MATHEMATICS WORK BOOK
CLASS - IX

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MAHEMATICS WORK BOOK

Class - IX

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রতন লাল নাথ
মন্ত্রী
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বার্তা

শিক্ষার প্রকৃত বিকাশের জন্য, শিক্ষাকে যুগোপযোগী করে তোলার জন্য প্রয়োজন শিক্ষাসংক্রান্ত নিরন্তর গবেষণা। প্রয়োজন শিক্ষা সংশ্লিষ্ট সকলকে সময়ের সঙ্গে সঙ্গে প্রশিক্ষিত করা এবং প্রয়োজনীয় শিখন সামগ্রী, পাঠ্যক্রম ও পাঠ্যপুস্তকের বিকাশ সাধন করা। এস সি ই আর টি ত্রিপুরা রাজ্যের শিক্ষার বিকাশে এসব কাজ সুনামের সঙ্গে করে আসছে। শিক্ষার্থীর মানসিক, বৌদ্ধিক ও সামাজিক বিকাশের জন্য এস সি ই আর টি পাঠ্যক্রমকে আরো বিজ্ঞানসম্মত, নান্দনিক এবং কার্যকর করবার কাজ করে চলেছে। করা হচ্ছে সুনির্দিষ্ট পরিকল্পনার অধীনে।

এই পরিকল্পনার আওতায় পাঠ্যক্রম ও পাঠ্যপুস্তকের পাশাপাশি শিশুদের শিখন সক্ষমতা বৃদ্ধির জন্য তৈরি করা হয়েছে ওয়ার্ক বুক বা অনুশীলন পুস্তক। প্রসঙ্গত উল্লেখ্য, ছাত্র-ছাত্রীদের সমস্যার সমাধানকে সহজতর করার লক্ষ্যে এবং তাদের শিখনকে আরো সহজ ও সাবলীল করার জন্য রাজ্য সরকার একটি উদ্যোগ গ্রহণ করেছে, যার নাম 'প্রয়াস'। এই প্রকল্পের অধীনে এস সি ই আর টি এবং জেলা শিক্ষা আধিকারিকরা বিশিষ্ট শিক্ষকদের সহায়তা গ্রহণের মাধ্যমে প্রথম থেকে দ্বাদশ শ্রেণির ছাত্র-ছাত্রীদের জন্য ওয়ার্ক বুকগুলো সুচারুভাবে তৈরি করেছেন। ষষ্ঠ থেকে অষ্টম শ্রেণি পর্যন্ত বিজ্ঞান, গণিত, ইংরেজি, বাংলা ও সমাজবিদ্যার ওয়ার্ক বুক তৈরি হয়েছে। নবম দশম শ্রেণির জন্য হয়েছে গণিত, বিজ্ঞান, সমাজবিদ্যা, ইংরেজি ও বাংলা। একাদশ দ্বাদশ শ্রেণির ছাত্র-ছাত্রীদের জন্য ইংরেজি, বাংলা, হিসাবশাস্ত্র, পদার্থবিদ্যা, রসায়নবিদ্যা, অর্থনীতি এবং গণিত ইত্যাদি বিষয়ের জন্য তৈরি হয়েছে ওয়ার্ক বুক। এইসব ওয়ার্ক বুকের সাহায্যে ছাত্র-ছাত্রীরা জ্ঞানমূলক বিভিন্ন কার্য সম্পাদন করতে পারবে এবং তাদের চিন্তা প্রক্রিয়ার যে স্বাভাবিক ছন্দ রয়েছে, তাকে ব্যবহার করে বিভিন্ন সমস্যার সমাধান করতে পারবে। বাংলা ও ইংরেজি উভয় ভাষায় লিখিত এইসব অনুশীলন পুস্তক ছাত্র-ছাত্রীদের মধ্যে বিনামূল্যে বিতরণ করা হবে।

এই উদ্যোগে সকল শিক্ষার্থী অতিশয় উপকৃত হবে। আমার বিশ্বাস, আমাদের সকলের সক্রিয় এবং নিরলস অংশগ্রহণের মাধ্যমে ত্রিপুরার শিক্ষাজগতে একটি নতুন দিগন্তের উন্মেষ ঘটবে। ব্যক্তিগত ভাবে আমি চাই যথাযথ জ্ঞানের সঙ্গে সঙ্গে শিক্ষার্থীর সামগ্রিক বিকাশ ঘটুক এবং তার আলো রাজ্যের প্রতিটি কোণে ছড়িয়ে পড়ুক।

(রতন লাল নাথ)

MAHEMATICS

Class - IX

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CONTENTS

CHAPTER-1

NUMBER SYSTEMS

Key points and formulae

- Rational Numbers : A number is called a rational number, if it can be written in the form $\frac{p}{q}$, where p and q are integers and $q \neq 0$.
- Irrational numbers : A number which can not be expressed in the form $\frac{p}{q}$ (where p and q are integers and $q \neq 0$) is called an irrational numbers.
- All the rational and irrational numbers make up the collection of real numbers.
- The decimal expansion of an irrational number is non-terminating non-recurring.
- The decimal expansion of a rational number is either terminating or non-terminating-recurring.
- There is a unique real number corresponding to every point on the number line.
- If r is rational and s is irrational, then $r+s$ and $r-s$ are irrational numbers, and rs & $\frac{r}{s}$ are irrational numbers, $r \neq 0$.
- For positive real numbers a and b the following identities hold :

  i) $\sqrt{ab} = \sqrt{a}\sqrt{b}$ ii) $\sqrt{\frac{a}{b}} = \frac{\sqrt{a}}{\sqrt{b}}$

  iii) $\left(\sqrt{a}+\sqrt{b}\right)\left(\sqrt{a}-\sqrt{b}\right) = a-b$ iv) $\left(a+\sqrt{b}\right)\left(a-\sqrt{b}\right) = a^2-b$

  v) $\left(\sqrt{a}+\sqrt{b}\right)^2 = a+2\sqrt{ab}+b$

- Rationalising factor : If the product of two irrational numbers is rational then each one is called the rationalising factor of the other.

  e.g. To rationalise the denominator of $\frac{1}{\sqrt{a}+b}$, we multiply this by $\frac{\sqrt{a}-b}{\sqrt{a}-b}$, where a and b are integers.

- Laws of Exponents : Let a>0, b>0 be real numbers and let *m* and *n* be rational numbers. Then, we have

  i) $a^m \times a^n = a^{m+n}$ ii) $\frac{a^m}{a^n} = a^{m-n}$

  iii) $\left(a^m\right)^n = a^{mn}$ iv) $a^m \times b^m = (ab)^m$

  v) $(ab)^m = a^m \times b^m$ vi) $\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}$

  vii) $a^{-n} = \frac{1}{a^n}$ vii) $a^o = 1$

- Let a>0 be a real number and *n* be a positive integer. Then *n*th root of *a* is defined as $\sqrt[n]{a} = b$, if $b^n = a$ and b>0.

  Therefore, we have $\sqrt[n]{a} = a^{\frac{1}{n}}$.

- Let a>0 be a real number. Let *m* and *n* be integers such that *m* and *n* have no common factors other then 1, and n>0. Then, $a^{\frac{m}{n}} = \left(\sqrt[n]{a}\right)^m = \sqrt[n]{a^m}$.

Exercise-1

Group-A (1 mark each)

Very Short Answer Type Questions :

1. **Fill in the blanks of the followings :**

   i) There are _____ rational numbers between any two given rational numbers.

   ii) Every point on the number line represents a unique _____ numbers.

   iii) If *r* is rational and *s* is irrational, then *r*–*s* is _____ number.

   iv) The rationalising factor of $\frac{1}{3+\sqrt{2}}$ is _____.

   v) Simplest from of $\frac{2^o + 7^o}{5^o}$ is _____.

2. Multiple Choice questions :

i) A rational number beween –2 and 2 is–

a) –2.3 b) 0 c) –3.2 d) 1.1010010001....

ii) Every point on a number line represents–

a) a rational number b) a natural number

c) an irrational number d) a unique real number.

iii) Decimal representation of a rational number cannot be–

a) terminating b) non-terminating

c) non-terminating repeating d) non-terminating non-repeating

iv) The decimal expansion of $\sqrt{3}$ is–

a) non-terminating non-recurring b) a finite decimal

c) 1.732 d) non-terminating recurring.

v) The product of any two irrational numbers is–

a) always an integer b) always an irrational number

c) sometimes rational, sometimes irrational d) always a rational number.

vi) Which of the following is irrational ?

a) $\frac{\sqrt{18}}{\sqrt{2}}$ b) $\sqrt{\frac{9}{25}}$ c) $\sqrt{11}$ d) $\sqrt{121}$

vii) A rational number between $\sqrt{3}$ and $\sqrt{5}$ is –

a) $\frac{\sqrt{3}\cdot\sqrt{5}}{2}$ b) 2.1 c) $\frac{\sqrt{3}+\sqrt{5}}{2}$ d) 2.3

viii) The value of $0.\overline{2}$ in the form $\frac{p}{q}$, where p and q are integers and $q \neq 0$ is –

a) $\frac{1}{5}$ b) $\frac{1}{9}$ c) $\frac{2}{5}$ d) $\frac{2}{9}$

ix) An irrational number between 5 and 6 is –

a) $\frac{1}{2}(5+6)$ b) $\sqrt{5\times6}$ c) $\sqrt{5+6}$ d) none of these

x) $\frac{1}{\sqrt{9}-\sqrt{8}}$ is equal to–

a) $\frac{1}{2}\left(3-2\sqrt{2}\right)$ b) $\frac{1}{3+2\sqrt{2}}$ c) $3-2\sqrt{2}$ d) $3+2\sqrt{2}$

xi) The value of $\frac{\sqrt{32}+\sqrt{48}}{\sqrt{8}+\sqrt{12}}$ is equal to–

a) $\sqrt{2}$ b) 2 c) 4 d) 8

xii) The value of $\sqrt[4]{\sqrt[3]{2^2}}$ is–

a) $2^{-\frac{1}{6}}$ b) 2^{-6} c) $2^{\frac{1}{6}}$ d) 2^6

xiii) The product $\sqrt[3]{2}\cdot\sqrt[4]{2}\cdot\sqrt[12]{32}$ equals

a) $\sqrt{2}$ b) 2 c) $\sqrt[12]{2}$ d) $\sqrt[12]{32}$

xiv) Value of $(256)^{0\cdot16}\times(256)^{0\cdot09}$ is–

a) 4 b) 16 c) 64 d) 256.25

xv) If $\sqrt{2}=1\cdot414$ then $\sqrt{\frac{\left(\sqrt{2}-1\right)}{\left(\sqrt{2}+1\right)}}$ = ?

a) 0.027 b) 2.414 c) 0.414 d) 0.612

3. **Answer the following questions :**

i) What is the type of decimal expansion of an irrational number?

ii) Write a rational number lie between $-\frac{2}{3}$ and $-\frac{1}{5}$.

iii) Find the value of $\sqrt{20}\times\sqrt{5}$.

iv) Find the value of 1.999... in the form $\frac{p}{q}$, where p and q are integers and $q\neq 0$.

v) Find an irrational number between $\frac{1}{9}$ and $\frac{2}{9}$.

vi) Find the value of $0\cdot\overline{3}+0\cdot\overline{4}$.

vii) If $3^m = 5^m$, then find the value of m.

viii) Write the simplest form of $\left(\sqrt[3]{8^2}\right)^{-\frac{1}{2}}$.

ix) If $\left(\frac{4}{11}\right)^{x-1} = \left(\frac{11}{4}\right)^{x-5}$ then find the value of x .

x) If $x = 5$ and $y = 3$ then what is the value of $(x+y)^{\frac{x}{y}}$.

4. **State whether the following statements are true or false :**

i) Number of rational numbers between 12 and 15 is finite.

ii) $\frac{\sqrt{12}}{\sqrt{3}}$ is not a rational number as $\sqrt{12}$ and $\sqrt{3}$ are irrationals.

iii) $\sqrt{18}\times\sqrt{2}$ is a rational number.

iv) The square of an irrational number is always rational.

v) $\frac{\sqrt{8}}{\sqrt{2}}$ is written in the form, $\frac{p}{q}$, $q \neq 0$ and so it is a rational number.

Group-B

Short Answer type questions : (2 marks)

1. Answer the following questions :

i) Find two rational numbers between $\frac{5}{2}$ and $\frac{8}{3}$.

ii) Find the sum of $0\cdot6+0\cdot\overline{7}+0\cdot4\overline{7}$ and express it in the form $\frac{p}{q}$, where, $q\neq0$ and p & q are integers.

iii) Write $\sqrt[6]{6}, \sqrt[3]{7}, \sqrt[4]{8}$ in ascending order of magnitude.

iv) Simplify : $\sqrt{p^{-1}q} \cdot \sqrt{p^{-1} \cdot r} \cdot \sqrt{r^{-1}p}$.

v) Simplify : $\sqrt[4]{81x^8y^4z^{16}}$

vi) Give an example of two irational numbers whose sum as well as product is rational.

vii) Evaluate : $\frac{2^n + 2^{n-1}}{2^{n+1} - 2^n}$

viii) If $x = 2 + \sqrt{3}$ then find $x + \frac{1}{x}$

ix) If $x = 3 - 2\sqrt{2}$ the find $x^2 + \frac{1}{x^2}$

x) If $3^x - 3^{x-2} = 8$ then find the value of x^x .

xi) Find the value of $(1296)^{0.17} \times (1296)^{0.08}$

xii) If $10^x = 64$, then find the value of $10^{\left(\frac{x}{2}+1\right)}$

xiii) Simplify : $(16)^{-\frac{1}{4}} \times \sqrt[4]{16}$

xiv) If $\frac{\sqrt{3}+\sqrt{2}}{\sqrt{3}-\sqrt{2}} = a + b\sqrt{6}$, then find the rational numbers a and b.

xv) If $5^{x-3} \times 3^{2x-8} = 125$, then find the value of x.

xvi) Locate $\sqrt{13}$ on the number line.

xvii) Express $0.12\overline{3}$ in the form $\frac{p}{q}$, where p & q are integers and $q \neq 0$.

xviii) Simplify : $\left[5\left(8^{\frac{1}{3}} + 27^{\frac{1}{3}}\right)^3\right]^{\frac{1}{4}}$

Group-C

Long Answer Type Questions : (3/4 marks)

Answer the following questions :

1. Represent the following numbers on the number line : $7,\ 7\cdot 2,\ \frac{-3}{2},\ \frac{-12}{5}$

2. Represent $\sqrt{5.6}$ on the number line geometrically.

3. Express $2\cdot\overline{36}+0.\overline{23}$ as a fraction in simplest form.

4. Simplify : $\frac{\sqrt{72}}{5\sqrt{72}+3\sqrt{288}-2\sqrt{648}}$

5. Find the values of a and b in each of the following :

   a) $\frac{3-\sqrt{5}}{3+2\sqrt{5}}=a\sqrt{5}-\frac{19}{11}$ b) $\frac{5+2\sqrt{3}}{7+4\sqrt{3}}=a-6\sqrt{3}$

   c) $\frac{\sqrt{11}-\sqrt{7}}{\sqrt{11}+\sqrt{7}}=a-b\sqrt{77}$ d) $\frac{\sqrt{7}+\sqrt{5}}{\sqrt{7}-\sqrt{5}}-\frac{\sqrt{7}-\sqrt{5}}{\sqrt{7}+\sqrt{5}}=a+\frac{7}{11}\sqrt{5}b$

6. Simplify :

   a) $\frac{1}{\sqrt{3}+\sqrt{2}}-\frac{2}{\sqrt{5}-\sqrt{3}}-\frac{3}{\sqrt{2}-\sqrt{5}}$

   b) $\frac{3\sqrt{2}}{\sqrt{3}+\sqrt{6}}-\frac{4\sqrt{3}}{\sqrt{6}+\sqrt{2}}+\frac{\sqrt{6}}{\sqrt{3}+\sqrt{2}}$

   c) $\frac{1}{\sqrt{2}+\sqrt{3}}+\frac{1}{\sqrt{3}+\sqrt{4}}+\frac{1}{\sqrt{4}+\sqrt{5}}+\frac{1}{\sqrt{5}+\sqrt{6}}$

   d) $\frac{\sqrt{2}}{\sqrt{3}}\cdot\frac{2+\sqrt{3}}{\sqrt{3}+1}-\frac{\sqrt{2}}{\sqrt{3}}\cdot\frac{2-\sqrt{3}}{\sqrt{3}-1}$

   e) $\frac{7\sqrt{3}}{\sqrt{10}+\sqrt{3}}-\frac{2\sqrt{5}}{\sqrt{6}+\sqrt{5}}-\frac{3\sqrt{2}}{\sqrt{15}+3\sqrt{2}}$

7. Simplify by rationalising the dinominator :

a) $\frac{2\sqrt{6}-\sqrt{5}}{3\sqrt{5}-2\sqrt{6}}$ b) $\frac{3}{\sqrt{3}+\sqrt{5}-2}$ c) $\frac{1}{\sqrt{7}+\sqrt{3}-\sqrt{2}}$

8. Prove that $\frac{1}{3-\sqrt{8}}-\frac{1}{\sqrt{8}-\sqrt{7}}+\frac{1}{\sqrt{7}-\sqrt{6}}-\frac{1}{\sqrt{6}-\sqrt{5}}+\frac{1}{\sqrt{5}-2}=5$

9. If $x=2-\sqrt{3}$, Find the value of $\left(x-\frac{1}{x}\right)^3$

10. If $a=\frac{3+\sqrt{5}}{2}$, then find the value of $a^2+\frac{1}{a^2}$.

11. If $x=2+\sqrt{3}$, then find the value of $x^3+\frac{1}{x^3}$.

12. If $x=\frac{\sqrt{3}+\sqrt{2}}{\sqrt{3}-\sqrt{2}}$ and $y=\frac{\sqrt{3}-\sqrt{2}}{\sqrt{3}+\sqrt{2}}$, then find the value of x^2+y^2.

13. If $\sqrt{2}=1\cdot414$, $\sqrt{3}=1\cdot732$, then value of $\frac{4}{3\sqrt{3}-2\sqrt{2}}+\frac{3}{3\sqrt{3}+2\sqrt{2}}$.

14. If $x=\frac{\sqrt{2}+1}{\sqrt{2}-1}$ and $y=\frac{\sqrt{2}-1}{\sqrt{2}+1}$, then find the value of x^2+y^2+xy.

15. If $x=\frac{1}{2-\sqrt{3}}$, then find the valu of x^3-2x^2-7x+5.

16. Simplify : (i) $(0\cdot00032)^{-\frac{2}{5}}$ (ii) $(256)^{-\left(4^{-\frac{3}{2}}\right)}$

17. Find the value of $\frac{4}{(216)^{-\frac{2}{3}}}+\frac{1}{(256)^{-\frac{3}{4}}}+\frac{2}{(243)^{-\frac{1}{5}}}$

18. If x is a possitive real number then simplify the following : $\sqrt[5]{x^4\sqrt[4]{x^3\sqrt[3]{x^2\sqrt{x}}}}$

19. Prove that

i) $\dfrac{a^{-1}}{a^{-1}+b^{-1}}+\dfrac{a^{-1}}{a^{-1}-b^{-1}}=\dfrac{2b^2}{b^2-a^2}$

ii) $\dfrac{1}{1+x^{a-b}}+\dfrac{1}{1+x^{b-a}}=1$

20. Prove that i) $\left(\dfrac{x^p}{x^q}\right)^{p+q}\left(\dfrac{x^q}{x^r}\right)^{p+r}\left(\dfrac{x^r}{x^p}\right)^{r+p}=1$

ii) $\left(x^{\frac{1}{a-b}}\right)^{\frac{1}{a-c}}\cdot\left(x^{\frac{1}{b-c}}\right)^{\frac{1}{b-a}}\cdot\left(x^{\frac{1}{c-a}}\right)^{\frac{1}{c-b}}=1$

Answer

Group -A

1. (i) Infinitely many, (ii) Real (iii) irrational (iv) $3-\sqrt{2}$ (v) 2
2. (i) b (ii) d (iii) d (iv) a (v) c (vi) c (vii) b (viii) d
   (ix) b (x) d (xi) b (xii) c (xiii) b (xiv) a (xv) c
3. (i) non-terminating non-recurring (ii) $-\dfrac{13}{30}$ (iii) 10 (iv) 2

   (v) 0.210210021000... (vi) $\dfrac{7}{9}$ (vii) 0 (viii) $\dfrac{1}{2}$ (ix) 3 (x) 32
4. (i) False (ii) False (iii) True (iv) False (v) True.

Group -B

1. (i) $\dfrac{31}{12}$, 9 (ii) $\dfrac{167}{90}$ (iii) $\sqrt[6]{6}<\sqrt[4]{8}<\sqrt[3]{7}$ (iv) 1 (v) $3x^2yz^4$.

   (vi) $\left(2+\sqrt{3}\right)$ and $\left(2-\sqrt{3}\right)$ (vii) $\dfrac{3}{2}$ (viii) 4 (ix) 34 (x) 4

(xi) 6 (xii) 80 (xiii) 1 (xiv) $a = 5, b = 2$ (xv) x=5 (xvii) $\frac{37}{300}$

(xviii) 5

Group -C

3. $\frac{257}{99}$ 4. $\frac{1}{5}$ 5. (a) $\frac{9}{11}$ (b) 11 (c) $a = \frac{9}{2}$ and $b = \frac{1}{2}$ (d) $a = 0,\ b = 1$

6. (a) 0 (b) 0 (c) $\sqrt{6} - \sqrt{2}$ (d) $\frac{\sqrt{6}}{3}$ (e) 1 7. (a) $\frac{4\sqrt{30} + 9}{21}$

(b) $\frac{2\sqrt{3} - 3\sqrt{2} - \sqrt{30}}{4}$ (e) $\frac{3\sqrt{3} - 4\sqrt{2} + \sqrt{42} - \sqrt{7}}{10}$ 9. $-24\sqrt{3}$ 10. 7

11. 52 12. 98 13. 2.063 14. 35 15. 3 16. (i) 25 (ii) $\frac{1}{2}$ 17. 214

18. $x^{\frac{119}{120}}$

CHAPTER-2

POLYNOMIALS

Key points and formulae

- Definition : The algebraic expression in which the variables involved have only non-negative integral exponent is called a 'Polynomial'.

  A polynomial $P(x)$ in one variable x is an algebraic expression in x of the form $P(x) = a_n x^n + a_{n-1}x^{n-1} + a_{n-2}x^{n-2} + ... + a_2x^2 + a_1x + a_0$ where $a_1, a_2, ..., a_n$ $(a_n \neq 0)$ are constants known as co-efficient of the respective terms a_1x, a_2x^2 ....., a_nx^n of the polynomial. Here a_0 is the constant term.

  e.g. (i) $2x^3 - 4x^2 + 5x - 7$ is a polynomial in one variable x.

  (ii) $4y^3 - 7y^2 + 3y - 8$ is a polynomial of one variable y.

- Degree of a Polynomial : Highest power of variable in a polynomial is called the degree of polynomial.
- Constant Polynomial : A polynomial of degree zero is called a constant polynomial.

  e.g. 4, $\frac{-7}{5}, \frac{3}{4}$ etc. constant polynomials.

- Zero Polynomial : The constant polynomial 0 is called zero polynomial. Degree of zero polynomial is not defined.
- Linear Polynomial : A Polynomial of degree 1 is called a linear polynomial. It is expressed in the form of $ax+b$, where a and b are real constants, $a \neq 0$.

  e.g. (i) $\sqrt{3}x - 5$ is a linear polynomial in x.

  (ii) $\frac{7}{5}y + 4$ is a linear polynomial in y.

- Quadratic Polynomial : A polynomial of degree 2 is called a quadratic polynomial. It is expressed in the form of $ax^2 + bx + c$, where a, b, and c are real constants and $a \neq 0$.
- Cubic Polynomial : A Polynomial of degree 3 is called a cubic polynomial. It is expressed in the form of $ax^3 + bx^2 + cx + d$, where a, b, c and d are real constants and $a \neq 0$.
- Monomial : A polynomial having one non-zero term is called a monomial.
- Binomial : A polynomial of two non-zero term is called a binomial.

- Trinomial : A polynomial having three non-zero terms is called a trinomial.
- Value of Polynomial : Value of a polynomial $p(x)$ at $x=a$ is $p(a)$.
- Zero of Polynomial : Zero of a polynomial $p(x)$ is a number a such that $p(a)=0$.

Note :

(i) '0' may be a zero of a polynomial.

(ii) Every real number is a zero of a zero polynomial.

(iii) A non-zero constant polynomial has no zero.

(iv) Every linear polynomial in one variable has a unique zero.

v) Maximum number of zeroes of a polynomial is equal to its degree.

- Polynomial equation : If $p(x)$ is polynomial then $p(x) = 0$ is a polynomial equation.
- Remainder Theorem : Let $p(x)$ be any polynomial of degree $n \geq 1$ and 'a' be any real number, then if $p(x)$ is divided by the linear polynomial $(x–a)$, the remainder is $p(a)$.
- Factor Theorem : If $p(x)$ is a Polynomial of degree $n \geq 1$ and 'a' be any real number, then $x–a$ is a factor of $p(x)$ if $p(a) = 0$

Note :

(i) $p(a) = 0$, if $x–a$ is a factor of $p(x)$.

