Class – Nine
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. $A = \{x : x \in \mathbb{R}$ and $x^2 - (p+q)x + pq = 0, p, q \in \mathbb{R}\}$, $B = \{2, 3\}$ and $C = \{3, 4, 5\}$.

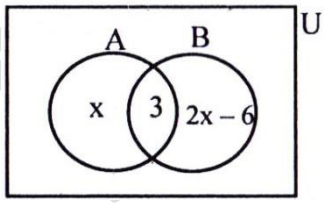
[D.B.- 16]

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, $n(A) = n(A' \cap B)$

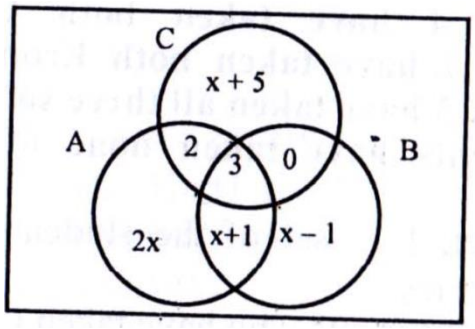


a) Find the value of $n(A' \cap B)$ in terms of x.

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, $U = A \cup B \cup C$ 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. $A = \{x : x \in Z$ and $x^2 \leq 4\}$, $B = \{x \in N : x$ is odd number and $x < 5\}$ 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 $f : \mathbb{R} \to \mathbb{R}$ and $g : \mathbb{R} \to \mathbb{R}$ are defined $f(x) = \frac{2x+2}{x-1}$ and $g(x) = \frac{x-3}{2x+1}$.

[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. $f(x) = \sqrt{2x-3}$ 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. **$A = \{x : x \in Z$ and $x^2 \leq 4\}$, $B = \{x \in N : x$ 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.

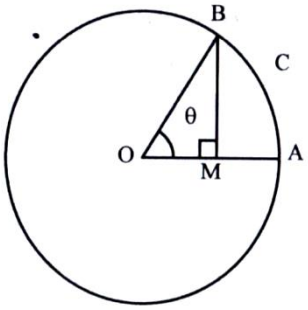
b) Find the value of $f^{-1}(3)$.

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

Chapter-8
Trigonometry
Exercise-8.1

Creative Questions:

1.



In figure OA = 10 cm. [Ctg.B.- 19]

a) Express θ° in radians.

b) A sprinter start his journey at 'A' and reached at 'B' within 5 seconds then find the velocity of the sprinter when θ = 60°.

c) If $2\left(\frac{OM}{OB}\right)^2 = 1 + 2\left(\frac{BM}{OB}\right)^2$ then find the value of θ [where $0 \le \theta \le 2\pi$]

2. M = tanθ, N = secθ and P = sinθ. [S.B.- 19]

a) Given that the radius of the Earth is 6440 km. What is distance of two places on the surface of the earth which subtend an angle of 7° at the centre of the Earth?

b) Prove that, $\frac{1-M-N}{N-M-1} = \sqrt{\frac{1+P}{1-P}}$.

c) If $P^2N - \frac{1}{N} = 1$ then find the value of θ, where $0 \le \theta \le 2\pi$

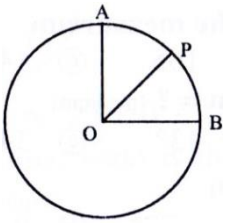
3. The wheel of a car moving from Dhaka to Khulna revolves 720 times in a minute. The radius of the wheel is 0.25 meter. [Dj.B.- 17]

a) Find the circumference of the wheel.

b) Find the speed of the car.

c) If the distance of Dhaka and Khulna subtends 2° angle at the centre of the earth, find the time required to go from Dhaka to Khulna. (The radius of the earth is 6440 km.)

4.



a) Find the value of $\cos^2\frac{\pi}{8} + \cos^2\frac{3\pi}{8} + \cos^2\frac{5\pi}{8} + \cos^2\frac{7\pi}{8}$.

b) From figure, prove that, ∠POB is a constant angle.

c) In the figure, if ∠POB = 8 and OB = 550 kilometer, find the value of PB.

5. Diameter of the earth is 12880 kilometer. Mymensingh and Barishal create 4.5° angle at the earth's centre. A person goes from Mymensingh to Barishal by a car having a wheel of radius 0.62 metre.

a) Express supplementary angle of 6° in radian.
b) Find the distance between Mymensingh and Barishal.
c) From Mymensingh to Barishal, how many times each of the car's wheel will move?

