SSLC / 10th Study Material

MATHEMATICS

Must Study Questions

- ✓ One Mark Questions
- ✓ Practical Geometry (8 mark)
- ✓ Graph (8 mark)
- ✓ Theorem's (5 mark)

Name: _____

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PART – I – 1 Mark Questions

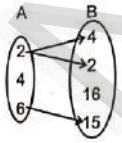
1. Relations and Functions

Text Book Questions

1. If $n(A \times B) = 6$ and $A = \{1,3\}$ then $n(B)$ is SEP-21
   (A) 1 (B) 2 **(C) 3** (D) 6
2. $A = \{a, b, p\}, B = \{2,3\}, C = \{p, q, r, s\}$ then $n[(A \cup C) \times B]$ is PTA-3
   (A) 8 (B) 20 **(C) 12** (D) 16
3. If $A = \{1,2\}, B = \{1,2,3,4\}, C = \{5,6\}$ and $D = \{5,6,7,8\}$ then state which of the following statement is true SEP-20
   (A) $(A \times C) \subset (B \times D)$ (B) $(B \times D) \subset (A \times C)$
   (C) $(A \times B) \subset (A \times D)$ (D) $(D \times A) \subset (B \times A)$
4. If there are 1024 relations from a set $A = \{1,2,3,4,5\}$ to a set B, then the number of element in B is PTA-2, JUL-22
   (A) 3 **(B) 2** (C) 4 (D) 8
5. The range of the relations $R = \{(x, x^2) | x$ is a prime number less than 13$\}$ is PTA-4, JUL-22
   (A)$\{2,3,5,7\}$ (B) $\{2,3,5,7,11\}$ **(C) {4,9,25,49,121}** (D) $\{1,4,9,25,49,121\}$
6. If the ordered pairs $(a + 2,4)$ and $(5, 2a + b)$ are equal then (a, b) is PTA-6, MAY-22
   (A) $(2, -2)$ (B) $(5,1)$ (C) $(2,3)$ **(D)** $(3, -2)$
7. Let $n(A) = m$ and $n(B) = n$ then the total number of non-empty relations that can be defined from A to B is
   (A) m^n (B) n^m **(C)** $2^{mn} - 1$ (D) 2^{mn}
8. If $\{(a, 8), (6, b)\}$ represents an identity function, then the value of a and b respectively. PTA-1
   (A) (8,6) (B) (8,8) (C) (6,8) (D) (6,6)
9. Let $A = \{1,2,3,4\}$ and $B = \{4,8,9,10\}$. A function $f: A \to B$ given by $f = \{(1,4), (2,8), (3,9), (4,10)\}$ is a PTA-4
   (A) Many-one function (B) Identity function
   (C) One-to-one function (D) Into function
10. If $f(x) = 2x^2$ and $g(x) = \frac{1}{3x}$, then $f \circ g$ is
    (A) $\frac{3}{2x^2}$ (B) $\frac{2}{3x^2}$ **(C)** $\frac{2}{9x^2}$ (D) $\frac{1}{6x^2}$
11. If $f: A \to B$ is a bijective function and if $n(B) = 7$, then $n(A)$ is equal to PTA-2
    (A) 7 (B) 49 (C) 1 (D) 14
12. Let f and g be two functions given by
    $f = \{(0,1), (2,0), (3, -4), (4,2), (5,7)\}$
    $g = \{(0,2), (1,0), (2,4), (-4,2), (7,0)\}$ then the range of $f \circ g$ is
    (A) $\{0,2,3,4,5\}$ (B) $\{-4,1,0,2,7\}$ (C) $\{1,2,3,4,5\}$ **(D)** $\{0, 1, 2\}$
13. Let $f(x) = \sqrt{1 + x^2}$ then
    (A) $f(xy) = f(x).f(y)$ (B) $f(xy) \geq f(x).f(y)$
    (C) $f(xy) \leq f(x).f(y)$ (D) None of these
14. If $g = \{(1,1), (2,3), (3,5), (4,7)\}$ is a function given by $g(x) = \alpha x + \beta$ then the values of α and β are PTA-6
    (A) $(-1,2)$ **(B)** $(2, -1)$ (C) $(-1, -2)$ (D) $(1,2)$
15. $f(x) = (x + 1)^3 - (x - 1)^3$ represents a function which is PTA-5
    (A)linear (B) cubic (C) reciprocal **(D) quadratic**

Creative MCQ

1. Let $f(x) = x^2 - x$, then $f(x-1) - f(x+1)$ is SEP-20
   (A) $4x$ (B) $2 - 2x$ **(C) $2 - 4x$** (D) $4x - 2$
2. If $n(A) = p, n(B) = q$ then the total number of relations that exist between A and B is PTA-1
   (A) 2^p (B) 2^q (C) 2^{p+q} **(D) 2^{pq}**
3. Given $f(x) = (-1)^x$ is a function from $\mathbb{N}$ to $\mathbb{Z}$. Then the range of f is PTA-3
   (A) $\{1\}$ (B) $\mathbb{N}$ **(C) $\{1, -1\}$** (D) $\mathbb{Z}$
4. The given diagram represents PTA-6



   (A) an onto function (B) a constant function
   (C) an one-one function **(D) not a function**

2. Numbers and Sequences

Text Book Questions

1. Euclid's division lemma states that for positive integers a and b, there exist unique integers q and r such that $a = bq + r$, where r must satisfy
   (A) $1 < r < b$ (B) $0 < r < b$ **(C) $0 \leq r < b$** (D) $0 < r \leq b$
2. Using Euclid's division lemma, if the cube of any positive integer is divided by 9 then the possible remainders are PTA-5, SEP-20
   (A) 0, 1, 8 (B) 1, 4, 8 (C) 0, 1, 3 (D) 1, 3, 5
3. If the HCF of 65 and 117 is expressible in the form of $65m - 117$, then the value of m is
   (A) 4 **(B) 2** (C) 1 (D) 3 MAY-22
4. The sum of the exponents of the prime factors in the prime factorization of 1729 is
   (A)1 (B) 2 **(C) 3** (D) 4 SEP-21,PTA-4,JUL-22
5. The least number that is divisible by all the numbers from 1 to 10 (both inclusive) is
   (A) 2025 (B) 5220 (C) 5025 **(D) 2520**
6. $7^{4k} \equiv$ _____$(mod\ 100)$ PTA-1
   (A) 1 (B) 2 (C) 3 (D) 4
7. Given $F_1 = 1, F_2 = 3$ and $F_n = F_{n-1} + F_{n-2}$ then F_5 is SEP-21, MDL
   (A) 3 (B) 5 (C) 8 **(D) 11**
8. The first term of an arithmetic progression is unity and the common difference is 4. Which of the following will be a term of this A.P.
   (A) 4551 (B) 10091 **(C) 7881** (D) 13531
9. If 6 times of 6th term of an A.P is equal to 7 times the 7th term, then the 13th terms of the A.P is
   (A) 0 (B) 6 (C) 7 (D) 13 PTA-4
10. An A.P consists of 31 terms. It is 16th term is m, then the sum of all the terms of this A.P is
    (A) 16m (B) 62m **(C) 31m** (D) $\frac{31}{2}$ m PTA-5
11. In an A.P., the first term is 1 and the common difference is 4. How many terms of the A.P must be taken for their sum to be equal to 120? MDL
    (A) 6 (B) 7 **(C) 8** (D) 9

12. If $A = 2^{65}$ and $B = 2^{64} + 2^{63} + 2^{62} + \cdots + 2^0$ which of the following is true? PTA-6, SEP-20
(A) B is 2^{64} more than A (B) A and B are equal
(C) B is larger than A by 1 **(D) A is larger than B by 1**

13. The next term of the sequence $\frac{3}{16}, \frac{1}{8}, \frac{1}{12}, \frac{1}{18}, \ldots$ is PTA-2
(A) $\frac{1}{24}$ **(B) $\frac{1}{27}$** (C) $\frac{2}{3}$ (D) $\frac{1}{81}$

14. If the sequence $t_1, t_2, t_3, \ldots$ are in A.P then the sequence $t_6, t_{12}, t_{18}, \ldots$ is
(A) a Geometric Progression
(B) an Arithmetic Progression
(C) neither an Arithmetic Progression nor a Geometric Progression
(D) a constant sequence

15. The value of $(1^3 + 2^3 + 3^3 + \cdots + 15^3) - (1 + 2 + 3 + \cdots + 15)$ is PTA-3
(A) 14400 (B) 14200 **(C) 14280** (D) 14520

Creative MCQ

1. If t_n is the nth term of an A.P., then $t_{8n} - t_n$ is MAY-22
(A) $(8n-1)d$ (B) $(8n-2)d$ (C) $(7n-2)d$ **(D) $(7nd)$**

2. The sequence $-3, -3, -3$ ..... is PTA-1
(A) An A.P only (B) a G.P only
(C) Neither A.P nor G.P **(D) both A.P and G.P**

3. If $2 + 4 + 6 + \cdots + 2k = 90$, then the value of k is PTA-3
(A) 8 **(B) 9** (C) 10 (D) 11

4. If a and b are two positive integers where $a > 0$ and b is a factor of a, then HCF of a and b is PTA-4
(A) b (B) a (C) $3ab$ (D) $\frac{a}{b}$

5. If a, b, c are in A.P then $\frac{a-b}{b-c}$ is equal to PTA-6
(A) $\frac{a}{b}$ (B) $\frac{b}{c}$ (C) $\frac{a}{c}$ **(D) 1**

3. Algebra

Text Book Questions

1. A system of three linear equations in three variables is inconsistent if their planes PTA-1, JUL-22
(A) Intersect only at a point (B) intersect in a line
(C) Coincides with each other **(D) do not intersect**

2. The solution of the system $x + y - 3z = -6$, $-7y + 7z = 7$, $3z = 9$ is JUL-22
(A) $x = 1, y = 2, z = 3$ (B) $x = -1, y = 2, z = 3$
(C) $x = -1, y = -2, z = 3$ (D) $x = 1, y = -2, z = 3$

3. If $(x - 6)$ is the HCF of $x^2 - 2x - 24$ and $x^2 - kx - 6$ then the value of k is PTA-4, MAY-22
(A) 3 **(B) 5** (C) 6 (D) 8

4. $\frac{3y-3}{y} \div \frac{7y-7}{3y^2}$ is PTA-5
(A) $\frac{9y}{7}$ (B) $\frac{9y^3}{21y-21}$ (C) $\frac{21y^2-42y+21}{3y^3}$ (D) $\frac{7(y^2-2y+1)}{y^2}$

5. $y^2+\frac{1}{y^2}$ is not equal to PTA-6, JUL-22

(A) $\frac{y^4+1}{y^2}$ **(B)** $\left(y+\frac{1}{y}\right)^2$ (C) $\left(y-\frac{1}{y}\right)^2+2$ (D) $\left(y+\frac{1}{y}\right)^2-2$

6. $\frac{x}{x^2-25}-\frac{8}{x^2+6x+5}$ gives

(A) $\frac{x^2-7x+40}{(x-5)(x+5)}$ (B) $\frac{x^2+7x+40}{(x-5)(x+5)(x+1)}$ **(C)** $\frac{x^2-7x+40}{(x^2-25)(x+1)}$ (D) $\frac{x^2+10}{(x^2-25)(x+1)}$

7. The square root of $\frac{256x^8y^4z^{10}}{25x^6y^6z^6}$ is equal to SEP-21

(A) $\frac{16}{5}\left|\frac{x^2z^4}{y^2}\right|$ (B) $16\left|\frac{y^2}{x^2z^4}\right|$ (C) $\frac{16}{5}\left|\frac{y}{xz^2}\right|$ **(D)** $\frac{16}{5}\left|\frac{xz^2}{y}\right|$

8. Which of the following should be added to make x^4+64 a perfect square MAY-22

(A) $4x^2$ **(B) $16x^2$** (C) $8x^2$ (D) $-8x^2$

9. The solution of $(2x-1)^2=9$ is equal to

(A) -1 (B) 2 **(C) $-1, 2$** (D) None of these

10. The values of a and b if $4x^4-24x^3+76x^2+ax+b$ is a perfect square are

(A) 100,120 (B) 10,12 **(C) $-120, 100$** (D) 12,10

11. If the roots of the equation $q^2x^2+p^2x+r^2=0$ are the squares of the roots of the equation $qx^2+px+r=0$, then q, p, r are in _____

(A) $A.P$ **(B) $G.P$** (C) Both $A.P$ and $G.P$ (D) None of these

12. Graph of a linear equation is a SEP-21, PTA-2

(A) Straight line (B) circle (C) parabola (D) hyperbola

13. The number of points of intersection of the quadratic polynomial x^2+4x+4 with the X axis is

(A) 0 **(B) 1** (C) 0 or 1 (D) -2 MAY-22

14. For the given matrix $A=\begin{bmatrix}1 & 3 & 5 & 7\\ 2 & 4 & 6 & 8\\ 9 & 11 & 13 & 15\end{bmatrix}$ the order of the matrix A^T is

(A) 2×3 (B) 3×2 (C) 3×4 **(D) 4×3**

15. If A is 2×3 matrix and B is a 3×4 matrix, how many columns does AB have

(A) 3 **(B) 4** (C) 2 (D) 5

16. If number of columns and rows are not equal in a matrix then it is said to be a

(A) Diagonal matrix **(B) rectangular matrix**

(C) square matrix (D) Identity matrix

17. Transpose of a column matrix is SEP-20

(A) Unit matrix (B) diagonal matrix

(C) column matrix **(D) Row matrix**

18. Find the matrix X if $2X+\begin{bmatrix}1 & 3\\ 5 & 7\end{bmatrix}=\begin{bmatrix}5 & 7\\ 9 & 5\end{bmatrix}$ PTA-6

(A) $\begin{bmatrix}-2 & -2\\ 2 & -1\end{bmatrix}$ **(B)** $\begin{bmatrix}\mathbf{2} & \mathbf{2}\\ \mathbf{2} & \mathbf{-1}\end{bmatrix}$ (C) $\begin{bmatrix}1 & 2\\ 2 & 2\end{bmatrix}$ (D) $\begin{bmatrix}2 & 1\\ 2 & 2\end{bmatrix}$

19. Which of the following can be calculated from the given matrices

$A=\begin{bmatrix}1 & 2\\ 3 & 4\\ 5 & 6\end{bmatrix}, B=\begin{bmatrix}1 & 2 & 3\\ 4 & 5 & 6\\ 7 & 8 & 9\end{bmatrix}$, (i) A^2 (ii) B^2 (iii) AB (iv) BA

(A) (i) and (ii) only (B) (ii) and (iii) only **(C) (ii) and (iv) only** (D) all of these

20. If $A=\begin{bmatrix}1 & 2 & 3\\ 3 & 2 & 1\end{bmatrix}, B=\begin{bmatrix}1 & 0\\ 2 & -1\\ 0 & 2\end{bmatrix}$ and $C=\begin{bmatrix}0 & 1\\ -2 & 5\end{bmatrix}$. Which of the following statements are correct?

