

**AHSEC Class 11 Exam Sample Paper - 3**

**Mathematics**

**Full marks -100**

**Time - 3 hrs.**

Q1. Answer the followings:

(1x10=10 Marks)

- a) A set which does not contain any element is called \_\_\_\_\_.
- b) A power set of a set A is \_\_\_\_\_ of all subsets of A.
- c) If  $n(A) = p$  and  $n(B) = q$ , then  $n(A \times B) =$  \_\_\_\_\_
- d) Two lines are *parallel* if and only if their slopes are \_\_\_\_\_.
- e) Solve  $-12x > 30$ , when  $x$  is an integer
- f) How many chords can be drawn through 21 points on a circle?
- g) If  $(a, b) = (x, y)$ , then  $a =$  \_\_\_\_\_ and  $b =$  \_\_\_\_\_.
- h) Find the centre and radius of the circles:  $(x + 5)^2 + (y - 3)^2 = 36$
- i) Solve the inequality:  $3x - 7 > 5x - 1$
- j) An \_\_\_\_\_ is the set of all points in a plane, the sum of whose distances from two fixed points in the plane is a constant.

Q2. Solve the followings (3x10=30 Marks)

- i) In a group of students, 100 students know Hindi, 50 know English and 25 know both. Each of the students knows either Hindi or English. How many students are there in the group?
- ii) Find the angle between the  $x$ -axis and the line joining the points  $(3, -1)$  and  $(4, -2)$ .
- iii) Find the 4th term in the expansion of  $(x - 2y)^{12}$ .

iv) Let  $R$  be the relation on  $\mathbf{Z}$  defined by  $R = \{(a,b): a, b \in \mathbf{Z}, a - b \text{ is an integer}\}$ . Find the domain and range of  $R$ .

v) Ravi obtained 70 and 75 marks in first two unit test. Find the minimum marks he should get in the third test to have an average of at least 60 marks.

vi) In how many ways can a team of 3 boys and 3 girls be selected from 5 boys and 4 girls?

vii) Prove using the principle of mathematical induction for all  $n \in \mathbf{N}$ :

$$a + ar + ar^2 + \dots + ar^n = \frac{a(r^n - 1)}{r - 1}$$

viii) Find all pairs of consecutive even positive integers, both of which are larger than 5 such that their sum is less than 23.

ix) Solve the following system of inequalities graphically:  $x + y \leq 6$ ,  $x + y \geq 4$

x) Find the general solution for each of the equation:  $\sin x + \sin 3x + \sin 5x = 0$ .

Q3. Solve the followings (4x10=40 Marks)

i) Without using the Pythagoras theorem, show that the points (4, 4), (3, 5) and (-1, -1) are the vertices of a right angled triangle.

ii) Prove That  $n(n + 1)(n + 5)$  is a multiple of 3

iii) In the expansion of  $(1 + a)^{m+n}$ , prove that coefficients of  $a_m$  and  $a_n$  are equal

iv) Find equation of the line parallel to the line  $3x - 4y + 2 = 0$  and passing through the point (-2, 3).

v) Find the distance of the point (-1, 1) from the line  $12(x + 6) = 5(y - 2)$ .

vi) Find the number of arrangements of the letters of the word INDEPENDENCE. In how many of these arrangements:

a.	do the words start with P
b.	do all the vowels always occur together

vii) Find the equation of the parabola that satisfies the given conditions:

Vertex (0,0) passing through (2,3) and axis is along  $x$ -axis.

[Mathdart.com](http://Mathdart.com)

viii) Find the principal and general solutions of the equation:  $\operatorname{cosec} x = -2$

ix) Prove:  $\sin 2x + 2 \sin 4x + \sin 6x = 4 \cos^2 x \sin 4x$

x) Prove:  $\frac{\sin x - \sin 3x}{\sin^2 x - \cos^2 x} = 2 \sin x$

Q4. Solve the followings (5x4=20 Marks)

i) If  $p$  is the length of perpendicular from the origin to the line whose intercepts on the axes are  $a$  and  $b$ , then show that

$$\frac{1}{p^2} = \frac{1}{a^2} + \frac{1}{b^2}$$

ii) A bag contains 5 black and 6 red balls. Determine the number of ways in which 2 black and 3 red balls can be selected.

iii) Find the coordinates of the foci and the vertices, the eccentricity and the length of the latus rectum of the hyperbola.

$$16x^2 - 9y^2 = 576$$

iv) Prove That:  $\tan 4x = \frac{4 \tan x (1 - \tan^2 x)}{1 - 6 \tan^2 x + \tan^4 x}$  and Find the value of  $\sin 75^\circ$ .

[Mathdart.com](http://Mathdart.com)

-----X-----X-----