(ii) $(x+a)$ is a factor of polynomial $p(x)$ if $p(–a) = 0$

(iii) $(ax–b)$ is a factor of polynomial $p(x)$ if $p(b/a) = 0$

iv) $(x–a)\ (x–b)$ are factors of polynomial $p(x)$ if $p(a) = 0$ and $p(b) = 0$

- Algebraic Identities : An algebraic identity is an algebraic equation that is true for all values of the variables occuring in it.
- Some useful algebraic identities :

i) $(x+y)^2 = x^2 + 2xy + y^2 = (x–y)^2 + 4xy$

ii) $(x–y)^2 = x^2 – 2xy + y^2 = (x+y)^2 – 4xy$

iii) $x^2–y^2 = (x+y)\ (x– y)$

iv) $(x+a)\ (x+b) = x^2 + (a+b)\ x + ab$

v) $(x+y+z)^2 = x^2 + y^2 + z^2 + 2xy + 2yz + 2zx$

vi) $(x+y)^3 = x^3 + 3x^2y + 3xy^2 + y^3 = x^3 + y^3 + 3xy\ (x+y)$

vii) $(x–y)^3 = x^3 – 3x^2y + 3xy^2 – y^3 = x^3 – y^3 – 3xy\ (x–y)$

viii) $x^3 + y^3 + z^3 - 3xyz = (x + y + z)(x^2 + y^2 + z^2 - xy - yz - zx)$

Now, if $x + y + z = 0$, then $x^3 + y^3 + z^3 - 3xyz = 0$ i.e. $x^3 + y^3 + z^3 = 3xyz$

Also, $x^2 + y^2 + z^2 - xy - yz - zx = \frac{1}{2}[(x-y)^2 + (y-z)^2 + (z-x)^2]$

ix) $x^3 + y^3 = (x+y)(x^2 - xy + y^2)$

x) $x^3 - y^3 = (x-y)(x^2 + xy + y^2)$

xi) $x^6 - y^6 = (x^3 + y^3)(x^3 - y^3) = (x-y)(x^2 - xy + y^2) \times (x-y)(x^2 + xy + y^2)$

xii) $x^8 - y^8 = (x + y)(x - y)(x^2 + y^2)(x^4 + y^4)$

xiii) $x^4 + x^2y^2 + y^4 = (x^2 - xy + y^2)(x^2 + xy + y^2)$

xiv) $x^3 + y^3 + z^3 = (x + y + z)^3 - 3(x + y)(y + z)(z + x)$

xv) $x^2 + y^2 = (x+y)^2 - 2xy = (x-y)^2 + 2xy$

xvi) $(x+y)^2 + (x - y)^2 = 2(x^2 + y^2)$

xvii) $(x+y)^2 - (x - y)^2 = 4xy$

Exercise-2

Group-A (1mark each)

Write the correct answer in each of the following :

1. $\sqrt{3}$ is a polynomial of degree.

   (a) 1 (b) 0 (c) 2 (d) $\frac{1}{2}$

2. Degree of the zero polynomial is–

   (a) 1 (b) 0 (c) Not defined (d) Any natural number.

3. Zero of the polynomial $p(x) = 5x + 3$ is

   (a) $\frac{-3}{5}$ (b) $\frac{3}{5}$ (c) $\frac{5}{3}$ (d) $\frac{-5}{3}$

4. The value of the polynomial $3x - 2x^2 + 1$, when $x = -1$ is

   (a) 4 (b) –2 (c) 0 (d) –4

5. If $x - 1$ is a factor of the polynomial $3x^2 - kx$, then the value of k is–

(a) 1 (b) 2 (c) 3 (d) 4

Fill in the blanks of the followings :

6. The coefficient of x in the expansion of $(x-2)^3$ is _____.
7. The value of $299^2 - 298^2$ is _____.
8. If $x^{91} + 91$ is divided by $x + 1$, then the remainder is _____.
9. If $\frac{a}{b} + \frac{b}{a} = -1$. $(a, b \neq 0)$ the value of $a^3 - b^3$ is _____.
10. Degree of the polynomial $0x^4 + 4x^3 + 0x^2 + 3x + 2$ is ____.

State whether the following true or false :

11. $x^2 - 3x + \frac{1}{x} + 5$ is a polynomial
12. If $p(x) = x^2 + 5\sqrt{2}x - 3$, then $p\left(5\sqrt{2}\right) = 97$
13. One of the zeroes of the polynomial $2x^2 + 7x - 4$ is $-\frac{1}{2}$
14. $x - 1$ is a factor of the polynomial $x^3 + x^2 - x + 1$
15. If $p(y) = y - 5$, then $p(y) + p(-y)$ is equal to -10

Write the answer of the followings :

16. What is the degree of the polynomial $(x^3+5)(4-x^5)$?
17. Name the polynomial containing two non-zero terms.
18. Write the number of zeroes in a cubic polynomial?
19. Factorise : $(x + y)^3 - (x^3 + y^3)$
20. If $a + b + c = 0$, then what is the value of $a^3 + b^3 + c^3$?

Group-B (2 marks each)

Write the answer of the following questions :

1. If $p(x) = x^2 - 3x + 2$, then what is the value of $p(0) + p(2)$?
2. Using remainder theorem, find the remainder when $2y^3 - 3y^2 - 7y + 2$ is divided by y.
3. Factoriese : $(x+2)^2 + p^2 + 2p\,(x + 2)$.
4. Find the zeores of the polynomial, $p(x) = (x-5)^2 + (2x + 7)^2$.
5. For what value of p, $x^3 - 2px^2 + 16$ is divisible by $x + 2$?
6. Using factor theorem verify that $q(x)$ is a factor of $p(x)$, where $p(x) = 2x^3 - 9x^2 + x + 12$ and $q(x) = 2x - 3$.
7. Show that -1 is a zero of the polynomial $2x^3 - x^2 + x + 4$.
8. Without actually culculating the cubes, find value of $79^3 - 35^3 - 44^3$.
9. Without expanding in cubes, factorise $(a - b)^3 + (b - c)^3 + (c - a)^3$.
10. With the help of factor theoren show that $a-b$ is a factor of
    $a\,(b^2-c^2) + b\,(c^2-a^2) + c\,(a^2-b^2)$.

Group-C (3/4 marks each)

Write the answer of the following questions :

1. Without actual division,
   Prove that $a^4+2a^3-2a^2+2a-3$ is exactly divisible by a^2+2a-3
2. If $(y-2)$ and $\left(y-\frac{1}{2}\right)$ are factors of $my^2 + 5y + n$, then show that $m = n$.
3. Verify that $x^3+y^3+z^3-3\,xyz = \frac{1}{2}(x+y+z)\,[(x-y)^2 + (y-z)^2 + (z-x)^2]$
4. Find the value of $x^3 + y^3 - 15xy + 125$, when $x+y = -5$
5. If $x+y = 1$ and $xy = -12$, find the value of $x^3 + y^3$.
6. Give possible expressions for length and breadth of the rectangle whose area is given by $2a^2 + a - 3$.

7. Simplify : $\dfrac{\left(a^2-b^2\right)^3+\left(b^2-c^2\right)^3+\left(c^2-a^2\right)^3}{(a-b)^3+(b-c)^3+(c-a)^3}$

8. If $a^2+b^2+c^2=280$ and $ab+bc+ca=\dfrac{9}{2}$, then find the value of $(a+b+c)^3$.

9. If $x+\dfrac{1}{x}=3$, then find $x^3+\dfrac{1}{x^3}$.

10. If $x=\dfrac{\sqrt{3}+\sqrt{2}}{\sqrt{3}-\sqrt{2}}$ and $y=\dfrac{\sqrt{3}-\sqrt{2}}{\sqrt{3}+\sqrt{2}}$, find the value of x^2-y^2+xy, where $\sqrt{6}=2.4$

11. If $x^2+\dfrac{1}{x^2}=7$, find the value of $x^3+\dfrac{1}{x^3}$

12. If the polynomials my^3+4y^2+3y-4 and y^3-4y+m leave the same remainder when divided by $y-3$, find the value of m.

13. If x, y, z are all non-zero and $x+y+z=0$, prove that $\dfrac{x^2}{yz}+\dfrac{y^2}{zx}+\dfrac{z^2}{xy}=0$

14. The polynomial $p(z)=z^4-2z^3+3z^2-kz+3k-7$ when divided by $(z+1)$ leaves the remainder 19. Find the values of k. Also find the remainder when $p(z)$ is divided by $z+2$.

15. The polynomial bx^3+3x^2-3 and $2x^3-5x+b$ when divided by $(x-4)$, leave the remainder R_1 and R_2 respectively. Find the value of b, if $2R_1-R_2=0$.

16. Factorise : $(x^2-4x)(x^2-4x-1)-20$.

17. If $(3x-2)$ is a factor of $3x^3+x^2-20x+12$, find the other factors.

18. Verify that $(x-1)$, $(x-2)$ and $(2x+1)$ are the factors of the polynomial $2x^3-5x^2+x+2$.

19. If $\left(\dfrac{8}{15}\right)^3-\left(\dfrac{1}{3}\right)^3-\left(\dfrac{1}{5}\right)^3=\dfrac{x}{75}$, find x.

20. If x and y are two positive real numbers such that $8x^3+27y^3=730$ and $2x^2y+3xy^2=15$, then evaluate $2x+3y$.

Answers

Group-A

1. (b) 2. (c) 3. (a) 4. (d) 5. (c) 6. 12 7. 597 8. 90 9. 0 10. 3 11. false
12. True 13. True 14. False 15. True 16. 8 17. Binomial 18. 3 19. $3xy\,(x+y)$
20. 3 abc.

Group-B

1) 2 2) 2 3) $(x + 2 + p)^2$ 4) 5, $\frac{-7}{2}$ 5) $p = 1$ 8. 3, 64, 980

9) $3(b - c)\,(c - a)\,(a - b)$

Group-C

4) 0 5) 37 6) $(2a + 3)$, $(a-1)$ 7) $(a + b)\,(b + c)\,(c + a)$ 8) 4913 9) 18

10) 97 11) 18 12. –1 14) $k = 5; 62$ 15) $\frac{18}{127}$ 16) $(x-5)\,(x+1)\,(x-2)^2$

17) $(x-2)$ and $(x+3)$ 19) $x = 8$ 20) 10

CHAPTER-3

COORDINATE GEOMETRY

Key points and formulae

- To locate the position of an object or point in a plane, we require two mutually perpendicular lines. The plane is called the Cartesian or coordinate plane and the lines are called the Co-ordinate axes.
- The Horizontal line is called the x axis and the vertical line is called the y axis.
- The coordinate axes divide the plane into four parts called quadrants.
- The point of intersection of the axes is called the origin.
- The distance of a point from the y axis is called its x - coordinate or abscissa and the distance of the point from the x-axis is called its y - coordinate or ordinate.
- If the abscissa of a point is x and the ordinate is y, then (x, y) are called the coordinates or ordered pair of the point.
- The coordinates of a point on the x axis are of the form $(x, 0)$ and that of the point on the y axis are $(0,y)$.
- The coordinates of the origin are $(0,0)$
- The coordinates of a point are of the form (x,y) in the first quadrant, $(-x,y)$ in the second quadrant, $(-x, -y)$ in the third quadrant and $(x,-y)$ in the fourth quadrant.
- If $x \neq y$ then $(x,y) \neq (y,x)$ and if $(x,y) = (y,x)$ then $x=y$.

Exercise-3

Group-A (1 mark each)

Very Short answer type question

- **Multiple Choice Questions :**

(Choose and write the correct option in the following questions) :

1. If $p\ (x,y)$ lies in IInd quadrant then which of the following is true about x and y ?

   (a) $x>0,\ y>0,$ (b) $x>0,\ y<0,$ (c) $x<0,\ y>0,$ (d) $x<0,\ y<0,$

2. In which quadrant will $(-4,6)$ lie?

   (a) I quadrant (b) II quadrant (c) II quadrant (d) IV quadrant

3. A point lies on negative side of x axis. Its distance from origin is 20 units. The coordinates of the point are–

   (a) (20, 0) (b) (–20, 0) (c) (0, 20) (d) (0, –20)

4. In how many parts does the coordinate axes divide the plane?

   (a) 1 part (b) 2 parts (c) 3 parts (d) 4 parts

5. The point of intersection of the axes is called –

   (a) abscissa (b) ordinate (c) origin (d) quadrant

6. Point (0, –7) lies

   (a) on the x axis (b) in the second quadrant

   (c) on the y axis (d) in the fourth quadrant.

7. Abscissa of all the points on the x axis is–

   (a) 0 (b) 1 (c) 2 (d) any number

8. The point (–5, 2) and (2, –5) lie in the–

   (a) Same quadrant (b) II and III quadrant respectively

   (c) II and IV quadrant respectively (d) IV amd II quadrant respectively.

9. Abscissa of (2, 3) is–

   (a) –2 (b) 3 (c) 2 (d) None of these

10. In which quadrant abscissa is negative and ordinate is positive?

    (a) II (b) III (c) I (d) IV

11. If the coordinates of the two points are P (–2, 3) and Q (–3, 5), then (Abscissa of P) – (Abscissa of Q) is–

    (a) –5 (b) 1 (c) –1 (d) –2

12. If $(x + 3, 5) = (2, 2–y)$ then the value of x and y are–

    (a) $x = 5, y = 3$ (b) $x = –1, y = –3$ (c) $x = 0, y = –3$ (d) $x = 1, y = 3$

13. If the Co-ordinates of the point P are (3, –5), then the perpendicular distance of P from the *y axis*.

    (a) 4 (b) 5 (c) 3 (d) 2

14. The point is at a distance of 5 units from x axis and 7 units from y axis. Then the coordinates of point could be–

    (a) (5, 7) (b) (7, 5) (c) (0, 7) (d) (7, 0).

- **Fill in the blanks of the followings :**

1. The point of intersection of the x axis and y axis in the cartesian plane is _____.
2. The x axis and the y axis divide the cartesian plane in _____ quadrants.
3. If the perpendicular distance of a point P from the x axis is 7 units along the negative direction of the y axis, then the ordinate of P is _____.
4. The distance of the point (3, 4) from y axis is _____.
5. The distance of the point (5, –2) from x axis is ____.
6. Point (–6, 5) lies in the _____ quadrant.

- **Answer the following questions :**

1. If the coordinates of the two points are A (–7, 8) and B (–8, 10), then find 2(Abscissa of A) – (Abscissa of B).
2. If (a + 2, 7) = (4, 3 –b), then find the value of a and b.
3. If y coordinate of a point is zero, then where will this point lie in the coordinate plane?
4. In which quadrants, the abscissa of a point is negative?
5. Find the point whose ordinate is –3 and which lies on y axis.
6. The point in which abscissa and ordinate have different signs will lie in which quadrant?
7. Where does the point (–2, 4) lie in the coordinate plane?
8. Find the point which lies on the line $y = -3x$ having abscissa 3.
9. Find the perpendicular distance of the point P (5, 7) from the y axis.
10. Find the point which lies on the line $y = 4x$ having ordinate 8.

- **State whether the following statement are true or false :**

1. Point (–3, –5) lies in the fourth quadrent.
2. Point (0, 0) lies on x and y axis both.
3. The perpendicular distance of the point (5, 7) from the x axis is 5.
4. Coordinate of a point on the y axis are of the form (0, y).
5. Abscissa of a point is positive in I and IV quadrant.
6. If y co-ordinate of a point is zero, then this point always lies on y axis.

7. The point (6, 0) lies on x axis.
8. Point (0, –9) lies in IV quadrant.
9. The point (0, –5) lies in II quadrant.
10. Point (2, –5) and (2, 5) are equidistance from x axis.

Group-B (2 marks each)

- **Short answer type questions :**

1. Find out quadrants in which the following points lie.
   i) Point A =(3, –4) ii) Point B = (–3, 4)
   iii) Point C = (–3, 4) iv) Point D = (3, 4)
2. Find the coordinates of the point.
   i) Which lies on x and y axes both
   ii) Whose ordinate is –4 and which lies on y axis.
3. Draw a rectangle ABCD in which vertices A, B, C and D are (1, 4), (–5, 4), (–5, –3) and (1, –3) respectively.
4. Find the area of the figure formed by joinng the points (5,0) (0,0), (0, 6)
5. Without plotting the points indicate the quadrant in which they will lie if
   i) Ordinate is –3 and abscissa is –2
   ii) Abscissa is 5 and ordinate is –6.
6. Plot the points A (5, 5) and B (–5, 5) in cartesian plane. Join AB, OA and OB. Name the type of triangle so obtained.
7. Find the value of x and y if $(x + 4, 3y – 2) = (9, 6)$.
8. Which axis is parallel to the line on which the two points with co-ordinates (5, 3) and (5, –2) lie?
9. Two points with coordinates (7, 6) and (–5, 6) lie on a line parallel to which axis? Justify your answer.
10. Determine whether the given point lie on a same straight line or not : (0, 5) $\left(\frac{5}{2}, 0\right)$ and (5, –5).
11. Plot the porints (x, y) given by the following table use scale 1cm = 1 unit.

x	2	4	–3	–2	3	0
y	4	2	0	5	–3	0

Group-C (3 / 4 marks each)

- **Long answer type questions :**

1. Points A (5, 3), B (–3, 3) and D (5, –4) are three vertices of a square ABCD. Plot these points on a graph paper and hence, find the co-ordinates of the vertex C.
2. Write the coordinates of the vertices of a rectangle whose length and breadth are 7 and 5 units respectively, one vertex at the origin, the longer side lies on the *x* axis and one of the vertices lies in the third quadrant.
3. Plot the points A (1,–1) and B (4, 5)

   i) Draw the line segment joinng these points. Write the co-ordinates of two points on this line segment between the points A and B.

   ii) Extend this line segment and write the coordinates of a point on this line. Which lies outside the line segment AB.
4. Write the coordinates of the vertices of a rectangle whose length and breadth are 6 and 3 units respectively, one vertex at the origin, the longer side lies on the *y* axis and one of the vertices lies in the second quadrant.
5. Plot the points P(1, 0), Q(4, 0) and S(1, 3). Find the coordinates of the point R such that PQRS is a square.
6. The three vertices of a rectangle ABCD are A(2, 2), B(–3, 2) and (–3, 5). Plot these points on a graph paper and find the coordinates of D. Also, find the area of rectangle ABCD.
7. Plot the points A (1,–3) and B (5, 4)

   i) Draw a line segment with these points. Write the coordinates of a point on this line segment AB.

   ii) Extend this line segment and write the coordinates of a point on this line which lies outside the line segment AB.
8. Plot the following point and check whether they are collinear or not.

   i) (2, 3), (3, 2), (1, –5)

   ii) (–1, 1), (–3, 3), (–5, 5)

Answers

Group-A

Very Short answer type questions :

- **Multiple Choice Questions :**

  1. (c) 2. (b) 3. (b) 4. (d) 5. (c) 6. (c) 7. (d) 8. (c) 9. (c) 10. (a)
  11. (b) 12. (b) 13. (c) 14. (b)

- **Fill in the blanks :**

  1) Origin (0, 0) 2) Four 3) –7 4) 3 unit 5) 2 units 6) II Quadrant

- **Answer the following questions :**

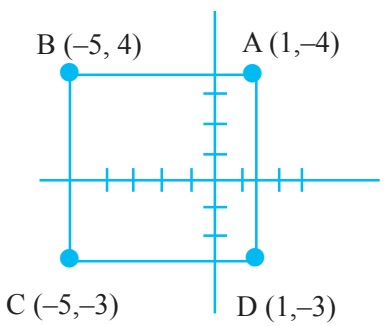
  1. –6 2. a=2, b= –4 3. on the *x* axis 4. II and III quadrant 5. (0, –3)
  6. II and IV quadrant 7. II quadrant 8. (3, –9) 9. 5 10. True.

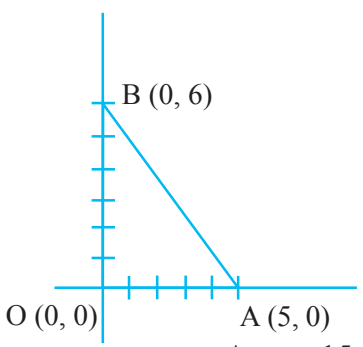
- **State whether the following statements are true or false :**

  1. False 2. True 3. False 4. True 5. True 6. False 7. True
  8. False 9. False 10. True.

Group-B

- **Short answer type questions :**

  1. i) Point A lies in the 4th quadrant.
     ii) Point B lies in the 2nd quadrant.
     iii) Point C lies in the 3rd quadrant.
     iv) Point D lies in the 1st quadrant.
  2. i) (0, 0) ii) (0, –4)
  3. 

  4. 

     Area = 15 sq unit

5. (i) III quadrant (ii) IV quadrant.

6. The obtained triangle is an isosceless triangle.

7. $x = 5$ and $\frac{8}{3}$

8. Both points lie on the line $x = 5$, which is parallel to y axis.

9. Both points lie on the line $y = 6$, which is parallel to x axis.

10. (0,5), $\left(\frac{5}{2},0\right)$ and (5, –5) lie on the same straight line.

Group-C

- **Long answer type questions :**

1. (–3, –4)

2. (–7, –5)

3 . (i) (2,1) and (3, 3) (ii) (5, 7)

4. O (0. 0), A (–6, 0), C (0, –3), the fourth vertex B (–6, –3)

5. Coordinates of R are (4, 3)

6. Coordinates of D are (2, 5)

7. (i) The point (2.7, 0) lies on the line segment AB. (ii) The point (0, –4.7) lies on the same line but outside the line segment AB.

8. (i) non-collinear (ii) collinear

9. (0, 0) (–7, 0), (–7, –4), (0, –4)

10. (2, 3) and area = 9 sq. units.

CHAPTER-4

LINEAR EQUATIONS IN TWO VARIABLES

Key points and formulae

1. An equation of the form $ax + by + c = 0$, where a, b and c are real numbers, such that a and b are not both zero, is called a linear equaton in two variables.
2. A linear equation in two variables has infinitely many solutions.
3. The graph of every linear equation in two variables is a straight line.
4. $x=0$ is the equation of the y-axis and $y = 0$ is the equation of the x-axis.
5. The graph of $x = a$ is a striaght line parallel to the y-axis.
6. The graph of $y = a$ is a stright line parallel to the x-axis.
7. An equation of the type $y = mx$ represents a line passing through the origin.
8. Every point on the graph of a linear equation in two variables is a solution of the linear equation. Moreover, every solution of the linear equation is a point on the graph of the linear equation.

EXERCISE-4

Group -A (1 mark each)

I. Fill in the blanks :

1. The equation of x-axis is _____.
2. The graph of $x = 4$ is a line, which is parallel to _____ axis.
3. Any point on the x-axis is of the form _____.
4. If (2, 0) is a solution of the linear equation $2x + 3y = k$ then the value of k is _____.
5. The equation of y-axis is _____.
6. A linear equation in two variables has _____ solutions.
7. Any point on the y-axis is of the form _____.
8. A linear equation in two variables x and y is the form _____.
9. The number of line (s) passing through a point (3, 4) is (are) _____.
10. The equation $2x – 5y = 9$ has _____ solutions.

II. Multiple Choice Questions :

1. The point of the form (a, a) always lies on–

   a) x-axis b) y-axis c) on the line $y = x$ d) on the line $x + y = 0$

2. The graph of $y = mx$ is a straight line –

   a) Parallel to x-axis b) Parallel to y-axis

   c) Passing through origin d) Coincides withh x-axis

3. $x = 5, y = -2$ is the solution of linear equation –

   a) $2x + y = 9$ b) $x + 3y = 1$ c) $2x - y = 12$ d) $x + 3y = 0$

4. Linear equation in one variable is –

   a) $2x = y$ b) $y^2 = 3y + 5$ c) $4x - y = 5$ d) $3t + 5 = 9t - 7$

5. Equation $y = 2x + 3$ has –

   a) Unique solution b) No solution

   c) Only two solutions d) Infinitely many solutions.

6. Equation of line perallel to x-axis and 2-units above the origin is–

   a) $y = 2$ b) $y = -2$ c) $x = 2$ d) $x = -2$

7. Graph of the equation $2x + 3y = 9$ cuts y-axis at the point–

   (a) $\left(\frac{9}{2}, 0\right)$ (b) $(0, 3)$ (c) $(0, 9)$ (d) $(3, 1)$

8. The distance between the graphs of the equations $y = -1$ and $y = 3$ is

   (a) 2 (b) 4 (c) 3 (d) 1

9. If $(2k-1, k)$ is a solution of the equation $10x - 9y = 12$, then $k =$

   (a) 1 (b) 2 (c) 3 (d) 4

10. The graph of the linear equation $2x - y = 4$ cuts x-axis at–

    (a) $(2, 0)$ (b) $(-2, 0)$ (c) $(0, -4)$ (d) $(0, 4)$

11. Equation of the line $y = 0$ represents–

    (a) y-axis (b) x-axis (c) both x-axis and y-axis (d) origin

12. The distance between the graph of the equations $x = -3$ and $x = 2$ is

    (a) 1 (b) 2 (c) 3 (d) 5

13. How many linear equations are satisfied by $x = 2$ and $y = 3$?

    (a) only one (b) Two (c) Infinitely many (d) Three

14. If (a, 4) lies on the graph of $3x + y = 10$, then the value of a is–

    (a) 3 (b) 1 (c) 2 (d) 4

15. The graph of the line $x–y = 0$ passes though the point–

    (a) $\left(-\frac{1}{2}, \frac{1}{2}\right)$ (b) $\left(\frac{3}{2}, \frac{-3}{2}\right)$ (c) $(0, –1)$ (d) $(1, 1)$

III. Write whether the following statements are true or false :

1. The point (0, 3) lies on the graph of the linear equation $3x + 4y = 12$.
2. The graph of every linear equations in two variables need not be a line.
3. The graph of the linear equation $x + 2y = 7$ passes through the point (0, 7)
4. Any point on the x-axis is of the form $(x, 0)$.
5. The graph of the linear equation $y=mx$ passes through the point (0, 0)

IV. Very Short answer type questions :

1. If the point (2, –2) lies on the graph of the linear equation $5x + ky = 4$, find the value of k.
2. Write the equation of a line passing through the point (0, 4) and parallel to x-axis.
3. Express the equation $5x = –y$ in the general form and indicate the value of a, b and c.
4. Express y in terms of x from the equation $3x + 2y = 8$.
5. The point (3, 4) lies on the graph of the equation $3y = ax + 7$; Find the value of 'a'.
6. The cost of a notebook is twice the cost of a pen. Write a linear equation in two variables to represent this statement.
7. Write the equation of a line parallel to y-axis and passing through the point (3, –7).
8. Express x in terms of y, given that $2x – 5y = 7$.
9. Express the equation $3x + 2 = 0$ in the form $ax + by + c = 0$.
10. Write two solutions of the equation $x = 4y$.