(i) $AB+C=\begin{bmatrix}5 & 5\\ 5 & 5\end{bmatrix}$ (ii) $BC=\begin{bmatrix}0 & 1\\ 2 & -3\\ -4 & 10\end{bmatrix}$ (iii) $BA+C=\begin{bmatrix}2 & 5\\ 3 & 0\end{bmatrix}$ (iv) $(AB)C=\begin{bmatrix}-8 & 20\\ -8 & 13\end{bmatrix}$

(A) (i) and (ii) only (B) (ii) and (iii) only (C) (ii) and (iv) only (D) all of these

Creative MCQ

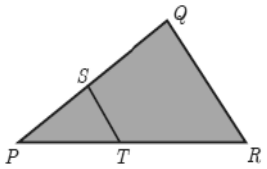
1. The G.C.D of a^m, a^{m+1}, a^{m+2} is — SEP-21
(A) a^m (B) a^{m+1} (C) a^{m+2} (D) 1
2. $\frac{a^2}{a^2-b^2}+\frac{b^2}{b^2-a^2}=$ — SEP-20
(A) $a-b$ (B) $a+b$ (C) a^2-b^2 **(D) 1**
3. The non- diagonal elements in any unit matrix are _____ — MDL
(A) 0 (B) 1 (C) m (D) n
4. The LCM of x^3-a^3 and $(x-a)^2$ is — PTA-1
(A) $(x^3-a^3)(x+a)$ (B) $(x^3-a^3)(x-a)^2$
(C) $(x-a)^2(x^2+ax+a^2)$ (D) $(x+a)^2(x^2+ax+a^2)$
5. The excluded value of the rational expression $\frac{x^3+8}{x^2-2x-8}$ is — PTA-2
(A) 8 (B) 2 **(C) 4** (D) 1
6. If a polynomial is a perfect square then its factors will be repeated _____ number of times — PTA-4
(A) Odd (B) zero **(C) even** (D) none of the above
7. $\frac{3y-3}{y}\div\frac{7y-7}{3y^2}$ is — PTA-5
(A) $\frac{9y}{7}$ (B) $\frac{9y^3}{21y-21}$ (C) $\frac{21y^2-42y+21}{3y^3}$ (D) $\frac{7(y^2-2y+1)}{y^2}$
8. The solution of $x^2-25=0$ is — PTA-5
(A) No real roots (B) real and equal roots
(C) Real and unequal roots (D) imaginary roots
9. For the given matrix $A=\begin{bmatrix}1 & 3 & 5\\ 2 & 4 & 6\end{bmatrix}$ the order of the matrix $(A^T)^T$ is — PTA-5
(A) 2×3 (B) 3×2 (C) 3×4 (D) 4×3
10. On dividing $\frac{x^2-25}{x+3}$ by $\frac{x+5}{x^2-9}$ — PTA-6
(A) $(x-5)(x-3)$ (B) $(x-5)(x+3)$ (C) $(x+5)(x-3)$ (D) $(x+5)(x+3)$

4. Geometry

Text Book Questions

1. If in triangles ABC and EDF, $\frac{AB}{DE}=\frac{BC}{FD}$ then they will be similar, when
(A) $\angle B=\angle E$ (B) $\angle A=\angle D$ **(C) $\angle B=\angle D$** (D) $\angle A=\angle F$
2. In ΔLMN, $\angle L=60^\circ$, $\angle M=50^\circ$. If $\Delta LMN\sim\Delta PQR$ then the value of $\angle R$ is — SEP-20
(A) 40° **(B) 70°** (C) 30° (D) 110°
3. If ΔABC is an isosceles triangle with $\angle C=90^\circ$ and $AC=5\ cm$, then AB is — PTA-4, MAY-22
(A) 2.5 cm (B) 5 cm (C) 10 cm **(D) $5\sqrt{2}\ cm$**

4. In a given figure $ST \parallel QR$, $PS = 2\ cm$ and $SQ = 3\ cm$. Then the ratio of the area of ΔPQR to the area of ΔPST is



(A) 25 : 4 (B) 25 : 7
(C) 25 : 11 (D) 25 : 13

5. The perimeters of two similar triangles ΔABC and ΔPQR are 36 cm and 24 cm respectively. If $PQ = 10\ cm$, then the length of AB is PTA-5

(A) $6\frac{2}{3}cm$ (B) $\frac{10\sqrt{6}}{3}cm$ (C) $66\frac{2}{3}cm$ **(D) 15 *cm***

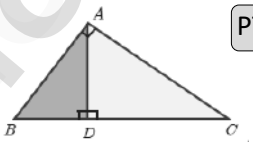
6. If in ΔABC, $DE \parallel BC$. $AB = 3.6\ cm, AC = 2.4\ cm$ and $AD = 2.1\ cm$ then the length of AE is

(A) 1.4 *cm* (B) 1.8 cm (C) 1.2 cm (D) 1.05 cm SEP-21, PTA-3, JUL-22

7. In a $\Delta\ ABC$, AD is the bisector of $\angle BAC$. If $AB = 8\ cm$, $BD = 6\ cm$ and $DC = 3\ cm$. The length of the side AC is PTA-6, MAY-22

(A) 6 cm **(B) 4 *cm*** (C) 3 cm (D) 8 cm

8. In the adjacent figure $\angle BAC = 90^\circ$ and $AD \perp BC$ then PTA-1

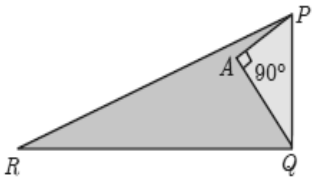


(A) $BD \cdot CD = BC^2$ (B) $AB \cdot AC = BC^2$
(C) $BD \cdot CD = AD^2$ (D) $AB \cdot AC = AD^2$

9. Two poles of heights 6 m and 11 m stand vertically on a plane ground. If the distance between their feet is 12 m, what is the distance between their tops?

(A) 13 *m* (B) 14 m (C) 15 m (D) 12.8 m

10. In the given figure, $PR = 26\ cm$, $QR = 24\ cm$, $\angle PAQ = 90^\circ$, $PA = 6\ cm$ and $QA = 8\ cm$. Find $\angle PQR$ PTA-6



(A) 80° (B) 85°
(C) 75° **(D) 90°**

11. A tangent is perpendicular to the radius at the PTA-2

(A) centre **(B) point of contact** (C) infinity (D) chord

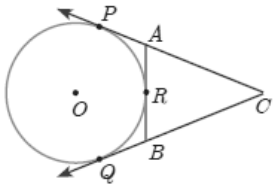
12. How many tangents can be drawn to the circle from an exterior point? SEP-21, JUL-22

(A) one **(B) two** (C) infinite (D) zero

13. The two tangents from an external points P to a circle with centre at O are PA and PB. If $\angle APB = 70^\circ$ then the value of $\angle AOB$ is

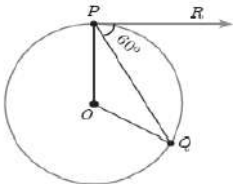
(A) 100° **(B) 110°** (C) 120° (D) 130°

14. If figure CP amd CQ are tangents to a circle with centre at O. ARB is another tangent touching the circle at R. If $CP = 11\ cm$ and $BC = 7\ cm$, then the length of BR is MDL



(A) 6 cm (B) 5 cm (C) 8 cm **(D) 4 *cm***

15. In figure if PR is tangent to the circle at P and O is the centre of the circle, then $\angle POQ$ is SEP-20



(A) 120° (B) 100°
(C) 110° (D) 90°

Creative MCQ

1. The perimeters of two similar triangles ΔABC and ΔPQR are $36cm$ and 24cm respective. If $PQ = 10cm$, then the length of AB is PTA-5
(A) $6\frac{2}{3}\ cm$ (B) $\frac{10\sqrt{6}}{3}\ cm$ (C) $66\frac{2}{3}\ cm$ **(D) $15\ cm$**

5. Coordinate Geometry

Text Book Questions

1. The area of triangle formed by the points $(-5,0)$, $(0,-5)$ and $(5,0)$ is SEP-21,PTA-2
(A) 0 sq. units **(B) 25 sq. units** (C) 5 sq. units (D) none of these
2. A man walks near a wall, such that the distance between him and the wall is 10 units consider the wall to be the Y axis. The path travelled by the man
(A) $x = 10$ (B) $y = 10$ (C) $x = 0$ (D) $y = 10$
3. The straight line given by the equation $x = 11$ is PTA-1, SEP-20
(A) Parallel to X axis **(B) parallel to Y axis**
(C) passing through the origin (D) passing through the point (0,11)
4. If $(5,7)$, $(3,p)$ and $(6,6)$ are collinear then the value of p is PTA-5, MAY-22
(A) 3 (B) 6 **(C) 9** (D) 12
5. The point of intersection $3x - y = 4$ and $x + y = 8$ is PTA-2, JUL-22
(A) (5,3) (B) (2,4) **(C) (3, 5)** (D) (4,4)
6. The slope of the line joining (12,3) and $(4, a)$ is $\frac{1}{8}$ the value of $'a'$ is PTA-3
(A) 1 (B) 4 (C) -5 **(D) 2**
7. The slope of the line which is perpendicular to line joining the points (0,0) and $(-8,8)$ is
(A) -1 **(B) 1** (C) $\frac{1}{3}$ (D) -8 MAY-22
8. If slope of the line PQ is $\frac{1}{\sqrt{3}}$ then the slope of the perpendicular bisector of PQ is PTA-6, JUL-22
(A) $\sqrt{3}$ **(B) $-\sqrt{3}$** (C) $\frac{1}{\sqrt{3}}$ (D) 0
9. If A is a point on the $y-$ axis whose ordinate is 8 and B is a point on the X axis whose abscissae is 5 then the equation of the line AB is
(A) $8x + 5y = 40$ (B) $8x - 5y = 40$ (C) $x = 8$ (D) $y = 5$
10. The equation of the line passing through the origin and perpendicular to the line $7x - 3y + 4 = 0$ PTA-4
(A) $7x - 3y + 4 = 0$ (B) $3x - 7y + 4 = 0$ **(C) $3x + 7y = 0$** (D) $7x - 3y = 0$
11. Consider four straight lines
(i) $l_1: 3y = 4x + 5$ (ii) $l_2: 4y = 3x - 1$ (iii) $l_3: 4y + 3x = 7$ (iv) $l_4: 4x + 3y = 2$
Which of the following statement is true
(A) l_1 and l_2 are perpendicular (B) l_1 and l_4 are parallel
(C) l_2 and l_4 are perpendicular (D) l_2 and l_3 are parallel
12. A straight line has equation $8y = 4x + 21$ which of the following is true. PTA-3
(A) The slope is 0.5 and the y intercept is 2.6 (B) The slope is 5 and the y intercept is 1.6
(C) The slope is 0.5 and the y intercept is 1.6 (D) The slope is 5 and the y intercept is 2.6
13. When proving that a quadrilateral is a trapezium it is necessary to show PTA-4
(A) Two sides are parallel **(B) Two parallel and two non- parallel sides**
(C) Opposite sides are parallel (D) All sides are of equal length

14. When proving that a quadrilateral is a parallelogram by using slopes you must find
(A) The slopes of two sides **(B) The slopes of two pair of opposite sides**
(C) The length of all sides (D) Both the length and slopes of two sides

15. (2,1) is the point of intersection of two lines
(A) $x-y-3=0, 3x-y-7=0$ **(B) $x+y=3,\ 3x+y=7$**
(C) $3x+y=3,\ x+y=7$ (D) $x+3y-3=0, x-y-7=0$

Creative MCQ

1. The perimeter of a triangle formed by the points (0,0), (1,0) and (0,1) is SEP-21
(A) $\sqrt{2}$ (B) 2 **(C) $2+\sqrt{2}$** (D) $2-\sqrt{2}$

