \neq 0, {a_2}^2 + {b_2}^2 \neq 0$.
6. If we draw lines representing the pair of equations on graph, only one of the 3 situations is possible.
   i. The two lines may intersect at one point. (one solution)
   ii. The two lines may not intersect, i.e. they may be parallel. (No solutions)
   iii. The two lines may be coincident. (infinitive many solutions)
7. If $a_1x + b_1y + c_1 = 0, a_2x + b_2y + c_2 = 0$ are two linear equations in two variables x and y.

Comparison of ratios	Graphical Representation	Algebraic interpretation	Consistency
$\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$	Intersecting lines	Unique solution	Consistent & independent
$\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$	Parallel lines	No solution	In consistent & independent
$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$	Coincident Lines (Dependent Lines)	Infinite Number of solutions	Consistent & dependent

8. Methods of solving pair of linear equations.
   i. Model method.
   ii. Graphical method.
   iii. Substitution method.(algebraic method)
   iv. Elimination method. (algebraic method)
   v. Cross-Multiplication Method. (algebraic method)

MULTIPLE CHOICE QUESTIONS

1). Which of the following equations is not a linear equation? ( )
A) $5 + 4x = y + 3$ B) $x + 2y = y - x$ C) $3 - x = y^2 + 4$ D) $x + y = 0$
2). Which of the following is a linear equation in one variable? ( )
A) $2x + 1 = y - 3$ B) $2t - 1 = 2t + 5$ C) $2x - 1 = x^2$ D) $x^2 - x + 1 = 0$
3). Which of the following numbers is a solution for the equation $2(x + 3) = 18$? ( )
A) 5 B) 6 C) 13 D) 21
4). The value of x which satisfies the equation $2x - (4 - x) = 5 - x$ is ( )
A) 4.5 B) 3 C) 2.25 D) 0.5
5). The equation $x - 4y = 5$ has ( )

A) No solution B) Unique solution C) Two solutions D) Infinite many Solutions

6). The pair of linear equations $x + y = 2,\ 2x + 2y = 4$ has ..... ( )
A) No solution B) Unique solution C) Two solutions D) Infinite many Solutions

7). The pair of linear equations $2x + y - 5 = 0,\ 3x - 2y - 4 = 0$ has ..... ( )
A) No solution B) Unique solution C) Two solutions D) Infinite many Solutions

8). The solution of pair of linear equations $2x + y - 5 = 0,\ 3x - 2y - 4 = 0$ is ..... ( )
A) $(1,\ 2)$ B) $(2, -1)$ C) $(-2,\ 1)$ D) $(2,\ 1)$

9). If $a_1x + b_1y + c_1 = 0, a_2x + b_2y + c_2 = 0$ has unique solution, then..... ( )
A) $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$ B) $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$ C) $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$ D) $\frac{b_1}{b_2} = \frac{c_1}{c_2}$

10). If $a_1x + b_1y + c_1 = 0, a_2x + b_2y + c_2 = 0$ has no solution, then..... ( )
A) $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$ B) $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$ C) $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$ D) $\frac{b_1}{b_2} = \frac{c_1}{c_2}$

11). If $a_1x + b_1y + c_1 = 0, a_2x + b_2y + c_2 = 0$ has infinite number of solutions, then..... ( )
A) $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$ B) $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$ C) $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$ D) $\frac{b_1}{b_2} = \frac{c_1}{c_2}$

MATCH THE FOLLOWING

1.	$2x + 2y = 5,\ -2x - 2y = 3$ has	( )	A.	Unique solution.
2.	$x + 3y = 3,\ 2x + 6y = 6$ has	( )	B.	No solutions.
3.	$x + y = 3,\ y - x = 1$ has	( )	C.	Infinite solutions.
4.	Solution of $x + y = 3,\ x - y = 1$	( )	D.	$(2, 1)$
5.	Solution $of\ x + y = 3, y - x = 1$	( )	E.	$(1, 2)$

Fill in the blanks

1). The condition to represent $ax + by + c = 0$ a linear equation is.....

2). The geometrical representation of a linear equation in two variables is a.....

3). A linear equation in two variables has.....solutions.

4). The system of equations which has at least one solution is called.....

5). The system of equations which has no solution is called.....

6). In model method.....are used to represent the unknowns.

7). If a man does $\frac{1}{5}$ th of a work in a day, he takes.....days to complete the work.

8). If a man does $\frac{2}{7}$ th of a work in a day, he takes.....days to complete the $\frac{5^{th}}{7}$ of the work.

Very short answer questions (1 mark questions)

1). Is a dependent pair of linear equations always consistent? Why or why not?
2). For what value of $'k'$, the pair of equation $3x + 4y + 2 = 0$ and $9x + 12y + k = 0$ represent coincident lines?
3). Define break-even point.

Short answer questions (2 marks questions)

1). For what value of $'p'$ the following pair of equations has a unique solution. $2x + py = -5$ and $3x + 3y = -6$.
2). Find the value of 'k' for which the pair of equations $2x - ky + 3 = 0, 4x + 6y - 5 = 0$ represent parallel lines.
3). For what value of $'k'$, the pair of equation $3x + 4y + 2 = 0$ and $9x + 12y + k = 0$ represent coincident lines.
4). Solve the following pair of linear equations by the substitution method. $x + y = 14$ $x - y = 4$.
5). Solve these simultaneous equations using the elimination method. $3x - 5y = 4, 3y - 4x = 2$.
6). Solve whether $3x + 2y = 11$, $2x + 3y = 4$, using elimination method.