Group -B (2 marks each)

- **Short Answer type questions :**

1. Find the point at which, the equation $3x - 2y = 6$ meets the x-axis.
2. Give two solutions of the equation $x + 3y = 8$
3. Find the coordinates of the points where the line $2x - y = 3$ meets both the axis.
4. If the point $(2k-3, k + 2)$ lies on the graph of the equation $2x + 3y + 15 = 0$, find the value of k.
5. How many solution (s) of equation $2x + 1 = x - 3$ are there on number line.
6. Give geometrical representation of equation $3x + 12 = 0$ in two variables.
7. Express the equation $x = 3y$ in the form $ax+by+c= 0$ and indicate the value of a, b and c.
8. Find the value of 'k' if $x = 2$, $y = 1$ is a solution of the equation : $2x + 3y =$ k.
9. Write the equations of two lines passing through (2, 3).
10. Determine the point on the graph of the linear equation $2x + 5y = 19$, whose ordinate is $1\frac{1}{2}$ times into abscissa.
11. Write the linear equation such that each point on its graph has an ordinate 3 times its abscissa.
12. Solve the equation $2y - 1 = y + 1$ and represent it graptically on the coordinate plane.

Group -C (3 marks each)

- **Long Answer type questions :**

1. Draw the graph of $y - 2x = -3$ and check, if (2, 3) is on the graph.
2. Give the geometrical representation of $2x + 3 = 0$ as an equation in (a) one variable
   (b) two variables.
3. Find three solutions for the equation $2x + 3y = 4$.
4. Draw the graph of $2x + y = 7$. Write the points where line meets x and y-axes.
5. Find three solutions of the equation $3 = 2x + y$
6. The linear equation that converts temperature from °F to °C scale is $F = \frac{9}{5}C + 32$. Is there a temperature which is numerically the same in both °F and °C scales ? If yes find it.

7. Find m, if point (7, –3) lies on the equation $\left(y-\frac{3}{7}\right)=m\left(x-\frac{2}{7}\right)$

8. For what value of c, the linear equation $2x + cy = 8$ has equal values of x and y for its solution.

9. Let y varies directly as x . If $y = 12$ when $x = 4$, then write a linear equation. What is the value of y when $x = 5$.

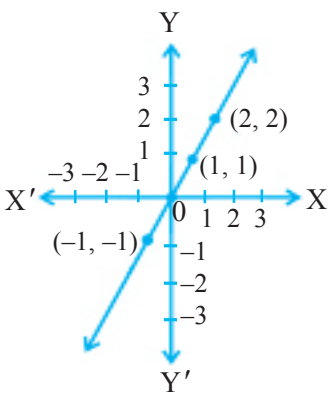
10. Draw the graph of the equation $2x + 3y = 6$. From the graph read the value of x, when $y=4$.

11. Check whether $x = –2$ and $y = 6$ is a solution of $3 (x–2) + 2 (y + 3) = 6$. Find one or more solution. How many more solution can you find?

12. For the graph given in fig. select the equation whose graph it is from the choices given below :

    a) $x + y = 0$ b) $y = 2x$

    c) $y = x$ d) $y = 2x + 1$



13. The taxi fare in a city are as follows. For the first kilometre the fare is ₹12 and for the subsequent distance it is ₹ 7 per km. Taking the distance covered as x km and total as ₹ y, write a linear equation and draw the graph.

14. Two pens and three pencils together cost ₹ 20. Represent this statement as a linear equation in two variables and give two solutions for it.

15. Draw the graphs of $y = x$ and $y = –x$ in the same graph. Also, find the co-ordinates of the point where the two lines intersect.

Group -D (4 marks each)

- **Long Answer type questions :**

1. Draw the graph of the equation $y - x = 2$. From the graph, determine–

   i) the value of y when $x = 4$ (ii) the value of x when $y = -3$.

2. You know that the force applied on a body is directly proportional to the acceleration produced in the body. If constant of proportionality is 2, write an equation to express this situation and plot the graph of equation.

3. Draw the graphs of each of the equation $x - 2y = 3$ and $4x + 3y = 1$ on the same graph.

4. Draw the lines $x = 4$, $y = 2$ and $x = y$, on the same graph paper and then identify what type of figure obtained? Also write the point of verties of this figure formed.

5. The parking charges of a car in a parking plot is ₹ 30 for the first two hours and ₹10 for subsequent hours. Taking total parking time to be x hours and total charges as ₹ y, write a linear equation in two variables to express the above statement. Draw a graph for the linear equation and read the charges for five hours.

6. Rita and Geeta, two students of class IX, together contributed ₹100 towards Prime-Minister's Relief fund to help the earthquake victims. Write a linear equation with this data satisfied. Draw the graph of the same.

7. The following observed values of x and y are thought to satisfy a linear equation. Write the linear equation :

x	6	–6
y	–2	6

   Draw the graph using the values of x, y as given in the above table.

   At what points the graph of the linear equation– a) Cuts the x - axis b) Cuts the y-axis.

8. Show that the points A (1,2), B (–1, –16) and C (0, –7) lie on the graph of the linear equation $y = 9x - 7$.

9. Draw the graphs of the lines $x - y = 1$ and $2x + y = 8$. Shade the area formed by these two lines and the y-axis. Also, find this area.

10. Three vertices of a rectangle ABCD are A (3,1), B (–3,1) and (–3, 3). Plot these points on a graph paper and find the co-ordinates of the fourth vertex D. Also, find the area of rectangle ABCD.

Answers

Group -A

I. 1) y=0 2) y-axis 3) $(x, 0)$ 4) $k = 4$ 5) $x = 0$ 6) Infinite 7) (0, y)
8) $ax + by + c = 0$ 9) Infinite 10) Infinite.

II. 1) c 2) c 3) c 4) d 5) d 6) a 7) b 8) b 9) b 10) a 11) b
12) d 13) c 14) c 15) d

III. 1) True 2) false 3) false 4) True 5) True.

IV. 1) $k = 3$ 2) $y = 4$ 3) $5x + y = 0$, $a = 5$, $b = 1$, $c = 0$ 4) $y = \frac{8-3x}{2}$
5) $a = \frac{5}{3}$ 6) $x = 2y$ 7) $k = -3$ 8) $x = \frac{7+5y}{2}$ 9) $3x + 0.y + 2 = 0$
10) $x = 4, y = 1 = 0, x = 0, y = 0$

Group -B

1) (2,0) 2) (5,1), (2,2) 3) $\left(\frac{3}{2}, 0\right)$, (0, –3), 4) $k = \frac{-15}{7}$ 5) one
6) $x + 0y = -4$ 7) $1.x - 3y + 0 = 0$, $a = 1, b = -3, c = 0$ 8) $k = 7$
9) $x + y = 5$, x–y = –1 10) (2, 3) 11) $y = 3x$.

Group -C

3) $\left(0, \frac{4}{3}\right)$, (2,0), (–1, 2) 4) x-axis (3.5, 0), y-axis (0,7) 5) (0,3), (1,1), (1.5, 0)
6) –40° 7) $m = -\frac{24}{47}$ 8) $c = \frac{8-2x}{x}$ 9) $y = 3x$, at $x = 5$, $y = 15$ 10) $x = -3$
11) $x = -2, y = 6$ is a solution, $x = 2, y = 0$ is another solution, Infinite solutions are there 12)
(c) $y = x$ 13) $7x - y + 5 = 0$ 14) $2x + 3y = 20$ 15) (2, 3)

Group -D

1) y=6, $x = -5$ 2) $F = 2a$ 4) (2, 2), (4, 2), (4, 4) 7) (3, 0), (0, 2), $2x + 3y = 6$
9) 13.5 sq. unit.

CHAPTER-5

INTRODUCTION TO EUCLID'S GEOMETRY

Key points and formulae

A) Some definitions in Euclidean Geometry

During Euclid's period, the notations of points, plane (or surface) and so on were derived from what was seen around them.

Some of the definitions given as follows :

- A **point** is that which has no part.
- A **line** is bredth-less length
- A **surface** is that which has length and breadth only.
- The **edges** of a surface are lines.
- A **plane surface** is one that lies evenly with the straight lines on itself.

B) Euclid's axioms :

Axioms are the assumptions that are obvious universal truths, but are not proved. These are used throughout mathematics and are not specially linked to geometry.

Some of Euclid's axioms are as follows :

- Things that are equal to the same things are equal to one another.
- If equals are added to equals then the wholes are also equal.
- If equals are subtracted from equals then the remainders are equal.
- Things that coincide with one another are equal to one another.
- The whole is greater than the part.
- Things that are double of the same things are equal to one another.

C) Euclid's postulates :

Postulates are also universal truth that need not to be proved. Euclid used the term "Postulate" for the assumptions that were specify to geometry.

Postulate 1 : *It is possible to draw a straight line from any point to any other point.* Euclid has frequently assumed this postulate without mentioning that there is a unique line joining two distinct points. The above result can be stated in the form of an axiom as follows :

Axiom : Given two distinct point there is a unique line that passes through them.

Postulate 2 : *A terminated line can be produced indefinitely.*

Note : According to present day terms, the second postulate states that a line segment can be extended on either side to form a line.

Postulate 3 : *It is possible to describe a circle with any centre and radius.*

Postulate 4 : *All right angles are equal to one another.*

Postulate 5 : *If a straight line falling on two straight lines forms interior angles that together measure less than two right angles on the same side of it, then the two straight lines when produced indefinitely, meet on that side on which the sum of the angles is less than two right angles. Euclid's fifth postulate is also called Parallel Postulate.*

Note : Two equivalent version of Euclid's fifth postulate are :

(i) "For every line l and for every point p not lying on l, there exists a unique line m passing through p and parallel to l". This is known as Playfair's Axiom.

(ii) In other words we can say that : "Two distinct intersecting lines can not be parallel to the same line."

Exercise : 5

Group -A [1 mark each]

Choose the correct answer :

1) The number of dimensions of a surface has–

(a) 1 (b) 2 (c) 3 (d) 0

2) Euclid divided his famous treatise 'The elements' into–

(a) 13 chapters (b) 12 chapters (c) 11 chapters (d) 9 chapters

3) Boundaries of surfaces are–

(a) Surfaces (b) Curves (c) lines (d) points

4) It is known that, if $x+y = 10$, then $x+y+z = 10 + z$. This illustrates Euclid's–

(a) first axiom (b) second axiom (c) third axiom (d) fourth axiom

5) Pythagoras was a student of–

(a) Euclid (b) Archimedes (c) Both (a) and (b) (d) Thales

Fill in the blanks :

6) The number of dimensions of a solid is ——.

7) The side faces of pyramid are always ——.

8) Lines are ———, if they do not intersect.

9) ——— Axiom is an equivalent version of Euclid's fifth postulates.

10) The country ——— is the mother land of Euclid.

State the followings True or False :

11) The statements that are proved are called axioms.

12) Two distinct intersecting lines can not be parallel to the same line.

13) The boundaries of the solids are curves.

14) Euclid stated that right angles are equal to each other is the form of a postulate.

15) The statements that were proved are called propostions or theorems.

Very Short Answer type questions :

16) How many lines can pass through a given point?

17) Name the line segments deermined by the three collinear points P, Q and R.

18) In how many points can two distinct lines at the most intersect?

19) Define parallel lines.

20) How many least number of distinct points determine a unique line?

Group -B [2 marks each]

Short Answer type questions :

1. What is the difference between a theorem and an axiom?

2. Define : (i) Concurrent lines (ii) Collinear points.

3. Slove the equation u–5 = 15 and state the axiom that you use here.

4. If P, Q and R are three points on a line and Q is between P and R, then prove that PR–QR=PQ.

5. Given three distinct points is a plane, how many lines can be drawn by joining them?

6. It is known that $x+y = 10$ and $x = z$. Show that $z+y=10$.

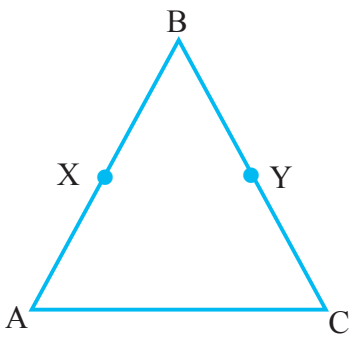
7. L, M, N are three lines in the same plane such that L intersects M and M||N. Show that L intersect N also.

8. Two salesman make equal sales during the month of August. In September, each salesman doubles his sale of the month of August. Compare their sales in September.

9. Look at the adjoining figure.

Show that the length PV > sum of lengths PQ + QR + RS.

10. In the adjoining figure, if AB = BC and BX = BY, then show that AX = CY

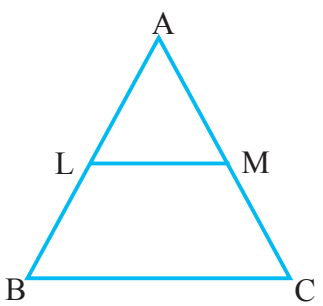


Group-C [3/4 marks each]

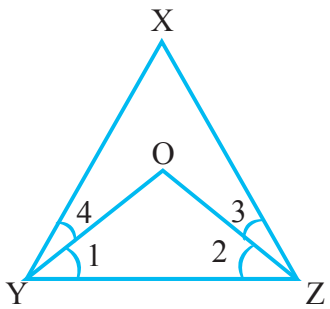
Long Answer type questions :

1. " Two intersecting lines connot be perpendicular to the same line."– Check whether it is an equivalent version the Euclid's fifth postulate.

2. In the adjoining figure, if $\angle A = \frac{1}{2}$ AB, MA = $\frac{1}{2}$ AC and LA = MA, Show that AB = AC.



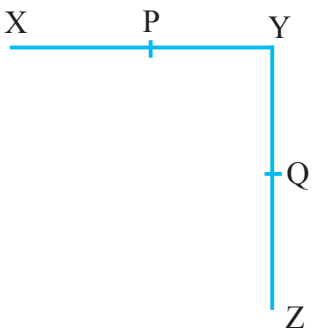
3. In the adjoining figure if $\angle XYZ = \angle XZY$ and $\angle 3 = \angle 4$ then show that YO = OZ.



4. Does Euclid's fifth postulate imply the existence of parallel lines ? Explain.

5. In the adjoining figure, (i) XY = YZ, P and Q are the mid points of XY and YZ respectively. Show that XP = QZ.

(ii) PY = YQ, P and Q are the mid points of XY and YZ respectively. Show that XY = YZ.



Answers

Group-A

1. (b) 2. (a) 3. (c) 4. (b) 5. (d) 6. 3 7. Triangle. 8. Parallel

9. Playfair's 10. Greece 11. False 12. True 13. False 14. True

15. True 16. Infinitely many 17. $\overline{PQ}$, $\overline{QR}$ and $\overline{PR}$ 18. One 20. Two

Group-B

3. u=20, Second Axiom.

5. One, if the three points are colinear and three, if points are non- collinear.

8. In September also their sales are again equal.

CHAPTER-6

LINES AND ANGLES

Key points and formulae

- Complementary angles : Two angles are said to be complementary, if the sum of their measure is 90°.
- Supplementary angles : Two angles are said to be Supplementary, if the sum of their measure is 180°.
- Adjacent angles : Two angles having a common vertex and a common arm are called adjacent angles if their uncommon arms are on either side of the common arm.
- Vertically opposite angles : Two angles are said to form a pair of vertically opposite angles if their arms form two pairs of opposite rays.
- Linear pair : Two angles are said to form a Linear pair, if the sum of their measure is 180°.
- If a ray stands on a line, then the adjacent angles so formed are supplementary and its converse.
- If two lines intersect each other, then the vertically opposite angles are equal.
- If a tansversal intersects two parallel lines, then

  i) corresponding angles are equal and conversely.

  ii) alternate interior angles are equal and conversely.

  iii) interior angles on the same side of the tansversal are supplementary and conversely.
- If a transversal intersects two lines such that, either

  i) any one pair of corresponding angles is equal, or

  ii) any one pair of alternate interior angles is equal, or

  iii) any one pair of interior angles on the same side of the transversal is supplementary, then the lines are parallel.
- The sum of the three angles of a triangle is 180°.
- If a side of a triangle is produced, the exterior angle so formed is equal to the sum of the two inerior opposite angles.

Group -A

1. Fill in the blanks :

a) The complementary angle of 35° is _____.

b) The supplementary angle of 132° is _____.

c) Two lines perpendicular to the same line are _____ to each other.

d) The angle which exceeds its complement by 30° is _____.

e) If one angle of a triangle is equal to the sum of other two angles, then the triangle is____.

f) Angles of a triangle are in the ratio 2:4:3. The smallest angle of the triangle is _____.

g) Exterior angle of a triangle is equal to the sum of the corresponding two interior_____.

2. Multiple Choice Questions (MCQs)

Choose the correct option in each of the following questions :

i) An exterior angle of a triangle is 105° and its interior opposite angles are equal. Each of these equal angles is–

(a) $37\frac{1°}{2}$ (b) $52\frac{1°}{2}$ (c) $72\frac{1°}{2}$ (d) 75°

ii) The angle which is twice its suppliment is–

(a) 60° (b) 120° (c) 110° (d) 130°

iii) A triangle can have–

a) two obtuse angle b) two right angles

c) two acute angles d) none of these.

iv) Angle ABC market in the Fig 6,1 is a/an

a) acute angle

b) obtuse angle

c) reflex angle

d) none of these

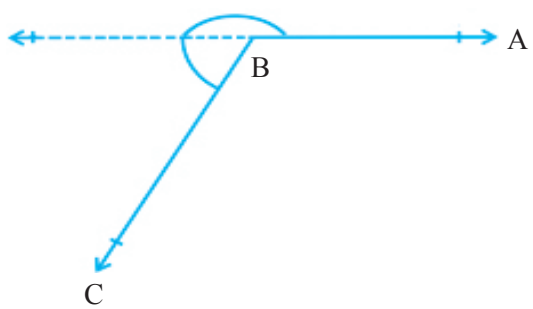


Fig 6.1

v) In fig 6.2 POQ is a line. The value of x is–

(a) 20° (b) 25°

(c) 30° (d) 30°

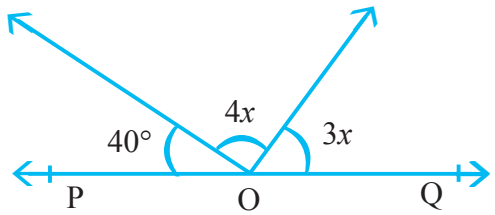


Fig 6.2

vi) The angles of a triangle are in the ratio 5:3:7. The triangle is–

(a) an acute angled triangle (b) an obtuse angled triangle

(c) a right triangle (d) an isosecles triangle.

vii) In Fig 6.3 bisectors of ∠B and ∠C meet at O. Then ∠BOC equal to–

(a) 70° (b) 110°

(c) 125° (d) 235°

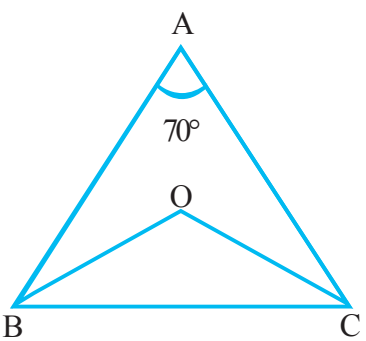


Fig. 6.3

viii) In Fig 6.4, if ∠1= 60° and ∠6 = 120°, then the lines m and n are–

(a) not parallel

(b) parallel

(c) perpendicular

(d) can not say

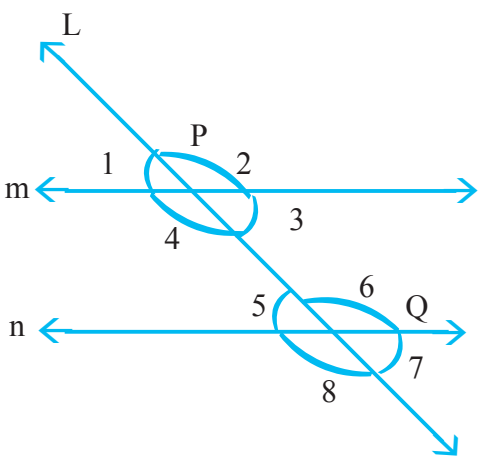


Fig. 6.4

ix) In the figure 6.5, straight lines AB and CD intersect at O. If $\angle AOC + \angle BOD = 130°$ then $\angle AOD = ?$

(a) 65° (b) 110°

(c) 125° (d) 115°

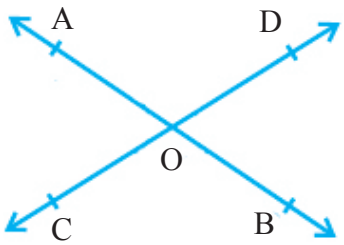


Fig. 6.5

x) In given fig. 6.6, $\angle OAB = 75°$, $\angle OBA = 55°$ and $\angle OCD = 100°$. Then, $\angle ODC = ?$

(a) 30° (b) 35°

(c) 40° (d) 45°

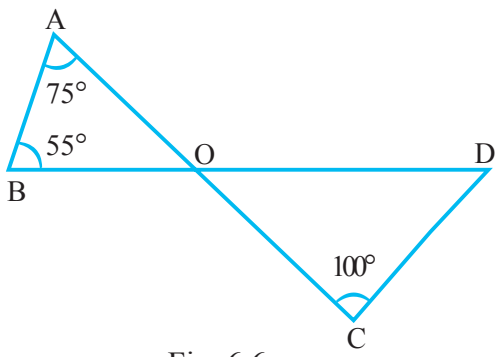


Fig. 6.6

3. Very Short Answer Questions :

Answer the following questions in one word, one sentence or as per the exact requirement of the question. [1 mark]

a) What is the sum of the angles at a point?

b) In fig 6.7, if $l \parallel m$, find angle x.

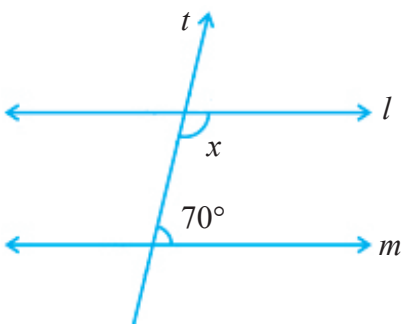


Fig. 6.7

c) In fig 6.8, what value of x will make AOB a straight line?

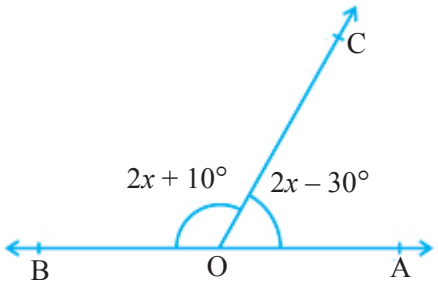


Fig. 6.8

d) Find the angle which is one-fifth its complement.

e) In fig. 6.9, if $l \parallel m$, then find $\angle x$.

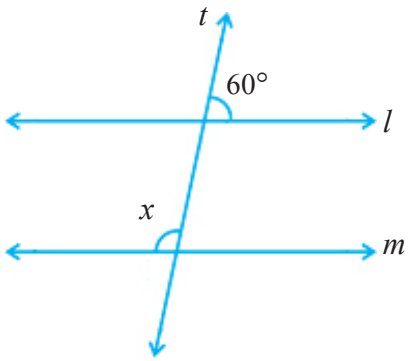


Fig. 6.9

f) Find the complement of the angle which is $\frac{2}{3}$ of a right angle.

g) Find the supplement of the angle 124°.

h) Find the value of x for which the angles $(2x–5)°$ and $(x–10)°$ are the complementary angles.

i) Find the measure of an angle which is equal to its supplement.

j) How many triangles can be drawn having its angles as 50°, 100°, 30°?

k) Can a triangle have two obtuse angles? Justify your answer.

l) Can triangle have all the angles less than 60°? Justify your answer.

Group-B

4. Very Short Answer Questions : (2 marks each)

a) If the ratio between two complementary angles is 2:3, then find the angles.

b) If the difference between two suppllementary angles is 40°, then find the angles.

c) If fig. 6.10, if $l \parallel m$,

then find the value of x.