2. If the points $A(6,1), B(8,2), C(9,4)$ and $D(p,3)$ are the vertices of a parallelogram, taken in order then the value of p is PTA-5
(A) -7 **(B) 7** (C) 6 (D) -6

6. Trigonometry

Text Book Questions

1. The value of $\sin^2\theta + \frac{1}{1+\tan^2\theta}$ is equal to
(A) $\tan^2\theta$ **(B) 1** (C) $\cot^2\theta$ (D) 0

2. $\tan\theta \operatorname{cosec}^2\theta - \tan\theta$ is equal to PTA-3
(A) $\sec\theta$ (B) $\cot^2\theta$ (C) $\sin\theta$ **(D) $\cot\theta$**

3. If $(\sin\alpha + \operatorname{cosec}\alpha)^2 + (\cos\alpha + \sec\alpha)^2 = k + \tan^2\alpha + \cot^2\alpha$, then the value of k is equal to
(A) 9 **(B) 7** (C) 5 (D) 3 PTA-1

4. If $\sin\theta + \cos\theta = a$ and $\sec\theta + \operatorname{cosec}\theta = b$, then the value of $b(a^2-1)$ is equal to
(A) $2a$ (B) $3a$ (C) 0 (D) $2ab$

5. If $5x = \sec\theta$ and $\frac{5}{x} = \tan\theta$, then $x^2 - \frac{1}{x^2}$ is equal to PTA-2
(A) 25 **(B) $\frac{1}{25}$** (C) 5 (D) 1

6. If $\sin\theta = \cos\theta$, then $2\tan^2\theta + \sin^2\theta - 1$ is equal to PTA-1, 4
(A) $\frac{-3}{2}$ **(B) $\frac{3}{2}$** (C) $\frac{2}{3}$ (D) $\frac{-2}{3}$

7. If $x = a\tan\theta$ and $y = b\sec\theta$ then
(A) $\frac{y^2}{b^2} - \frac{x^2}{a^2} = 1$ (B) $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ (C) $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ (D) $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 0$

8. $(1+\tan\theta+\sec\theta)(1+\cot\theta-\operatorname{cosec}\theta)$ is equal to
(A) 0 (B) 1 **(C) 2** (D) -1

9. $a\cot\theta + b\operatorname{cosec}\theta = p$ and $b\cot\theta + a\operatorname{cosec}\theta = q$ then $p^2 - q^2$ is equal to
(A) $a^2 - b^2$ **(B) $b^2 - a^2$** (C) $a^2 + b^2$ (D) $b - a$ PTA-5

10. If the ratio of the height of a tower and the length of its shadow is $\sqrt{3}:1$, then the angle of elevation of the sun has measure PTA-6, SEP-21
(A) 45° (B) 30° (C) 90° **(D) 60°**

11. The electric pole subtends an angle of 30° at a point on the same level as its foot. At a second point 'b' metres above the first, the depression of the foot of the pole is 60°. The height of the pole (in metres) is equal to
(A) $\sqrt{3}\,b$ **(B) $\frac{b}{3}$** (C) $\frac{b}{2}$ (D) $\frac{b}{\sqrt{3}}$

12. A tower is 60 m height. Its shadow is x metres shorter when the sun's altitude is 45° than when it has been 30°, then x is equal to MAY-22
(A) 41.92 m **(B) 43.92 m** (C) 43 m (D) 45.6 m

13. The angle of depression of the top and bottom of 20 m tall building from the top of a multistoried building are 30° and 60° respectively. The height of the multistoried building and the distance between two buildings (in meters) is
(A) $20, 10\sqrt{3}$ (B) $30, 5\sqrt{3}$ (C) 20, 10 **(D) $30, 10\sqrt{3}$**

14. Two persons are standing 'x' metres apart from each other and the height of the first person is double that of the other. If from the middle point of the line joining their feet an observer finds the angular elevations of their tops to be complementary, then the height of the shorter person (in metres) is
(A) $\sqrt{2}x$ **(B) $\frac{x}{2\sqrt{2}}$** (C) $\frac{x}{\sqrt{2}}$ (D) $2x$

15. The angle of elevation of a cloud from a point h metres above a lake is β. The angle of depression of its reflection in the lake is 45°. The height of location of the cloud from the lake is JUL-22
(A) $\frac{h(1+\tan\beta)}{1-\tan\beta}$ (B) $\frac{h(1-\tan\beta)}{1+\tan\beta}$ (C) $h\tan(45^0-\beta)$ (D) none of these

Creative MCQ

1. If $\tan\theta + \cot\theta = 2$ then $\tan^2\theta + \cot^2\theta$ is equal to SEP-20
(A) 0 (B) 1 **(C) 2** (D) 4

2. The angle of elevation and depression are usually measured by a device called PTA-1
(A) Clinometer (B) kaleidoscope (C) Periscope (D) Telescope

3. $\frac{\sin(90^\circ-\theta)\sin\theta}{\tan\theta} + \frac{\cos(90^\circ-\theta)\cos\theta}{\cot\theta} =$ PTA-2
(A) $\tan\theta$ **(B) 1** (C) -1 (D) $\sin\theta$

7. Mensuration

Text Book Questions

1. The curved surface area of a right circular cone of height 15 cm and base diameter 16 cm is
(A) $60\pi\ cm^2$ (B) $68\pi\ cm^2$ (C) $120\pi\ cm^2$ **(D) $136\pi\ cm^2$**

2. If two solid hemispheres of same base radius r units are joined together along their bases, then curved surface area of this new solid is MAY-22
(A) $4\pi r^2$ sq. units (B) $6\pi r^2$ sq. units (C) $3\pi r^2$ sq. units (D) $8\pi r^2$ sq. units

3. The height of a right circular cone whose radius is 5 cm and slant height is 13 cm will be
(A) 12 cm (B) 10 cm (C) 13 cm (D) 5 cm SEP-21

4. If the radius of the base of a right circular cylinder is halved keeping the same height, then the ratio of the volume of the cylinder thus obtained to the volume of original cylinder is JUL-22
(A) 1 : 2 **(B) 1 : 4** (C) 1 : 6 (D) 1 : 8

5. The total surface area of a cylinder whose radius is $\frac{1}{3}$ of its height is PTA-1
(A) $\frac{9\pi h^2}{8}$ sq. units (B) $24\pi h^2$ sq. units **(C) $\frac{8\pi h^2}{9}$ sq. units** (D) $\frac{56\pi h^2}{9}$ sq. units

6. In a hollow cylinder, the sum of the external and internal radii is 14 cm and the width is 4 cm. If its height is 20 cm, the volume of the material in it is PTA-4
(A) $5600\pi\ cm^3$ **(B) $1120\pi\ cm^3$** (C) $56\pi\ cm^3$ (D) $3600\pi\ cm^3$

7. If the radius of the base of a cone is tripled and the height is doubled then the volume is
(A) made 6 times **(B) made 18 times** (C) made 12 times (D) unchanged

8. The total surface area of a hemi-sphere is how much times the square of its radius.
(A) π (B) 4π **(C) 3π** (D) 2π PTA-3, SEP-21, JUL-22

9. A solid sphere of radius x cm is melted and cast into a shape of a solid cone of same radius. The height of the cone is
(A) $3x\ cm$ (B) $x\ cm$ **(C) $4x\ cm$** (D) $2x\ cm$

10. A frustum of a right circular cone is of height $16\ cm$ with radii of its ends as $8\ cm$ and $20\ cm$. Then, the volume of the frustum is
(A) $3328\pi\ cm^3$ (B) $3228\pi\ cm^3$ (C) $3240\pi\ cm^3$ (D) $3340\pi\ cm^3$

11. A shuttle cock used for playing badminton has the shape of the combination of
(A) a cylinder and a sphere (B) a hemisphere and a cone
(C) a sphere and a cone **(D) frustum of a cone and a hemisphere**

12. A spherical ball of radius r_1 units is melted to make 8 new identical balls each of radius r_2 units. Then $r_1 : r_2$ is PTA-6, SEP-20
(A) 2 : 1 (B) 1 : 2 (C) 4 : 1 (D) 1 : 4

13. The volume (in cm^3) of the greatest sphere that can be cut off from a cylindrical log of wood of base radius $1\ cm$ and height $5\ cm$ is
(A) $\frac{4}{3}\pi$ (B) $\frac{10}{3}\pi$ (C) 5π (D) $\frac{20}{3}\pi$

14. The height and radius of the cone of which the frustum is a part are h_1 units and r_1 units respectively. Height of the frustum is h_2 units and radius of the smaller base is r_2 units. If $h_2 : h_1 = 1 : 2$ then $r_2 : r_1$ is PTA-2
(A) 1 : 3 **(B) 1 : 2** (C) 2 : 1 (D) 3 : 1

15. The ratio of the volumes of a cylinder, a cone and a sphere, if each has the same diameter and same height is PTA-5
(A) 1 : 2 : 3 (B) 2 : 1 : 3 (C) 1 : 3 : 2 **(D) 3 : 1 : 2**

Creative MCQ

1. If the radius of the cylinder is doubled, the new volume of the cylinder will be _____ times the original volume MAY-22
(A) Same (B) 3 **(C) 4** (D) 2

2. A child reshapes a cone made up of clay of height $24\ cm$ and radius $6\ cm$ into a sphere, then the radius of sphere is SEP-20
(A) $24\ cm$ (B) $12\ cm$ **(C) $6\ cm$** (D) $48\ cm$

3. If the volume of sphere is $36\pi cm^3$, then its radius is equal to PTA-3
(A) $3\ cm$ (B) $2\ cm$ (C) $5\ cm$ (D) $10\ cm$

4. C.S.A of solid sphere is equal to PTA-5
(A) T.S.A of solid sphere (B) T.S.A of hemisphere (C) C.S.A of hemisphere (D) none of these

8. Statistics and Probability

Text Book Questions

1. Which of the following is not a measure of dispersion? PTA-6
(A) Range (B) Standard deviation **(C) Arithmetic mean** (D) Variance

2. The range of the data 8,8,8,8,8,…8 is
(A) 0 (B) 1 (C) 8 (D) 3

3. The sum of all deviations of the data from its mean is
(A) Always positive (B) Always negative **(C) zero** (D) non- zero integer

4. The mean of 100 observations is 40 and their standard deviation is 3. The sum of squares of all observations is SEP-20
(A) 40000 **(B) 160900** (C) 160000 (D) 30000

5. Variance of first 20 natural numbers is PTA-5
(A) 32.25 (B) 44.25 **(C) 33.25** (D) 30

6. The standard deviation of a data is 3. If each value is multiplied by 5 then the new variance is
(A) 3 (B) 15 (C) 5 **(D) 225**

7. If the standard deviation of x, y, z is p then the standard deviation of $3x + 5, 3y + 5, 3z + 5$ is
(A) $3p + 5$ **(B) $3p$** (C) $p + 5$ (D) $9p + 15$

8. If the mean and coefficient of variation of a data are 4 *and* 87.5% then the standard deviation is
(A) 3.5 (B) 3 (C) 4.5 (D) 2.5

9. Which of the following is incorrect? PTA-1, 4, 5
(A) $P(A) > 1$ (B) $0 \leq P(A) \leq 1$ (C) $P(\emptyset) = 0$ (D) $P(A) + P(\bar{A}) = 1$

10. The probability a red marble selected at random from a jar containing p red, q blue and r green marbles is
(A) $\frac{q}{p+q+r}$ **(B) $\frac{p}{p+q+r}$** (C) $\frac{p+q}{p+q+r}$ (D) $\frac{p+r}{p+q+r}$

11. A page is selected at random from a book. The probability that the digit at units place of the page number chosen is less than 7 is SEP-21, JUL-22
(A) $\frac{3}{10}$ **(B) $\frac{7}{10}$** (C) $\frac{3}{9}$ (D) $\frac{7}{9}$

12. The probability of getting a job for a person is $\frac{x}{3}$. If the probability of not getting the job is $\frac{2}{3}$ then the value of x is MAY-22
(A) 2 **(B) 1** (C) 3 (D) 1.5

13. Kamalam went to play a lucky draw contest. 135 tickets of the lucky draw were sold. If the probability of kamalam winning is $\frac{1}{9}$, then the number of tickets bought by kamalam is
(A) 5 (B) 10 **(C) 15** (D) 20

14. If a letter is chosen at random from the English alphabets $\{a, b, \ldots., z\}$, then the probability that the letter chosen precedes x. SEP-20
(A) $\frac{12}{13}$ (B) $\frac{1}{13}$ **(C) $\frac{23}{26}$** (D) $\frac{3}{26}$

15. A purse contains 10 notes of ₹ 2000, *15* notes of ₹500, and *25* notes of ₹200. One note is drawn at random. What is the probability that the note is either a ₹ 500 note or ₹200 note?
(A) $\frac{1}{5}$ (B) $\frac{3}{10}$ (C) $\frac{2}{3}$ **(D) $\frac{4}{5}$**

Creative MCQ

1. The range of first 10 prime numbers is PTA-2
(A) 9 (B) 20 **(C) 27** (D) 5

2. A letter is selected at random from the word 'PROBABILITY'. The Probability that it is not a vowel is
(A) $\frac{4}{11}$ **(B) $\frac{7}{11}$** (C) $\frac{3}{11}$ (D) $\frac{6}{11}$ MDL