Essay type questions (4 marks questions)

1). Check whether $2x + y - 5 = 0$, $3x - 2y - 4 = 0$ is intersecting, parallel or coincident lines. Find the solution if the equations are consistent. $2x + y - 5 = 0$, $3x - 2y - 4 = 0$.
2). The perimeter of a rectangular plot of land is 32m. If the length is increased by 2m and the breadth is decreased by 1m, the area of the plot remains the same. Find the length and breadth of the plot.
3). Check whether $3x + 2y = 5$, $2x - 3y = 7$, are consistent or inconsistent. Solve them graphically.
4). Check whether $\frac{3}{2}x + \frac{5}{3}y = 7$, $9x - 10y = 14$, are consistent or inconsistent. Solve them graphically.
5). 5 pencils and 7 pens together cost ₹50 whereas 7 pencils and 5 pens together cost ₹46. Find the cost of one pencil and that of one pen.
6). The area of a rectangle gets reduced by 80 sq. units it its length is reduced by 5 units and breadth is increased by 2 units. If we increase the length by 10 units and decrease the breadth by 5 units, the area will increase by 50 sq. units. Find the length and breadth of the rectangle.
7). Solve the following pair of linear equations $3x + 2y = 11, 2x + 3y = 4$ using elimination method.
8). Snigdha went to a bank to withdraw ₹2000. She asked the cashier to give ₹50and ₹100 notes only. Snigdha got 25 notes in all. Can you tell how many notes of ₹50 and ₹100 she received?
9). In a competitive exam, 3 marks are be awarded for every correct answer and for every wrong answer, 1 mark is deducted. Madhu scored 40 marks in this exam. Had 4 marks been awarded for each correct answer and 2 marks deducted for each incorrect answer, Madhu would have scored 50 marks. How many questions were there in the test? (Madhu attempted all the questions).
10). Mary told her daughter, "Seven years ago, I was seven times as old as you are now. Also, three years from now, I shall be three times as old as you will be." Find the present age of Mary and her daughter.
11). The ratio of incomes of two persons is $9 : 7$ and the ratio of their expenditures is $4 : 3$. If each of them manages to save ₹2000 per month, find their monthly income.
12). The sum of a two digit number and the number obtained by reversing the digits is 66. If the digits of the number differ by 2, find the number. How many such numbers are there?
13). Places A and B are 100 km apart on a highway. One car starts from A and another from B at the same time at different speeds. If the cars travel in the same direction, they meet in 5hours. If they travel towards each other, they meet in 1 hour. What are the speeds of the two cars?
14). Two angles are complementary. The larger angle is $3°$ less than twice the measure of the smaller angle. Find the measure of each angle.
15). Solve the given pair of equations. $\frac{2}{x} + \frac{3}{y} = 13$, $\frac{5}{x} - \frac{4}{y} = -2$.
16). Solve the given pair of equations. $\frac{2}{\sqrt{x}} + \frac{3}{\sqrt{y}} = 2$, $\frac{4}{\sqrt{x}} - \frac{9}{\sqrt{y}} = 1$.
17). Kavitha thought of constructing 2 more rooms in her house. She enquired about the labour. She came to know that 6 men and 8 women could finish this work in 14 days. But she wanted the work completed in only 10 days. When she enquired, she was told that 8 men and 12 women could finish the work in 10 days. She wondered how much time would be taken to finish the work if one man or one woman worked alone.
18). A boat goes 30 km upstream and 44 km downstream in 10 hours. In 13 hours it can go 40 km upstream and 55 km downstream. Determine the speed of the stream and that of the boat in still water.

Chapter -05: QUADRATIC EQUATIONS

CONCEPTS

1. **Quadratic equation:** A Quadratic Equation is one that can be written in the standard form $ax^2 + bx + c = 0$, where a, b, and c are real numbers and a does not equal zero.
2. The general form of quadratic equation in variable x is $ax^2 + bx + c = 0$.
3. **Root:** A real number α is called a root of the quadratic equation $ax^2 + bx + c = 0, a \neq 0$ if $a\alpha^2 + b\alpha + c = 0$.
4. **Discriminant:** $b^2 - 4ac$ is called the discriminant of the quadratic equation $ax^2 + bx + c = 0$.
5. The roots of the quadratic equation $ax^2 + bx + c = 0$ are given by $\frac{-b \pm \sqrt{b^2-4ac}}{2a}$.
6. Nature of roots of quadratic equation $ax^2 + bx + c = 0$.

Discriminant	Roots	No of roots	Nature of roots
$b^2 - 4ac > 0$	$\frac{-b + \sqrt{b^2 - 4ac}}{2a}, \quad \frac{-b - \sqrt{b^2 - 4ac}}{2a}$	2	Distinct & Real roots
$b^2 - 4ac = 0$	$\frac{-b}{2a}, \quad \frac{-b}{2a}$	1	Same & Real roots
$b^2 - 4ac < 0$			No real roots

7. $\alpha + \beta = \frac{coefficient\ of\ x}{coefficient\ of\ x^2} = \frac{-b}{a}$.
8. $\alpha\beta = \frac{constant}{coefficient\ of\ x^2} = \frac{c}{a}$

MULTIPLE CHOICE QUESTIONS

1). Which of the following equations is quadratic equation? ( )
A) $x^2 - 6x - 4 = 0$ B) $x^3 - x^2 + 2x - 1 = 0$ C) $x^2 + \frac{1}{x^2} = 2$ D) $x^4 + x + 7 = 0$

2). The roots of the quadratic equation $x - \frac{1}{x} = 0$ are..... ( )
A) 0 B) ± 1 C) ± 2 D) ± 3

3). The roots of the quadratic equation $x^2 - 6x - 4 = 0$ ( )
A) Real and equal B) Real and distinct C) cannot be determined D) Complicated

4). The valve of k if $x^2 - 6x + k = 0$ has equal roots. ( )
A) 6 B) -6 C) 9 D) -9

5). The valve of k in $x^2 - kx + 2 = 0$ if the sum of the roots is zero. ( )
A) 1 B) 2 C) -1 D) 0

6). If one root of the equation $x^2 - px + 6 = 0$ is 3 then the value of p is ..... ( )
A) 6 B) 1 C) 5 D) -1

7). The valve of k if $x^2 - 6x + k = 0$ has real and distinct roots. ( )
A) $k > 9$ B) $k < 9$ C) $k = 9$ D) $k = 6$

8). The quadratic equation $ax^2 + bx + c = 0$ has two distinct real roots if..... ( )
A) $b^2 - 4ac < 0$ B) $b^2 - 4ac = 0$ C) $b^2 - 4ac > 0$ D) $b^2 = 4ac$