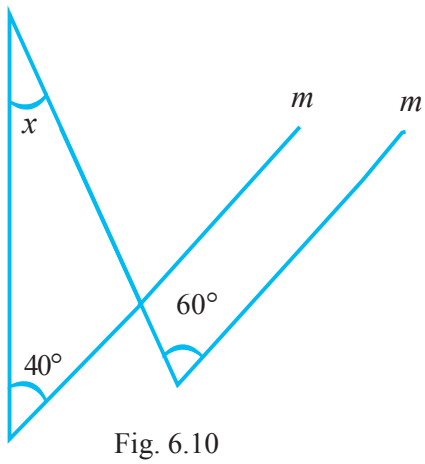


Fig. 6.10

d) In ΔABC, $\angle A+\angle B=110°$, $\angle C+\angle A=135°$, Find $\angle A$.

e) In Fig. 6.11, find the value of x.

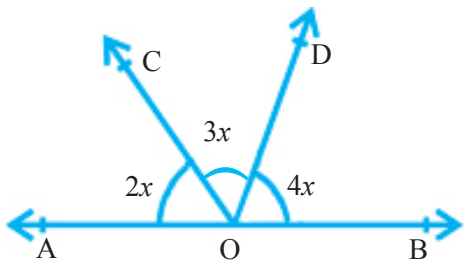


Fig. 6.11

f) Two adjacent angles on a straight line one in the ratio 5:4. Find the measure of each one of these angles.

g) Find the measure of an angle which is

i) one-fourth of its complement.

ii) four times of its suplement.

h) In fig. 6.12, AB||DE.
Find the measure of ∠AOD.

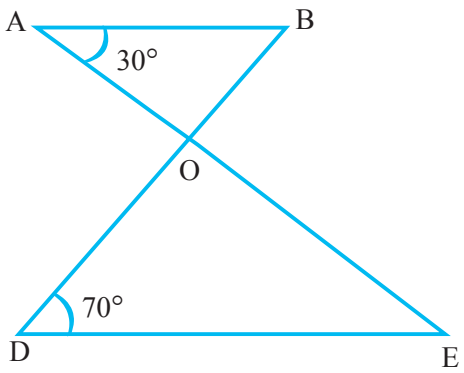


Fig. 6.12

i) In a Δ ABC, ∠C =∠A, AC–AB = 3cm and its perimeter is 15 cm. Find AC.

j) In fig. 6.13. For what value of x will the lines l and m be parallel to each other?

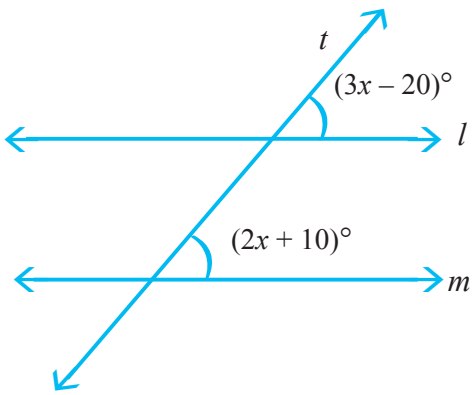


Fig. 6.13

k) In fig 6.14, find the value of x.

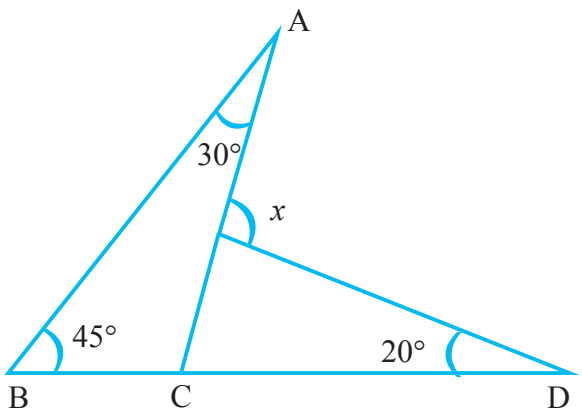


Fig. 6.14

l) In fig. 6.15, AB||CD||EF.
Find the value of x.

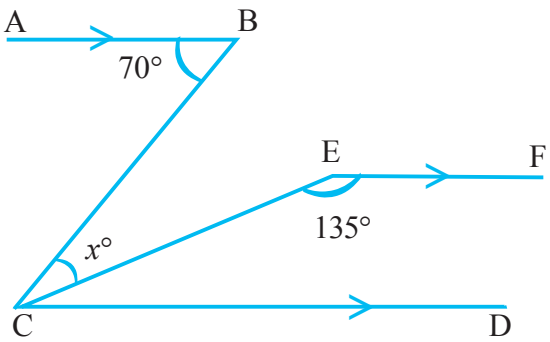


Fig. 6.15

Group -C

5. Long Answer Questions) 3/4 marks each)

a) In fig. 6.16, OD is the bisector of AOC, OE is the bisector of BOC and OD⊥OE. Show that the points A, O and B are collinear.

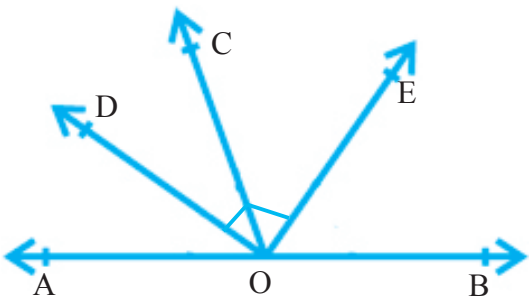


Fig. 6.16

b) In fig. 6.17 DE||QR and AP and BP are bisector of ∠EAB and ∠RBA respectively. Find ∠APB.

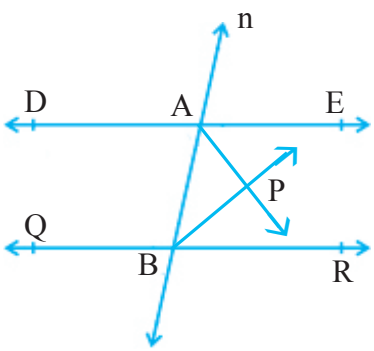


Fig. 6.17

c) If the bisector of angles $\angle B$ and $\angle C$ of a triangle ABC meet at a point O, then prove that $\angle BOC = 90° + \frac{1}{2}\angle A$.

d) In fig. 6.18, $\angle Q > \angle R$, PA is the bisector of $\angle QPR$ and $PM \perp QR$. Prove that $\angle APM = \frac{1}{2}(\angle Q - \angle R)$.

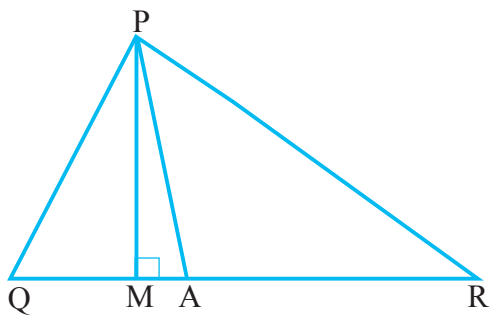


Fig. 6.18

e) In fig. 6.19, prove that $\angle ADC = \angle A + \angle B + \angle C$.

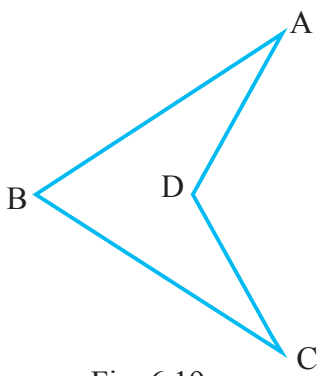


Fig. 6.19

f) In fig. 6.20, AB is a mirrior. PQ is the incident ray and QR the reflected ray. If $\angle PQR = 112°$, find $\angle PQA$.

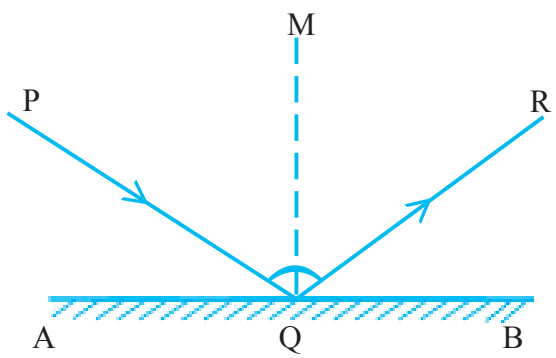


Fig. 6.20

g) Prove that the bisector of a pair of vertically opposite angle are in the same straight line.

h) In the fig. 6.21, three coplanar lines AB, CD and EF intersect at a point O. Find the value of x. Hence, find $\angle AOD$, $\angle COE$ and $\angle AOE$.

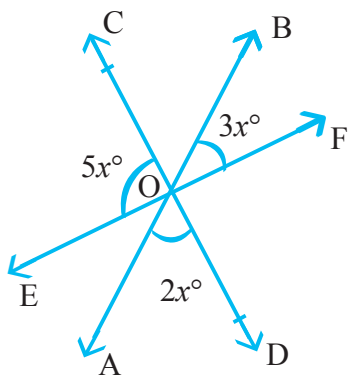


Fig. 6.21

i) If two parallel lines are intersected by a transversal, prove that the bisector of the two pairs of interior angles enclose a rectangle.

j) In fig. 6.22, AB||CD and $\angle AOC = x°$. If $\angle OAB = 104°$ and $\angle OCD = 116°$, find the value of x.

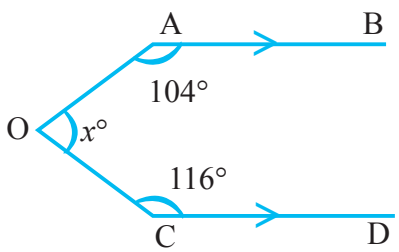


Fig. 6.22

k) In fig. 6.23, $\angle ABC = 80°$ and $\angle DEF = 45°$. The arms DE and EF of $\angle DEF$ and BC at P and Q respectively. Prove that PD||BA.

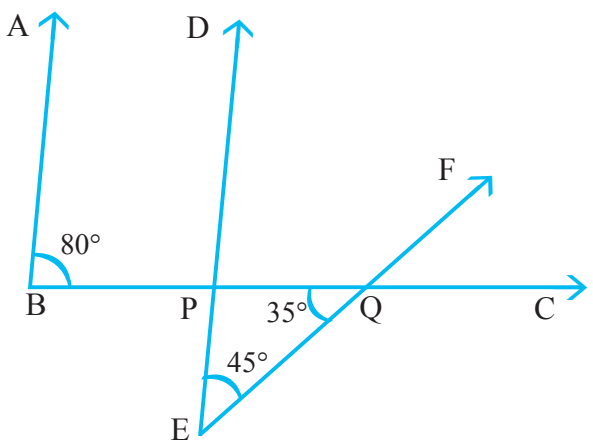


Fig. 6.23

l) In fig. 6.24, AB||CD, ∠A = 90° and ∠AEC = 40°. Find ∠ECD.

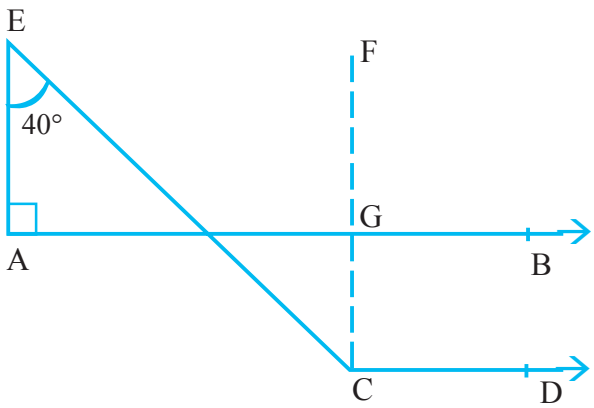


Fig. 6.24

m) In fig. 6.25, AB||CD,
Find the values of *x, y* and *z* .

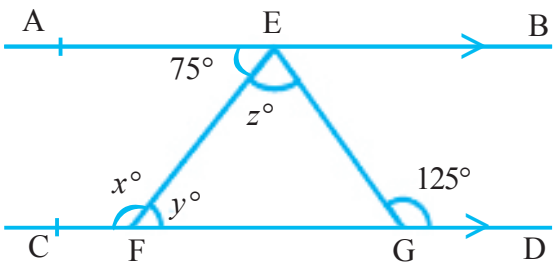


Fig. 6.25

n) In fig. 6.26, AB||PQ,
Find the values of *x* and *y* .

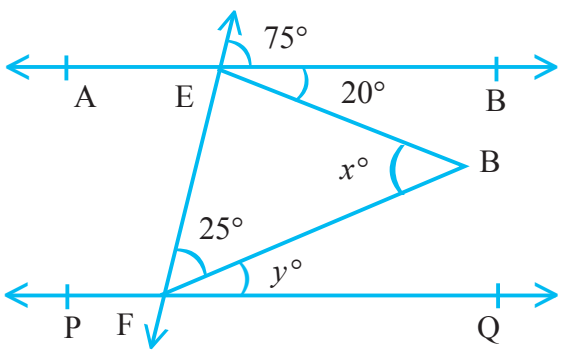


Fig. 6.26

o) In fig. 6.27, AB||CD,
Find the values of x.

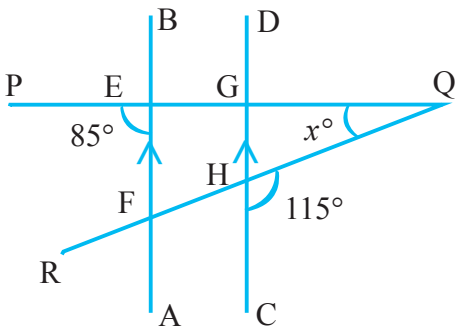


Fig. 6.27

p) In fig. 6.28, PQ||RS, ∠PAB = 70° and ∠ACS = 100°. Determine ∠ABC, ∠BAC and ∠CAQ.

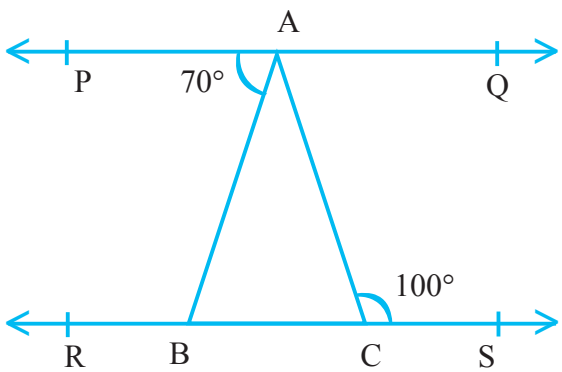


Fig. 6.28

Answers

Group -A

1. (a) 55° (b) 48° (c) Parallel (d) 60° (e) a right triangle (f) 40° (g) opposite angles

2. (i) b (ii) b (iii) c (iv) c (v) a (vi) a (vii) c (viii) b (ix) d (x) a

3. (a) 360° (b) 110° (c) 50° (d) 15° (e) 120° (f) 30° (g) 56° (h) $x = 35$
   (i) 90° (j) Infinitely many triangle (k) No, angle sum cannot be more than 180°
   (l) No, angle sum cannot be less than 180°

Group -B

4. (a) 36°, 54° (b) 70°, 110° (c) 20° (d) 65° (e) $x = 20°$ (f) 100°, 80°
   (g) 18°, 144° (h) 100° (i) 7cm (j) $x = 30$ (k) 95° (l) 25°.

Group -C

5. (b) 90° (f) 34° (h) $x = 18$, $\angle AOD = 36°$, $\angle COE = 90°$, $\angle AOE = 54°$ (j) $x = 140$
   (l) 130° (m) $x = 105$, $y = 75$, $z = 50$ (n) x = 70, y = 50 (o) x = 20
   (p) $\angle ABC = 70°$, $\angle BAC = 30°$, CAQ = 80°.

CHAPTER-7

TRIANGLES

Key points and formulae

- Two geometrical figures having exactly the same shape and size are known as congruent figures.
- For Congruence we use the symbol $\cong$.
- Criteria for congruence of two triangles

  i) SAS ii) ASA iii) SSS iv) RHS
- AAS criterion for congruence of two triangles as particular case of ASA criterion.
- Angles opposite to equal sides of a triangle are equal.
- Sides opposite to equal angles of a triangle are equal.
- A point equidistant from two given points lees on the perpendicular bisector of the linesegment joining the two points and its converse also true.
- In a triangle

  i) Sides opposite to the greater angle is longer.

  ii) Angle opposite to the longer side is greater

  iii) The sum of length of any two sides is greater than the third side.
- If Δ PQR is congruent to Δ ABC we write

  Δ PQR $\cong$ Δ ABC
- The parts of Δ PQR fall on corresponding parts of Δ ABC

  P $\leftrightarrow$ A, Q$\leftrightarrow$B, R$\leftrightarrow$C,

  PQ $\leftrightarrow$ AB, QR $\leftrightarrow$ BC, PR $\leftrightarrow$ AC
- If is written as Δ QRP $\cong$ Δ ABC is not correct, in this case.
- In two congruent triangles corresponding parts are equal and we write in short CPCT.

Exercise-7

Group-A (1 mark each)

Very Short Answer :

I. **Write the correct answer–**

1. Which of the following is not a criterion for congruence of triangle ?

   a) SAS b) ASA c) AAA d) SSS

2. If AB = QR, BC = RP and CA = PQ then–

   a) $\Delta ABC \cong \Delta PQR$ b) $\Delta CBA \cong \Delta PQR$

   c) $\Delta CAB \cong \Delta PQR$ d) $\Delta BCA \cong \Delta PQR$

3. In ΔABC, AB = AC and $\angle B = 50°$ then $\angle C$ is equal to–

   a) 40° b) 50° c) 80° d) 130°

4. If $\Delta ABC \cong \Delta FDE$ and AB = 6 cm, $\angle B = 40°$, $\angle A = 80°$ then

   a) DF = 6cm $\angle F = 60°$ b) DF = 6 cm $\angle E = 60°$

   e) DE = 6 cm $\angle E = 60°$ d) DE = 6 cm $\angle D = 40°$

5. If in ΔABC, $\angle A = 50°$ and $\angle B = 60°$ then–

   a) AB <BC <CA b) CA <AB <BC

   c) BC <AB <CA d) BC <CA <AB

6. If in ΔABC, AB = 2.5 cm and BC = 6 cm then length of AC is–

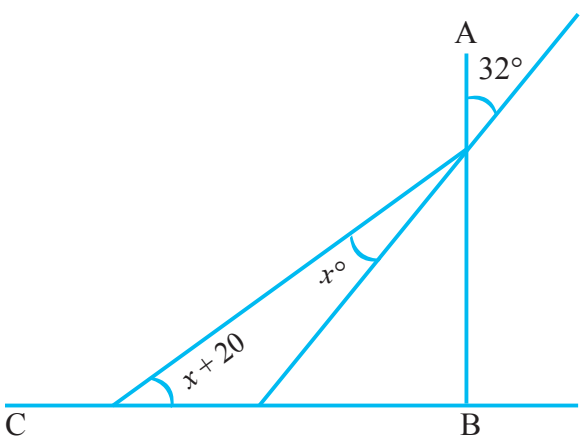
   a) 3.5 cm b) 4 cm c) 3.1 cm d) 3 cm

7. In a ΔABC if $\angle A = 60°$, $\angle B = 80°$ and bisectors of $\angle B$ and $\angle C$ meet at O then $\angle BOC$ =

   a) 60° b) 120° c) 150° d) 32°

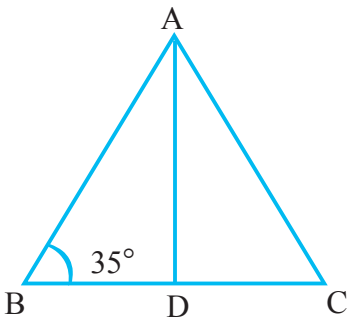
8. In the given figure if $AB \perp BC$ then x =

   a) 18° b) 19° c) 10° d) 32°



9. In the given figure if AD is a median and AB = AC then ∠BAD =

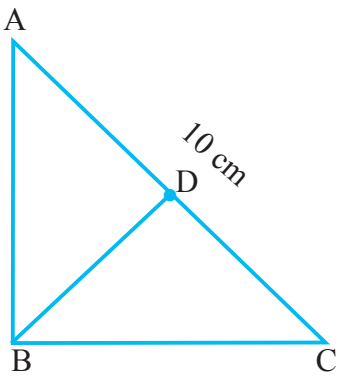
a) 55° b) 70° c) 35° d) 60°



10. In the Δ ABC, ∠B = 90°, D is the mid point of AC then BD =

a) 4 cm b) 5 cm

c) 20 cm d) 15 cm

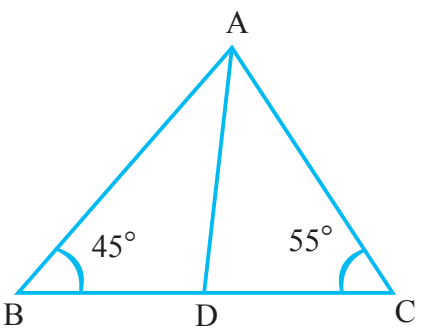


II. Fill in the blanks :

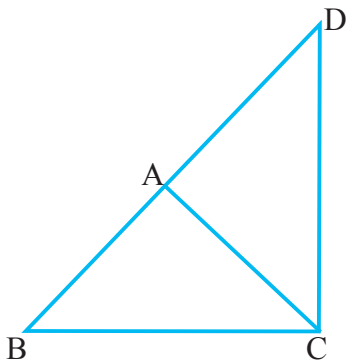
11. If Δ ABC ≅ Δ ACD then Δ ABC is isosecles with AB = ...
12. In an isosecles triangle altitude drawn from the vertex ..... the base.
13. Two triangles are congruent of two sides and ..... angle of one triangle are equal to the two sides and the included angle of the other triangle.
14. In Δ ABC of AB = AC and ∠A = 70° then ∠C = ...
15. In a triangle, angle opposite to the ..... side is larger.

III. Answer the following questions :

16. In a right angled Δ ABC, ∠B = 90°, find the longest side.
17. In the given figure if AD is the bisector of ∠BAC find ∠ADB.



18. In the given figure if AB = AC = AD
then find $\angle B + \angle D$



19. If the altitudes of a triangle are equal then find the measure of each angle.

20. If the length of two sides of a triangle are 9 cm and 10 cm then write the least length (in whole number) of the third side.

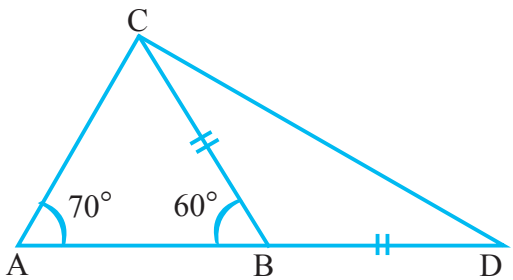
Group-B (2 marks each)

. **Short answer type questions :**

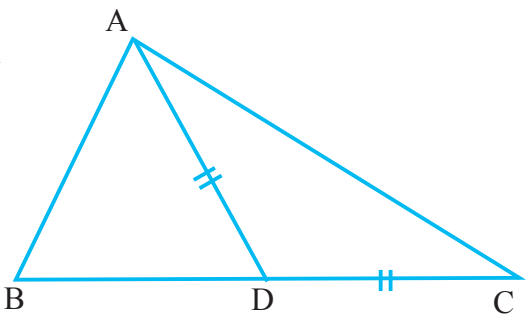
Answer of the following questions :

1. In ABC if $\angle A = 40°$ and $\angle B = 60°$, then write the longest and shortest side of the triangle, give reasons.

2. In given figue if BD=BC then write the relation between AD and CD, give reasons.

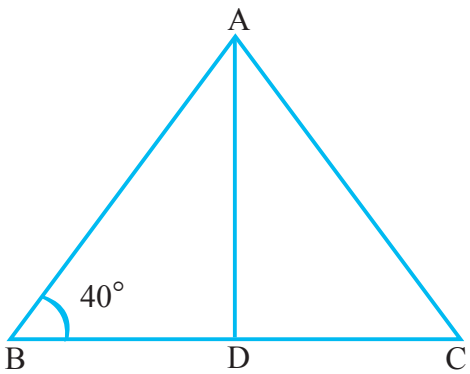


3. In the given ΔABC, $\angle B = 2\angle C$. D is a point on BC such that AD bisect $\angle BAC$ and AD=CD. Find $\angle BAC$.