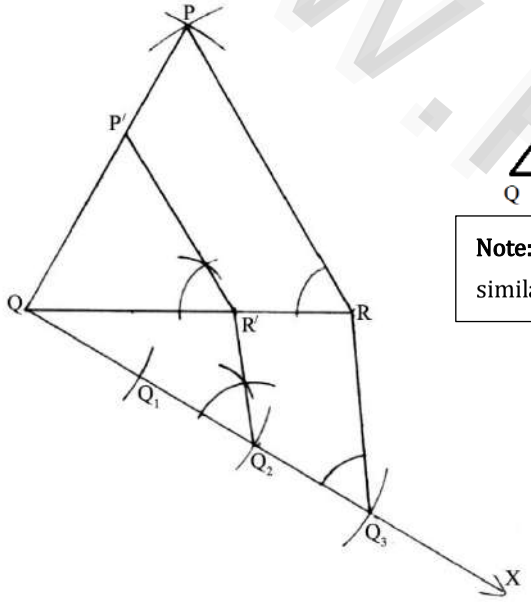
3. Probability of getting 3 heads or 3 tails in tossing a coin 3 times is PTA-4
(A) $\frac{1}{8}$ **(B) $\frac{1}{4}$** (C) $\frac{3}{8}$ (D) $\frac{1}{3}$

4. A fair die is thrown once. The probability of getting a prime (or) composite number is PTA-6
(A) 1 (B) 0 **(C) $\frac{5}{6}$** (D) $\frac{1}{6}$

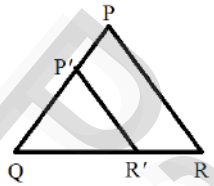
PART IV - 8 Mark Questions - Geometry

Exercise 4.1

10. Construct a triangle similar to a given triangle PQR with its sides equal to $\frac{2}{3}$ of the corresponding sides of the triangle PQR (scale factor $\frac{2}{3}<1$)



Rough Diagram



Note: If $\frac{2}{3}<1$, then the similar triangle will be inside

Steps of construction:

1. Construct a ΔPQR with any measurement.
2. Draw a ray QX making an acute angle with QR on the side opposite to vertex P.
3. Locate 3 (the greater of 2 and 3 in $\frac{2}{3}$) points Q_1, Q_2 & Q_3 on QX so that $QQ_1 = Q_1Q_2 = Q_2Q_3$
4. Join Q_3R and draw a line through Q_2 (the second point, 2 being smaller of 2 and 3 in $\frac{2}{3}$) parallel to Q_3R to intersect QR at R'
5. Draw line through R' parallel to the line RP to intersect QP at P'. Then $\Delta P'QR'$ is the required triangle each of whose sides is two-three of the corresponding sides of ΔPQR.

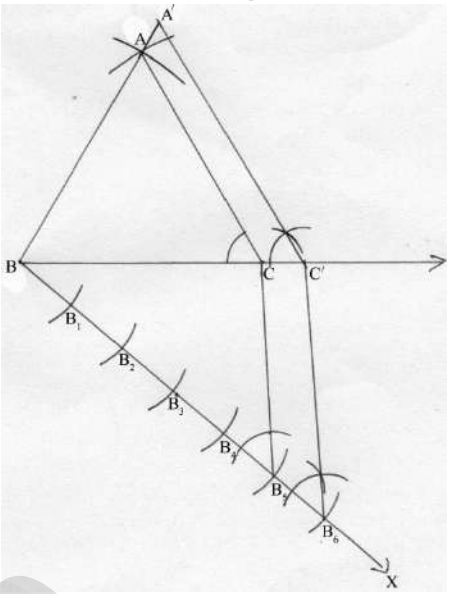
Similar Problems

Solve Your Self

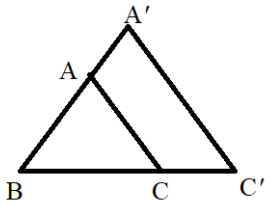
11. Construct a triangle similar to a given triangle LMN with its sides equal to $\frac{4}{5}$ of the corresponding sides of the triangle LMN (scale factor $\frac{4}{5}<1$).

Eg.4.10: Construct a triangle similar to a given triangle PQR with its sides equal to $\frac{3}{5}$ of the corresponding sides of the triangle PQR (scale factor $\frac{3}{5}<1$)

12. Construct a triangle similar to a given triangle ABC with its sides equal to $\frac{6}{5}$ of the corresponding sides of the triangle ABC (scale factor $\frac{6}{5}>1$). PTA-1, SEP-20



Rough Diagram



Note: If $\frac{6}{5}>1$, then the similar triangle will be outside

Steps of construction:

1. Construct a ΔABC with any measurement.
2. Draw a ray BX making an acute angle with BC on the side opposite to vertex A.
3. Locate 6 points (the greater of 6 and 5 in $\frac{6}{5}$) B_1, B_2, B_3, B_4, B_5 and B_6 on BX so that $BB_1 = B_1B_2 = B_2B_3 = B_3B_4 = B_4B_5 = B_5B_6$
4. Join B_4 (the 5th point, 5 being smaller of 6 and 5 in $\frac{6}{5}$) to A and draw a line through B_6 parallel to B_5C intersecting the extended line segment BC at C'.
5. Draw a line through C' parallel to CA intersecting the extended line segment BA at A'. Then $A'BC'$ is the required triangle each of whose sides is six-fifths of the corresponding sides of ΔABC.

Similar Problems

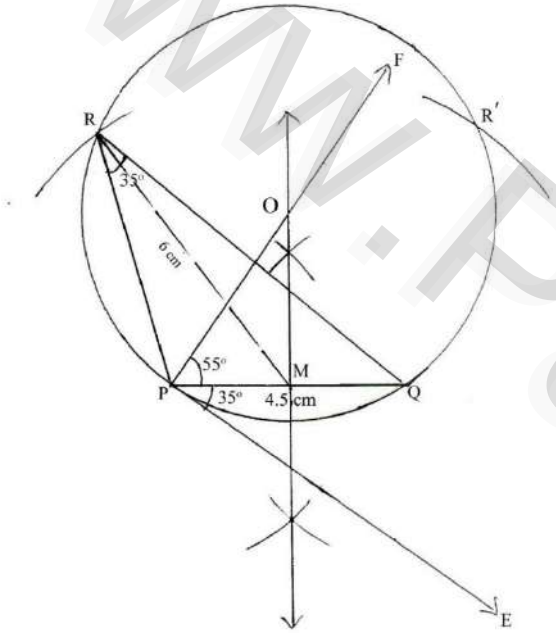
Solve Your Self

13. Construct a triangle similar to a given triangle PQR with its sides equal to $\frac{7}{3}$ of the corresponding sides of the triangle PQR (scale factor $\frac{7}{3}>1$). (JUL-22)

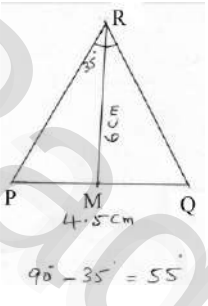
Eg.4.11: Construct a triangle similar to a given triangle PQR with its sides equal to $\frac{7}{4}$ of the corresponding sides of the triangle PQR (scale factor $\frac{7}{4}>1$)

Exercise 4.2

11. Construct a ΔPQR which the base $PQ = 4.5cm$, $\angle R = 35^\circ$ and the median RG from R to PQ is 6 cm. SEP-21



Rough diagram



Steps of construction:

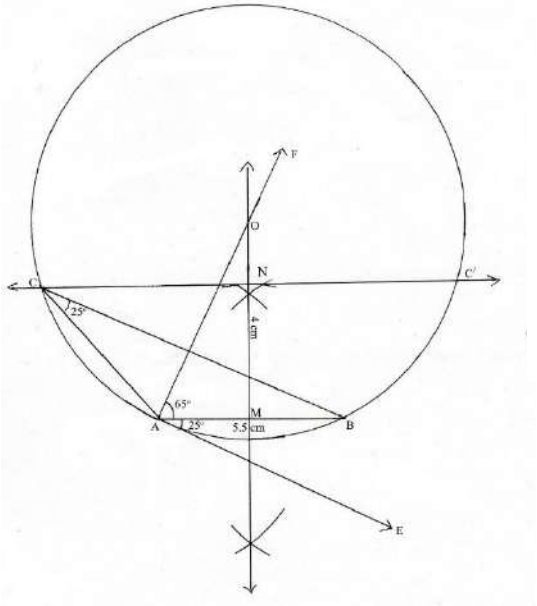
1. Draw a line segment $PQ = 4.5\ cm$,
2. Draw $\angle QPE = 35°$, At P, draw PF such that $\angle FPE = 90°$
3. Draw perpendicular bisector to PQ intersects at M and PF intersects at O.
4. With O as centre, OP as radius draw a circle.
5. From M cut the circle on both sides with 6 cm.
6. Mark R and R'
7. Join PR and RQ, PQR is the required triangle

Similar Problems

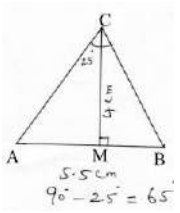
Solve Your Self

Eg.4.17: Construct a ΔPQR in which $PQ = 8cm$, $\angle R = 60°$ and the median RG from R to PQ is $5.8cm$. Find the length of the altitude from R to PQ. **(PTA-4)**

14. Construct a ΔABC such that $AB = 5.5cm$, $\angle C = 25^\circ$ and the altitude from C to AB is 4 cm. MAY-22



Rough diagram



Steps of construction:

1. Draw $AB = 5.5\ cm$
2. Draw $\angle BAE = 25°$, $\angle FAE = 90°$, Draw perpendicular bisector to AB, the perpendicular bisector meets AF at O and AB at M
3. Draw a circle with O as centre, OA or OB as radius.
4. Cut the perpendicular bisector at the distance of 4 cm from M and name as N.
6. Draw CC', Join AC and BC
7. ΔABC is the required triangle.

Similar Problems

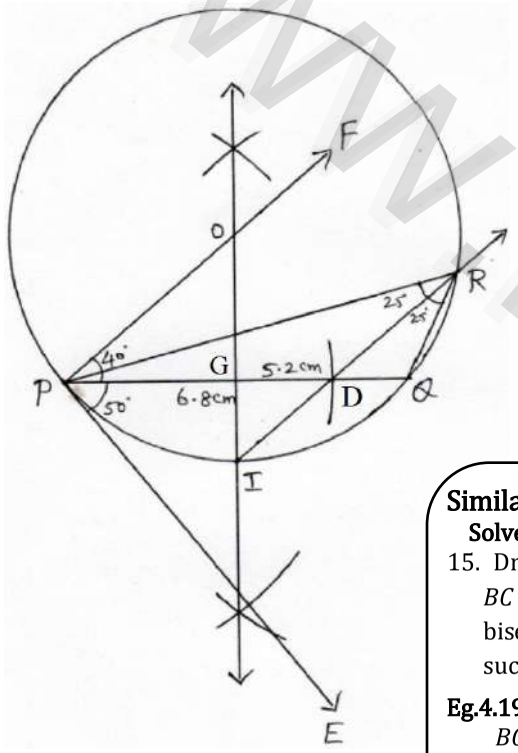
Solve Your Self

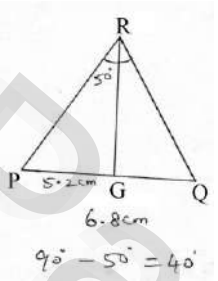
12. Construct a ΔPQR in which $QR = 5cm, \angle P = 40^\circ$ and the median PG from P to QR is 4.4 cm. Find the length of the altitude from P to QR
13. Construct a ΔPQR such that $QR = 6.5cm, \angle P = 60^\circ$ and the altitude from P to QR is of length 4.5 cm.

Eg.4.18: Construct a triangle ΔPQR such that $QR = 5cm$, $\angle P = 30°$ and the altitude from P to QR is of length 4.2 cm. **(PTA-5)**

16. Draw ΔPQR such that $PQ = 6.8cm$, vertical angle is 50° and the bisector of the vertical angle meets the base at D where $PD = 5.2cm$. PTA-4

Rough diagram





Similar Problems

Solve Your Self

15. Draw a triangle ABC of base $BC = 5.6cm, \angle A = 40^\circ$ and the bisector of $\angle A$ meets BC at D such that $CD = 4\ cm$

Eg.4.19: Draw a triangle ABC of base $BC = 8cm$, $\angle A = 60°$ and the bisector of $\angle A$ meets BC at D such that $BD = 6cm$. **(MDL)**

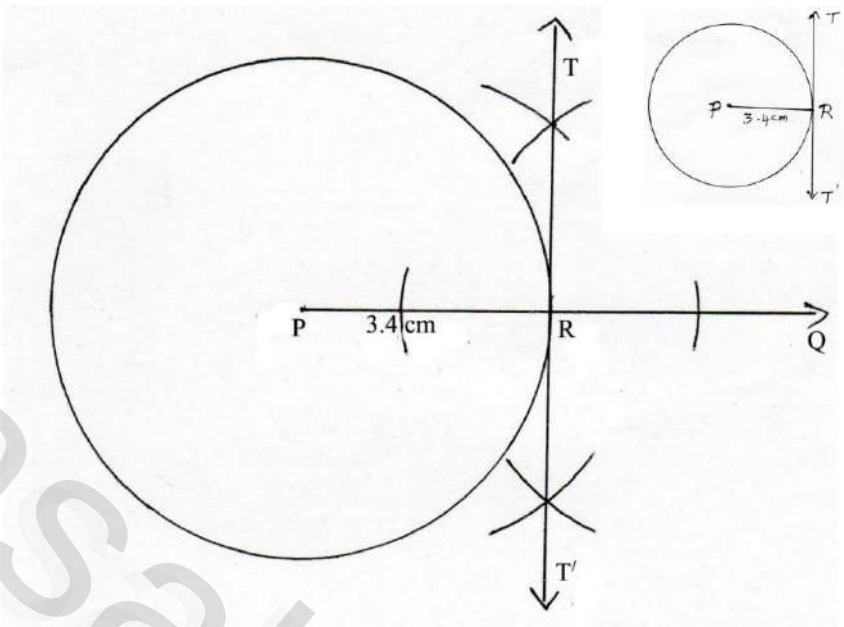
Steps of construction:

1. Draw a line segment $PQ = 6.8\ cm$
2. At P, draw PE such that $\angle QPE = 50°$
3. At P, draw PF such that $\angle EPF = 90°$
4. Draw the perpendicular bisector to PQ, which intersects PF at O and PQ at G.
5. With O as centre and OP as radius draw circle
6. From P, mark an arc of 5.2 cm on PQ at D.
7. The perpendicular bisector intersects the circle at I.
8. Join ID.
9. ID produced meets the circle at R. Now join PR and QR. Then ΔPQR is the required triangle.

