Class – Ten
Chapter – One
Set and Function
Exercise-1.1

Creative Questions:-

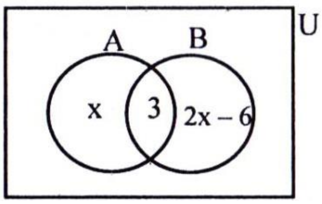
1. A survey implemented on 100 students of class ten shows that 57 students like Rose, 49 students like Belly and 37 students like Hasna-hena flower. Among them 27 students like Rose and Belly, 23 students like Belly and Hasna-hena, 29 students like both Hasna-hena and Rose flower. 17 students like all that flowers.[B.B.- 19]

a) Show these data at Venn diagram with short description.
b) How many students does not like any flower of these three? Find it.
c) How many students like only one flower of these three? Find it.

2. $\mathbf{A = \{x : x \in \mathbb{R} \text{ and } x^2 - (p+q)x + pq = 0, p, q \in \mathbb{R}\}, B = \{2, 3\}}$ **and C = {3, 4, 5}.**
[D.B.- 16]

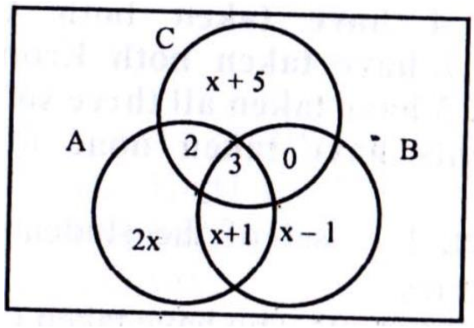
a) Define subset and complementary set.
b) Show that, $P(B \cap C) = P(B) \cap P(C)$.
c) Prove that, $A \times (B \cup C) = (A \times B) \cup (A \times C)$.

3. In the Venn diagram, the elements of the sets A and B are shown. Given, $\mathbf{n(A) = n(A' \cap B)}$



a) Find the value of $n(A' \cap B)$ in terms of x.
b) Find the value of x, n(A) and n(B).
c) Prove that, $n(A \cup B) = n(A) + n(B) - n(A \cap B)$.

4. In the following Venn diagram, $\mathbf{U = A \cup B \cup C}$ **and n(U) = 50**



a) Find the value of x
b) Find the value of $n(B \cap C')$ and $n(A' \cap B)$
c) Find the value of $n(A \cap B \cap C')$

Exercise-1.2

Creative Questions:-

1. $\boldsymbol{A = \{x : x \in Z \text{ and } x^2 \le 4\}, B = \{x \in N : x}$ **is odd number and** $\mathbf{x < 5\}}$ **and C = {3, 5}**
[Ctg.B. - 19]

a) Express C by set builder method.
b) Show that, $P(B) \cup P(C) \subset P(B \cup C)$
c) $S = \{(x, y): x \in A, y \in A$ and $y = \sqrt{4 - x^2}\}$, Describe the relation by tabular method and determine Domain.

2. The functions $\boldsymbol{f}: \mathbb{R} \to \mathbb{R}$ **and** $\mathbf{g}: \mathbb{R} \to \mathbb{R}$ **are defined** $\boldsymbol{f}(\mathbf{x}) = \frac{\mathbf{2x+2}}{\mathbf{x-1}}$ **and** $\mathbf{g(x)} = \frac{\mathbf{x-3}}{\mathbf{2x+1}}$**.**
[D.B. - 17]

a) Find the domain of f.
b) Show that, g is a one-one and onto function.
c) If $3\,f^{-1}(x) = x$, then find the value of x.

3. $\boldsymbol{f(x) = \sqrt{2x - 3}}$ **is a function.**
[S.B. - 17]

a) If f(x) = 1, then determine the value of x.
b) Determine the Domain of $f(x)$ and show the function is a one-one.
c) Determine the range of $f^{-1}(x)$.