4. If $\Delta ABC \cong \Delta DEF$ and AB = 7 cm DF = 6 cm and EF = 5 cm, find the perimeter of ΔABC .

5. In the given figure AD is median and AB = AC find $\angle BAD$.



Group-C (3/4 marks each)

Long answer type questions :

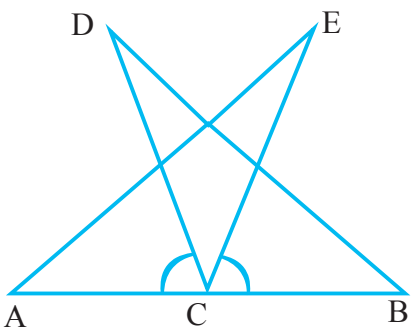
Answer of the following questions :

1. Prove that the median from the vertex of an isosceles triangle is the bisector of the vertical angle.

2. In the given figure AC=BC, $\angle DCA = \angle ECB$ and $\angle DBC = \angle EAC$.

   Prove that $\Delta DBC \cong \Delta EAC$ and hence

   DC = EC and BD = AE



3. In ΔABC if AE is the bisector of $\angle A$ show that

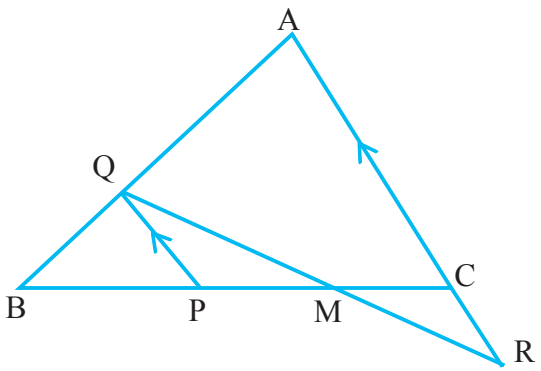
   AB > BE and AC > EC

4. If 'O' is an interior point of ΔABC then prove that,

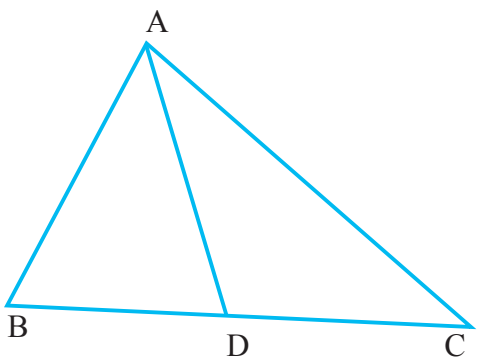
   i) $AB + AC > OB + OC$ ii) $AB + BC + CA > OA + OB + OC$

   iii) $OA + OB + OC > \frac{1}{2}(AB + BC + AC)$

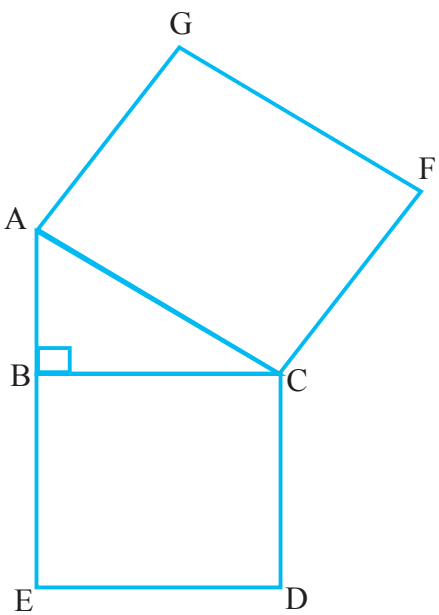
5. In the given figure, ABC is an equlateral triangle PQ||AC and BP = CR. Prove that QR bisects PC.



6. In the adjoinning figure AC > AB and AD is the bisector of ∠BAC. Prove that ∠ADC > ∠ADB



7. In the given figure ∠ABC = 90°. ACFG and BCDE are two squares, prove that AD = BF



8. Prove that the perimeter of a triangle is greater than the sum of its three medians.

9. If D is the mid point of the hypotenuse AC of a right angled ΔABC Prove that $BD=\frac{1}{2}AC$

10. If in ΔPQR, X is any point on the side QR then show that $PQ+QR+RP > 2PX$

11. In quadrilateral ABCD, AD = BC and $\angle DAB = \angle CBA$ prove that
    i) $\Delta ABD \cong \Delta BAC$
    ii) BD = AC
    iii) $\angle ABD = \angle BAC$

12. If in quadrilateral ABCD, AB = AD and CB = CD prove that AC is the perpendicular bisector of BD.

13. ABC is a right triangle such that AB = AC and bisector of $\angle C$ intersect the side AB at D. Prove that AC + AD = BC.

14. Prove that sum of any two sides of a triangle is greater than twice the median with respect to the third side.

15. If S is any point in the interior of ΔPQR show that SQ + SR < PQ + PR.

Answers

Group-A

1. (c) 2. (c) 3. (b) 4. (b) 5. (d) 6. (b) 7. (b) 8. (b) 9. (a) 10. (b)

11. AC 12. Bisect 13. Included 14. 70° 15. Greater 16. AC

17. $\angle BAC = 80°$, $\angle ADB = 95°$ 18. 90° 19. 60° 20. 2 cm

Group-B

(1) Greatest AB, Smallest BC (2) AD > CD (3) 72° (4) 18 cm

(5) $\angle BAD = 50°$.

CHAPTER-8

QUADRILATERALS

Key points and formulae

Different types of quadrilaterals : Tropezium, Parallelogram, Rectangle, Rhombus and Square.

- Sum of the angles of a quadrilateral is 360°.
- A diagonal of a parallelogram divides it into two congruent triangles.
- In a parallelogram
  - i) opposite angles are equal.
  - ii) opposite sides are equal.
  - iii) diagonals bisect each other.
- A quadrilateral is a parallalogram, if
  - i) its opposite angles are equal.
  - ii) its opposite sides are equal.
  - iii) its diagonals bisect each other.
  - iv) a pair of opposite sides is equal and parallel.
- Diagonals of a rectangle bisect each other and are equal and vice-versa.
- Diagonals of a rhombus bisect each other at right angles and vice-versa.
- Diagonals of a square bisect each other at right angles and are equal and vice-versa.
- The line-segment joining the mid-point of any two sides of a triangle is parallel to the third side and is half of it.
- A line drawn through the mid-point of a sides of a triangle parallel to another side bisects the third side.
- The quadilateal formed by joing the mid-points of the sides of a quadrilateral, taken in order, is a parallelogram.
- The diagonals of a parallelogram are equal if and only if it is a rectangle.
- In a parallelogram the bisectors of any two consecutive angles intersect at a right angle.
- The angle bisectos of a parallelogram from a rectangle.

Exercise-8

Group-A (1 mark each)

Very short answer type questions–

1. Fill in the blanks :

a) If one pair of opposite sides are equal and parallel, then the figure is _____.

b) Consecutive angles of a parallelogram are _____.

c) The _____ divides a parallelogram into two congruent triangles.

d) The bisector of the angles of a parallelogram enclose a _____.

e) If consecutive sides of a parallelogram are equal, then it is necessarly a _____.

f) Figure formed by joining the mid-points of the adjacentt sides of a quadrilateral is a ____

.

2. Multiple-Choice Questions (MCQ)

Choose the correct answer in each of the following questions :-

i) Three angles of a quadrilateral are 80°, 95° and 112°. Its fourth angle is–

a) 78° b) 85° c) 73° d) 100°

ii) If angles A, B, C and D of a quadrilateral ABCD, taken in order, are in the ratio 3:7:6:4, then ABCD is a–

a) rhombus b) Parallelogram c) trapezium d) kite

iii) If the diagonals of a quadrilateral bisect each other at right angles then the figure is a–

a) trapezium b) Parallelogram c) rectangle d) rhombus

iv) ABCD is a rhombus such that $\angle ACB = 50°$. Then $\angle ADB = ?$

a) 65° b) 40° c) 25° d) 130°

v) The length of each side of a rhombus is 10 cm and one of its diagonals is of length 16cm. The length of the other diagonal is–

a) 13 cm b) 12 cm c) $2\sqrt{39}$ cm d) 6 cm

vi) In a quadrilateral ABCD, AO and BO are the bisectors of $\angle A$ and $\angle B$ suspectively, $\angle C = 70°$ and $\angle D = 30°$. Then $\angle AOB = ?$

a) 50° b) 60° c) 80° d) 100°

vii) The figure formed by joining the mid points of the adjacent sides of a parallelogram is a–

a) rhombus b) square c) rectangle d) paralleogram.

viii) The figure formed by joining the midpoints off the adjacent sides of a rectangle is a–

a) rhombus b) square c) rectangle d) paralleogram.

ix) The figure obtained by joining the mid-points of the sides of a rhombus, taken in order, is

a) rhombus b) rectangle c) a square d) any paralleogram.

x) Which of the following is not true for a parallelogram?

a) opposite sides are equal.

b) opposite angle are equal.

c) opposite angle are bisected by the diagonals.

d) diagonals bisect each other.

xi) The diagonals of a parallelogram ABCD intersect at O. If $\angle BOC = 90°$ and $\angle BDC = 50°$, then $\angle OAB =$

a) 40° b) 50° c) 10° d) 90°

xii) ABCD is a parallelogram in which diagonal AC bisects $\angle BAD$. If $\angle BAC = 35°$, then $\angle ABC=$

a) 70° b) 110° c) 90° d) 120°

xiii) If two consecutive sides of a rhombus are represented by $3x - 6$ and $x + 14$ then the perimeter of the rhombus is–

a) 10 b) 24 c) 70 d) 96

xiv) If in a rectangle ABCD, diagonal AC bisects $\angle A$ as well as $\angle C$ then ABCD is a –

a) paralleogram rhombus b) square c) rhombus d) trapezium .

3. Answer the following questions :

a) Three angles of a quadrilateral ABCD are equal. Is it a parallelogram?

b) If PQRS is a parallelogram, find $\angle P - \angle R$.

c) Diagonals of quadrilateral PQRS bisect each other. If $\angle P = 45°$, determine $\angle Q$.

d) In a trapezium ABCD, AB||CD, if $\angle B = 60°$, find $\angle C$.

e) In a parallelogram ABCD, $\angle D = 110°$. Find the values of $\angle A$ and $\angle B$.

f) Two opposite angle of a parallelogram are $(2x + 6)°$ and $(96 - x)°$. Find the value of x.

g) In a parallelogram PQRS, what is $\angle Q + \angle R$?

h) Name the special types of quadrilaterals in which diagonals bisect each other at right angles.

i) In Δ ABC, D and E are mid-points of sides AB and AC respectively. If BC = 8 cm, find the length of DE.

j) In parallelogram ABCD if ∠A = $(2x + 25)°$ and ∠B = $(3x – 5)°$, find the value of x.

k) In thee fig. 8.1, ABCD is a parallelogram. What is the sum of angles x, y and z.

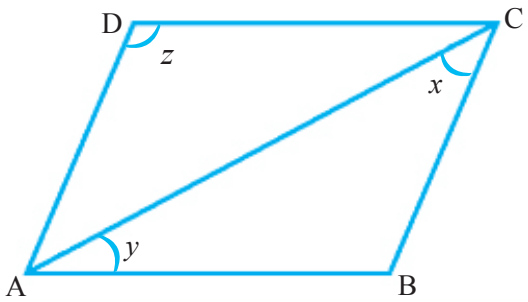


fig. 8.1

l) If two adjacent sides of a kite are 5 cm and 7 cm, find its perimeter.

4. Which of the following statements are True (T) and which are False (F) ?

a) In a parallelogram, the diagonals are equal.

b) In all the angles of quadrilateral are equal it is a parallelogram.

c) The diagonals of parallelogram bisect each other.

d) The diagonals of rhombus are not equal.

e) All the angles of parallelogram are acute angle.

f) In a trapezium both pair of opposite sides are parallel.

Group-B (2 marks each)

5. Short Answer questions :

a) In a quadrilateral the angles are in the ratio 2:4:5:7, then find the difference between the greatest and the smallest angle.

b) In an angle of a parallelogram is two-third of its adjacent angle, find the angles of the parallelogram.

c) The perimeter of a parallelogram is 38 cm. If the longer side is 11cm, find the length of the shorter side.

d) In fig. 8.2, ABCD is a parallelogram. Find the values of x and y.

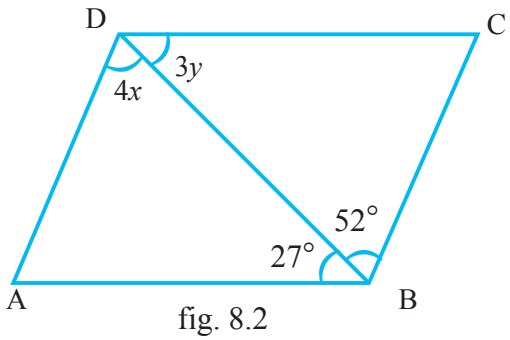


fig. 8.2

e) If the angles of a quadrilateral are $(x–15)°$, $x°$, $(x+20)°$ and $(2x+5)°$, then find the greatest angle of the quadrilateral.

f) One of the diagonals of a rhombus is equal to a side of the rhombus. Find the angles of the rhombus.

g) ABCD is a trapezium in which AB||DC, M and N are the mid-points of AD and BC respectively. If AB = 14 cm and MN = 10 cm, find CD.

h) In fig. 8.3, ABCD is a parallelogram.
If $\angle DAB = 60°$ and $\angle DBC = 80°$, find $\angle CDB$.

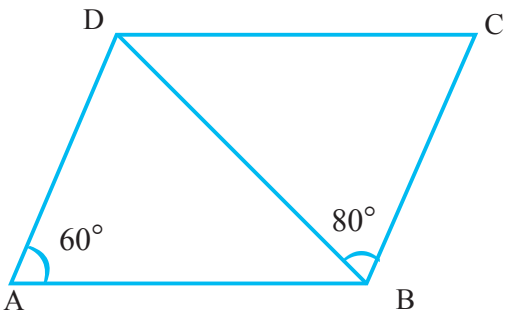


fig. 8.3

i) In fig. 8.4, ABCD is a rhombus. Find the value of x.

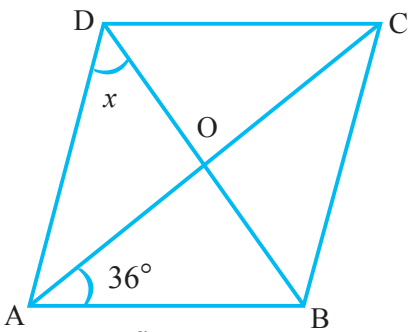


fig. 8.4

j) In fig. 8.5, ABCD is a trapezium in which $\angle A = x + 25°$, $\angle B = y°$, $\angle C = 95°$ anc $\angle D = 2x+5°$, then find the values of x and y.

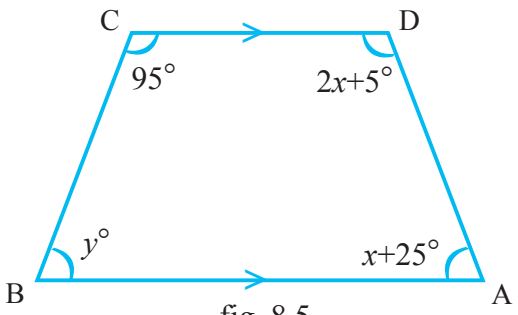


fig. 8.5

k) Two adjacent angles of a parallelogram are in the ratio 2:3. Find all the four angles of the parallelogram.

l) In fig. 8.6, ABCD is a parallelogram. Find the values of x, y and z.

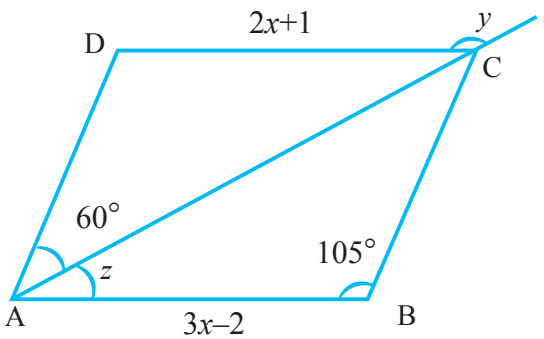


fig. 8.6

m) In fig. 8.7, D is the mid-point of AB and $PC = \frac{1}{2} AP = 3cm$. If AD = DB = 4cm and DE||BP. Find AE.

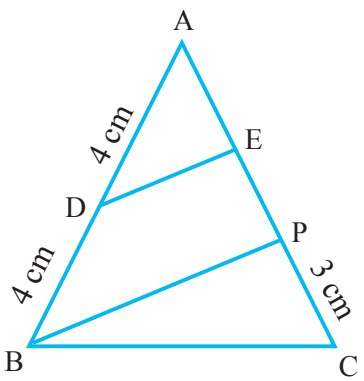


fig. 8.7

Group-C (3/4 mark each)

6. Long answer questions :

a) D, E and F are the mid-points of the sides BC, CA and AB, respectively of an equilateral triangle ABC. Show that ΔDEF is also an equilateral triangle.

b) In fig. 8.8, P is the mid-point of side BC of parallelogram ABCD such that ∠BAP = ∠DAP. Prove that AD = 2CD.

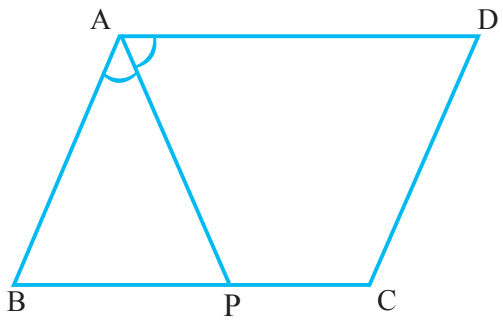


fig. 8.8

c) Prove that, the bisector of any two consecutive angles of parallelogram intersect at right angles.

d) In fig. 8.9, Points M and N are taken on opposite sides AB and CD respectively of a parallelogram ABCD such that AM= CN. Show that AC and MN bisect each other.

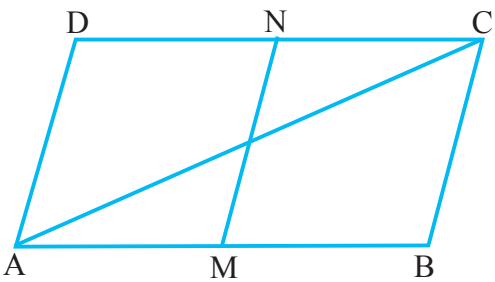


Fig. 8.9

e) A square is inscribed in an isosecles right triangle so that the square and the triangle have one angle common. Show that the vertex of the square which is opposite to the vertex of the common angle bisects the hypotenuse.

f) In a parallelogram ABCD, AB = 10 cm and AD = 6 cm. The bisector of ∠A meets DC in E. AE and BC produced meet at F. Find the length of CF.

g) In fig. 8.10, ABCD is a parallelogram and ∠DAB = 60°. If the bisector of angles A and B meet at M on CD, prove that M is the mid-point of CD.

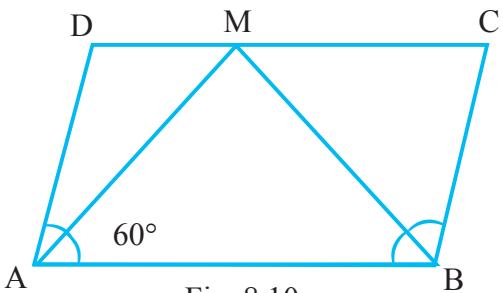


Fig. 8.10

h) E is the mid-point of a median AD of Δ ABC and BE is produced to meet AC at F.

Show that AF = $\frac{1}{3}$ AC.

i) E and F are respectively the mid-point of the non-parallel sides AD and BC of a trapezium ABCD. Prove that EF||AB and EF = $\frac{1}{2}$ (AB+CD).

j) Prove that the line segment joining the mid-points of the diagonals of a trapezium is parallel to the parallel sides of the trapezium and equal to half of their difference.

k) In fig. 8.11, ABCD is a Parallelogram and E is the mid-point of AD. A line through D, drawn parallel to EB, meets AB produced at F and BC at L. Prove that (i) AF = 2 DC (ii) DF = 2 DL.

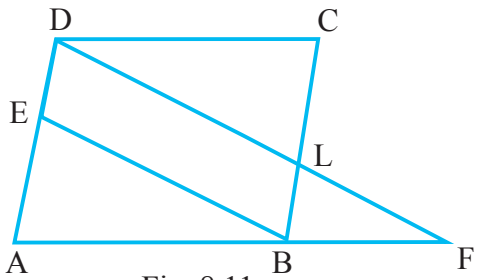


Fig. 8.11

l) PQRS is a parallelogram. M is point on PS such that PM = $\frac{1}{3}$ PS and N is a point on RQ such that RN = $\frac{1}{3}$ QR. Prove that PNRM is a parallelogram.

m) ABCD is a quadrilateral in which AB||CD and AD = BC. Prove that ∠A = ∠B and ∠C = ∠D.

n) P, Q, R and S are respectively the mid-points of sides AB, BC, CD and DA of quadrilateral ABCD in which AC = BD and AC⊥BD. Prove that PQRS is a square.

o) ABCD is a rhombus, EABF is straight line such that EA = AB = FB. Prove that ED and FC when prouced meet at right angles.

p) In fig. 8.12, ABCD is Parallelogram in which P and Q are the mid-points of opposite sides AB and CD. If AQ intersects DP at S and BQ intersects CP at R, Show that PSQR is a parallelogram.

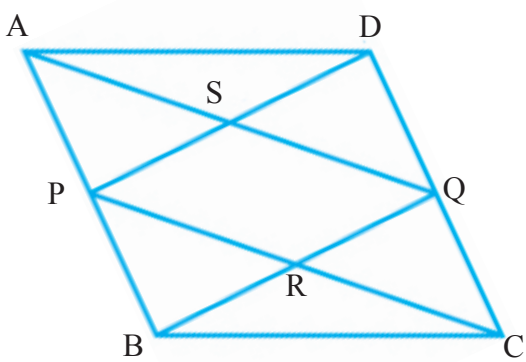


Fig. 8.12

Answers

Group - A

1. (a) Parallelogram (b) Supplementary (c) diagonal (d) rectangle
   (e) rhombus (f) Parallelogram

2. (i) c (ii) c (iii) d (iv) b (v) b (vi) a (vii) d (viii) a
   (ix) b (x) c (xi) a (xii) b (xiii) d (xiv) b

3. (a) It need not be parallelogram, because we may have $\angle A = \angle B = \angle C = 75°$ and $\angle D = 135°$. Here $\angle B \neq \angle D$.
   (b) 0° (c) $\angle Q = 135°$ (d) 120° (e) $\angle A = 70°, \angle B = 110°$ (f) 30
   (g) 180° (h) square and rhombus (i) 4 cm (j) $x = 32$ (k) 180° (l) 24 cm

4. (a) F (b) F (c) T (d) T (e) F (f) F

Group-B

5. (a) 100° (b) 72°, 108°, 72°, 108° (c) 8 cm (d) $x = 13°$, $y = 9°$ (e) 145°
   (f) 60°, 120°, 60°, 120° (g) 6 cm (h) 40° (i) $x = 54°$ (j) $x = 50°, y = 85°$
   (k) 72°, 108°, 72°, 108° (l) $x = 3, y = 165°, z = 15°$ (m) AE= 3 cm.

Group-C

6. (f) 4 cm

CHAPTER-9

AREAS OF PARALLELOGRAMS AND TRIANGLES

Key points and formulae

- Two congruent figures have equal areas but the converse need not be true.
- Two figures are said to be on the same base and between the same parallels, if they have a common base (side) and the vertices (or the vertex), opposite to the commone base of each figure lie on a line parallel to the base.
- Area of a parallelogram is the product of its base and the corresponding altitude.
- Parallelograms on the same base (or equal bases) and between the same parallels are equal in area.
- Parallelograms on the same base (or equal bases) and having equal areas lie between the same parallels.
- If a parallelogram and a triangle are on the same base and between the same parallels, then area of the triangle is half the area of the parallelogram.
- Triangles on the same base (or equal bases) and between the same parallels are equal in area.
- Area of a triangle is half the product of its base and the corresponding altitude.
- Triangles on the same base (or equal bases) and having equal areas lie between the same parallels.
- A median of a triangle divides it into two triangles of equal areas.

Exercise-9

Group-A (1 mark each)

A. Multiple Choice Quesions (MCQs)

(Choose the correct option)

1. A diagonal of a parallelogram divides it into two–

   a) Congruent triangles b) right triangles

   c) triangles of equal area d) isosceles triangles

2. The median of a triangle divides it into two–

a) triangles of equal area b) Congruent triangles

c) right angled triangles d) isosceles triangles

3. The fig. 1, obtained by joining the mid points of the adjacent sides of a rectangle of sides 8 cm and 6 cm is–

a) a rectangle of area 24 cm^2.

b) a square of area 25 cm^2.

c) a trapezium of area 24 cm^2.

d) a rhombus of area 24 cm^2.

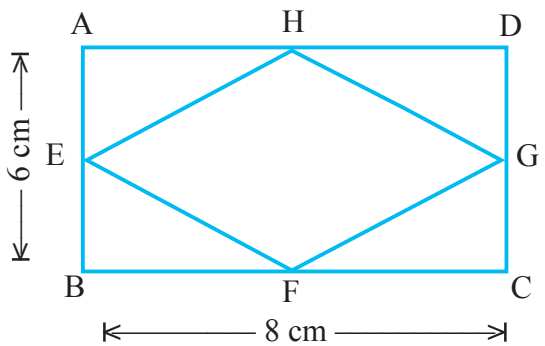


fig. 1

4. In the fig.2, the area of parallelogram ABCD is–

a) AB × BM b) BC × BN

c) DC × DL d) AD × DL

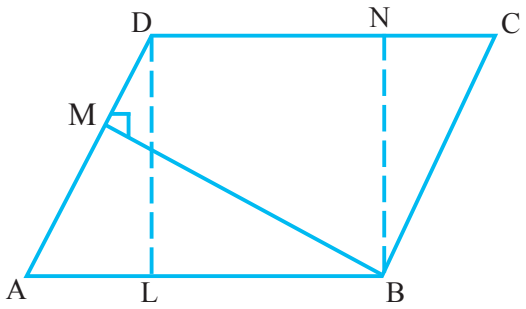


fig. 2

5. In fig. 3, if parallelogram ABCD and rectangle ABEM are of equal area, then–

a) Perimeter of ABCD = Perimeter of ABEM

b) Perimeter of ABCD < Perimeter of ABEM

c) Perimeter of ABCD > Perimeter of ABEM

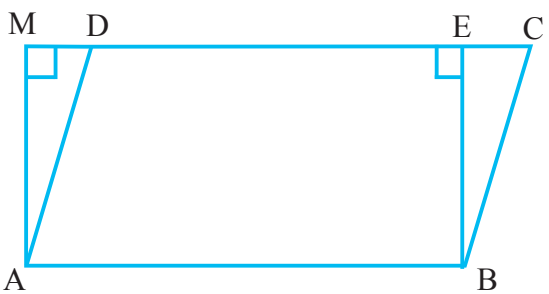


fig.3

d) Perimeter of ABCD = $\frac{1}{2}$ (Perimeter of ABEM)

6. Two parallelograms are on equal bases and between the same parallels. The ratio of their areas is–

a) 1:2 b) 1:1 c) 2:1 d) 3: 1

7. ABCD is a quadrilateral whose diagonal AC divides it into two parts, equal in area, then ABCD–

   a) is a rectangle b) is always a rhombus

   c) is a parallelogram d) None of these

8. In Δ ABC, P is a point on BC such that BP : PC = 3:5, then area (Δ ABP) : area (Δ ABC) is –

   a) 5:8 b) 7:8 c) 1:8 d) 3:8

9. The area of a trapezium is 60 cm^2. The distance between its parallel side is 6 cm. If one of the parallel side is 8 cm then the other parallel side is–

   a) 6 cm b) 10 cm c) 12 cm d) 16 cm

10. The area of a rhombus is 48 cm^2. If one of its diagonal is 12 cm. Then the other diagonal is–

    a) 4 cm b) 6 cm c) 10 cm d) 8 cm.