9). The quadratic equation $ax^2 + bx + c = 0$ has same real roots if..... ( )
A) $b^2 - 4ac < 0$ B) $b^2 - 4ac = 0$ C) $b^2 - 4ac > 0$ D) $b^2 + 4ac < 0$

10). The discriminant of $x^2 - 6x + 9 = 0$ ( )

A) -6 B) 9 C) 6 D) 0

MATCH THE FOLLOWING

1.	$b^2 - 4ac > 0$	( )	A.	Two equal real roots.
2.	$b^2 - 4ac = 0$	( )	B.	No real roots.
3.	$b^2 - 4ac < 0$	( )	C.	Two equal roots.
4.	Discriminant of $2x^2 - 6x + 3 = 0$	( )	D.	-3 1
5.	Discriminant of $2x^2 - 3x + 5 = 0$	( )	E.	12

Fill in the blanks

1). The standard form of quadratic equation is.....

2). The discriminant of the quadratic equation $ax^2 + bx + c = 0$ is.....

3). If $b^2 - 4ac > 0$ then the number of roots of quadratic equation $ax^2 + bx + c = 0$ is.....

4). If $b^2 - 4ac = 0$ then the number of roots of quadratic equation $ax^2 + bx + c = 0$ is.....

5). If $b^2 - 4ac < 0$ then the number of real roots of quadratic equation $ax^2 + bx + c = 0$ is.....

6). The sum of the roots of the quadratic equation $ax^2 + bx + c = 0$ is .....

7). The product of the roots of the quadratic equation $ax^2 + bx + c = 0$ is.....

8). Discriminant of $ax^2 - (a + b)x + b = 0$ is.....

9). The sum of roots of $x^2 - 3x + 7 = 0$ is.....

10). If one root of $x^2 - px + q = 0$ is 2 and $p^2 = 4q$ then the other root is.....

11). The product of roots of $px^2 + qx + r = 0$ is.....

12). The product of roots of $x^2 - 2x = 15$ is.....

13). The product of roots of $3x^2 - 10x + 3 = 0$ is.....

14). The product of roots of $8x^2 = 3$ is.....

15). The product of roots of $3x^2 + 9x + 6\sqrt{3} = 0$ is.....

Very short answer questions (1 mark questions)

1). Define quadratic equation.

2). The product of two consecutive positive integers is 306. Find the integers.

3). Find two numbers whose sum is 27 and product is 182.

4). Find the roots of the equation $x^2 - 10x + 9 = 0$ by the method of completing the square.

5). Find the discriminant of the quadratic equation $x + \frac{1}{x} = \frac{5}{2}$.

6). Show that the sum of roots of a quadratic equation is $\frac{-b}{a}$.

7). Show that the product of roots of a quadratic equation is $\frac{c}{a}$.

Short answer questions (2 marks questions)

1). The hypotenuse of a right triangle is 25 cm. We know that the difference in lengths of the other two sides is 5 cm. Find out the length of the two sides?

2). Find the roots of the equation $2x^2 - 5x + 3 = 0$, by factorization.

3). Find the roots of the quadratic equation $x - \frac{1}{3x} = \frac{1}{6}$.

4). Find the roots of the quadratic equation $3(x-4)^2-5(x-4)=12$ by factorization.
5). Find two consecutive positive integers, sum of whose squares is 613.
6). Find two consecutive odd positive integers, sum of whose squares is 290.
7). Find the dimensions of a rectangle whose perimeter is 28 meters and whose area is 40 square meters.
8). Find the roots of the equation $5x^2-6x-2=0$ by the method of computing the square.
9). Find the roots of the equation $2x^2+x-4=0$ by applying the quadratic formula.
10). If a polygon of 'n' sides has $\frac{1}{2}n\ (n-3)$ diagonals. How many sides will a polygon with 65 diagonals have? Is there a polygon with 50 diagonals?
11). Find the values of k for each of the quadratic equations $2x^2+kx+3=0$, so that they have two equal roots.

Essay type questions (4 marks questions)

1). The altitude of a right triangle is 7 cm less than its base. If the hypotenuse is 13 cm, find the other two sides.
2). The difference of squares of two numbers is 180. The square of the smaller number is 8 times the larger number. Find the two numbers.
3). A train travels 360 km at a uniform speed. If the speed had been 5 km/h more, it would have taken 1 hour less for the same journey. Find the speed of the train.
4). Two water taps together can fill a tank in $9\frac{3}{8}$ hours. The tap of larger diameter takes 10hours less than the smaller one to fill the tank separately. Find the time in which each tap can separately fill the tank.
5). A ball is thrown vertically upward from the top of a building 96 feet tall with an initial velocity 80 m/second. The distance 's' of the ball from the ground after t seconds is $S=96+80t-16t^2$. After how may seconds do the ball strike the ground?
6). Is it possible to design a rectangular mango grove whose length is twice its breadth, and the area is 800 m^2? If so, find its length and breadth.
7). The sum of the ages of two friends is 20 years. Four years ago, the product of their ages in years was 48. Is the situation possible? If so, determine their present ages.

Chapter -06: PROGRESSIONS

CONCEPTS

1. **Patterns:** Things are numbers that are arranged following a rule or rules.
2. **Term:** Each number in the pattern is called term.
3. **Progression:** A series of values in which every term is obtained from its predecessor in the same way.
4. **Arithmetic progression** $(\mathrm{A.P})$**:** Arithmetic progression is a list of numbers in which each term is obtained by adding or subtracting a fixed number to the preceding term except the first term.
5. $\mathrm{A.P}=a,a+d,a+2d,a+3d$ … … …..
6. **Common difference(d):** The difference between any term and the preceding term is called common difference.
7. Common difference $d=a_2-a_1=a_3-a_2$.
8. Common difference may be zero. Exe: 2,2,2,2 ……is also an arithmetic progression.
9. Arithmetic progressions are of two types.
   i. Finite arithmetic progression.
   ii. Infinite arithmetic progression.
10. **Finite arithmetic progression:** A finite portion of an arithmetic progression is called a finite arithmetic progression. (or) An arithmetic progression with finite number of terms is called Finite arithmetic progression.
11. Finite arithmetic progression will have last term.
12. The sum of the members of a finite arithmetic progression is called an arithmetic series. Exe: $3+7+11+15$.
13. **Infinite arithmetic progression:** An arithmetic progression which is not finite is called infinite arithmetic progression.