4. $\boldsymbol{A = \{x : x \in Z \text{ and } x^2 \le 4\}, B = \{x \in N : x \text{ is odd and } x} < 5\}$ and **C = {3, 5}.**
[R.B. - 15]

a) Show A in tabular method.
b) Show that, $P(B) \cup P(C) \subset P(B \cup C)$.

c) The relation S = {(x, y): x ∈ A, y ∈ A and y = $\sqrt{4-x^2}$} is to be expressed in tabular method. Find Dorn S and Range S.

5. $F(x) = \frac{1}{x-5}$ **is a function.** **[C.B.- 15]**

a) If (x) = 2, find the value of x.

b) Find the domain of F(x) and determine whether it is one-one.

c) Find the value of $F^{-1}(3)$.

6. **The functions** $f: R \to R$ **and** $g: R \to R$ **are defined by** $f(x) = x^7 + 5$ **and** $g(x) = (x-5)^{\frac{1}{7}}$ **respectively.**

a) Find the value of $g^{-1}(-1)$.

b) Ascertain whether f(x) is an onto function.

c) Show that, $f = g^{-1}$.

7. A function is defined by $f(x) = \frac{2x+2}{x-1}$.

a) Find the range of the function.

b) Find the value of $f^{-1}(3)$.

c) If $f^{-1}(p) = kp$, express k in terms of p.

Chapter – Two
Algebraic Expression
Exercise - 2

Creative Questions:-

1. $\mathbf{B = \{x : x\ integer\ and\ x^2 < 5\}}$, $\mathbf{R = \{(x, y) : x \in B,\ y \in B}$**, and 2x = y + 2}** **and** $\mathbf{F(y) = y^3 - 3y^2 + 5y - 9}$**.** **[D.B.- 19]**

a) Find the domain of the function $f(x) = \frac{2x}{\sqrt{1-3x}}$.

b) Describe the given relation R in roaster method and ascertain whether the relation R is a function.

c) If F(y) yields the same remainder upon division by $(y-s)$ and $(y-t)$ where s ≠ t. Show that, $s^2 + t^2 + st - 3s - 3t + 5 = 0$.

2. **(i)** $\mathbf{f}: \mathbb{R} - \left\{\frac{1}{5}\right\} \to \mathbb{R}, \mathbf{f(x) = \frac{1+x}{1-5x}}$

(ii) $\mathbf{A = x(x+1)}$. **[Dj.B.- 19]**

a) Determine whether the sets {3, 5, 7} and {1, 2, 3, 4} are equivalent or not.

b) Show that, the function described by f is one-one but not onto.

c) Express $\frac{3x^2+x+2}{A}$ into partial fractions.

3. $\mathbf{P(x) = 18x^3 - 15x^2 - x + 2}$**[C.B.-19]**

a) Show that, (3x + 1) is a factor of P(x).

b) If P(x) yields the same remainder upon division by (x - m) and (x - n), then show that, $18m^2 + 18mn + 18n^2 - 15m - 15n - 1 = 0$.

c) Express $\frac{3x-2}{P(x)}$ into partial fractions.

4. **Given that,** $\mathbf{F(x) = \frac{2x-3}{3x+2}}$ **and** $\mathbf{A = \frac{2x}{x^4-1}}$ **[J.B.-19]**

a) Find the domain of F.

b) Find the value of $F^{-1}(-3)$.

c) Express A into partial Fractions.

5. $\mathbf{P(x) = 18x^3 + 15x^2 - x + a}$, $\mathbf{Q(x) = x^3 + x^2 - 6x}$ **are two algebraic equation.** **[C.B. – 17]**

a) Resolve into factors of Q (x).

b) Find the value of a if (3x + 2) is a factor of the polynomial P(x).

c) Express the partial fractions of $\frac{x^2+x-1}{Q(x)}$.