11. The diagonal of a square is 8 cm its are is–

    a) 16 sq. cm b) 64 sq. cm c) 32 sq. cm d) 48 sq. cm.

B. Fill in the blanks :

1. Two —— figure have equal areas but the converse is not true.
2. Parallelogram on the same base and between the same parallels are equal in ———.
3. A diagonal of a Parallelogram divides the Parallelogram into two ——— of equal area.
4. Area of a triangle is half the product of its ——— and the corresponding ———.
5. Triangles on the same base and between the same parallels are ——— in area.
6. Area of rhombus is half the product of the lengths of its ———.
7. Area of a trapezium is half of the sum of its ——— sides multiplied by its ——.
8. If each diagonal of a quadrilateral divides it into two triangles of equal area, then the quadrilatural is a———.
9. If a parallelogram and a triangle are on the same base and between the same parallels, then area of the triangle is ——— the area of the parallelogram.
10. A ——— of a parallelogram divides it into two ——— of equal areas.

C. State whether the following statement are true of false :

1. Two congruent polygonal region have equal areas.
2. Two plygonal region having equal area must be congruent.
3. Area of a polygonal region is always real number.
4. Diagonal of parallelogram divides it into two triangles of equal area.
5. Triangles on the same base and having equal areas lie between the same parallels.
6. The three altitudes of an equilateral triangle are equal in length.
7. A Parallelogram and a rectangle on the same base and between same parallel lines are equal in area.
8. Area of a square = $\frac{1}{2}$ × (diagonal)^2.
9. Diagonals of a parallelogram divides it into four triangles of equal areas.
10. Two trapezium on equal base and lying between same parallel lines are equal in areas.
11. Area of a rhombus whose diagonals are 8 cm and 6 cm is 48 cm^2.
12. Area of a rhombus is equal to product of its diagonals.

D. Very short answer questions :

1. If a triangle and a parallelogram are on the same base and between the same parallels, then find the ratio of the area of the triangle to the area of parallelogram.
2. The area of a rhombus is 12 cm^2. If one of its diagonal is 8 cm, then find the other diagonal.
3. In fig. 4, ABCD is a parallelogram and P is the point of intersection of its diagonals AC and BD. If the area of Δ APB is 12 cm^2, then find the area of parallelogram ABCD.

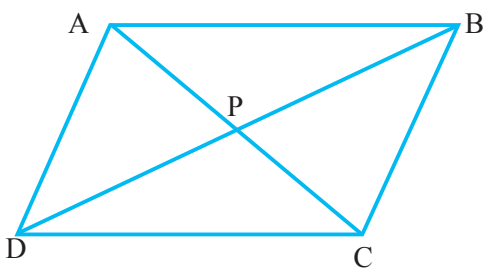


fig.4

4. What is the area of trapezium?
5. What is the formula for finding the area of a triangle?
6. The area of parallelogram ABCD is 26 cm^2, what is the area of Δ ABC?
7. ABCD is a parallelogram and X is the mid point of AB. If area (AXCD) = 24 cm^2 then, find area Δ ABC?
8. ABC and BDE are two euilateral triangles such that D is the mid point of BC, then show that area (Δ BDE) = $\frac{1}{4}$ area (Δ ABC).
9. ABCD is a trapezium with parallel sides AB = a cm and DC = b cm. E and F are the mid points of the non-parallel sides. Find the ratio of area (ABEF) and area (EFCD).
10. If fig 5, the area of the parallelogam ABCD is 90 cm^2 . Find area (Δ ABD).

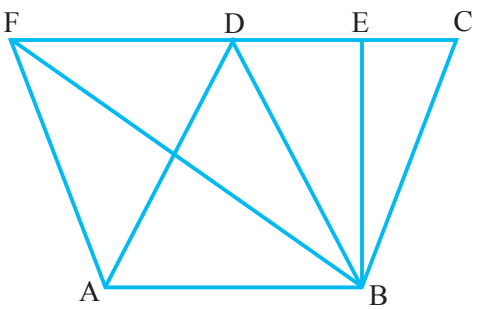


fig. 5

Group-B (2 marks each)

Short Answer questions :

1. The diagonal of a square is 12 cm . Find its area.
2. The area of a trapezium is 39 cm^2. The distance between its parallel sides is 6 cm. If one of the parallel sides is 5 cm, then find the other parallel side.
3. In Δ ABC, if L and M are the points on AB and AC, respectively such that LM||BC. Prove that area (Δ LOB) = area (Δ MOC).
4. Prove that median of a trriangle divides it into two triangles of equal area.
5. D and E are mid points of BC and AD respectively. If area of Δ ABC = 10 cm^2, find area of Δ EBD.
6. ABCD is a parallelogram. P is any point on CD. If area (Δ DPA) = 15 cm^2 and area (Δ APC) = 20 cm^2, find the area (Δ APB).

7. The medians BE and CF of a Δ ABC intersect at G. Prove that area (Δ GBC) = area of quadrilateral AFGE.

8. In parallelogram PQRS, PQ = 10cm. The altitudes corresponding to the sides PQ and SP are respectively 6cm and 8 cm. Find SP.

9. In fig. 7, PQRS is a rectangle. If PS= 8 cm, and SR=4 cm. then find the area of Δ ABC.

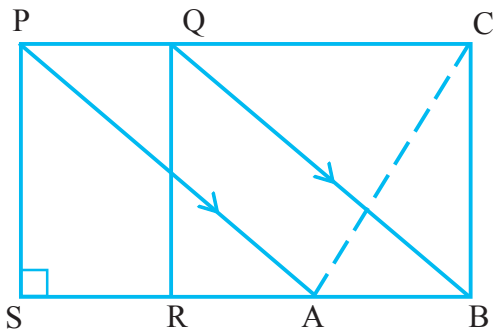


fig. 7

10. ABC and BDE are two equilateral triangle such that D is the mid point of BC. Then prove that area (Δ BDE) = $\frac{1}{4}$ area (Δ ABC).

Group-C (3/4 marks each)

Long Answer questions :

1. O is any point on the diogonal PQ of parallelogram PQRS. Prove that area (Δ PSO) = area (Δ PQO)

2. In a triangle ABC, E is the mid-point of median AD. Show that area (Δ BED) = $\frac{1}{4}$ area (Δ ABC).

3. In a Parallelogram ABCD, E amd F are any two points on the sides AB and BC respectively. Show that area (Δ ADF) = area (Δ DCE).

4. In fig. 8, ABCD is a parallelogram and BC is produced to point Q such that BC=CQ. If AQ intersects DC at P. Show that area (Δ BPC) = area (Δ DPQ).

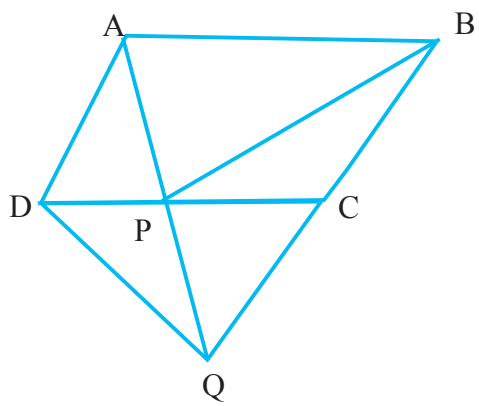


fig. 8

5. ABCD is a trapezium in which AB||DC. DC is produced to E such that CE=AB, Prove that area (Δ ABD) = area (Δ BCE).

6. In fig 9, ABCD is a parallelogram in which BC is produced to E such that CE=BC. AE intersects CD at F. If area of Δ BDF = 3 cm^2, find the area of parallelogram ABCD.

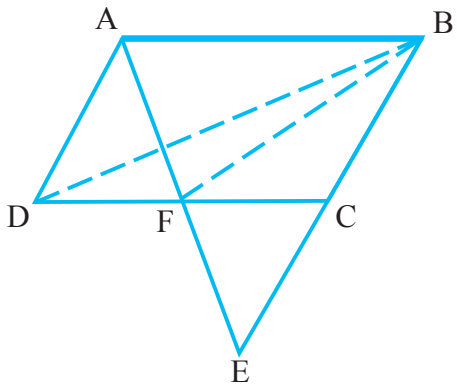


fig. 9

7. In fig. 10, ABCD is a parallelogram. Points P and Q on BC trisects BC. Prove that

area (Δ APQ) = area (Δ DPQ) = $\frac{1}{6}$ area ($||^{gm}$ ABCD)

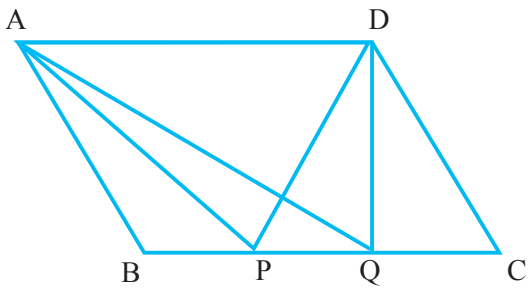


fig. 10

8. If the medians of a Δ ABC intersect at G. Show that area (Δ AGC) = area (Δ AGB)= area (Δ BGC) = $\frac{1}{3}$ area (Δ ABC).

Answers

Exercise-9

Group - A

A) 1. (c) 2. (a) 3. (d) 4. (c) 5. (c) 6. (b) 7. (c) 8. (d) 9. (c) 10. (d) 11. (c)

B) 1. Congruent 2. area 3. triangles 4. base, altitude 5. equal 6. diagonals.
7. height, parallel 8. parallelogram. 9. half 10. diagonals, triangles.

C) (1) T (2) F (3) T (4) T (5) T (6) T (7) T (8) T (9) T
(10) F (11) F (12) F

D) (1) 1:2 (2) 3 cm (3) 48 cm^2 (4) Area of Trapezium = $\frac{1}{2}$ × sum of the parallel sides × height. (5) Area of Triangle = $\frac{1}{2}$ × base × altitude (6) Area of Δ ABC = 13 cm^2.

(7) 16 cm^2 (9) $\frac{3a+b}{3b+a}$ (10) 45 cm^2.

Group -B

(1) 72 cm^2 (2) 8 cm (5) 2.5 cm^2 (6) 35 cm^2 (8) 7.5 cm (9) 16 cm^2.

Group -C

6. 12 cm^2.

CHAPTER-10

CIRCLES

Key points and formulae

- Equal chords of a circle (or of congruent circles) subtend equal angles at the centre.
- If the angles subtended by the chords of a circle (or of congruent circles) at the centre (or centres) are equals then the chords are equal.
- The perpendicular drawn from the centre of the corcle to achord bisects the chord.
- The line drawn through the centre of a circle bisecting a chord is perependicular to the chord.
- There is one and only circle passing through three given non-collinear points.
- Equal chords of a circle (or of congruent circles) are equidistant from the centre (or centres).
- Chords equidistant from the centre of a circle are equal in length.
- If two chords of a circle are equal, then their correnspondingarcs are eongruent and conversety, if two areas are congruent, then their corresponding chords are equal.
- Congruent arcs of a circle subtend equal angles at the centre.
- The angle subtended by an arc at the centre is doubled the angle subtended by it at any point on the remaining part of the circle.
- Angles in the same segment of a circle are equal.
- If a line segment joining two points subtends equal angles at two other points lying on the same side of the line containing the line segment, then the four points are concclic.
- The sum of either pair of opposite angle of a cyclic quadrilateral is 180°.
- If the sum of a pair of opposite angle of a quadrilateral is 180°, the quadrilateral is cyclic.

Group-A (1 mark each)

1. Fill in the blanks :

i) A line segment joining the centre and a point on the circle is called its _____.

ii) The vertex of the central angle is always at _____.

iii) Equal chords of a circle are _____ from the centre.

iv) Circle having the same centre are called_____.

v) A line segment joining two points on the circle is called a _____ of the circle.

vi) Two circles are said to be congruent if and only if their _____ are equal.

vii) Three non collinear points describe a _____ circle.

2. Multiple choice questions :

i) The length of chord which is at a distance 12 cm from the centre of a circle of radius 13 cm is–

a) 12 cm b) 10 cm c) 13 cm d) 8 cm

ii) In fig.10.1, if OA = 5cm, AB = 8 cm and OD is perpendicular to AB, then CD is equal to–

a) 3 cm b) 4 cm c) 2 cm d) 5 cm

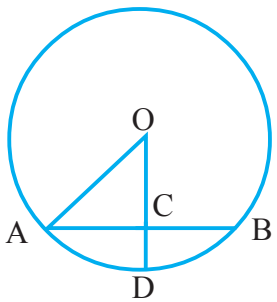


fig 10.1

iii) If PQ = 12cm, QR = 16 cm and PQ⊥ QR, then the radius of the circle passing through the points P, Q and R is–

a) 10 cm b) 6 cm c) 12 cm d) 8 cm

iv) In fig. 10.2, if ∠AOC = 130°, then ∠ABC is equal to–

a) 130° b) 65° c) 115° d) 50°

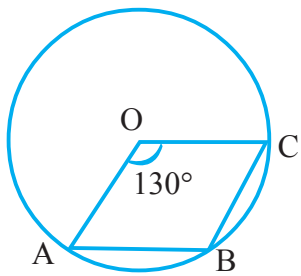


fig 10.2

v) In fig. 10.3, if $\angle ABC = 30°$ then $\angle AOC$ is equal to

a) 30° b) 60° c) 15° d) 90°

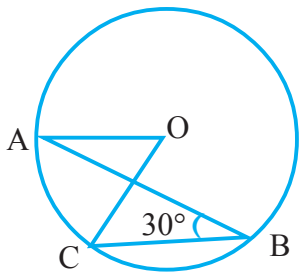


fig 10.3

vi) ABCD is a cyclic quadrilateral such that AB is a diameter of the circle circumscribing it and $\angle ADC = 130°$ then $\angle BAC$ is equal to–

a) 40° b) 50° c) 80° d) 30°

vii) In fig. 10.4, if $\angle OAB = 40°$ then $\angle ACB$ is equal to–

a) 40° b) 50° c) 60° d) 70°

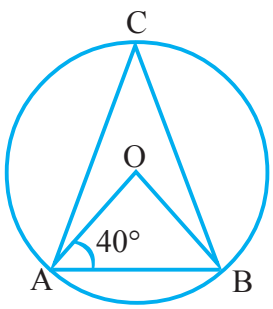


fig 10.4

viii) In fig. 10.5, BC is a diameter of the circle with centre 'O' and $\angle BAO = 60°$. Then $\angle ADC$ is equal to–

a) 30° b) 45° c) 60° d) 110°

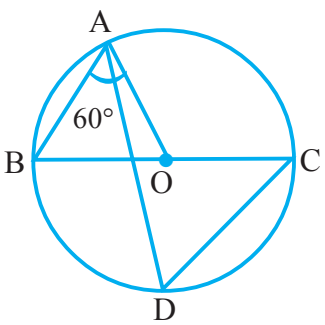


fig 10.5

ix) In fig. 10.6, if $\angle AOB = 90°$ and $\angle ABC = 30°$, then $\angle CAO$ is equal to–

a) 30° b) 45° c) 90° d) 60°

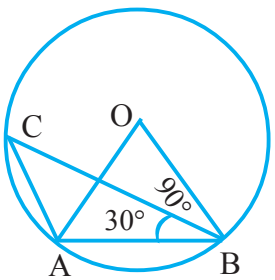


fig 10.6

x) In fig. 10.7, ABCD is a cyclic quadrilateral in which $\angle DBC = 80°$ and $\angle BAC = 40°$, then BCD is equal to–

a) 40° b) 60° c) 80° d) 90°

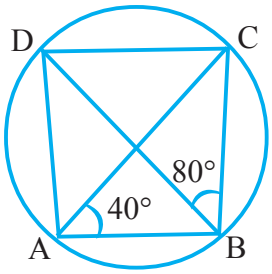


fig 10.7

3. **Write True or False :**

i) Chord passing through the centre of the circle is called radius.

ii) A circle has infinite number of diameter.

iii) Through three collinear points a circle can be drawn.

iv) If AOB is a diameter of a circle and C is any point on the circle, then $AC^2 + BC^2 = AB^2$.

v) Two chords AB and CD of a circle are each at distances 4 cm from the centre. Then AB = CD.

Group-B (2 marks each)

4. Short answer type questions :

i) The length of a chord of a circle of radius 10 cm is 12 cm. Find the distance of the chord from the centre of the circle.

ii) If a diameter of a circle bisects each of the two chords of the circle, prove that the chords are parallel.

iii) AB and AC are two equal chords of a circle. Prove that the bisector of the $\angle BAC$ passes through the centre of the circle.

iv) O is the circumcentre of the triangle ABC and D is the mid-point of the base BC. Prove that $\angle BOD = \angle A$.

v) If a line is drawn parallel to the base of an isosceles triangle to intersect its equal sides, Prove that the quadrilateral so formed is cyclic.

vi) In an isosceles Δ ABC with AB=AC, a circle passing through B and C interests the sides AB and AC at D and E respectively. Prove that DE||BC.

vii) A chord of a cirle is equal to its radius. Find the angle subtended by this chord at a point in major segment.

viii) PQRS is a cyclic quadrilateral and PQ is a diameter. If $\angle PSR = 150°$ then find $\angle RPQ$.

ix) In fig. 10.8, AOB is a diameter of the circle and C, D, E are any three points on the semi-circle. Find the value of $\angle ACD + \angle DEB$.

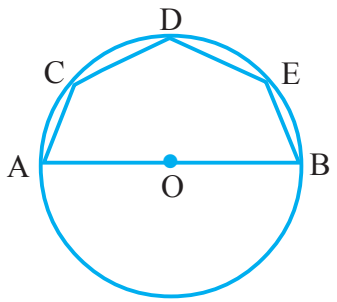


fig 10.8

x) On a common hypotenuse AB, two right triangles ACB and ADB are situated on opposite side. Prove that $\angle BAC = \angle BDC$.

xi) If a pair of opposite sides of a cyclic quadrilateral are equal, prove that its diagonals are also equal.

xii) In fig. 10.9, AOB is a diameter and OD$\perp$AB. If C be any point on arc DB, find $\angle BAD$ and $\angle ACD$.

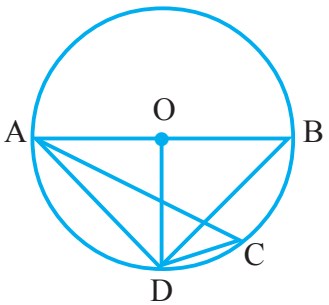
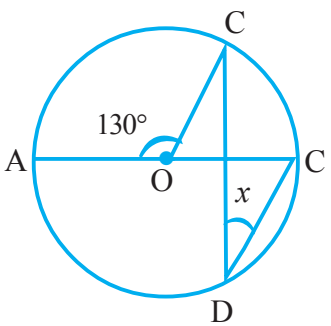


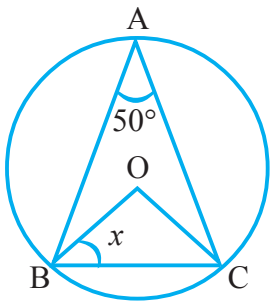
fig 10.9

xiii) Find the value of x in each of the following figures.

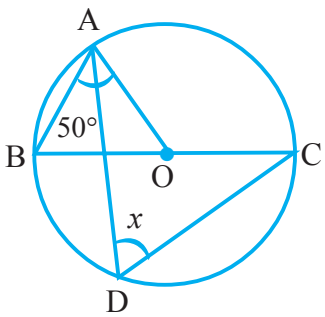
a)



b)



c)



xiv) If two chords of a circle are equally inclined to the diameter through their point of intersection, prove that the chords are equal.

xv) Two circles wih centres O and O′ intersect at two points A and B. A line PQ is drawn parallel to OO′ through A (or B) intersecting the circles at P and Q. Prove that PQ=2 OO′.

Group -C (3/4 marks each)

5. **Long answer type questions.**

i) AB and CD are two parallel chords of a circle which are on opposite sides of the centre such that AB = 10 cm, CD =24 cm and the distance between AB and CD is 17 cm. Find the radius of the circle.

ii) In a circle of radius 5cm, AB and AC are two equal chords of length 6 cm each. Find the length of the chord BC.

iii) An equilateral triangle of side 9cm is inscribed in a circcle. Find the radius of the circle.

iv) Two equal chords AB and CD of a circle with centre O, when produced meet at a point E. Prove that AE = EC.

v) In fig. 10.10, O is the centre of the circle.

Prove that $\angle XOZ = 2\,(\angle XZY + \angle YXZ)$

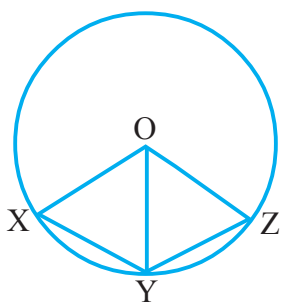


fig 10.10

vi) In fig. 10.11, AB is a diameter of a circle with centre O and CD = OC. If AC and BD when produced meet at P, then prove that $\angle APB = 60°$

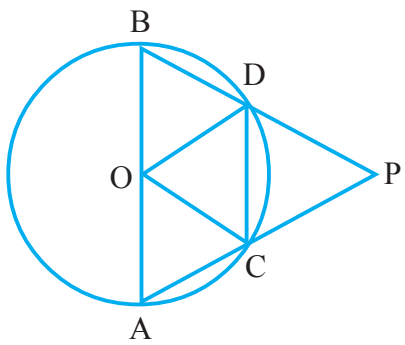


fig 10.11

vii) Prove that the quadrilateral formed by angle bisectors of a cyclic quadrilateral is also cyclic.

viii) If ABC is an equilateral triangle inscribed in a circle and P be any point on the minor arc BC which does not coincide with B or C, prove that PA is angle bisector of $\angle BPC$.

ix) If bisectors of opposite angles of a cyclic quadrilateral ABCD intersect the circle, circumscribing it at the points P and Q, prove that PQ is a diameter of the circle.

x) AB and AC are two chords of a circle of radius r such that AB = 2AC. If P and q are the distance of AB and AC from the centre, pove that $4q^2 = p^2 + 3r^2$.

xi) In fig. 10.12, O is the centre of the circcle, $\angle BCO = 30°$. Find x and y.

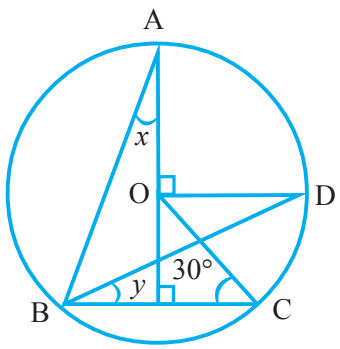


fig 10.12

xii) If two circles intersect at two points. Prove that their centres lie on the perpendicular bisector of the common chord.

xiii) A circle has radius $\sqrt{2}$ cm. It is divided into two segments by a chord of length 2cm. Prove that the angle subtended by the chord at a point in major segment is 45°.

xiv) In fig. 10.13, O is the centre of the circle, BD = OD and CD⊥AB.Find ∠CAB.

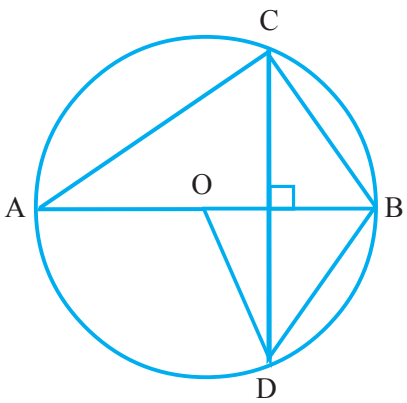


fig 10.13

Answer

1. i) radius ii) centre iii) equidistant iv) concentric v) chord vi) radii or diameters. vii) unique.
2. i) b ii) c iii) a iv) c v) b vi) a vii) b viii) c ix) d x) b
3. i) false ii) True iii) False iv) True v) True.
4. i) 8 cm viii) 60° ix) 270° xii) 45°, 45° xiii) a) 25° b) 40° c) 50°
5. i) 13 cm ii) 9.6 cm iii) $3\sqrt{3}$cm xi) $x = 30°$, $y = 15°$ xiv) 30°.