14. Infinite arithmetic progression will not have last term.
15. The sum of the members of a finite arithmetic progression is called an arithmetic series.
16. In A. P nth term $a_n = a + (n-1)d$.
17. In A. P sum of n terms $S_n = \frac{n}{2}(2a + (n-1)d) = \frac{n}{2}(a + l)$
18. In A. P. the sum of the first n terms is n times the average of the first and last term.
19. In A. P. $a_1 = S_1, a_2 = S_2 - S_1, d = S_2 - 2S_1,\ \ a_n = S_n - S_{n-1}$.
20. **Arithmetic mean:** when three quantities are in A.P. the middle term is said to be the arithmetic mean of the other two.
21. If a, b, c are in A.P then $b = \frac{a+c}{2}$.
22. Arithmetic mean of a, b is $\frac{a+b}{2}$.
23. **Geometric Progression** (G. P)**:** A sequence in which the ratio of each term (except the first) to the preceding term is a non – zero constant. G. P $= a, ar^2, ar^3$ … …
24. Common ratio (r): The constant ratio in G.P is called common ratio. $r = \frac{a_2}{a_1} = \frac{a_3}{a_2} = \frac{a_4}{a_3}$.
25. In G. P nth term $a_n = ar^{n-1}$.

Formulae

1) In (A. P) nth term $a_n = a + (n-1)d$.
2) In (A. P) sum of n terms $S_n = \frac{n}{2}(2a + (n-1)d) = \frac{n}{2}(a + l)$
3) In (A. P) $a_1 = S_1, t_2 = S_2 - S_1, d = S_2 - 2S_1$.
4) If a, b, c are in A.P then $b = \frac{a+c}{2}$.
5) Arithmetic mean of a, b is $\frac{a+b}{2}$.
6) Sum of first n natural numbers $(\sum n) = \frac{n(n+1)}{2}$.
7) $1 + 2 + 3 + \cdots + n = \frac{n(n+1)}{2}$.
8) Sum of first n odd natural numbers is n^2.
9) Sum of first n even natural numbers is $n^2 + n$ or $n(n+1)$
10) In G. P nth term $t_n = ar^{n-1}$.

MULTIPLE CHOICE QUESTIONS

1). The common difference of AP may be…… ( )
A) Positive B) Negative C) 0 D) all

2). The common difference of $-7, -9, -11, -13, ..$ is…… ( )
A) 2 B) -7 C) -9 D) -2

3). The common difference of $\frac{1}{4}, \frac{-1}{4}, \frac{-3}{4}, \frac{-5}{4}$, … … . is…… ( )
A) $\frac{1}{4}$ B) $\frac{-1}{4}$ C) $\frac{-1}{2}$ D) $\frac{1}{2}$

4). The 7th term of the AP: $\frac{1}{4}, \frac{-1}{4}, \frac{-3}{4}, \frac{-5}{4}$, … … . is…… ( )
A) $\frac{1}{4}$ B) $\frac{-11}{4}$ C) $\frac{-7}{4}$ D) $\frac{11}{4}$

5). If $a = 10, d = 10$ of AP, then 4th term is…… ( )
A) 10 B) 20 C) 30 D) 40

6). If $a = -2, d = 0$ of AP, then 3th term is…… ( )
A) 2 B) -2 C) -4 D) -6

7). The number of terms in the AP 7,13,19, … . .205 is…… ( )
A) 34 B) 33 C) 32 D) 31

8). The sum of first n positive integers is given by…… ( )
A) $\frac{n(n-1)}{2}$ B) $\frac{n(n+1)}{2}$ C) $\frac{n(2n+1)}{2}$ D) $\frac{n(n+2)}{2}$

9). The number of terms in AP $-5 + (-8) + (-11) + \cdots . . + (-230)$ is…… ( )
A) 70 B) 72 C) 74 D) 76

10). If $a_n = 3 + 4n$, then the 5th term is…… ( )
A) 12 B) 17 C) 19 D) 23

11). The 20th term of $\frac{5}{2}, \frac{5}{4}, \frac{5}{8}$ is…… ( )

A) $\frac{5}{2^{10}}$ B) $\frac{5}{2^{20}}$ C) $\frac{1}{2^{10}}$ D) $\frac{5}{2^5}$

12). The common ratio of $2, 2\sqrt{2}, 4$ is..... ( )

A) 2 B) $2\sqrt{2}$ C) $\sqrt{2}$ D) 4

13). .....term of the GP $2, 8, 32$ ... ... is 512 ( )

A) 5 B) 8 C) 12 D) 16

MATCH THE FOLLOWING

1.	Arithmetic mean of 9 and 25	( )	A.	21.
2.	The arithmetic mean of 17, 18, 19	( )	B.	20.
3.	The arithmetic mean of 6 and 32 is x, then x is.....	( )	C.	19.
4.	Sum of first 6 natural numbers is.....	( )	D.	18
5.	Sum of first 4 even natural numbers is	( )	E.	17