6. The radius of the earth is 6440 k.m. The two places A and B on the surface of the earth which subtend an angle of 2° at the centre of the earth. Somaiya takes 't' hours to reach from A to B. The wheel of the car revolves 880 times in a minute. The radius of the wheel is 25 cm.

a) What distance (in metre) does the wheel of the car cover by revolving 5 times?
b) What is the speed of the car? Determine it.
c) Find the value of 't'.

7. Radius of the earth is 6440 km. The arc joining Dhaka with Panchagarh subtend an angle of 5° at the centre of the earth. A person wants to go Panchagarh for seeing the natural beauty in winter season. He is going by a car and the diameter of a wheel of the car is 0.84 m.

a) Express 5° in radian.
b) What is the distance between Dhaka and Panchagarh.
c) Each wheel of the car revolves how many times to travel that distance?

Exercise-8.2

Creative Questions:

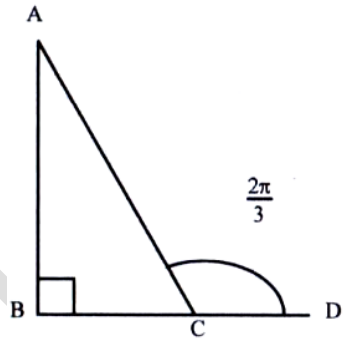
1. $\tan\theta = a, \sec\theta = b$ and $\frac{\cos\theta}{1-\sin\theta} = c$ [D.B.- 19]

a) The measures of the three angles of a triangle are in the ratio 5 : 6 : 7. Express the smallest angle in radians.
b) Prove that, $\frac{a+b-1}{a-b+1} = c$.
c) If $c = \sqrt{3}$, then find the value of 6, where $0 \le \theta \le 2\pi$

2. $x = a\cos\theta$ and $y = b\sin\theta$ [R.B.- 19]

a) If $\frac{x}{y} = 1$, then determine the value of $\frac{a\sin\theta + b\cos\theta}{a\sin\theta - b\cos\theta}$
b) If $x - y = \sqrt{a^2 + b^2 - c^2}$, then prove that, $a\sin\theta + b\cos\theta - c = 0$.
c) If $a = 3$ and $b = \sqrt{2}$, then solve the equation $x + y^2 = 3$ where $0 \le \theta \le 2\pi$.

3. (i)



(ii) $2\sin\alpha\cos\alpha + 1 = 2\cos\alpha + \sin\alpha$ [Dj.B.- 19]

a) If $\cos\theta = -\frac{4}{5}$, then find the value of $\tan\theta$.
b) Prove that, $\cot(A + C) = \frac{\cot A \cot C - 1}{\cot C + \cot A} + \cot B$.
c) Find the solution of the equation given in (ii), where $0 \le \alpha \le 2\pi$

4. $X = \frac{\cot A + \text{cosec}A - 1}{\cot A - \text{cosec}A + 1}$ and $Y = \cot A - \text{cosec}\, A$ [C.B.- 19]

a) If $A = \frac{2\pi}{3}$, then find the value of Y.
b) Prove that, $XY = -1$
c) If $Y = \left(\sqrt{3}\right)^{-1}$ and $0 \le A \le 2\pi$, then find the value of A.

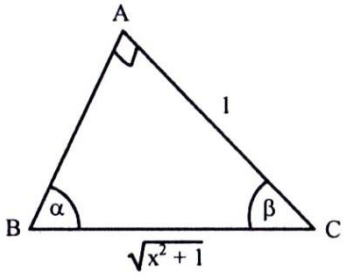
5. Musa Ebrahim saw that a hill subtends angle of $7'$ at a point 540 kilometer from the foot of hill and write an equation is $x = \tan\theta + \sec\theta$. [R.B.- 17]

a) Find the height of the hill.

b) From the equation find the value of $\sin\theta = \frac{x^2-1}{x^2+1}$.

c) From the equation if x = 1, find the value of θ; where $0° \leq \theta < 90°$

6.



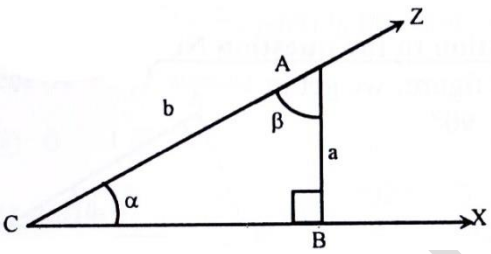
[D.B.- 16]

a) Find the value of $\sin(\alpha+\beta) + \cos(\alpha+\beta)$.

b) Considering the stem prove that, $(\sin\alpha - \cos\alpha)^2 = 1 - 2\sin\alpha.\cos\alpha$.

c) If $x^2 + \frac{1}{x^2} = 2$, then find the value of α.