6. $\mathbf{P(x) = x^3 - 6x^2 + 11x - 6}$**.** **[J.B.-17]**

a) Determine the ratio of degree and leading co-efficient of P(x).

b) If the remainders of P(x) upon division by (x – m) and (x – n) are same where m ≠ n, then show that, $x^2 + mn + n^2 - 6m - 6n + 11 = 0$.

c) Express: $\frac{x^3}{P(x)}$ as partial fractions.

7. $\mathbf{P(a, b, c) = (a + b + c)(ab + bc + ca)}$ **and** $\mathbf{Q(a, b, c) = (b + c)(c + a)(a + b)}$

a) If $(x-y)^2 + (y-z)^2 = 0$, show that, x = y = z.

b) Show that, $Q(a, b, c) + abc = P(a, b, c)$.

c) If P(a, b, c) = abc, Justify $\frac{1}{(a+b+c)^9} = \frac{1}{a^9} + \frac{1}{b^9} + \frac{1}{c^9}$ is possible or not.

8. The polynomial of x, y, z and F(x, y, z) = $\mathbf{x^3 + y^3 + z^3 - 3xyz}$

a) Show that, F(x, y, z) is a cyclic expression.

b) Factorize F(x, y, z) and if F(x, y, z) = 0, (x + y + z) ≠ 0 Show that, $x^2 + y^2 + z^2$ = xy + yz + zx.

c) If x = (b + c - a), y = (c + a - b) and z = (a + b – c) Show that, F(a, b, c) : F(x, y, z) = 1 : 4.

9. Two polynomials of variable x are $\mathbf{P(x) = 7x^2 - 3x + 4x^4 - a + 12x^3}$ and $\mathbf{Q(x) = 6x^3 + x^2 - 9x + 26}$.

a) Expressing P(x) ideally determine leading co-efficient.

b) A factor of P(x) is (x + 2) then find the value of a.

c) Show that, there is a common factor of P(x) and Q(x).

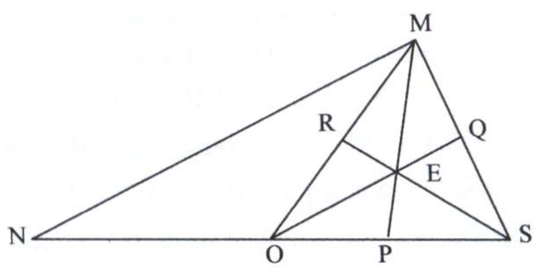
Chapter – Three

Geometry

Exercise – 3.1

Creative Questions:-

1.



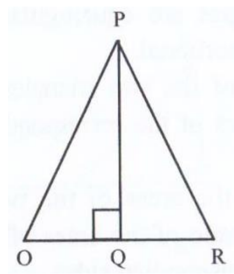
This figure P, Q, R and O are the middle points of the sides OS, MS, MO and NS respectively. [R.B.- 19]

a) If PE = 3 cm, then find the value of PM.

b) Prove that, $MO^2 + NO^2 = \frac{1}{2}(MN^2 + MS^2)$.

c) From ΔMOS, Prove that, $3(ME^2 + OE^2 + SE^2) = MO^2 + MS^2 + SO^2$.

2.



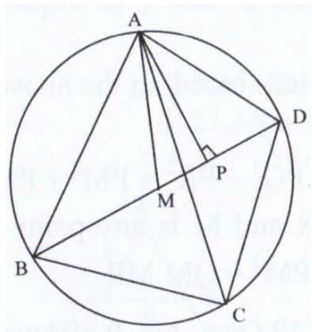
ΔPOR and ∠OPR = 90°. [Ctg.B.- 19]

a) The length of three medians of APOR are 3 cm, 4 cm and 5 cm respectively then find the length of the hypotenuse OR

b) Prove that, $PR^2 = PO^2 + OR^2 - 2OR.OQ$.

c) Prove that, $PQ^2 = OQ.QR$

3.