Fill in the blanks

1. $a_n = \frac{n}{n+1}$, then a_4 =.....
2. The common difference of the series $13,\ 8,\ 3,\ -2$, is.....
3. The common difference of the series $0.6,\ 1.7,\ 2.8,\ 3.9$, is.....
4. The common difference of the series $x + \frac{4x}{3} + \frac{5x}{3} + 2x + \cdots$ is.....
5. The n[th] term of A.P is $2n + 5$. Its common difference is.....
6. In A.P $t_n = 5n - 1$. Its common difference is.....
7. The n[th] term of A.P is $n - 3$. Its first term is.....
8. The 11[th] term in $1, 3, 5, 7, \ldots\ldots$ .. is.....
9. In the series $10,\ 8,\ 6, \ldots\ -28$ is .....term.
10. If $x + y, x - y, x - 3y$, ... are in A.P then its 15[th] term is.....
11. If $a = -3, d = -2$ then its 20[th] term is.....
12. If $k + 2, 4k - 6, 3k - 2$ are in A.P then k = ...
13. The n^{th} term of $1 + 3 + 5 + \ldots\ldots\ldots$ .. is.....
14. The n^{th} term of $2 + 4 + 6 + \ldots\ldots$ .. is.....
15. In A. P, n^{th} term is $3n + 1$ then S_n =.....
16. If $\sum n = 66$ then n = ...
17. Sum of n terms of $(a - 1) + (a - 2) + a - 3) + \cdots$ is.....
18. The 10[th] term in$1,\ 2,\ 3,\ 4, \ldots\ldots$ is.....
19. Sum of first n natural numbers is.....
20. Sum of first 10 natural numbers is.....
21. Sum of first 100 natural numbers is.....
22. $65 - \sum_{n=1}^{10} n$ = ...
23. Arithmetic mean of 4 and 20 is.....
24. Arithmetic mean of 5 and 25 is.....
25. Arithmetic mean of $a + 2,\ a,\ a - 2$ is.....
26. Arithmetic mean of $a + 2,\ a - 2$ is.....
27. If $a = 12, b = 18$, then the Arithmetic mean of a, b is.....
28. In A.P the sum of 3 terms is 39, its middle term is.....

29. The no. of multiples of 9 between 1, 1000 is……
30. The sum of all the integers between 50 and 350 which end in 1 is……
31. The terms $4, 8, 16, 32$.. are in ……
32. The n^{th} term of a, ar, ar^2, ar^3, …. is……
33. The common ratio of $3, -6, 12, -24,\ 48, \ldots$.. is……
34. The common ratio of $4, -8, 16, -32 \ldots$.. is……
35. The common ratio of $2, \sqrt{8}, 4 \ldots$.. is……
36. The common ratio of $1 - \frac{1}{3} + \frac{1}{9} - \frac{1}{27} + \ldots$.. is……
37. The common ratio of $\frac{1}{2}, -\frac{1}{4}, \frac{1}{8}, -\frac{1}{16}$, .. is……
38. The n^{th} term in $8, 16, 32, 64$ is……
39. The n^{th} term in $1, \frac{1}{2}, \frac{1}{4}, \frac{1}{8}$, … is……
40. The 7^{th} term in $1, -\frac{1}{2}, \frac{1}{4}$ …. is……
41. The 11^{th} term in $1, -\frac{1}{2}, \frac{1}{4}$ …. is……
42. The 10^{th} term in $\frac{3}{2}, \frac{3}{4}, \frac{3}{8}$ … is……
43. In G. P, $t_n = 5(0.3)^{n-1}$. Its common ratio is……
44. If the n^{th} term of a G. P is $2(0.5)^{n-1}$ then the common ratio is……
45. If the n^{th} term of a G. P is $2(0.2)^{n-1}$ then its 3rd term is……
46. In G. P the 6th term is 24 and 13th term is $\frac{3}{16}$ then its 20th term is……
47. In G. P the 1th term is 1 and 4th term is 27 then its common ratio is……

Very short answer questions (1 mark questions)

1). Find the first term and common difference of AP of $-5, -1, 3, 7, \ldots$
2). Find the 10th term of the AP: $5, 1, -3, -7 \ldots$
3). In a flower bed, there are 23 rose plants in the first row, 21 in the second, 19 in the third, and so on. There are 5 rose plants in the last row. How many rows are there in the flower bed?
4). Find the 30th term of the AP: $10, 7, 4$ … … …
5). Which term of the AP: 3, 8, 13, and 18. . . is 78?
6). If the sum of the first 14 terms of an AP is 1050 and its first term is 10, find the 20th term.
7). Write the G.P. if the first term $a = 3$, and the common ratio $r = 2$.

Short answer questions (2 marks questions)

1). If $a = 4$ and $d = -3$ of an AP. Find the first four terms.
2). Which term of the AP: $21, 18, 15 \ldots$ is – 81? Is there any term 0? Give reason for your answer.
3). Determine the AP whose 3rd term is 5 and the 7th term is 9.
4). How many two-digit numbers are divisible by 3?
5). Check whether, –150 is a term of the AP : 11, 8, 5, 2 . . .
6). If the 3rd and the 9th terms of an AP are 4 and – 8 respectively, which term of this AP is zero?
7). Find the 20th term from the end of the AP: 3, 8, 13, . . . 253.
8). How many terms of the AP: 24, 21, 18, . . . must be taken so that their sum is 78?
9). Find the sum of first 24 terms of the list of numbers whose nth term is given by $a_n = 3 + 2n$.
10). In an AP: Given $a_{12} = 37, d = 3$, find a and S_{12}.
11). Write three terms of the G.P. when the first term $a = \sqrt{5}$ and the common ratio $\frac{1}{5}$ are given?
12). Find x so that $x,\ x + 2,\ x + 3$ are consecutive terms of a geometric progression.
13). Find the 20th and nth term of the G.P. $\frac{5}{2}, \frac{5}{4}, \frac{5}{8}$.
14). Which term of the G.P: $2,\ 2\sqrt{2},\ 4 \ldots$.. is 128?
15). In a GP the 3rd term is 24 and 65th term is 192. Find the 10th term.
16). Find the 12th term of a G.P. whose 8th term is 192 and the common ratio is 2.

Essay type questions (4 marks questions)

1). The sum of the 4th and 8th terms of an AP is 24 and the sum of the 6th and 10th terms is 44. Find the first three terms of the AP.
2). The first and the last terms of an AP are 17 and 350 respectively. If the common difference is 9, how many terms are there and what is their sum?
3). Find the sum of the first 40 positive integers divisible by 6.
4). 200 logs are stacked in the following manner: 20 logs in the bottom row, 19 in the next row, 18 in the row next to it and so on. In how many rows are the 200 logs placed and how many logs are in the top row?