CHAPTER-11

CONSTRUCTIONS

Key points and formulae

- To bisect a given angle
- To draw perpendicular bisector of a line segment.
- To construct angles of 15°, 30°, 45°, 60°, 90° etc.
- To construct a triangle given its base, a base angle and the sum of other two sides
- To construct a triangle given its base, a base angle and difference of other two sides.
- To construct a triangle given its perimeter and the two base angles.
- Geometrical construction means using only a ruler and a pair of compasses as geometrical instruments.

EXERCISE-11

Group-A

Very Short answer type questions. (1 mark each)

Choose the correct answer :

1) With the help of a ruler and a pair of compass it is not possible to construct an angle of–

(a) 37.5° (b) 40° (c) 22.5° (d) 67.5°

2) With the help of a ruler and a compass, it is possible to construct an angle of–

a) 35° b) 40° c) 37.5° d) 47.5°

3) The construction of a triangle ABC, given that BC = 6 cm ∠B=45° is not possible when difference of AB and AC equal to :

(a) 6.9 cm (b) 5.2 cm (c) 5.0 cm (d) 4.0 cm

4) The construction of a triangle ABC, given that BC = 3 cm $\angle C = 60°$ is possible when difference of AB and AC equal to :

(a) 3.2 cm (b) 3.1 cm (c) 3 cm (d) 2.8 cm

5) Write True or False in each of the following :

a) An angle of 52.5° can be constructed by ruler and compass.

b) An angle of 42.5° can be constructed by ruler and compass

c) A triangle ABC can be constructed in which AB = 5 cm, $\angle A = 45°$ and AB + BC+AC = 5 cm.

d) A triangle ABC can be constructed in which $\angle B = 105°$, $\angle C = 90°$ and AB + BC+AC = 10 cm.

e) A triangle ABC can be constructed in which BC = 6 cm $\angle C = 30°$ and AC – AB = 4 cm.

f) A triangle ABC can be constructed in which $\angle B = 60°$, $\angle C = 45°$ and AB + BC+AC = 12 cm.

Group-B

Short answer type questions : (3 marks each)

1) Draw a line segment of length 5.6 cm and construct its perpendicular bisectors.

2. Construct the following angles whose measures are–

i) $22\frac{1}{2}^{\circ}$ ii) 60° iii) 30° iv) 45°

3. Construct a triangle whose measure is 30° and then construct its bisector

4. Construct the following angles whose measures are–

i) 120° ii) 105° iii) 75° iv) 150°

5. Draw a line segment of length 9 cm. Bisect it and measure the length of each part.

6. Draw an obtuse angle and bisect it. Measure each of the angles so obtained.

7. Using ruler and compasses only, draw a right angle.

8. Using ruler and compasses only, draw an angle of measure 135°.

9. Draw an angle and label it as $\angle ABC$. Construct another angle, (using ruler and compasses) equal to $\angle ABC$.

10. Using ruler and compasses only, draw an angle of 210° .

Croup-C

Long Answer type questions : (4 marks each)

1. Construct an equilateral triangle if its altitude is 4.5 cm.
2. Construt a right angled triangle whose hypotenuse measure 8 cm and one side is 6 cm.
3. Construct a triangle ABC in which AB = 7 cm, BC + CA = 9 cm and ∠A=45°.
4. Construct a triangle ABC, in which BC =5.5 cm, ∠B=60° and AB + AC = 8 cm.
5. Construct a right angled triangle whose base is 6 cm and sum of its hypotenuse and other side is 9 cm.
6. Construct a triangle ABC in which AB = 6 cm, ∠A=45° and AC – BC = 3 cm.
7. Construct a triangle Δ ABC in which BC = 5 cm, ∠C=60° and AC– AB=1.5 cm.
8. Construct a triangle PQR in which QR = 6 cm, ∠Q=60° and PR – PQ = 2 cm.
9. Construct a Δ ABC with base of length 5 cm. The sum of two sides is 7 cm and one base angle is 60°.
10. Construct a Δ ABC in which BC = 5.6 cm, ∠B=30° and the difference between the other two sides is 3 cm.
11. Construct a Δ ABC whose perimeter = 9 cm, ∠B=60° and ∠C=45° .
12. Construct a Δ ABC whose perimeter = 10 cm, ∠B=30° and ∠C=60° .
13. Construct a Δ ABC whose perimeter = 14 cm and the sides are in the ratio 2:3:4.
14. Construct a triangle XYZ in which ∠Y=30°, ∠Z=90° and XY + YZ +ZX=11cm
15. Construct a right angled triangle whose perimeter is equal to 10 cm and one acute angle equal to 60°.

Answer

Group-A

1. (b) 2. (c) 3. (a) 4. (d)

5. (a) True (b) False (c) False (d) False (e) True (f) True

CHAPTER-12

HERON'S FORMULA

Key points and formulae

- Triangle with base = b unit and altitude = h unit :

  Area $= \frac{1}{2} \times b \times h$ sq. unit

- Triangle with sides as a, b, c

  i) Semi-perimeter (s) $= \frac{a+b+c}{2}$ unit

  ii) Area $= \sqrt{s(s-a)\ (s-b)\ (s-c)}$ sq. unit (Heron's formula)

- Isosceles triangle with base a unit and equal sides b unit

  Area of isosecles triangle $= \frac{a}{4}\sqrt{4b^2 - a^2}$ sq. unit

- Equilateral triangle with side a

  Height $= \frac{\sqrt{3}}{2}a$ unit , Area $= \frac{\sqrt{3}}{4}a^2$ sq. unit

- Right angle triangle with base a unit, altitude b unit and hypotenuse h unit,

  Hypotenuse $(h) = \sqrt{a^2 + b^2}$ unit (pythagorus theorem)

- Parallelogram with base b unit and altitude h unit,

  Area $= b \times h$ sq. unit

- Rhombus with diagonals d_1 and d_2 ,

  i) Area $= \frac{1}{2} d_1\ d_2$ sq. unit

  ii) Perimeter $= 2\sqrt{d_1^{\,2} + d_2^{\,2}}$ unit

- Trapezium with parallel sides a unit and b unit and the distance between two sides as h unit,

  Area $= \frac{1}{2}(a+b) \times h$ sq. unit

- Regular hexagon with side a,

  Area = 6 × area of a equilateral triangle with side a unit

  $$= 6 \times \frac{\sqrt{3}}{4} a^2 \text{ sq unit}$$

- Rectangle with length a unit and breadth b unit :

  i) Area = $a \times b$ sq. unit

  ii) Perimeter = $2 \times (a+b)$ unit

  iii) Diagonal = $\sqrt{a^2+b^2}$ unit

- Square with side a unit :

  i) Area = a^2 sq. unit

  ii) Perimeter = $4 \times a$ unit

  iii) Diagonal = $\sqrt{2} \times a$ unit

Exercise - 12

Section-A (1 mark each)

I. Fill in the blanks :

i) If the base and height of a triangle are 30 cm and 12 cm respectively, then its area is——

ii) If the area of an equilateral triangle is $36\sqrt{3}$ cm^2, then its length of side is ——.

iii) If the length of base and area of an isosceles triangle are 24cm and 192cm^2, then its height is ——.

iv) If the area of a right isosceles triangle is 200 cm^2, then the length of its hypotenuse is _____.

v) If the diagonal of a square field is 46 m, then its area is ____.

vi) The diagonals of a rhombus are 24 cm and 10 cm, then its perimeter is ——.

vii) The sum of the lengths of the diagonals of a square is $30\sqrt{2}$ cm, then its area is ——.

II. Choose the correct answer :

i) The perimeter of an equilateral triangle is 60 m. The area is–

(a) $10\sqrt{3}$ m^2 (b) $15\sqrt{3}$ m^2 (c) $20\sqrt{3}$ m^2 (d) $100\sqrt{3}$ m^2

ii) The height of an equilateral triangle is 6 cm. Then the area of this triangle is–

(a) $12\sqrt{3}$ cm^2 (b) $15\sqrt{3}$ cm^2 (c) $25\sqrt{3}$ cm^2 (d) $16\sqrt{3}$ cm^2

iii) The area of an isosceles triangle having base 2 cm and the length of one of the equal sides 4 cm, is–

a) $\sqrt{15}\ cm^2$ b) $\sqrt{\frac{15}{2}}\ cm^2$ c) $2\sqrt{15}\ cm^2$ d) $4\sqrt{15}\ cm^2$

iv) The area of a rectangular plot is 462 m^2 and its length is 28 m. The perimeter of the plot is–

—.

a) 44.5 m b) 89m c) 46.5 m d) None of these.

v) The base and the corresponding altitude of a parallelogram are 10 cm and 3.5 cm respectively. The area of parallelogram is–

a) 30 cm^2 b) 13.5 cm^2 c) 35 cm^2 d) $\frac{35}{2}$ cm^2

vi) The area of a regular hexagon is $600\sqrt{3}$ cm^2, then its length of side is

(a) 30 cm (b) $20\sqrt{2}$ cm (c) $20\sqrt{3}$ cm (d) 20 cm

vii) The parallel sides of a trapezium are 28 cm and 14 cm and the distance between them is 5 cm. The area of trapezium is–

a) 210 cm^2 b) 105 cm^2 c) 201cm^2 d) 150 cm^2

viii) In Δ ABC, AB=AC=4 cm and $\angle A=90°$, then area of Δ ABC is–

(a) 16 cm^2 (b) 4 cm^2 (c) 8 cm^2 (d) 10 cm^2

III. Very short answer type questions (VSA) :

i) The area of a triangle is 48cm^2. Its base is 12cm. What is its altitude?

ii) Find the area of an equilateral triangle whose one side measures 8cm.

iii) If the side of a rhombus is 10 cm and one diagonal is 16 cm, then find the area of the rhombus.

iv) Find the area of a rhombus whose diagonals are 12 cm and 9 cm.

v) The perimeter of a rectangular plot of ground is 120 m. The breadth is $\frac{2}{3}$ of the length. Find its length.

vi) Find the length of the diagonal of a square whose area is 24200 sq.m.

vii) The perimeter of a square is 40cm. Find its diagonal.

Section-B (2 marks each)

Short answer type questions :

1) Find the area of a triangle having sides 15cm, 14cm and 13cm.

2) The base of an isosecles triangle measures 24 cm and its area 92 cm^2. Find its perimeter.

3) The perimeter of a right angled triangle is 60 cm. Its hypotenuse is 25 cm. Find the area of the triangle.

4) Find the cost of laying grass in a triangular field of sides 50 m, 65 m and 65 m at the rate of Rs. 7 per m^2.

5) The perimeter of an isosceles triangle is 32 cm. The ratio of the equal side to its base is 3:2. Find the area of the triangle.

6) The perimeter of a triangular field is 420 m and its sides are in the ratio 6:7:8. Find the area of the triangular field.

7) From a point in the interior of an equilateral triangle, perpendiculars are drawn on the three sides. The lengths of the perpendiculars are 14 cm, 10 cm and 6 cm. Find the area of the triangle.

8) In a four-sided field, the length of the longer diagonal is 128 m. The lengths of the perpendiculars from the opposite vertices upon this diagonal are 22.7 m and 17.3 m. Find the area of the field.

9) The adjacent sides of a parallelogram are 36 cm and 27 cm in length. If the distance between the shorter sides is 12 cm, find the distance between the longer sides.

10) If the base of a right-angled triangle measures 48 cm and its hypotenuse measures 50cm. Find the area of the triangle.

Section-C (3/4 marks each)

Long Answer type questions :

1) Find the area of the triangle whose sides are 42 cm, 34 cm and 20 cm in length. Hence, find the height corresponding to the longest side.

2) The perimetter of a triangle is 50 cm. One side of the triangle is 4cm longer than the smaller side and the third side is 6 cm less than twice the smaller side. Find the area of the triangle.

3) The perimeter of a rhombus is 100 cm and one of its diagonal is 40 cm. Find the length of other diagonal.

4) Find the area of a trapezium whose parallel sides are 77 cm, 60 cm and the other two sides are 25 cm, 26 cm.

5) A rectangular park 80 m × 60 m has two roads each 10m wide running in the middle of it, one parallel to the length and the other parallel to the breadth. Find the cost of constructing the roads at the rate of ₹ 100 per sq.m.

6) The sides of a quadrilateral, taken in order are 5, 12, 14 and 15 cm respectively and the angle contained by the first two sides at a right angle. Find its area.

7) The difference between the lengths of the parallel sides of a trapezium is 8cm, the perpendicular distance between these sides is 24 cm and the area of the trapezium is 312 cm^2. Find the length of each of the parallel sides.

8) ABCD is a square. F is the mid-point of AB and BE is one third of BC. If the area of the ΔFBE is 108cm^2, Find the length of AC.

Answer

Section-A

I. (i) 180cm^2 (ii) 12cm (iii) 16cm (iv) $20\sqrt{2}$ cm (v) 1058 m^2 (vi) 52cm (vii) 225cm^2

II. (i) d (ii) a (iii) a (iv) b (v) c (vi) d (vii) b (viii) c

III. (i) 8cm (ii) $16\sqrt{3}$ cm^2 (iii) 96 cm^2 (iv) 54cm^2 (v) 36 m (vi) 220m
(vii) $10\sqrt{2}$ cm

Section-B

(1) 84 cm^2 (2) 64 cm (3) 150 cm^2 (4) ₹ 10500 (5) $32\sqrt{2}$ cm^2 (6) $2100\sqrt{15}$ m^2
(7) $300\sqrt{3}$ cm^2 (8) 2560 m^2 (9) 9cm (10) 336 cm^2

Section-C

(1) 336 cm^2, 16 cm (2) $20\sqrt{30}$ sq.cm (3) 30 cm (4) 1644 cm^2 (5) ₹ 130000
(6) 114 cm^2 (7) 17 cm, 9 cm (8) $36\sqrt{2}$ cm

CHAPTER-13

SURFACE AREAS AND VOLUMES

Key points and formulae

- Cuboid whose length = l unit, breadth = b unit and height = h unit
  a) Volume of cuboid = lbh unit^3.
  b) Lateral surface area of cuboid = $2h\,(l+b)$ unit^2.
  c) Total surface area of cuboid = $2\,(lb+bh+hl)$ unit^2.
  d) Diagonal of cuboid = $\sqrt{l^2+b^2+h^2}$ unit
- Cube whose edge = a unit
  a) Volume of cube = a^3 unit^3.
  b) Lateral surface area of cube = $4a^2$ unit^2.
  c) Total surface area of cube = $6a^2$ unit^2.
  d) Diagonal of cube = $a\sqrt{3}$ unit.
- Right circular cylinder
  whose radius = r unit
  height = h unit
  a) Volume of cylinder = $\pi r^2 h$ unit^3
  b) Curved surface area of cylinder = $2\pi rh$ unit^2
  c) Total surface area of cylinder = $2\pi r\,(r+h)$ unit^2
- Right circular cone
  Whose radius = r unit
  height = h unit
  slant height = l unit
  a) $l^2 = h^2 + r^2$
  b) Curved surface area of cone = πrl unit^2
  c) Total surface area of cone = $\pi r\,(l+r)$ unit^2

- Sphere, whose radius = r unit.
  a) Surface area of sphere = $4\pi r^2$ unit^2
  b) Volume of sphere = $\frac{4}{3}\pi r^3$ unit^3
- Hemisphere whose radius = r unit.
  a) Curved surface area of hemisphere = $2\pi r^2$ unit^2
  b) Total surface area of hemisphere = $3\pi r^2$ unit^2
  c) Volume of hemisphere = $\frac{2}{3}\pi r^3$ unit^3.

Exercise-13

Group-A (1 mark each)

A. Multiple choice question

i) If the surface area of a sphere is 144π m^2, then its volume is–

a) 288π m^3 b) 188π m^3 c) 300π m^3 d) 200π m^3.

ii) The length of the longest rod that can be fit in a cubical vessel of side a cm is–

a) a cm b) $3a$ cm c) $a\sqrt{3}$ cm d) $\frac{a}{3}$ cm

iii) Three cubes of metal with edges 3cm, 4cm and 5 cm respectively are melted to form a single cube. The base area of the new cube formed is–

a) 12 cm b) 36 cm c) 18 cm d) 6 cm.

iv) If the ratio of volumes of two spheres is 1:8, then the ratio of their surface areas is–

a) 1 : 2 b) 1 : 4 c) 1 : 8 d) 1 : 16

v) A cone and a hemisphere have equal bases and volumes, the ratio of their height is–

a) 1 :2 b) 2 : 1 c) $\sqrt{2}:1$ d) 4 : 1

vi) If a sphere is inscribed in a cube , then the ratio of the volume of the sphere to the volume of the cube is–

a) π : 2 b) π : 3 c) π : 4 d) π : 6

vii) The curved surface area of one cone is twice that of the other, while the slant height of the latter is twice that of the former, the ratio of their radii is–

a) 2 : 1 b) 4 : 1 c) 8 : 1 d) 1 : 1

viii) The radii of two cylinders are in the ratio of 2:3 and their heights are in the ratio of 5:3. The ratio of their volumes is–

a) 10:17 b) 20:27 c) 17:27 d) 20:37

ix) The total surface area of a cone whose radius is $\frac{r}{2}$ and slant height $2l$ is–

a) $2\pi r\,(l+r)$ b) $\pi r\,(l+ {}^{r}\!/_{4})$ c) $\pi r\,(l+r)$ d) $2\pi rl$

x) The curved surface area of a right circular cone of height 15cm and base diameter 16cm is–

a) 60π cm^2 b) 68π cm^2 c) 120π cm^2 d) 136π cm^2 .

Write True or False :

i) If each edge of a cube is increased by 50% then the percentage increase by 50% then the percentage increase in its surface area is 125%.

ii) In a cylinder, if the radius is halved and the height is doubled then the volume will be halved.

iii) If the height of a cone is doubled then its volume is increased by 200% .

iv) Two cubes have their volumes in the ratio 1:27. The ratio of their surface area is 1:9.

v) If the height and the radius of a cone are doubled the volume of the cone becomes 4 times.

Group-B (2 marks each)

Short Answer question :

1. Three cubes each of side 5cm are joined end to end. Find the surface area of the resulting cuboid.
2. The surface area of a cuboid is 758 cm^2. Its length and breadth are 14cm and 11cm respectively. Find its height.
3. A river 2m deep and 45m wide is flowing at the rate of 3 km/hr. Find the volume of water that runs into the sea per minute.
4. A box made of sheet metal cost ₹ 1620 at ₹ 30 per square metre. If the box is 5m long and 3m wide find its height.
5. 1 cm^3 of gold is drawn into a wire 0.1mn in diameter. Find the length of the wire.
6. The curved surface area of cylinder is 1320 cm^2 and its base had diameter 21cm. Find the height and the volume of the cylinder.

7. Water flows at the rate of 10 m/min through a cylindrical pipe 5mm in diameter. How long would it take to fill a conical vessel whose diameter is 40cm and depth is 24cm?

8. The curved surface area of a cone is 4070 cm^2 and its diameter is 70 cm. Find its slant height.

9. How many spheres 12cm in diameter can be made from a metallic cylinder of diameter 8cm and height 90cm?

10. A cone and a hemisphere have equal base and equal volumes. Find the ratio of their heights.

Group-C (3/4 marks each)

Long Answer question :

1) A closed iron tank 12m long, 9m wide and 4m deep is to be made. Determine the cost of iron sheet used at the rate of Rs. 5 per meter sheet. Sheet being 2m wide.

2) The length of a hall is 20m and width 16m. The sum of the areas of the floor and roof is equal to the sum of the areas of the four walls. Find the height and volume of the hall.

3) How many cubes whose edge measures 3cm can be formed by melting a cube block of metal whose edge is 15cm.?

4) A cube 9cm edge is immersed completely in a rectangular vessel containing water. If the dimensions of the base are 15cm and 12cm. Find the raise in water level in the vessel.

5) Two cubes each of volume 512 cm^3 are joined end to end. Find the surface area of the resulting cuboid.

6) The diameter of a roller 120 cm long is 84cm. If it takes 500 complete revolutions to level a playground determine the cost of levelling it at the rate of 30 paise per square metre.

7) The circumference of the base of a cylindrical vessel is 132 cm and its height is 25cm. How many litres of water can it hold?

8) The curved surface area of a cylindrical pillar is 264 m^2 and its volume is 924 m^3. Find the diameter and height of the pillar.

9) How many litres of water flow out of a pipe having area of cross section of 5 cm^2 in one minute, if the speed of water in the pipe is 30 cm/sec?

10) A solid cylinder has a total surface area of 231 cm^2, its curved surface area is $\frac{2}{3}$ of total surface area. Find the volume of the cylinder.

11) The diameters of two cones are equal. If their slant heights are in the ratio 5:4, find the ratio of their curved surface area.

12) The height and the radius of the base of a cone are 12 cm and 5 cm respectively. Find the curved surface area and the volume of the cone.

13) Find the volume of the largest right circular cone that can be fitted in a cube whose edge is 14 cm.

14) If the radius of the base of cone is halved, keeping the height same. What is the ratio of the volume of the reduced cone to that of the original cone.

15) The surface areas of two spheres are in the ratio 1:4. Find the ratio of their volumes.

16) A hemispherical lead of radius 9 cm is cost into a right circular cone of height 72 cm. Find the radius of the base of cone.

Answers

Group-A

A. (i) a (ii) c (iii) b (iv) b (v) a (vi) d (vii) b (viii) b (ix) b (x) d

B. (i) True (ii) True (iii) False (iv) True (v) False

Group-B

(1) 350 m^2 (2) 9 cm (3) 4500 m^3 (4) 1.5m (5) 127.27 (6) 20 cm, 6930 cm^3
(7) 51 min 12 sec. (8) 37 cm (9) 5 (10) 2:1

Group-C

(1) ₹ 960 (2) 8.88 m, 2844.4 m^3 (3) 125 (4) 4.05cm (5) 640cm^2
(6) ₹ 475.20 (7) 34.65 lt. (8) 14m, 6m (9) 9 lt. (10) 269.5 cm^3

(11) 5:4 (12) $314\frac{2}{7}$ cc, $204\frac{2}{7}$ sq. cm. (13) 718.66 cm^3 (14) 1:4

(15) 1:8 (16) 4.5 cm

CHAPTER-14

STATISTICS

Key points and formulae

- Facts or figures, collected with a definite purpose, are called data.
- Statistics is the area of study dealing with the presentation, analysis and interpretation of data.
- Data can be presented graphically in the form of bar graphs, histograms and frequency polygons.
- The three measures of central tendency for ungrouped data are :

  (i) Mean : It is found by adding all the vaules of the observations and dividing it by the total number of observation. It is denoted by $\bar{x}$.

  So, $\bar{x} = \frac{\sum_{i=1}^{n} x_i}{n}$.

  For ungrouped frequency distribution it is $\bar{x} = \frac{\sum_{i=1}^{n} f_i x_i}{\sum_{i=1}^{n} f_i}$

  (ii) Median : It is the value of the middle most observations

  If n is an odd number, then median = Value of $\left(\frac{n+1}{2}\right)^{th}$ observation

  If n is an even number, then Median = Mean of the value of $\left(\frac{n}{2}\right)^{th}$ & $\left(\frac{n}{2}+1\right)^{th}$ observations.

  (iii) Mode : The mode in the most frequently occuring observation.

Group-A (1 mark each)

Very short Answer/type questions

A. Fill in the blanks :

1) The mode is the most _____ occuring observation.

2) The class mark of the class 100-125 is _____.

3) The range of the data : 25, 18, 20, 22, 16, 6, 17, 15, 12, 30, 32, 10, 19, 8, 11, 20 is ____.

4) In a frequency distribution, The mid value of a class is 10 and the width of the each class in 6. The upper limit of the class is _____.

5) The mean of the marks scored by 40 students was found to be 35. Later on it was discovered that a score of 43 was misread as 34. Then the correct mean is _____.

6) The median of the numbers 9, 5, 7, 17, 13, 18, 13, 9, 5, 17, 13, 12, 17 is ____.

7) The median of the numbers 45, 34, 65, 48, 93, 54, 22, 86, 45, 87 is _____.

8) Mode of the data 51, 14, 71, 15, 91, 2, 51, 19, 41, 51, 18, 15, 51 is _____.

9) The median of the data arranged in ascending order 8, 9, 12, 18, $(x + 2)$, $(x + 4)$, 30, 31, 34, 39 is 24. Then the value of x is _____.

10. The mean of eight numbers is 40. If one number is excluded, their mean becomes 30. The excluded number is _____.

B. Choose the correct answer :

1) In the class intervals 40-50, 50-60 the number 50 is included in–

   a) 40-50 b) 50-60 c) both the intervals d) None of the intervals

2) If each observation of a data is increased by 7, then their mean–

   a) remains same.

   b) becomes 7 times the original mean.

   c) Is decreased by 7.

   d) Is increased by 7.