Exercise 4.4

11. Draw a tangent at any point R on the circle of radius 3.4cm and centre at P?

Rough diagram



Steps of construction:

1. Draw a circle with centre P radius 3.4 cm
2. Take a point R on the circle. Join PR
3. PR is extended. Draw a perpendicular line to TR which is extended such that R is the centre point .
4. Now TT' is the required tangent which passes through the point R.

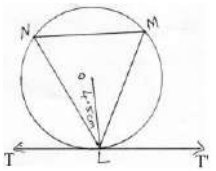
Similar Problems

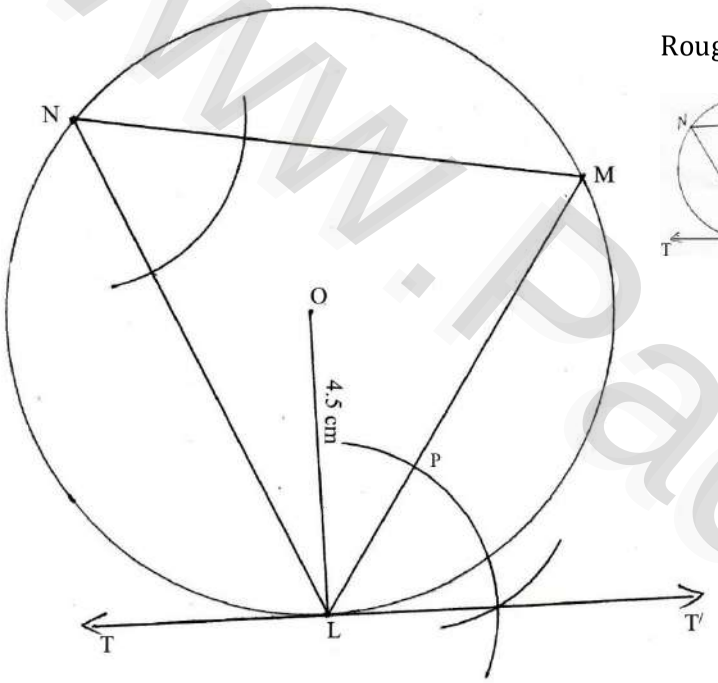
Solve Your Self

Eg.4.29: Draw a circle of radius 3 cm. Take a point P on this circle and draw a tangent at P.

12. Draw a circle of radius 4.5 cm. Take a point on the circle. Draw the tangent at that point using the alternate segment theorem.

Rough diagram





Steps of construction:

1. With O as the centre, draw a circle of radius 4.5cm
2. Take a point L on the circle. Through L draw any chord LM.
3. Take a point N distinct from L and M on the circle. Join LN and NM.
4. Through L draw a tangent TT' such that $\angle TLM = \angle MNL$
5. Arc cuts the line LM meet at P.
6. At P, draw one arc meets at Q.
7. Join LQ extended at T'
8. TT' is the required tangent.

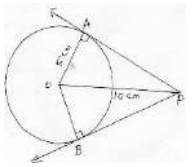
Similar Problems

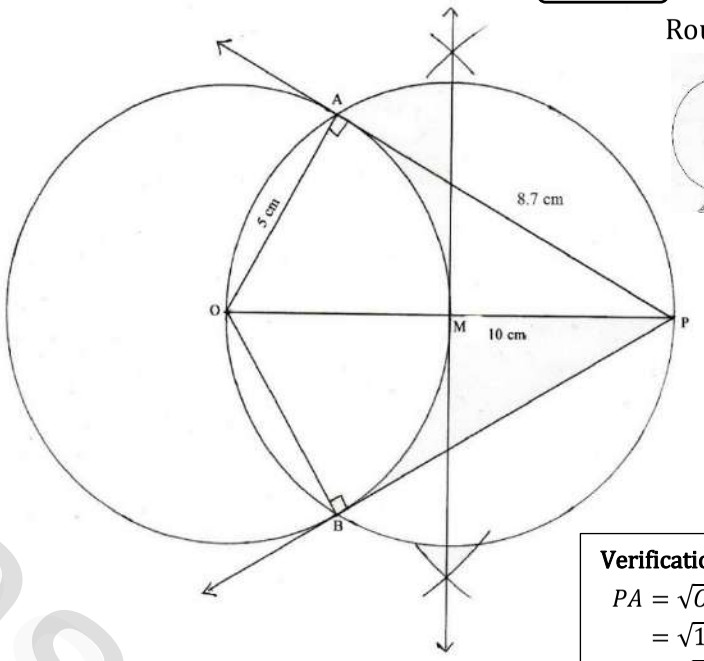
Solve Your Self

Eg.4.30: Draw a circle of radius 4 cm. At a point L on it draw a tangent to the circle using the alternate segment.

13. Draw the two tangents from a point which is 10 cm away from the centre of a circle of radius cm. Also, measure the lengths of the tangents. SEP-20

Rough diagram





The length of the tangent is 8.7cm

Verification:

$$PA = \sqrt{OP^2 - OA^2}$$
$$= \sqrt{10^2 - 5^2}$$
$$= \sqrt{100 - 25}$$
$$= \sqrt{75}$$
$$\simeq \mathbf{8.7\ cm}$$

Steps of construction:

1. Draw a circle of radius 5 cm with O as Centre.
2. Mark a point P, 10 cm away from the Centre O.
3. Join OP, Draw a perpendicular bisector for OP and Mark the point OP meets at M.
4. With M as centre, MO or MP as radius draw a circle which cuts the previous circle at A and B.
5. Join PA and PB which are the required tangents.

Similar Problems

Solve Your Self

14. Take a point which is 11 cm away from the centre of a circle of radius 4 cm and draw the two tangents to the circle from that point. **(PTA-2)**
15. Draw the two tangents from a point which is 5 cm away from the centre of a circle of diameter 6 cm. Also, measure the lengths of the tangents. **(MAY-22)**
16. Draw a tangent to the circle from the point P having radius 3.6 cm, and centre at O. Point P is at a distance 7.2 cm from the centre.

Eg.4.31: Draw a circle of diameter 6 cm from a point P, Which is 8 cm away from its centre. Draw the two tangents PA and PB to the circle and measure their lengths. **(JUL-22)**

PART IV - 8 Mark Questions - Graph

Exercise 3.15

Types of Variation	Equation	Graph
Direct Variation	$\frac{y}{x} = k$	straight line
Indirect Variation	$xy = k$	smooth curve known as a Rectangular Hyperbola

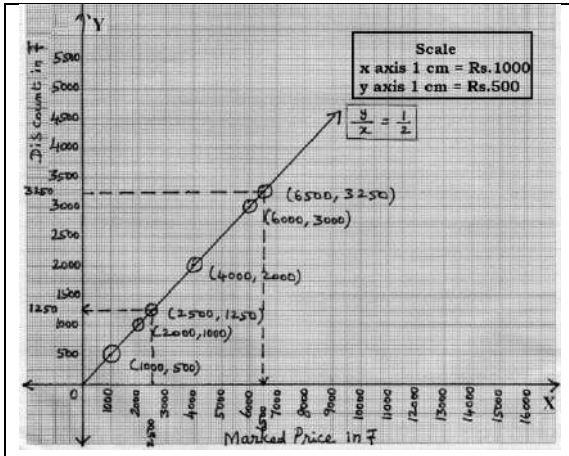
1. A garment shop announces a flat 50% discount on every purchase of items for their customers. Draw the graph for the relation between the Marked Price and the Discount. Hence find(i) the marked price when a customer gets a discount of ₹ 3250 (from graph) (ii) the discount when the marked price is ₹ 2500

X axis → Marked Price, Y axis → Discount , Given: Discount 50%

$\frac{50}{100} = \frac{1}{2} \Rightarrow \quad k = \frac{1}{2}$ Direct Variation: $\frac{y}{x} = k$

Marked Price (X)	1000	2000	2500	4000	6000	6500
Discount (Y)	500	1000	1250	2000	3000	3250

$\frac{y}{x} = \frac{500}{1000} = \frac{1000}{2000} = \frac{1250}{2500} = \frac{2000}{4000} = \frac{3000}{6000} = \frac{3250}{6500}$



Let Marked Price be ₹ 1000

Discount 50%

$\Rightarrow 1000 \times \frac{1}{2} = 500$

i) if $y = 3250, x = ?$

$\frac{y}{x} \Rightarrow \frac{3250}{x} = \frac{1}{2}$

$2 \times 3250 = x$

$x = 6500 \Rightarrow (6500, 3250)$

ii) If $x = 2500, y = ?$

$\frac{y}{x} \Rightarrow \frac{y}{2500} = \frac{1}{2}$

$2y = 2500$

$y = \frac{2500}{2} = 1250$

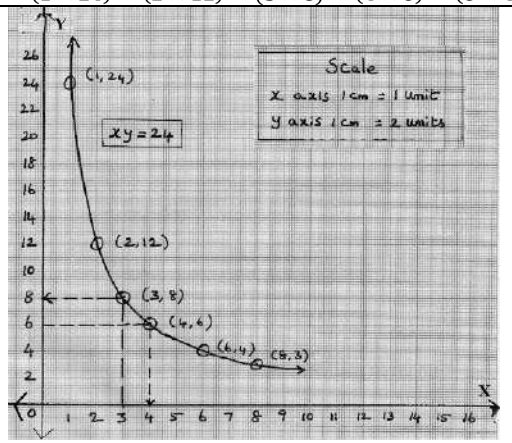
$(2500, 1250)$

2. Draw the graph of $xy = 24, x, y > 0$. Using the graph find (i) y when $x = 3$ (ii) x when $y = 6$

$xy = 24 \Rightarrow y = \frac{24}{x}$, Inverse Variation: $xy = k$

x	1	2	3	4	6	8
y	24	12	8	6	4	3

$xy = (1 \times 24) = (2 \times 12) = (3 \times 8) = (4 \times 6) = (6 \times 4) = (8 \times 3) = 24 \Rightarrow \quad k = 24$



Solution:

i) $x = 3, y = ?$

$3(y) = 24$

$y = \frac{24}{3}$

$y = 8$

$(3, 8)$

ii) $y = 6, x = ?$

$x(6) = 24$

$x = \frac{24}{6}$

$x = 4$

$(4, 6)$

3. Graph the following linear function $y = \frac{1}{2}x$. Identify the constant of variation and verify it with the graph. Also (i) find y when $x = 9$ (ii) find x when $y = 7.5$

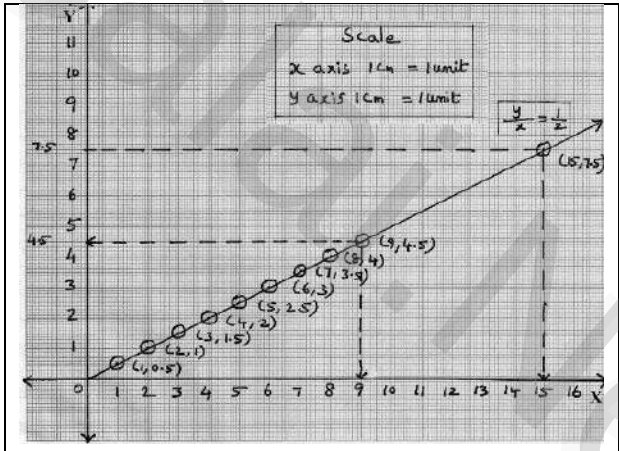
Given: Linear function $y = \frac{1}{2}x$ Constant of variation: $\frac{y}{x} = \frac{1}{2} \Rightarrow \frac{y}{x} = k \Rightarrow \quad k = \frac{1}{2}$ or 0.5

Direct Variation

x	1	2	3	4	5	6	7	8	9	15
y	0.5	1	1.5	2	2.5	3	3.5	4	4.5	7.5

$\frac{y}{x} = \frac{0.5}{1} = \frac{1}{2} = \frac{2}{4} = \frac{2.5}{5} = \frac{3}{6} = \frac{3.5}{7} = \frac{4}{8} = \frac{4.5}{9} = \frac{7.5}{15} = \frac{1}{2}$

$\frac{y}{x} = \frac{1}{2} \Rightarrow 2y = x \Rightarrow y = \frac{x}{2}$ If $x = 1 \Rightarrow y = \frac{1}{2}$ (or) 0.5



Solution:

i) If $x = 9, y = ?$

$y = \frac{x}{2} = \frac{9}{2}$

$y = 4.5$

$(9, 4.5)$

ii) If $y = 7.5$

$x = ?, y = \frac{x}{2}$

$7.5 = \frac{x}{2}$

$2 \times 7.5 = x$

$x = 15$

$(15, 7.5)$

Similar Problems

Solve Your Self

Eg.3.47: Varshika drew 6 circles with different sizes. Draw a graph for the relationship between the diameter and circumference of each circle as shown in the table and use it to find the circumference of a circle when its diameter is 6cm.