Chapter -07: COORDINATE GEOMETRY

CONCEPTS

1. Father of Analytical Geometry is Rene Descartes.
2. The horizontal line in the graph is called X- axis.
3. The vertical line in the graph is called Y- axis.
4. The intersecting point of horizontal and vertical lines is called origin (O). It is represented by (0, 0).
5. X and Y axes divide the plane into four regions.
6. Four regions are called quadrants.
7. They are denoted by Q_1, Q_2, Q_3, Q_4.
8. Every point in the plane is denoted by a unique ordered pair(x, y).
9. In $(x, y), x$ is called x coordinate or abscissa.
10. In $(x, y), y$ is called y coordinate or ordinate.
11. If $x > 0, y > 0$ then (x, y) lies in Q_1.
12. If $x < 0, y > 0$ then (x, y) lies in Q_2.
13. If $x < 0, y < 0$ then (x, y) lies in Q_3.
14. If $x > 0, y < 0$ then (x, y) lies in Q_4.
15. If $x = 0, y > 0$ then (x, y) lies on positive $Y -$ axis.
16. If $x = 0, y < 0$ then (x, y) lies on negative $Y -$ axis.
17. If $x > 0, y = 0$ then (x, y) lies on positive $X -$ axis.
18. If $x < 0, y = 0$ then (x, y) lies on negative $X -$ axis.
19. If $x = 0, y \neq 0$ then (x, y) lies on $Y -$ axis.
20. If $x \neq 0, y = 0$ then (x, y) lies on $X -$ axis.
21. $Q_1 \cap Q_2 = \emptyset$.
22. The y coordinates of $X -$ axis is zero.
23. The x coordinates of Y- axis is zero.
24. The distance between two points (x_1, y_1) and (x_1, y_2)on a line parallel to Y-axis is $|y_2 - y_1|$.
25. The distance between two points (x_1, y_1) and (x_2, y_1)on a line parallel to X-axis is $|x_2 - x_1|$.
26. Distance from $(0, 0)$ to (x, y) is $\sqrt{x^2 + y^2}$.
27. The distance between two points $A(x_1, y_1), B(x_2, y_2)$ is $\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$.
28. **Collinear points:** The points that lie on the same line are called collinear points.
29. The point which divides the line segment joining P and Q internally in a ratio $m: n = \left(\frac{mx_2 + nx_1}{m+n}, \frac{my_2 + ny_1}{m+n}\right)$.
30. The point which divides the line segment joining P and Q externally in a ratio $m: n = \left(\frac{mx_2 - nx_1}{m-n}, \frac{my_2 - ny_1}{m-n}\right)$.
31. The ratio that $Y -$ axis divides the line joining $(x_1, y_1), (x_2, y_2)$ is $\frac{-x_1}{x_2}$.
32. The ratio of which (x, y) divides the line obtained by joining $(x_1, y_1), (x_2, y_2)$ is $\frac{x - x_1}{x - x_2}$.
33. The point of trisection divides the line segment in the ratio $1: 2$ and $2: 1$.
34. The mid-point of the segment joining $A(x_1, y_1), B(x_2, y_2)$ is $\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$.

35. If one end point of a diameter of circle is $(x_1, y_1)$and mid point is (x, y)then its second end point $(x_2, y_2) = (2x - x_1, 2y - y_1)$.
36. If one end point of a diameter of circle is $(x_1, y_1)$and mid point is $(0, 0)$then its second end point $(x_2, y_2) = (-x_1, -y_1)$.
37. The coordinates of Centroid $G = \left(\frac{x_1+x_2+x_3}{3}, \frac{y_1+y_2+y_3}{3}\right)$.
38. Slope of $X-$ axis is zero.
39. Slope of line parallel to $X-$ axis is zero.
40. Slope of $Y-$ axis is undefined.
41. Slope of line parallel to $Y-$ axis is undefined.
42. If the slopes are equal then the lines are parallel.
43. If the lines are parallel then the slopes are equal.
44. The slope of two parallel lines is equal.
45. The ratio that $X-$ axis divides the line joining $(x_1, y_1), (x_2, y_2)$ is $\frac{-y_1}{y_2}$.
46. If $(x_1, y_1), (x_2, y_2)$ are two vertices of a triangle and Centroid is (x, y), then the third side $(x_3, y_3) = (3x - x_1 - x_2,\ 3y - y_1 - y_2)$.
47. Area of a triangle whose vertices are $A(x_1, y_1), B(x_2, y_2)$ and $C(x_3, y_3) = \frac{1}{2}|x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2)|$.
48. Area of triangle whose vertices are $(0, 0), (a, 0), (0, b)$ is $\frac{1}{2}ab$.
49. Area of a triangle Heron's Formula $A = \sqrt{S(S-a)(S-b)(S-c)}$ Where $S = \frac{a+b+c}{2}$. $(a, b, c$ are three sides of the triangle).
50. If A, B, C are collinear then the area of $\Delta ABC = 0$.
51. **Inclination of a line:** The angle made by a line with $X-$ axis is in the anticlockwise direction is its **steepness** or **inclination**.
52. The inclination of a line lies between $0^0 and\ 180^0$.
53. Ratio between y coordinate and x coordinate is called **slope**.
54. Slope $m = y/x$.
55. Slope $m = tan\theta$. (Here θ is angle).
56. Slope of the line passing through $A(x_1, y_1),\ B(x_2, y_2)$ is $m = \frac{y_2-y_1}{x_2-x_1}$.