3. The points scored by a Kabadi team in a series of matches are as follows :

   18, 24, 18, 14, 25, 15, 17, 12, 17, 27, 18, 17, 48, 28, 18, 28. What is the median of the points scored by the team?

   a) 12 b) 14 c) 18 d) 25

4. The marks obtained by 12 students of a class in a test are 36, 27, 5, 19, 34, 23, 37, 23, 16, 23, 20, 38. Then the mode is–

   a) 23 b) 26 c) 20 d) 36

5. Let $\bar{x}$ be the mean of $x_1, x_2, \ldots . x_n$, & $\bar{y}$ by the mean of $y_1, y_2, \ldots . y_n$. If $\bar{z}$ in the mean of $x_1, x_2, \ldots . x_n, y_1, y_2, \ldots . y_n$ then $\bar{z}$ =

   a) $(\bar{x} + \bar{y})$ b) $\frac{1}{2}(\bar{x} + \bar{y})$ c) $\frac{1}{n}(\bar{x} + \bar{y})$ d) $\frac{1}{2n}(\bar{x} + \bar{y})$

6. The marks obtained by 20 students of a class in a test (out of 50) are given below:

   40, 44, 45, 46, 50, 42, 41, 8, 26, 28, 9, 32, 24, 6, 42, 36, 39, 41, 29, 43.

   The range of the data is–

   a) 44 b) 54 c) 90 d) 10

7. For drawing a frequency polygon of a continuous frequency distribution, we plot the points whose ordinates are the frequencies of the respective classes and abscissa are the–

   a) Upper limits of the classes

   b) Lower limits of the classes

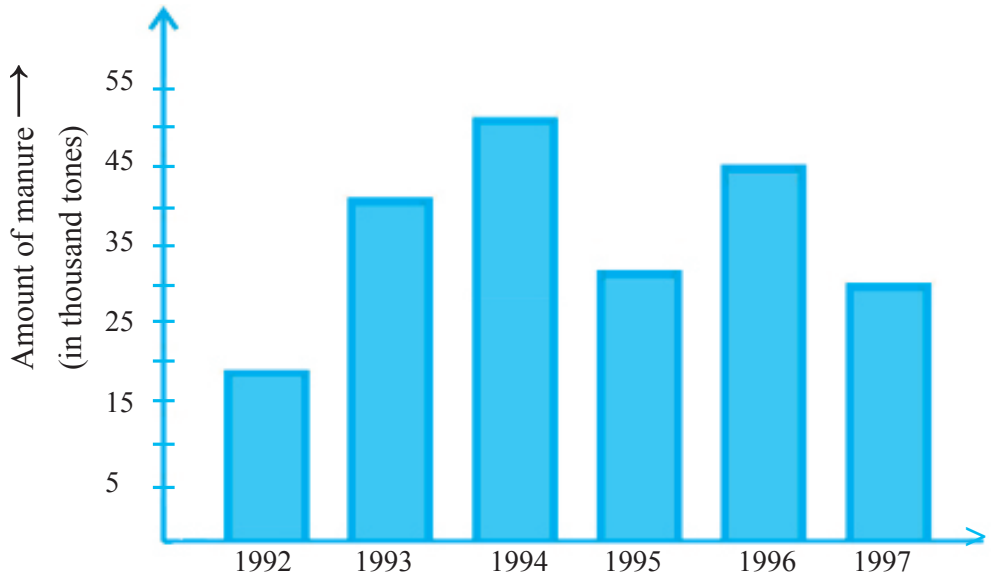
   c) Class marks of the classes

   d) Upper limits of the preceding classes

8. Let U be the upper class boundary of a class in a frequency distribution and M be the class mark of the class. Which one of the following is the lower class boundary (L) of the class?

   a) $M + \frac{M+L}{2}$ b) $L + \frac{M+L}{2}$ c) $2M - U$ d) $M - 2L$

9. The following graph gives the amount of manure (in thousand tones) manufactured by a company during some years.



In which year the amount of manure manufactured by the company was maximum?

a) 1992 b) 1996 c) 1993 d) 1994

10. What is the Mean of the following data ?

x_i	13	5	7	17
f_i	6	8	15	1

a) 9 b) 10.2 c) 17.8 d) 8

C. Answer the following questions :

1. The heights (in cm) of 9 students of a class are as follows :

150, 160, 140, 140, 150, 140, 150, 144, 148

Find the median of the data.

2. The following observations have been arranged in ascending order. If the median of the data is 54, find the value of x.

29, 32, 48, 50, x, $x + 2$, 72, 78, 84, 95.

3. Mean of 18 numbers is 10. If 2 is multiplied to every number, what will be the new mean?

4. The mean of 20 numbers is 32. If 5 is added to each number, then find the new mean.

5. Find the mode of the following distribution.

   3.5, 3.5, 3.1, 3.5, 3.7, 3.8, 3.5, 3.6, 3.7, 3.2.

6. The given table presents the number of illiterate males in the age group (10-34) in a town.

Age group	10-14	15-19	20-24	25-29	30-34
No of males	300	890	800	300	210

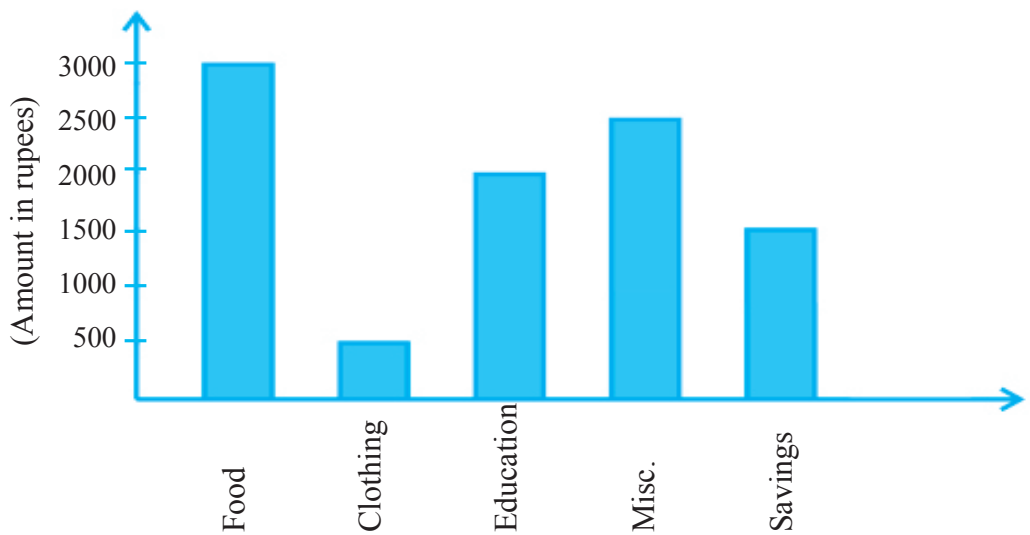
   Convert this distribution into a continuous frequency distribution.

7. The demand of different shirt sizes, as obtained by a survey, is given below.

Size	38	39	40	41	42	43	44	Total
No of persons (wearing it)	26	39	20	15	13	7	5	125

   Find the mode as observed from the survey.

8. The following bar graph represents the monthly expenditure of a person.



   Find his expenditure for food and education.

9. The width of each of 5 continuous classes in a frequency distribution is 5 and the lower limit of the lowest class is 10. What is the upper limit of the highest class?

10. The frequency distribution of height (in cm) of 25 students are as follows :

Height (in cm)	150-160	160-170	170-180	180-190	190-200
No. of students	7	2	4	10	2

What is the number of students having height less than 180 cm?

Group-B (2 marks each)

Short Answer type questions :

1) The runs scored by players of a cricket team are as follows :

57, 17, 26, 91, 115, 26, 83, 41, 57, 0, 26. Find their median and mode

2) Find the mean of 25 numbers if the mean of 15 of them is 18 and the mean of remaining numbers is 13.

3) Arnav scored 63 in English. 57 in Hindi, 82 in Mathematics, 55 in Social Science and x in science. If his average score is 60, find the average of best four of them.

4) The mean of 90 items was found to be 45. Later on it was discovered that two items were misread as 26 & 19 instead of 62 and 09 respectively. Find the correct mean.

5) If $\bar{x}$ is the mean of $x_1, x_2, \ldots x_n$, then for $a \neq 0$,

Find the mean of $ax_1, ax_2, \ldots ax_n, \frac{x_1}{a}, \frac{x_2}{a}, \ldots \frac{x_n}{a}$.

6) The mean of the following data is 11.

x_i	13	5	7	19	11	13
f_i	6	8	15	P	8	4

Find the value of P.

7) Draw histogram for the following distribution

Marks	0-10	10-20	20-30	30-40
No. of students	2	5	3	5

8) Construct a frequency polygon for the following distribution.

Class interval	20-30	30-40	40-50	50-60
Frequency	2	5	3	4

9) The water tax bills (in ₹) of 20 house in a locality are given below. Construct a grouped frequency distribution wth class size 10.

30, 32, 45, 54, 71, 58, 68, 72, 66, 56, 51, 40, 14, 20, 15, 35, 44, 66, 55, 54.

10) Find the mean of the following distribution.

x	10	30	50	70	90
f	7	9	10	15	9

Group-C (3/4 marks each)

Long Answer type questions :

1) 100 surnames where randomly picked up for a test and the frequency distribution of number of letters in the English alphabet in the surnames was found as follows :

Number of letters	Number of Surnames
1–3	5
4–6	25
7–9	40
10–12	24
13–15	6

Draw a histogram to depict the given information .

2) Draw a frequency polygon for the following distribution.

Class interval	1-5	6-10	11-15	16-20	21-25	26-30
Frequency	5	8	4	3	6	9

3) Construct the frequency table with equal class intervals from the following data on the monthly wages (in ₹) of 30 workers working in a factory, taking one of the class intervals as 210–230 (230 not included)

220, 215, 306, 280, 210, 254, 306, 302, 319, 300

311, 272, 210, 258, 220, 256, 306, 316, 240, 278

292, 318, 304, 320, 290, 242, 268, 242, 268, 316

Prepare the frequency polygon of such data.

4) The percentage of marks of 200 students in a test were recorded as follows :

Percentage of marks	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89
No of students	7	11	20	46	57	37	15	7

Draw a histogram for the above data.

5) The number of books sold by a shopkeeper in a certain week was as follows :

Day	Monday	Tuesday	Wednesday	Thrusday	Friday	Saturday
No of books	420	180	230	340	160	120

Draw a bargraph for the above data.

6) In a study of diabetic patients in a area, the following data was obtained.

Age (in years)	10-20	20-30	30-40	40-50	50-60	60-70	70-80
No of patients	3	8	30	36	27	15	6

Represent the above data by a histogram and frequency polygon.

7) The number of rupee note of different denominations are given below in the table

Denominations ₹	5	10	20	50	100
Number of notes	10	40	30	25	20

Find Mode for the above data. Draw bargraph corresponding to above data.

8) Calculate the mean for the following distribution.

x	5	6	7	8	9	10	12	13	14
f	4	8	14	12	16	6	9	2	4

9) The runs scored by two teams A & B on the first 42 balls in a cricket match are given below :

No. of Balls	1-6	7-12	13-18	19-24	25-30	31-36	37-42
Runs scored by Team A	2	1	8	9	4	5	6
Runs scored by Team B	5	6	2	10	5	6	3

Draw their frequency polygons on the same graph with same axis and units.

10) In a class of 90 students, the marks (out of 50) obtained in a weekly test were as follows:

Marks	16-20	21-25	26-30	31-35	36-40	41-45	46-50
No of students	4	12	18	26	14	10	6

Draw histogram and frequency polygon for the above data in the same graph.

Answers

Group-A

Very short Answer

A. Fill in the blanks :

1. Frequently 2. 112.5 3. 26 4. 13 5. 35.25 6. 13 7. 51
8. 51 9. 21 10. 110

B. Choose the correct answer :

1. b 2. d 3. c 4. a 5. d 6. a 7. c 8. c 9. d
10. d

C. Answer the following questions :

1. 148 2. 53 3. 20 4. 37 5. 3.5 7. 39
8. Food ₹ 3000, Education ₹ 2000 9. 35 10. 13

Group-B

Short Answer type :

1. Median-41, Mode - 26 2. 16 3. 64.25 4. 45.29 5. $\frac{1}{2}\left(a+\frac{1}{a}\right)\bar{x}$
6. 11 10. 54

Group-C

Long Answer type :

7. 10 8. 8.75

CHAPTER-15

PROBABILITY

Key points and formulae

- An event for an experiment is the collection of some outcomes of the experiments.
- The emperical (or experimental) probability P(E) of an event E is given by

$$P(E) = \frac{\text{Number of trials in which E has happend}}{\text{Total number of trials}}$$

- The probability of an event E is denoted by P(E) and $0 \leq P(E) \leq 1$

Exercise-15

Group-A (1 mark each)

Very short Answer type questions

A. Fill in the blanks :

1) The Probability of a sure event is _____ .
2) The probability of an impossible event is _____.
3) A coin was tossed for 100 times. Result is as follows : Head : 45, Tail : 55. The probability of getting head is ____.
4) Two coins were tossed for 5 times simultaneously and it was found that 2 heads : 3 times; 1 head : 2 times. Then the probability of getting no head is _____.
5) In a criket match one batsman plays 30 balls and hits 6 boundaries. The probability of his hitting boundary is _____.
6) When three coins are tossed simultaneously, the probability of getting 3 head is ____.
7) When three dice are thrown the probability of sum being 17 is _____.
8) When two dice are thrown, the probability of getting sum 11 is _____.
9) A single letter is selected at random from the word 'PROBABILITY'. The probability that it is a vowel is _____.
10) The record of a weather station shows that out of the past 250 consecutive days, its weather forecasts were correct 200 times. The probability that on a given day it was correct is _____.

B. Choose the correct answer :

1) In a non-leap year, the probability of having 53 tuesdays or 53 wednesdays is–

a) $\frac{1}{7}$ b) $\frac{2}{7}$ c) $\frac{3}{7}$ d) None of these

2) Three coins were tossed 200 times. The number of times 2 heads came up is 72. Then the probability of 2 heads coming up is–

a) $\frac{1}{25}$ b) $\frac{2}{25}$ c) $\frac{7}{25}$ d) $\frac{9}{25}$

3. A bag has 4 red balls and 2 yellow balls. A ball is drawn from the bag without looking into the bag. What is the probability of getting a red ball?

a) $\frac{1}{3}$ b) $\frac{2}{3}$ c) $\frac{5}{6}$ d) $\frac{1}{6}$

4. There are 5 prizes on 1000 tickets of a lottery of company. Probability of winning a prize is–

a) $\frac{199}{200}$ b) $\frac{1}{200}$ c) $\frac{198}{200}$ d) None of these

5. A dice is thrown once. Probability of getting a number 3 or 4 is-

a) $\frac{1}{6}$ b) $\frac{2}{3}$ c) $\frac{1}{2}$ d) $\frac{1}{3}$

6. There are 50 tickets numbered 1 to 50 in a box. Probability of drawing a ticket bearing prime number is–

a) $\frac{13}{50}$ b) $\frac{3}{10}$ c) $\frac{17}{50}$ d) None of these

7. Probability of a leap-year having 53 sundays is–

a) $\frac{1}{7}$ b) $\frac{3}{7}$ c) $\frac{2}{7}$ d) None of these

8. A dice is thrown once. Probability of getting a multiple of 2 is–

a) $\frac{1}{6}$ b) $\frac{2}{3}$ c) $\frac{1}{2}$ d) $\frac{1}{3}$

9. Cards are marked with 1 to 25 are placed in the box and mixed thoroughly. One card is drawn at random from the box. What is the probability of getting a number divisible by 4?

a) $\frac{8}{25}$ b) $\frac{9}{25}$ c) $\frac{6}{25}$ d) $\frac{3}{25}$

10. The probability of getting an ace card from a well shuffled pack of 52 cards is–

a) $\frac{1}{13}$ b) $\frac{12}{13}$ c) $\frac{13}{52}$ d) None of these

C. Answer the following questions :

1. Compute the probability of the occurrence of an event if the probability of not occuring the event is 0.56
2. From a bag of red and blue balls, the probability of picking a red ball is $\frac{x}{2}$. Find x if the probability of picking a blue ball is $\frac{2}{3}$.
3. A box contains 50 bolts and 150 nuts. On checking the box, it was found that half of bolts and half of the nuts are rusted. If one item is chosen at random, find the probability that it is rusted.
4. In a survey of 364 children aged 9-12 it was found that 91 liked to eat potato chips. If a child is selected at random, compute the probability that he/she does not like to eat patato chips.
5. A bag contains x white, y red and z-blue balls. A ball is drawn at random, then what is the probability of getting a blue ball?
6. In a study of 642 people, it was found that 514 people have a high school certificate. If a person is selected at random, find the probability that the person has a high school certificate.
7. In a throw of dice, find the probability of not getting 4 or 5.
8. Out of 35 students participating in a debate 10 are girls. What is the probability that winner is a boy?
9. During an interview for the post of estate manager, 15 candidates appeared. Out of which 8 were retired army man, 4 were retired principals and 3 others from different departments. What is the probability of selecting a retired army man for this post?
10. Out of 35 students of a class, 21 opt automobile engineering and other financial management. What is the probability of choosing a student who took financial management?

Group-B (2 marks each)

Short Answer type Question

1) Two coins are tossed simultaneously for 360 times. The number of times '2 tails' appeared was three times of 'No tail' appeared and the number of times '1 tail' appeared was two times of 'tail' 'No tail' appeared. What is the probability of getting two tails?

2) From a deck of cards, 10 cards are picked at random and shuffled. The cards are as follows:

   6, 5, 3, 9, 7, 6, 4, 2, 8, 2

   Find the probability of picking a card from above having value more than 5 and find the probability of picking a card with an even number on it.

3) A bag contains 4 red balls, 6 green balls and some white balls. If the probability of not drawing a white ball in one draw be $\frac{2}{3}$, then find the number of white balls.

4) In a box there are 10 non-defective and some defective bulbs. If the probability that a bulb selected at random from the box to be defective is $\frac{2}{7}$ then find the number of defective bulbs.

5) In 150 throws of a dice, 2 is obtained 76 times. In a random throw of dice, what is the probability of not getting 2?

6) Two dice are thrown at the same time, find the probability that the sum of two numbers appearing of the top of the dice is more than nine.

7) In a cricket match, a batsman hit the boundary 5 times out of 40 balls played by him. Find the probability that the boundary is not hit by the ball.

8) Cards numbered from 7 to 49 are put in a box & mixed throughly. A card is drawn from the box, what is the probability that the number written on it is–

   i) A prime number.

   ii) A multiple of 7

9) Mathematics book of class IX contains 15 chapters. A mathamatics teacher asked one of the students to write the names of each chapters on slips. One name on one slip. She mixed the slips throughly in a box.

She called a student to pick up one of the slips. What is the probability that the chapter written on it is from.

i) Geometry ii) Algebra

[No. of geometry chapters 5, chapters of Algebra-2]

10) One number is chosen at random from numbers 1 to 100. Find the probability that it is divisible by 4 or 6.

Group-C (3/4 marks each)

Long Answer type questions:

1. The daily cost of milk (in ₹) supplied to 25 house in a locality are given below :

Cost (in ₹)	**Number of houses**
40–50	4
50–60	5
60–70	3
70–80	5
80–90	2
90-100	6

If one house is chosen at random, find the probability that :-

a) The milk bill of the house lies between ₹ 60 and ₹ 80

b) House is paying at the most ₹ 69, for the milk bill.

c) Milk bill of the house is below ₹ 50.

2. A travel company has 100 drivers for driving buses to various tourist destination. Given below is a table showing the resting number of the drivers after covering a certain distance (in km).

Distance (in km)	After 80 km	After 115 km	After 155 km	After 200 km
No. of drivers	13	47	30	10

What is the probability that the driver chosen at random

a) Takes a halt after covering 80 km?

b) Takes a halt after covering 115 km?

c) Takes a halt after covering 155 km?

d) Takes a halt after covering 200 km?

3. For travelling different mode of transport used by 1500 people are as follows :

Mode of transport	**Number of people**
Cycle	250
Scooter	400
Car	270
Bus	220
Train	260
No mode of Transport	100

Find the probability of number of people

i) used car or scooter only?

ii) used only cycle?

iii) used at least one kind of mode of transport?

4. Three coins are tossed simultaneously 180 times and it is found that 3 tails appeared 34 times, 2 tails appeared 55 times. 1 tail appeared 72 times and no tail appeared 19 times. Find the probability of getting (a) 3 tails (b) 2 tails (c) 1 tail (d) 0 tail.

5. The table given below shows the marks obtained by 50 students of a class in a list with maximum marks 100.

Marks (%)	0-15	15-30	30-45	45-60	60-75	Above 75
No.of students	6	10	10	14	6	4

A student of the class is selected at random.

Find the probability that he gets

a) less than 15% marks

b) 60% or more marks.

c) marks equal to or greater than 45% but less than 60%.

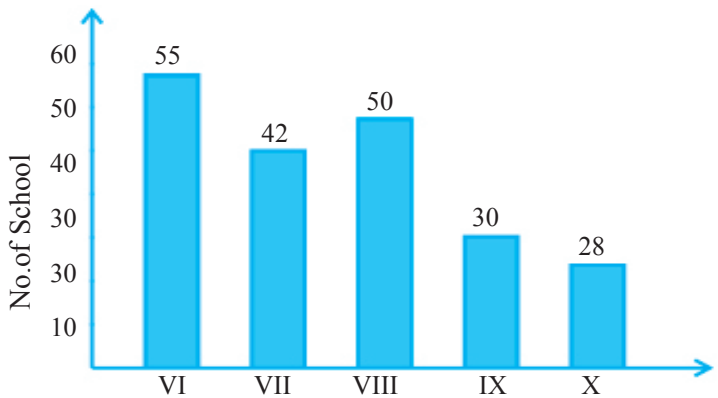
6. Following are the age (in years) of 300 patients getting medical treatment in a hospital.

Age (in years)	10-20	20-30	30-40	40-50	50-60	60-70
No.of patients	80	40	50	70	40	20

One of the patients is selected at random. Find the probability that his age is

a) 10 years or more
b) Less than 10 years
c) More than 70 years
d) 70 years or less

7. The bar graph below shows the number of students is different classes of a school.



In the annual function of primary classes, class IX & X was deputed for discipline duty, student of class VII & Class VIII for sitting, class VI students were to welcome the chief guests.

Find the probability that a student chosen is–

a) Deputed for sitting
b) a student of class X
c) numember of welcome committee.

8. Over the past 200 working days, the number of defective parts produced by a machine is given in the following table.

Number of defective parts	0	1	2	3	4	5	6	7	8	9	10	11	12	13
Days	50	32	22	18	12	12	10	10	10	8	6	6	2	2

Determine the probability that tomorrow's output will have.

a) No defective part
b) Atleast one defective part
c) Not more than 5 defective parts.
d) More than 13 defective parts.

9. A recent survey found that the ages of workers in a factory is distributed as follows :

Age (in years)	20-29	30-39	40-49	50-59	60 and above
No.of workers	38	27	86	46	3

If a person is selected at random, find the probability that the person is.

a) 40 years or more.

b) Under 40 years.

c) having age from 30 to 39 years.

d) under 60 but over 39 years.

10. A company selected 4000 house holds at random and surveyed them to findout a relationship between income level and the numberr of television sets in a home. The information so obtained is listed in the following table.

Monthly income (in ₹)	Number of television / house			
	0	1	2	above 2
Lsss than 10,000	20	80	10	0
10,000 – 14999	10	240	60	0
15000 – 19999	0	380	120	30
20000 – 24999	0	520	370	80
25000 and above	0	1100	760	220

Find the probability :

a) of a house hold earning ₹10,000 ₹ 14,999 per month and having exactly one television.

b) of a house hold earning ₹ 25,000 and more per month and having 2 televisions.

c) of a house hold not having any television.

Answers

Group-A

A. Fill in the blanks :

(1) 1 (2) 0 (3) 0.45 (4) 0 (5) $\frac{1}{5}$ (6) $\frac{1}{8}$ (7) $\frac{1}{72}$ (8) $\frac{1}{18}$ (9) $\frac{4}{11}$ (10) 0.8

B. Choose the correct answer :

(1) b (2) d (3) b (4) b (5) d (6) b (7) c (8) c (9) c (10) a

C. Question answer :

(1) 0.44 (2) $\frac{2}{3}$ (3) $\frac{1}{2}$ (4) 0.75 (5) $\frac{z}{x+y+z}$ (6) 0.8006 (7) $\frac{2}{3}$ (8) $\frac{5}{7}$ (9) $\frac{8}{15}$

(10) $\frac{2}{5}$

Group-B

Short Answer type Questions :

(1) $\frac{1}{2}$ (2) $\frac{1}{2}, \frac{3}{5}$ (3) 5 (4) 4 (5) $\frac{37}{75}$ (6) $\frac{1}{6}$ (7) $\frac{7}{8}$ (8) i) $\frac{12}{43}$ ii) $\frac{7}{43}$

(9) i) $\frac{1}{3}$ ii) $\frac{2}{15}$ (10) $\frac{33}{100}$

Group-C

Long Answer type Questions :

(1) a) $\frac{8}{25}$ b) $\frac{12}{25}$ c) $\frac{4}{25}$

(2) a) $\frac{13}{100}$ b) $\frac{47}{100}$ c) $\frac{30}{100}$ d) $\frac{1}{10}$

(3) a) 0.447 b) 0.167 c) 0.933

(4) a) 0.189 b) 0.306 c) 0.4 d) 0.106

(5) a) 0.12 b) 0.20 c) 0.28

(6) a) 1 b) 0 c) 0 d) 1

(7) a) 0.449 b) 0.137 c) 0.268

(8) a) 0.25 b) 0.75 c) 0.73 d) 1

(9) a) 0.675 b) 0.325 c) 0.135 d) 0.66

(10) a) 0.06 b) 0.19 c) 0.0075

NOTE

NOTE