7.



[C.B.- 16]

a) Find the value of sec α.

b) If a = 1 and b = 2, then prove that, $\cos3\beta = 4\cos^3\beta - 3\cos\beta$.

c) If $a + \sqrt{b^2-a^2} = \sqrt{2}b$, then find the value of β.

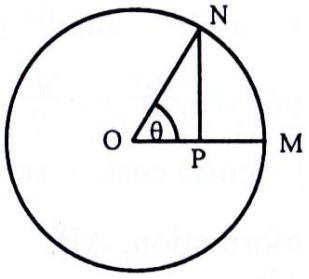
8. P = acosθ and Q = bsinθ. [J.B.- 16]

a) Find the value of $\frac{P^2}{a^2} + \frac{Q^2}{b^2}$.

b) If $P - Q = c$, prove that, $a\sin\theta + b\cos\theta = \pm\sqrt{a^2+b^2-c^2}$

c) If $a^2 = 3, b^2 = 7$ and $Q^2 + P^2 = 4$, prove that $\tan\theta = \pm\frac{1}{\sqrt{3}}$

9.



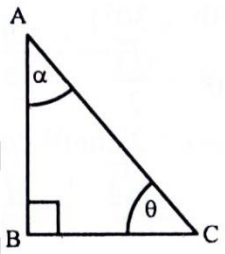
In the figure, O is the centre of a circle and OM = arc MN. [Dj.B.- 16]

a) Express θ in degree.

b) Prove that θ is a constant angle.

c) Determine for what value of θ, $\frac{PN}{ON} + \frac{OP}{ON} = \sqrt{2}$, where $0 < \theta < 2\pi$.

10.



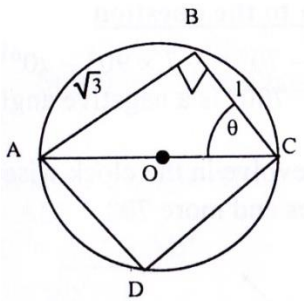
[Ctg.B.- 16]

a) Find the quadrant, in which -700° lie with figure.

b) If $\left(\frac{AC}{BC}\right)^2 + \left(\frac{AB}{BC}\right)^2 = \frac{5}{3}$ then find the value of θ

c) According to the stem, show that, $\sin2\alpha = 2\sin\alpha.\cos\alpha = \frac{2tan\alpha}{1+\tan^2\alpha}$.

11.



ABCD is a cyclic quadrilateral with centre O of the circle ABCD.[S.B.- 16]

a) Find the value of θ in circular system.

b) In ΔABC show that, cos(B + C) = cosB cosC - sinB sinC

c) What is the speed of the wheel, if ABCD is a circular wheel and it revolve ten times in a second?

12. Given, $A = \sec\theta - \tan\theta$

a) If $\theta = \frac{\pi}{4}$, what is the value of $A^2 + 2A$.

b) Prove that, $\sin\theta = \frac{1 - A^2}{1 + A^2}$

c) Show that $\frac{\sin\theta - \cos\theta + 1}{\sin\theta + \cos\theta - 1} = \frac{1}{A}$

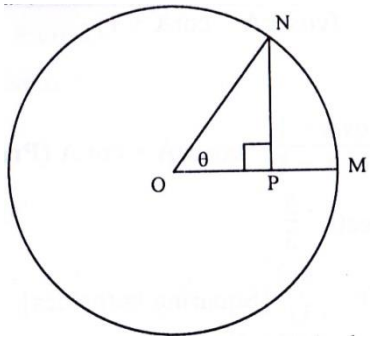
13. We have, $\sin^2 ax + \cos^2 ax = 1$, then-

a) What is the relation between $\sin\theta$ and $\tan\theta$. And why $(\sin\theta)^2 = \sin^2\theta$

b) Prove that, $\frac{\sin A + \cos A + 1}{\sin A - \cos A + 1} = \text{cosec}A + \cot A$.

c) If $\sec\theta = \frac{5}{3}$ and $\tan\theta$ negative, the find the value of $\frac{\text{cosec}\theta - \cot\theta}{\text{cosec}\theta + \cot\theta}$

14. In the figure, O is the centre of a circle and OM = arc MN

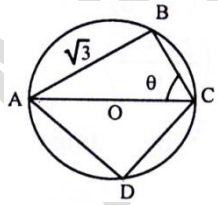


a) Express the angle θ in degree.

b) Prove that, θ is a constant angle

c) Determine for what value of θ $\frac{PN}{ON} + \frac{OP}{ON} = \sqrt{2}$, where $0 < \theta < 2\pi$

15.