MULTIPLE CHOICE QUESTIONS

1). A point on the x-axis..... ( )
A) $(0, 2)$ B) $(2, 0)$ C) $(2, 2)$ D) $(3, 3)$

2). A point on the y-axis..... ( )
A) $(0, 2)$ B) $(2, 0)$ C) $(2, 2)$ D) $(3, 3)$

3). The distance between A (4, 0) and B (8, 0) is..... ( )
A) 0 B) 8 C) -4 D) 4

4). The distance between A (8, 3) and B (-4, 3) is..... ( )
A) 12 B) -12 C) 4 D) -4

5). The distance between two point A(4, 3) and B(8, 6) ( )
A) 3 B) 25 C) 5 D) 4

6). The distance between the points (0, 0) and (3, 4) ( )
A) 5 B) 4 C) 3 D) 7

7). The midpoint of the line segment joining the points $(2,\ 7)$ and $(12,\ -7)$ ( )
A) $(2,\ 0)$ B) $(7,\ 0)$ C) $(0,\ 7)$ D) $(-7,\ 0)$

8). The centroid of the triangle whose vertices are $(-4, 6),\ (2, -2)$ and $(2,\ 5)$ respectively is..... ( )
A) $(0,\ 0)$ B) $(0,\ 2)$ C) $(0,\ 3)$ D) $(3,\ 0)$

9). The area of the triangle whose vertices are $(0, 0), (3, 0)$ and $(0, 2)$ is.....sq units ( )
A) 3 B) 6 C) 2 D) 12

10). Slope of the line whose end points $(2,3),(4,5)$ is..... ( )

A) 2 B) 1 C) 3 D) 4

11). The perimeter of a triangle with vertices $(0,4),(0,0)$ and $(3,0)$ is..... ( )

A) 4 B) 3 C) 7 D) 12

12). If the points $(0,0),(1,2)$ and (x,y) are collinear then ..... ( )

A) $x = y$ B) $2x = y$ C) $x = 2y$ D) $x = -2y$

MATCH THE FOLLOWING

1.	Slope of the x-axis is.....	( )	A.	Not defined.
2.	Slope of the y-axis is.....	( )	B.	$\frac{1}{\sqrt{3}}$.
3.	If inclination is 30^0 then slope is.....	( )	C.	0.
4.	If inclination is 60^0 then slope is.....	( )	D.	1
5.	If inclination is 45^0 then slope is.....	( )	E.	$\sqrt{3}$

Fill in the blanks

1) If $a < 0$ then $(-a,a)$ lies in.....quadrant.
2) Of $(0,6)$, $(6,0),(6,6),(6,-6)$,..... lies on $Y-$ axis.
3) Of $(0,2)$, $(2,0),(2,2),(2,-2)$..... lies on $X-$ axis.
4) The intersecting point of $x = 0$, $y = 0$ is.....
5) The intersecting point of $x = 4$, $y = 5$ is.....
6) Equation of $y-$ axis is.....
7) The line which contains $(3,0)$ is.....
8) The line which contains $(0,5)$ is.....
9) Slope of the line making an angle of 60^0 with the positive direction of $X-$axis is.....
10) Slope of the line making an angle of 45^0 with the positive direction of $X-$axis is.....
11) Slope of the line making an angle of 135^0 with the positive direction of $X-$axis is.....
12) Slope of the line making an angle of 135^0 with the negative direction of $X-$axis is.....
13) The angle made by the line $y = x$ with $X-$axis is.....
14) The slope of line is $\sqrt{3}$, its inclination is.....
15) Slope of $x-$ axis is.....
16) Slope of the line parallel to $x-$ axis is.....
17) Slope of the line $y = 5$ is.....
18) Slope of $y-$ axis is.....
19) Slope of the line parallel to $y-$ axis is.....
20) Slope of the line $x = 2y$ is.....
21) Slope of the line joining the points $(4,6),(2,-5)$ is.....
22) Slope of the line joining the points $(8,1),(2,-5)$ is.....
23) Slope of the line joining the points $(-a,a),(0,a+a\sqrt{3})$ is.....
24) If $(p,2),(-3,4),(7,-1)$ are linear then $p =$.....
25) If $(1,3),(2,5),(3,k)$ are linear then $k =$.....
26) Slope of the line joining $(3,2),(4,k)$ is 2 then $k =$.....
27) Distance between origin and (a,b) is.....
28) Distance between origin and$(2cos\theta,\ 2sin\theta)$ is.....
29) Distance between $(0,1)$, $(2,3)$ is.....
30) Distance between $(acos\theta,0),(0,asin\theta)$is.....
31) If the distance between $(0,1),(8,k)$ is 10 units then $k =$.....

32) Distance between $(\sqrt{3}+1,\sqrt{2}-1),(\sqrt{3}-1,\sqrt{2}+1)$is.....

33) If $3x+4y=12$ intesects at $x,$ and y axes at A, B then the length of $\overline{AB}$ =.....

34) Radius of circle with origin as center is $\sqrt{12}$. The point $(3,4)$ lies .....of the circle.

35) If the vertices of a triangle are $A(-1,0),B(3,0),\ C(1,4)$then it is.....triangle.

36) The triangle with vertices $(0,0),(1,0),(0,1)$ is.....triangle.

37) Perimeter of the triangle with vertices $(-a,0),(a,0),(0,a)$ is.....

38) Midpoint of $(sin^2\theta, sec^2\theta\ ),(cos^2\theta,-tan^2\theta\ )$ is.....

39) $(4,7),(1,4),(3,2),(6,5)$are the vertices of a parallelogram, then the intersect point of its diagonal is .....

40) If the diagonals of quadrilateral bisects each other than the fourth vertex of a quadrilateral whose remaining vertices are $(2,\ 4),(4,\ 2),(7,\ 5)$ is.....

41) If the end points of the diameter of a circle are $(3,\ 2),(5,-4)$ then its centre is.....

42) If $(2,-4)$ and $(6,-2)$ are the two vertices of diameter of circle then its centre is .....

43) The Centre of the circle is $(0,0)$ and one end point is $(-2,\ 3)$ then its second point is.....

44) The point which divides the join of $(2,-3),(-4,9)$ in the ratio $2:3$ internally is.....

45) y −axis divides the segment joining the points $(-3,2),(6,1)$ in .....ratio.

46) The midpoint of a line segment divides it in.....ratio.

47) The centroid of the triangle whose vertices are $(1,2),(2,3),(3,4)$ is.....

48) The centroid of the triangle whose vertices are $(2,0)\ (0,\ 2),\ (0,0)$ is.....