Diameter (x) cm	1	2	3	4	5
Circumference (y) cm	3.1	6.2	9.3	12.4	15.5

4. The following table shows the data about the number of pipes and the time taken to till the same tank

No. of pipes (x)	2	3	6	9
Time Taken (in min) (y)	45	30	15	10

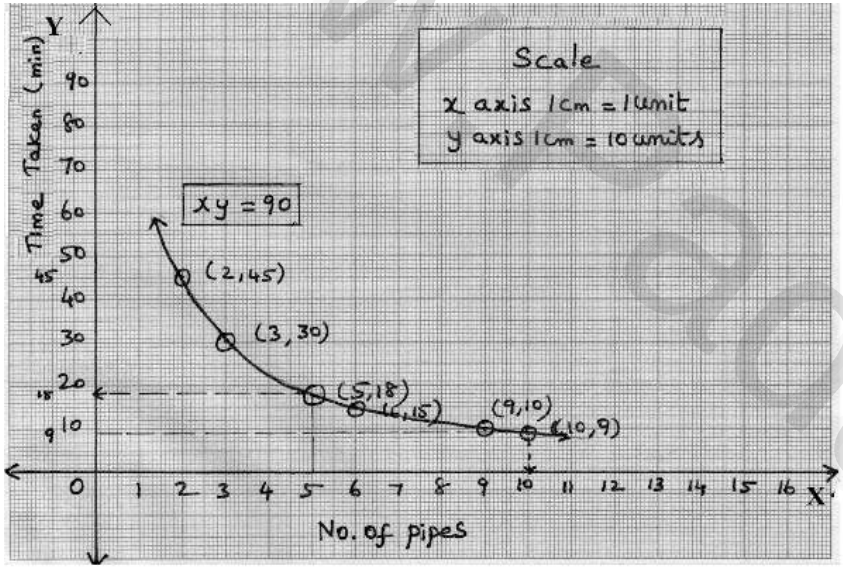
Draw the graph for the above data and hence

(i) find the time taken to fill the tank when five pipes are used

(ii) Find the number of pipes when the time is 9 minutes

Inverse Variation: $xy = k$

$(2 \times 45) = (3 \times 30) = (6 \times 15) = (9 \times 10) \Rightarrow k = 90 \Rightarrow xy = 90$



Solution:

i) If $x = 5, y = ?$

$5(y) = 90$

$y = \frac{90}{5} = 18$ min. **(5, 18)**

ii) if $y = 9, x = ?$

$x(9) = 90$

$x = \frac{90}{9} = 10$ Pipes **(10, 9)**

Similar Problems

Solve Your Self

Eg.3.49: A company initially started with 40 workers to complete the work by 150 days. Later, it decided to fasten up the work increasing the number of workers as shown below.

Number of workers (x)	40	50	60	75
Number of days (y)	150	120	100	80

(i) Graph the above data and identify the type of variation.

(ii) From the graph, find the number of days required to complete the work if the company decides to opt for 120 workers?

(iii) If the work has to be completed by 30 days, how many workers are required?

5. A school announces that for a certain competitions, the cash price will be distributed for all the participants equally as show below

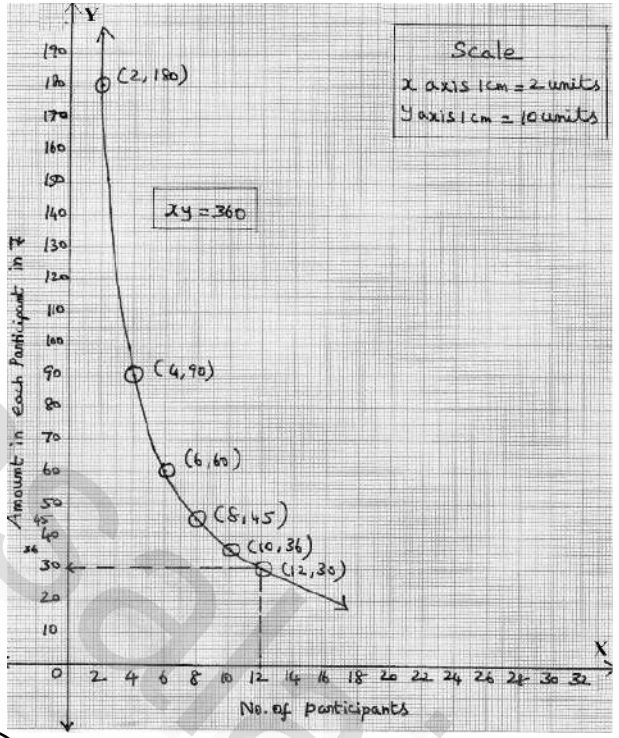
No. of participants (x)	2	4	6	8	10
Amount for each participant in ₹ (y)	180	90	60	45	36

(i) Find the constant of variation

(ii) Graph the above data and hence, find how much will each participant get if the number of participants are 12

Inverse Variation: $xy = k$

$(2 \times 180) = (4 \times 90) = (6 \times 60) = (8 \times 45) = (10 \times 36) = 360 \Rightarrow k = 360$



Solution:

(i) Constant of Variation

$k = \mathbf{360}$

(ii) If $x = 12, y = ?$

$12(y) = 360$

$y = \frac{360}{12} = 30$

(12, 30)

Similar Problems

Solve Your Self

Eg.3.50: Nishanth is the winner in a Marathon race of 12 km distance. He ran at the uniform speed of 12km/hr and reached the destination in 1 hour. He was followed by Aradhana, Ponmozhi, Jeyanth, Sathya and Swetha with their respective speed of 6 km/hr, 4 km/hr, 3 km/hr and 2km/hr. And, they covered the distance in 2 hrs, 3 hrs, 4 hrs and 6 hours respectively. Draw the speed-time graph and use it to find the time taken to Kaushik with his speed of 2.4km/hr.

6. A two wheeler parking zone near bus stand charges as below

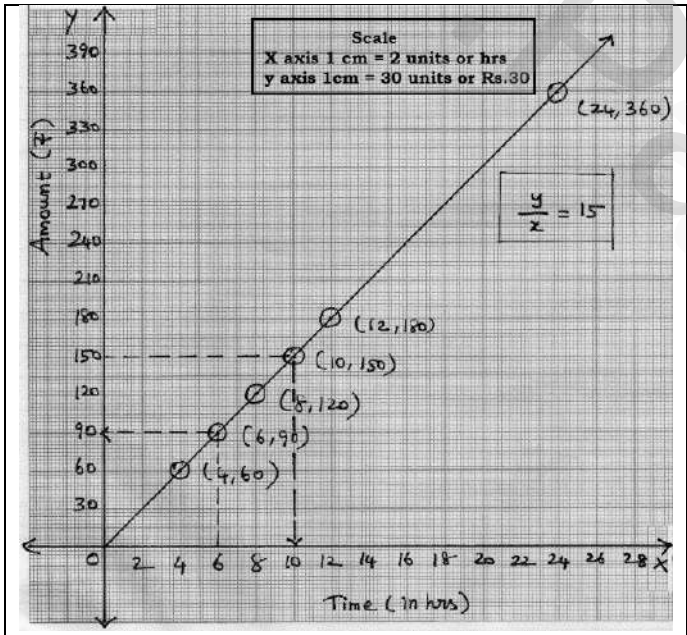
Time (in hours) (x)	4	8	12	24
Amount ₹ (y)	60	120	180	360

Check if the amount charged are in direct variation or in inverse variation to the parking time. Graph the data. Also (i) find the amount to be paid when parking time is 6 hr (ii) find the parking duration when the amount paid is ₹ 150

It is Direct Variation: $\frac{y}{x} = k$,

$$\frac{y}{x} = \frac{60}{4} = \frac{120}{8} = \frac{180}{12} = \frac{360}{24} = 15$$

$$k = 15$$



Solution:

i) if $x = 6$,

y =?

$\frac{y}{x} = 15$

$\frac{y}{6} = 15$

$y = 15 \times 6$

$y = 90$

(6, 90)

ii) If $y = 150$,

x =?

$\frac{150}{x} = 15$

$150 = 15x$

$x = \frac{150}{15}$

$x = 10$ hrs

(10, 150)

Similar Problems

Solve Your Self

Eg.3.48: A bus is travelling at a uniform speed of 50 km/hr. Draw the distance-time graph and hence find (i) the constant of variation (ii) how far will it travel in $1\frac{1}{2}$ hr (iii) the time required to cover a distance of 300 km from the graph.

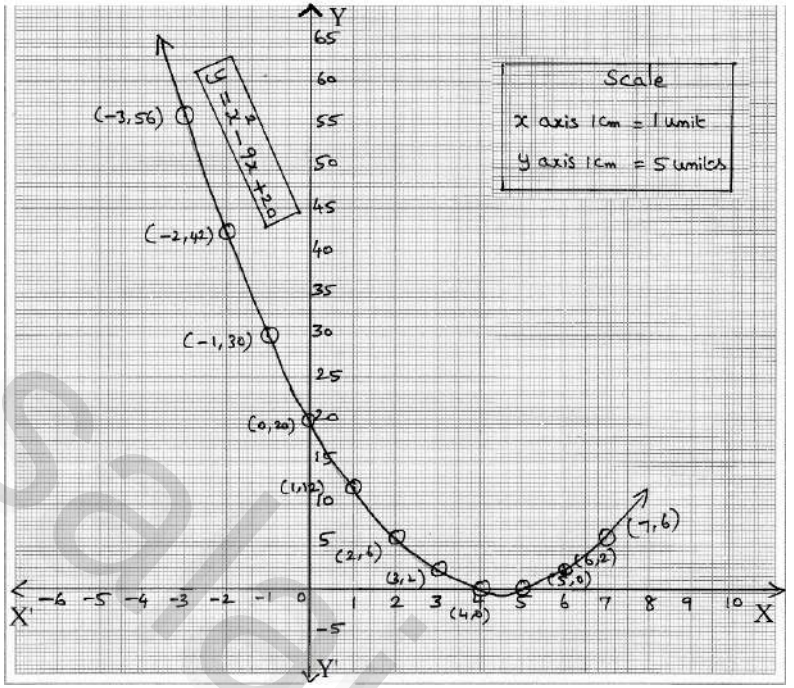
Exercise 3.16

1. Graph the following quadratic equations and state their nature of solutions.

(i) $x^2 - 9x + 20 = 0$ JUL-22

$y = x^2 - 9x + 20$										
x	−3	−2	−1	0	1	2	3	4	5	6
x^2	9	4	1	0	1	4	9	16	25	36
$-9x$	27	18	9	0	−9	−18	−27	−36	−45	−54
20	20	20	20	20	20	20	20	20	20	20
$y = x^2 - 9x + 20$	56	42	30	20	12	6	2	0	0	2

Points: (−3, 56), (−2,42), (−1,30), (0,20), (1,12), (2,6), (3,2), (4,0), (5,0), (6,2)



Solution $x = \{4, 5\}$ **Real and unequal roots.**

Similar Problems

Solve Your Self

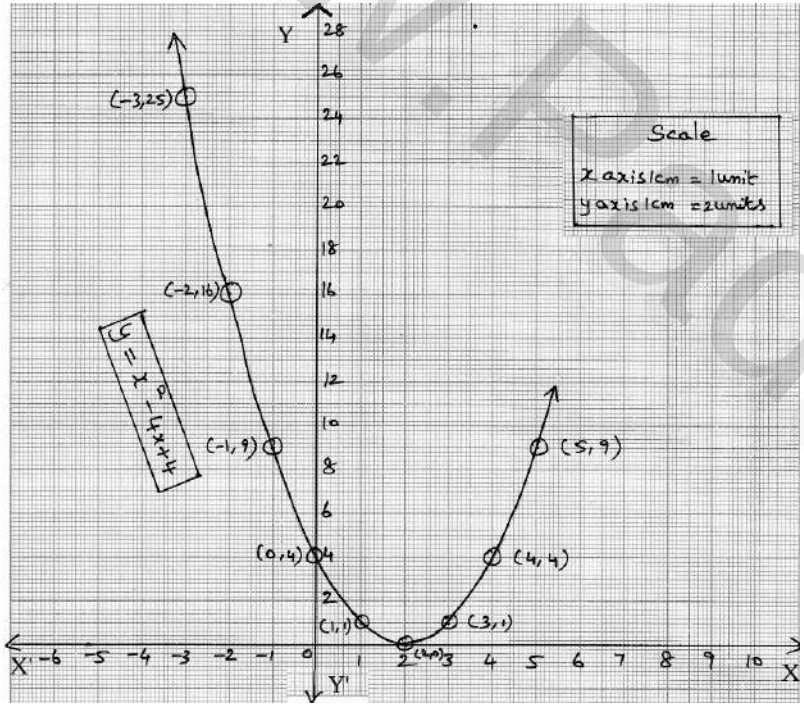
1. Graph the following quadratic equations and state their nature of solutions.
   (iv) $x^2 - 9 = 0$ (vi) $(2x - 3)(x + 2) = 0$