ABCD is a cyclic quadrilateral.

a) Find the area of the ΔABC.

b) Prove that $\cot A + \cot B + \cot C + \cot D = 0$.

c) Find the value of θ and with the value of θ justify the identity $\sin 3\theta = 3\sin\theta - 4\sin^3\theta$

16. $x\cos A - y\sin A = z$

a) Show that $\tan B + \cot B = \sec B \text{cosec} B$

b) Show that, $y\cos A + x\sin A = \pm\sqrt{x^2 + y^2 - z^2}$

c) If $x = 3, y = -2\sin A$ and $z = 0$, find the value of A where $0 < A < 2\pi$.

Chapter – 11
Coordinate Geometry
Exercise-11.1

Creative Questions:

1. A(3, 4), B(−4, 2) and C(6, −1) are three vertices of a triangle.

a) Find the length of the median AD?

b) Determine the area of the triangle ABC.

c) If the point P(x, y) is equidistant from A and B then show that, 14x + 4y = 5

2. A(0, -l), B(-2, 3), C(6, 7) and D(8, 3) are the vertices of a quadrilateral.

a) What is the basic difference between quadrilateral and polygon?

b) Show these four vertices form a rectangle.

c) Find out the area and length of the diagonals of the quadrilateral.

3. A straight line pass through the points B (5, 8) and C(1, 12).

a) Find the distance between B and C.

b) Determine the equation of straight line. Also find the coordinate of the points at which the line intersects the axes.

c) What type of quadrilateral form with the vertices A (5, 0), B, C and D (1, 4)? Find its area.

Exercise-11.2

Creative Questions:

1. A(6, 12), B(2, -3), C(6, - 3) and D(10, 12) are the vertices of a quadrilateral. [D.B.- 19]

a) Find the slope of the straight line passing through the points P (-3, 4) and Q (-4, 2).

b) Ascertain whether the quadrilateral formed with the points A, B, C and D is a parallelogram or a rectangle.

c) Find the area of the portion of the quadrilateral ABCD which lies on the first quadrant.

2. The vertices of a quadrilateral, arranged in anti-clockwise order, are P(3, 4), Q(-4, 2), R(6, - 1) and S(k, 3). [C.B.- 19]

a) Find the slope of the straight line passing through the points Q and R.

b) From the point T(x, y) the distance of Q is equal to the distance of R, prove that, 20x - 6y = 17.

c) Find the value of k if the area of the quadrilateral PQRS is thrice the area of the triangle PQR.

3. BCDE is a cyclic quadrilateral which vertices are B(3p – 2, p), C(6p, 6p + 1), D(6 + 2p, 3p), E (– 2p, p + 2) and BD and CE are its diagonals.[S.B.- 19]

a) Show that, the slope of the straight line connecting the points M(2, 7) and N(5, 3) make obtuse angle with x-axis positively.

b) If P = - 1, then draw the quadrilateral and find its area.

c) Prove that, the area of the rectangle contained by BD and CE is equal to the sum of the area of the two rectangles contained by the two pairs of opposite sides.

4. The vertices of a quadrilateral are P (-4, 12), Q(7, 7), R (10, -4) and S(6, 0). [J.B.- 19]

a) Find the distance of PR.

b) Find the area of the quadrilateral PQRS by showing in a graph.

c) Find the area of the triangle which is produced by x-axis and y axis with the line PS.

5. $\mathbf{A(3,-6), B(-6,-2), C(-2, b)}$ and D(8, -4) are four points their position on the same plane. [C.B.- 17]

a) Find the distance between B and C.

b) If the distance of x-axis and the point A are equal from P(x, y), show that, $x^2 - 6x + 12y + 45 = 0$.

c) Find the area of the quadrilateral ABCD taking the vertices in anti-clockwise order and find the perimeter of ABCD

6. The distance of any point of the from (x, x) from a point R(3, -3) is twice the distance of the point from the y-axis.

a) What are the values of x.

b) If there are two points P and Q satisfying the stimulus condition, find the nature of ΔPQR.

c) Find the area of the triangle PQR in terms of its sides and perimeter.

7. $\mathbf{A(2,3), B(8,1), C(11,5)}$ and D(x, y) are four vertices of a parallelogram.

a) Find the slope of AB.

b) Prove that by vector methods that the diagonals, AC and BD bisect each other.

c) Find the co-ordinate of D.