In the figure M is the middle point of BD and AP ⊥ BD. [B.B.- 19]

a) Show that, $AM^2 - AD^2 = PM^2 - PD^2$.

b) Show that, $AB^2 + AD^2 = 2(BM^2 + AM^2)$.

c) Prove that, AC.BD = AB.CD + BC.AD.

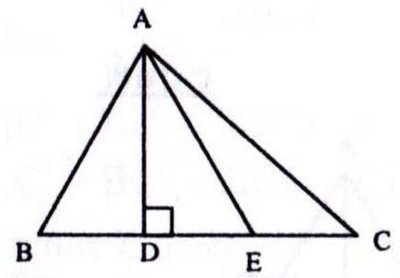
4. Circumcenter, centroid and orthocenter of a triangle ABC are S, G and O respectively. [All B.- 18]

a) Define orthogonal projection of a point with figure

b) Prove that, three points S, G and O are collinear.

c) If the length of the median of the triangle given in the stem are AD, BE and CF respectively, then prove that, $3(AB^2 + BC^2 + CA^2) = 4(AD^2 + BE^2 + CF^2)$.

5.



In the figure, BD = ED = CE and AD $\perp$ BC. [B.B.- l7]

a) If DE = 2cm. and AD = 3cm, find the length of AC.

b) Prove that, $AB^2 + AC^2 = AD^2 + AE^2 + 4DE^2$.

c) Prove that, $AC^2 = AB^2 + BC^2 - 2BC.BD$.

Exercise – 3.2

Creative Questions:-

1. PQRS is a cyclic quadrilateral and PR and QS are its diagonals. [D.B.-19]

a) In a right angled triangle ABC hypotenuse AC = 2cm. Find the sum of the areas of the squares drawn on the three medians.

b) Prove that, the area of the rectangle contained by PR and QS is equal to the sum of the area of the two rectangles contained by two pairs of opposite sides.

c) If PR is a diameter and QF is the perpendicular drawn from the vertex Q on PR, then prove that, QF^2 = PF.RF

2. In ΔPQR the perpendicular QM and RN intersect at the point S. The line joining the points circumcenter T and orthocenter S intersect the median PL at the point O.

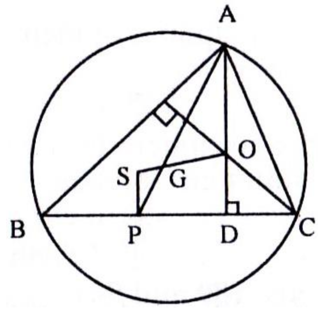
[S.B.- 19]

a) Show that, the points A (1, 2), B (4, 3) and C (7, 4) are collinear.

b) Show that, the centroid of the triangle is O.

c) If PL $\perp$ QR then prove that, QS.SM = RS.SN = PS.SL

3.



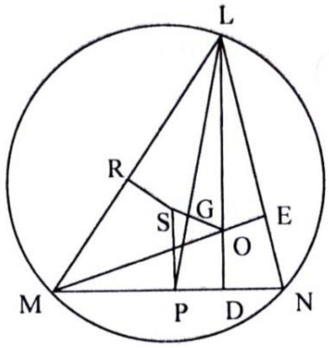
In the picture follow S is the circumcenter, O is orthocenter and G is the centroid of the triangle ABC. AP is the median. [R.B.-17]

a) What is nine point circle?

b) Prove that, AG : GP = 2 : 1.

c) If Δ ABC the median AP is extended the point of circle F, prove that, AF.BC = AB. CF + AC. BF.

4.



In the figure O is the orthocenter, S is the circumcenter, G is the centroid and LP is the median of the triangle LMN. MN = a, LN = b, LM = c.

[S.B.- 17]

a) If OL = 9 cm then determine the value of SP.

b) Show that, S, G, O are collinear.

c) If $\angle$N is an acute angle, prove that, a. ND = b. NE