Eg.3.51(i): Discuss the nature of solutions of the following quadratic equations. $x^2 + x - 12 = 0$ **(SEP-20, 21)**

(ii) $x^2 - 4x + 4 = 0$ MAY-22

$y = x^2 - 4x + 4$									
x	-3	-2	-1	0	1	2	3	4	5
x^2	9	4	1	0	1	4	9	16	25
$-4x$	12	8	4	0	-4	-8	-12	-16	-20
4	4	4	4	4	4	4	4	4	4
$y = x^2 - 4x + 4$	25	16	9	4	1	0	1	4	9

Points: $(-3, 25), (-2,16), (-1,9), (0,4), (1,1), (2,0), (3,1), (4,4), (5,9)$



Solution: $x = \{2,0\}$, **Real and equal roots**

Similar Problems

Solve Your Self

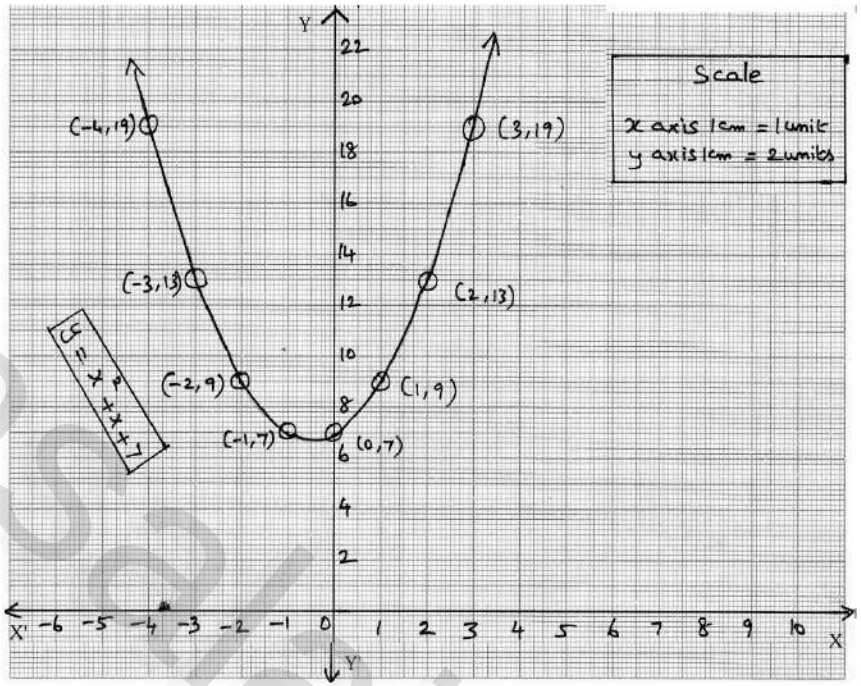
1. Graph the following quadratic equations and state their nature of solutions.
   (v) $x^2 - 6x + 9 = 0$

Eg.3.51(ii): Discuss the nature of solutions of the following quadratic equations. $x^2 - 8x + 16 = 0$

(iii) $x^2 + x + 7 = 0$

$y = x^2 + x + 7$								
x	-4	-3	-2	-1	0	1	2	3
x^2	16	9	4	1	0	1	4	9
x	-4	-3	-2	-1	0	1	2	3
7	7	7	7	7	7	7	7	7
$y = x^2 + x + 7$	19	13	9	7	7	9	13	19

Points: $(-4, 19), (-3,13), (-2,9), (-1,7), (0,7), (1,9), (2,13), (3,19)$



Solution: **No real roots**

Similar Problems

Solve Your Self

Eg.3.51(iii): Discuss the nature of solutions of the following quadratic equations. $x^2 + 2x + 5 = 0$

3. Draw the graph of $y = x^2 + x$ and hence solve $x^2 + 1 = 0$

$y = x^2 + x$							
x	-3	-2	-1	0	1	2	3
x^2	9	4	1	0	1	4	9
x	-3	-2	-1	0	1	2	3
$y = x^2 + x$	6	2	0	0	2	6	12

Points: $(-3,6), (-2,2), (-1,0), (0,0), (1,2), (2,6), (3,12)$

$y = x^2 + x + 0$

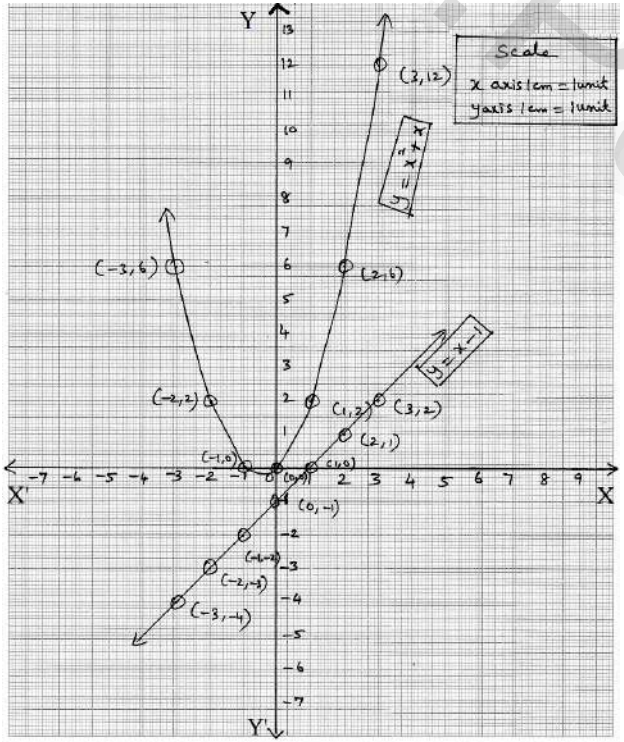
$0 = x^2 + 0x + 1$

(−) (−)

$y = x - 1$

$y = x - 1$							
x	-3	-2	-1	0	1	2	3
-1	-1	-1	-1	-1	-1	-1	-1
y	-4	-3	-2	-1	0	1	2

Points: $(-3,-4), (-2,-3), (-1,-2), (0,-1), (1,0), (2,1), (3,2)$



Solution:

No real roots.

Similar Problems

Solve Your Self

Eg.3.53: Draw the graph of $y = x^2 + 4x + 3$ and hence find the roots of $x^2 + x + 1 = 0$

4. Draw the graph of $y = x^2 + 3x + 2$ and use it to solve $x^2 + 2x + 1 = 0$ PTA-5

$y = x^2 + 3x + 2$								
x	-4	-3	-2	-1	0	1	2	3
x^2	16	9	4	1	0	1	4	9
$3x$	-12	-9	-6	-3	0	3	6	9
2	2	2	2	2	2	2	2	2
$y = x^2 + 3x + 2$	6	2	0	0	2	6	12	20

Points: $(-4,6), (-3,2), (-2,0), (-1,0), (0,2), (1,6), (2,12), (3,20)$

$y = x^2 + 3x + 2$

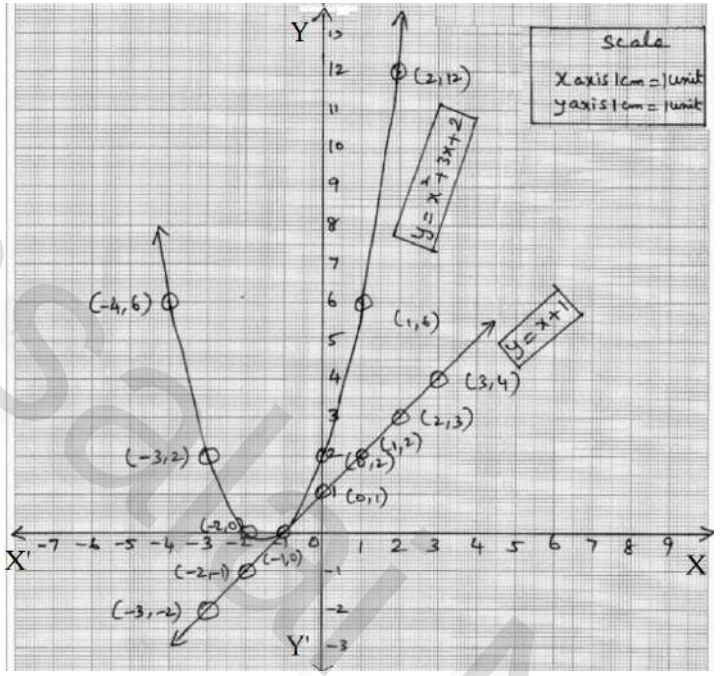
$0 = x^2 + 2x + 1$

(−) (−) (−)

$y = x + 1$

$y = x + 1$							
x	-3	-2	-1	0	1	2	3
1	1	1	1	1	1	1	1
y	-2	-1	0	1	2	3	4

Points: $(-3,-2), (-2,-1), (-1,0), (0,1), (1,2), (2,3), (3,4)$



Solution : $\{-1, 0\}$

Similar Problems

Solve Your Self

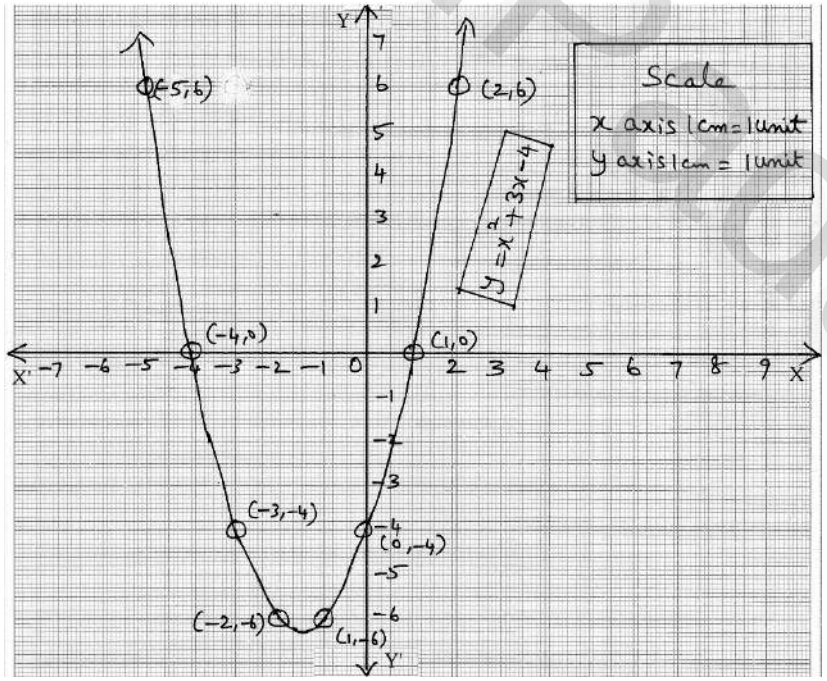
Eg.3.55: Draw the graph of $y = x^2 - 4x + 3$ and use it to solve $x^2 - 6x + 9 = 0$ **(MAY-22, JUL-22)**

5. Draw the graph of $y = x^2 + 3x - 4$ and use it to solve $x^2 + 3x - 4 = 0$ SEP-21

$y = x^2 + 3x - 4$								
x	-5	-4	-3	-2	-1	0	1	2
x^2	25	16	9	4	1	0	1	4
$3x$	-15	-12	-9	-6	-3	0	3	6
-4	-4	-4	-4	-4	-4	-4	-4	-4
$y = x^2 + 3x - 4$	6	0	-4	-6	-6	-4	0	6

Points: $(-5,6), (-4,0), (-3,-4), (-2,-6), (-1,-6), (0,-4), (1,0), (2,6)$

$y = x^2 + 3x - 4$
$0 = x^2 + 3x - 4$
(−) (−) (+)
$y = 0$



Solution: $x = \{-4, 1\}$

Similar Problems
Solve Your Self
Eg.3.54: Draw the graph of $y = x^2 + x - 2$ and hence solve $x^2 + x - 2 = 0$. **(PTA-1)**

7. Draw the graph of $y = 2x^2 - 3x - 5$ and hence solve $2x^2 - 4x - 6 = 0$ PTA-3, SEP-20

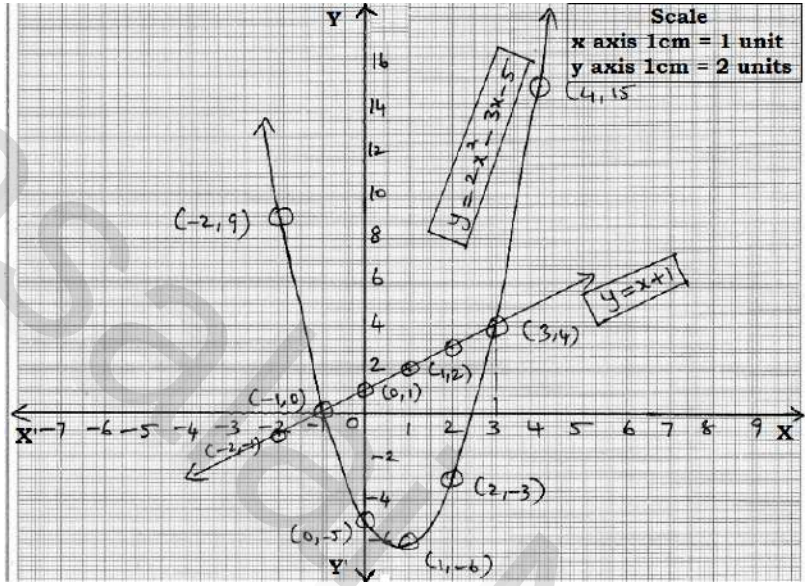
$y = 2x^2 - 3x - 5$								
x	-2	-1	0	1	2	3	4	5
x^2	4	1	0	1	4	9	16	25
$2x^2$	8	2	0	2	8	18	32	50
$-3x$	6	3	0	-3	-6	-9	-12	-15
-5	-5	-5	-5	-5	-5	-5	-5	-5
$y = 2x^2 - 3x - 5$	9	0	-5	-6	-3	4	15	30