49) The centroid of the triangle whose vertices are $(tan^2\theta,\ sec^2\theta\ ),(cos^2\theta,\ -sin^2\theta\ ),(sin^2\theta,-sec^2\theta\ )$ is...

50) The centroid of the triangle whose sides are $x\ =\ 0,\ y=\ 0$ and $x+y\ =\ 6$ is .....

51) $(-1,4),(5,2)$ are two vertices of a triangle and $(0,-3)$ is the centroid of that triangle. Its third vertex is...

52) Area of the triangle whose vertices are $(x_1,y_1),(x_2,y_2)$, and (x_3,y_3) is.....

53) Area of the triangle whose vertices are $(2,0)(0,2)$, and $(0,0)$ is.....

54) Area of the triangle whose vertices are $(0,0)(a,0)$, and $(0,a)$ is.....

55) If three points are collinear, then area of triangle formed by the three points is.....

56) If D,E,F are the mid points of the sides BC,CA,AB respectively and area of ΔABC is 64 sq.units then area of $\Delta DEF\ =$ .....

57) If $A(p,2),B(-3,4),C(7,1)$ are collinear, then p =.....

Very short answer questions (1 mark questions)

1). What is the distance between A $(4,0)$ and B $(8,0)$.

2). A and B are two points described in $(8,3),(-4,3)$. Find the distance between A and B.

3). Find the distance between two point A $(4,2)$ and B (8, 6).

4). Line AB has end points A $(1,\ -3)$ and B $(-4,4)$, find AB to the nearest tenth.

5). Find the radius of the circle whose Centre is (3, 2) and passes through $(-5,6)$.

6). Find the centroid of the triangle whose vertices are $(3,\ -5),(-7,4),(10,-2)$ respectively.

7). Find the coordinates of a point A, where AB is the diameter of a circle whose centre is $(2,-3)\ and\ B\ is\ (1,4)$.

8). The end points of a line are $(2,3),(4,5)$. Find the slope of the line.

9). Find the slope of the line joining the two given points $(0,0)$ and $(\sqrt{3},3)$.

10). Justify A horizontal line has slope '0', why?

Short answer questions (2 marks questions)

1). Find a relation between x and y such that the point $(x\ ,\ y)$ is equidistant from the points $(7,1)$ and$(3,5)$.

2). Find a point on the y-axis which is equidistant from the points A $(6,5)$ and B $(-\ 4,3)$.

3). Find the values of y for which the distance between the points $P\ (2,\ -3)\ and\ Q(10,\ y)$ is 10 units.

4). Find the coordinates of the point which divides the line segment joining the points $(4,\ -3)\ and\ (8,5)$ in the ratio $3:1$ internally.

5). The points $(2,3),(x,\ y),(3,-2)$ are vertices of a triangle if the centroid of this triangle is G$(0,0)$, find $(x,\ y)$.

6). In what ratio does the point (– 4, 6) divide the line segment joining the points A (– 6, 10) and B (3, – 8)?

7). Find the ratio in which the y-axis divides the line segment joining the points $(5,\ -6)\ and\ (1,\ -4)$. Also find the point of intersection.
8). If the points $A(6,1), B(8,2), C(9,4)$ and $D(P,3)$ are the vertices of a parallelogram, taken in order, find the value of P.
9). If $(1,2), (4,y), (x,6)\ and\ (3,5)$ are the vertices of a parallelogram taken in order, find x and y.
10). Find the area of a rhombus if its vertices are $(3,0), (4,5), (-1,4)$ and $(-2,\ -1)$ taken in order.
11). The points $(3,\ -2)\ (-2,8)$ and $(0,4)$ are three points in a plane. Show that these points are collinear.
12). Find the area of the triangle whose lengths of sides are 15m, 17m, 21m (use Heron's Formula) and verify your answer by using the formula $A\ = \frac{1}{2}bh$.
13). Find the slope of $\overline{AB}$ with the end points $A(-2,-5), B(1,-7)$.

Essay type questions (4 marks questions)

1). Show that the points A (4, 2), B (7, 5) and C (9, 7) are three point lie on a same line.
2). Show that the points $(1,7), (4,2), (-1,-1)\ and\ (-4,4)$ are the vertices of a square.
3). Check whether $(5,-2), (6,4)\ and\ (7,\ -2)$ are the vertices of an isosceles triangle.
4). Show that the following points form a equilateral triangle $A(a,0), B(-a,0), C(0,\ a\sqrt{3})$.
5). Prove that the points $(-7,-3), (5,10), (15,8)\ and\ (3,-5)$ taken in order are the corners of a parallelogram.
6). Show that the points $(-4,\ -7), (-1,2), (8,5)\ and\ (5,\ -4)$ taken in order are the vertices of a rhombus.
7). Find the coordinates of the points of trisection of the line segment joining $(4,-1)\ and\ (-2,-3)$.
8). Find the coordinates of the points which divide the line segment joining $A(-2,2)$ and $B(2,8)$ into four equal parts.
9). Consider the points of triangle are A (2, 8), B (2, 1) and C (9, 0). What is the area of the ΔABC?
10). Find the coordinates of the point which divides the line segment joining the points $(a+\ b,\ a\ -\ b)$ and $(a\ -\ b,\ a+\ b)$ in the ratio $3:2$ internally.
11). Find the area of a triangle whose vertices are $(1,\ -1), (-4,6)$ and $(-3,\ -5)$.
12). Find the area of a triangle formed by the points $A(5,2), B(4,7)$ and $C(7,\ -4)$.
13). If $A(-5,7), B(-4,-5), C(-1,\ -6)$ and $D(4,5)$ are the vertices of a quadrilateral. Then, find the area of the quadrilateral ABCD.
14). Find the value of 'K' for which the points $(8,1), (K,-4), (2,-5)$ are collinear.
15). Find the area of the triangle formed by joining the mid-points of the sides of the triangle whose vertices are $(0,-1), (2,1)$ and $(0,3)$. Find the ratio of this area to the area of the given triangle.
16). The sides of a triangular plot are in the ratio of 3:5:7 and its perimeter is 300m. Find its area. (Use Heron's formula)