Points: $(-2,9), (-1,0), (0,-5), (1,-6), (2,-3), (3,4), (4,15), (5,30)$

$y = 2x^2 - 3x - 5$
$0 = 2x^2 - 4x - 6$
(−) (+) (+)
$y = x + 1$

x	-2	-1	0	1	2	3
1	1	1	1	1	1	1
$y = x + 1$	-1	0	1	2	3	4

Points: $(-2,-1), (-1,0), (0,1), (1,2), (2,3), (3,4)$



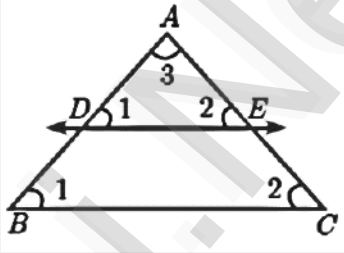
Similar Problems
Solve Your Self
2. Draw the graph of $y = x^2 - 4$ and hence solve $x^2 - x - 12 = 0$
6. Draw the graph of $y = x^2 - 5x - 6$ and hence solve $x^2 - 5x - 14 = 0$ **(PTA-2, 6)**
8. Draw the graph of $y = (x - 1)(x + 3)$ and hence solve $x^2 - x - 6 = 0$
Eg.3.52: Draw the graph of $y = 2x^2$ and hence solve $2x^2 - x - 6 = 0$ **(PTA-4)**

4. Geometry

Theorems

Theorem 1: Basic Proportionality Theorem (BPT) or Thales theorem MAY-22

Statement: A straight line drawn parallel to a side of triangle intersecting the other two sides, divides the sides in the same ratio.



Proof:

Given: In ΔABC, D is a point on AB and E is a point on AC.

To prove: $\frac{AD}{DB} = \frac{AE}{EC}$

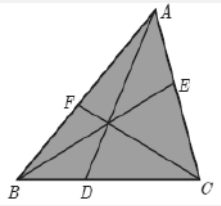
Construction: Draw a line $DE \parallel BC$

No.	Statement	Reason
1.	$\angle ABC = \angle ADE = \angle 1$	Corresponding angles are equal because $DE \parallel BC$
2.	$\angle ACB = \angle AED = \angle 2$	Corresponding angles are equal because $DE \parallel BC$
3.	$\angle DAE = \angle BAC = \angle 3$	Both triangles have a common angle
4.	$\Delta ABC \backsim \Delta ADE$	By AAA similarity
	$\frac{AB}{AD} = \frac{AC}{AE}$	Corresponding sides are proportional
	$\frac{AD+DB}{AD} = \frac{AE+EC}{AE}$	Split AB and AC using the points D and E
	$1 + \frac{DB}{AD} = 1 + \frac{EC}{AE}$	On simplification
	$\frac{DB}{AD} = \frac{EC}{AE}$	Cancelling 1 on both sides
	$\frac{AD}{DB} = \frac{AE}{EC}$	Taking reciprocals
Hence proved		

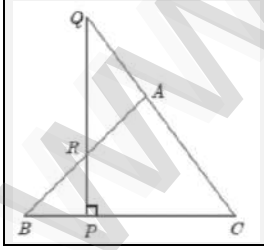
Corollary: If in ΔABC, a straight line DE parallel to BC, intersects AB at D and AC at E, then (i) $\frac{AB}{AD} = \frac{AC}{AE}$ (ii) $\frac{AB}{DB} = \frac{AC}{EC}$

Ceva's Theorem (without proof)

Statement: Let ABC be a triangle and let D, E, F be points on lines BC, CA, AB respectively. Then the cevians AD, BE, CF are concurrent if and only if $\frac{BD}{DC} \times \frac{CE}{EA} \times \frac{AF}{FB} = 1$ where the lengths are directed. This also works for the reciprocal of each of the ratios as the reciporcal of 1 is 1.

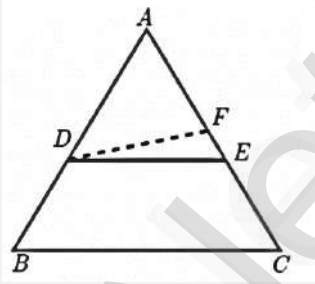


Menelaus Theorem (without proof)



Statement: A necessary and sufficient condition for points P, Q, R on the respective sides BC, CA, AB (or their extension) of a triangle ABC to be collinear is that $\frac{BP}{PC} \times \frac{CQ}{QA} \times \frac{AR}{RB} = -1$ where all segments in the formula are directed segments.

Theorem 2: Converse of Basic Proportionality Theorem



Statement: If a straight line divides any two sides of a triangle in the same ratio, then the line must be parallel to the third side.

Proof:

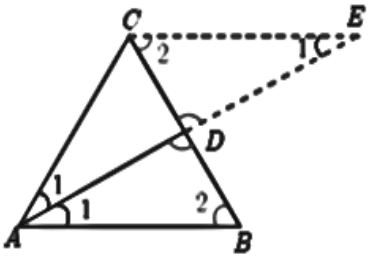
Given: In $\Delta ABC, \frac{AD}{DB} = \frac{AE}{EC}$

To prove: $DE \parallel BC$

Construction: If DE is not parallel to BC. Draw $BF \parallel DE$

No.	Statement	Reason
1.	$\frac{AD}{DB} = \frac{AE}{EC}$ ..... (1)	Given
2.	In $\Delta ABC,\ DF \parallel BC$	Construction
3.	$\frac{AD}{DB} = \frac{AF}{FC}$ ..... (2)	Thales theorem
4.	$\frac{AE}{EC} = \frac{AF}{FC}$ $\frac{AE}{EC} + 1 = \frac{AF}{FC} + 1$ $\frac{AE+EC}{EC} = \frac{AF+FC}{FC}$ $\Rightarrow \frac{AC}{EC} = \frac{AC}{FC}$ $EC = FC$ Therefore, $E = F$ Thus $DE \parallel BC$	From (1) and (2) Adding 1 to both sides Cancelling AC on both sides Our assumption that DE is not parallel to BC is wrong. Hence Proved

Theorem 3: Angle Bisector Theorem



Statement: The internal bisector of an angle of a triangle divides the opposite side internally in the ratio of the corresponding sides containing the angle.

PTA-5,SEP-20, JUL-22

Proof:

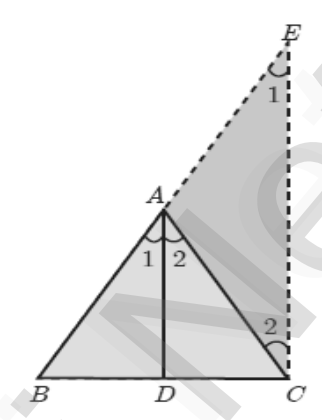
Given : In $\Delta ABC,\ AD$ is the internal bisector

To prove: $\frac{AB}{AC} = \frac{BD}{CD}$

Construction : Draw a line through C parallel to AB. Extend AD to meet line through C at E

No.	Statement	Reason
1.	$\angle AEC = \angle BAE = \angle 1$	Two parallel lines cut by a transversal make alternate angles equal.
2.	ΔACE is isosceles $AC = CE$ ..... (1)	In $\Delta ACE,\ \angle CAE = \Delta CEA$
3.	$\Delta ABD \sim \Delta ECD$ $\frac{AB}{CE} = \frac{BD}{CD}$	By AA similarity
4.	$\frac{AB}{AC} = \frac{BD}{CD}$	From (1) $AC = CE$ Hence proved.

Theorem 4: Converse of Angle Bisector Theorem PTA-3, 4



Statement: If a straight line through one vertex of a triangle divides the opposite side internally in the ratio of the other two sides, then the line bisects the angle internally at the vertex.

Proof:

Given : ABC is a triangle.

AD divides BC in the ratio of the sides containing the angles $\angle A$ to meet BC at D.

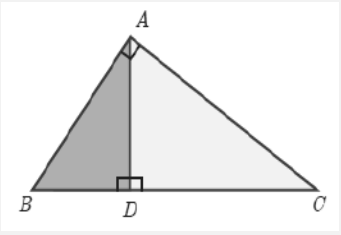
That is $\frac{AB}{AC} = \frac{BD}{DC}$ ..... (1)

To prove : AD bisects $\angle A$ i.e. $\angle 1 = \angle 2$

Construction : Draw $CE \parallel DA$. Extend BA to meet at E.

No.	Statement	Reason
1.	Let $\angle BAD = \angle 1$ and $\angle DAC = \angle 2$	Assumption
2.	$\angle BAD = \angle AEC = \angle 1$	Since $DA \parallel CE$ and AC is transversal, corresponding angles are equal
3.	$\angle DAC = \angle ACE = \angle 2$	Since $DA \parallel CE$ and AC is transversal, Alternate angles are equal
4.	$\frac{BA}{AE} = \frac{BD}{DC}$ ..... (2)	In ΔBCE by thales theorem
5.	$\frac{AB}{AC} = \frac{BD}{DC}$	From (1)
6.	$\frac{AB}{AC} = \frac{BA}{AE}$	From (1) and (2)
7.	$AC = AE$.....(3)	Cancelling AB
8.	$\angle 1 = \angle 2$	ΔACE is isosceles by (3)
9.	AD bisects $\angle A$	Since, $\angle 1 = \angle BAD = \angle 2 = \angle DAC$. Hence proved

Theorem 5: Pythagoras Theorem



Statement: In a right angle triangle, the square on the hypotenuse is equal to the sum of the squares on the other two sides.

Proof: SEP-21, PTA-4

Given : In ΔABC, $\angle A = 90°$

To prove : $AB^2 + AC^2 = BC^2$

Construction : Draw $AD \perp BC$

No.	Statement	Reason
1.	Compare ΔABC and ΔDBA $\angle B$ is common $\angle BAC = \angle BDA = 90°$ Therefore, $\Delta ABC \backsim \Delta DBA$ $\frac{AB}{BD} = \frac{BC}{AB}$ $AB^2 = BC \times BD$ ...(1)	Given $\angle BAC = 90°$ and by construction $\angle BDA = 90°$ By AA similarity

2.	Compare ΔABC and ΔDAC $\angle C$ is common $\angle BAC = \angle ADC = 90°$ Therefore, $\Delta ABC \backsim \Delta DAC$ $\frac{BC}{AC} = \frac{AC}{DC}$ $AC^2 = BC \times DC$ ... (2)	Given $\angle BAC = 90°$ and by construction $\angle ADC = 90°$ By AA similarity

Adding (1) and (2) we get

$AB^2 + AC^2 = (BC \times BD) + (BC \times DC)$

$= BC \times (BD + DC)$

$= BC \times BC$

$AB^2 + AC^2 = BC^2$

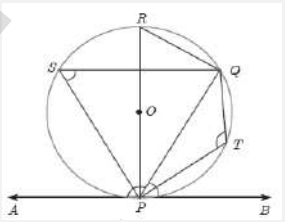
Hence the theorem is proved.

Converse of Pythagoras Theorem

Statement: If the square of the longest side of a triangle is equal to sums of squares of other two sides, then the triangle is a right angle triangle.

Theorem 6: Alternate Segment theorem

Statement: If a line touches a circle and from the point of contact a chord is drawn, the angles between the tangent and the chord are respectively equal to the angles in the corresponding alternate segments.



Proof:

Given : A circle with centre at O, tangent AB touches the circle at P and PQ is a chord. S and T are two points on the circle in the opposite sides of chord PQ.

To prove : (i) $\angle QPB = \angle PSQ$ and (ii) $\angle QPA = \angle PTQ$

Construction : Draw the diameter POR. Draw QR, QS and PS.

No.	Statement	Reason
1.	$\angle RPB = 90°$ Now, $\angle RPQ + \angle QPB = 90°$ ... (1)	Diameter RP is perpendicular to tangent AB.
2.	In $\Delta RPQ, \angle PQR = 90°$ ... (2)	Angle in a semicircle is 90°.
3.	$\angle QRP + \angle RPQ = 90°$ ... (3)	In a right angled triangle, sum of the two acute angles is 90°.
4.	$\angle RPQ + \angle QPB = \angle QRP + \angle RPQ$ $\angle QPB = \angle QRP$ ... (4)	From (1) and (3).
5.	$\angle QRP = \angle PSQ$ ... (5)	Angles in the same segment are equal.
6.	$\angle QPB = \angle PSQ$ ... (6)	From (4) and (5); Hence (i) is proved.
7.	$\angle QPB + \angle QPA = 180°$ ... (7)	Linear pair of angles.
8.	$\angle PSQ + \angle PTQ = 180°$ ...(8)	Sum of opposite angles of a cyclic quadrilateral is 180°.
9.	$\angle QPB + \angle QPA = \angle PSQ + \angle PTQ$	From (7) and (8).
10.	$\angle QPB + \angle QPA = \angle QPB + \angle PTQ$	$\angle QPB = \angle PSQ$ from (6)
11.	$\angle QPA = \angle PTQ$	Hence (ii) is proved. This completes the proof.