



**DELHI PUBLIC SCHOOL**  
**SAIL TOWNSHIP, RANCHI**  
**HALF YEARLY EXAMINATION (2017-18)**

Class:- X  
Time- 3 Hrs.

Subject:- Mathematics  
F. M:- 80

General Instructions:-

1. All the questions are compulsory.
2. Section-A comprises of 4 questions of 1 mark each.
3. Section-B comprises of 6 questions of 2 marks each.
4. Section - C comprises of 8 questions of 3 marks each.
5. Section - D comprises of 10 questions of 4 marks each.

Section - A

[1x4=4]

1. What is the least number that is divisible by all the numbers from 1 to 10?
2. If both the zeros of the quadratic polynomial  $ax^2 + bx + c$  are equal and opposite in sign, find the value of b.
3. If  $\sec 4A = \operatorname{cosec} (A - 20^\circ)$ , where  $4A$  is an acute angle, find the value of A.
4. For a given data, with 70 observations the 'less than ogive' and the 'more than ogive' intersect at (20.5, 35). Find the median of the data.

Section - B

[2x6=12]

5. Find the zeroes of the polynomial  $f(u) = 4u^2 + 8u$  and verify the relation between the zeroes and its coefficients.
6. If  $\tan \theta + \cot \theta = 2$ , evaluate  $\sin \theta + \cos \theta$
7. If  $\Delta ABC \sim \Delta DEF$  such that the area of  $\Delta ABC$  is  $9 \text{ cm}^2$  and the area of  $\Delta DEF = 16 \text{ cm}^2$  and  $BC = 2.1 \text{ cm}$ . Find the length of EF.
8. A game consists of tossing a one rupee coin three times and noting its outcome each time. Hanif wins if all the tosses give the same result. Calculate the probability that Hanif will lose the game.
9. Find the value of 'k' for which the given equation has real roots.  
 $kx^2 - 6x - 2 = 0$
10. If  $S_n$  be the sum of first 'n' terms of an A.P. given by  $S_n = 5n^2 + 3n$ , calculate its  $n^{\text{th}}$  term.

Section - C

[3x8=24]

11. Show that the square of any positive integer is of the form  $3m$  or  $3m + 1$  for some positive integer m.
12. If the zeroes of the polynomial  $f(x) = x^3 - 3x^2 + x + 1$  are  $a-b$ ,  $a$ ,  $a+b$ , find 'a' and 'b'.
13. Solve the equation:-  
 $x + y = a + b$   
 $ax - by = a^2 - b^2$
14. Prove the following trigonometric identity:-  
$$\frac{\cos A - \sin A + 1}{\cos A + \sin A - 1} = \operatorname{Cosec} A + \cot A$$
15. ABC is an isosceles triangle right - angled at B. Similar triangles ACD and ABE are constructed on the sides AC and AB. Find the ratio between the areas of  $\Delta ABE$  and  $\Delta ACD$ .

16. Find the mean of the following frequency distribution using step-deviation method:

CI	0-10	10-20	20-30	30-40	40-50
Frequency	7	12	13	10	8

17. If the  $m^{\text{th}}$  term of an A. P. be  $\frac{1}{n}$  and  $n^{\text{th}}$  term  $\frac{1}{m}$ , show that its  $(mn)^{\text{th}}$  term is 1 .
18. If the equation  $(1+m^2)x^2 + 2mcx + (c^2 - a^2)$  has equal roots , prove that  $c^2 = a^2(1+ m^2)$

Section - D

[10x4=40]

19. (i) Prove that  $3+2\sqrt{5}$  is irrational .  
(ii) Prove that there is no natural number for which  $4^n$  end with the digit zero.
20. Find all the zeros of the polynomial  $f(x) = x^4 - 6x^3 - 26x^2 + 138x - 35$  if two zeros are  $2 \pm \sqrt{3}$
21. The fraction of people in a society using CNG in their vehicles becomes  $\frac{9}{11}$ , if 2 is added to both its numerator and denominator and it becomes  $\frac{5}{6}$ , if 3 is added to both the numerator and the denominator. Find the fraction. Which environmental value is being depicted by the above fraction?
22. If  $\sec \theta + \tan \theta = p$ , show that  $\frac{p^2-1}{p^2+1} = \sin \theta$
23. State and prove Pythagoras Theorem.
24. A spiral is made up of successive semi-circles with centres alternately at A and B starting with centre at A, of radii 0.5 cm, 1.0 cm, 1.5 cm, 2.0 cm and so on. What is the total length of such a spiral made up of thirteen consecutive semi-circles? (Take  $\pi = \frac{22}{7}$ )
25. The median of the distribution of 60 students below is 28.5 , find the values of x and y.

CI	0-10	10-20	20-30	30-40	40-50	50-60
No. Of Students	5	x	20	15	y	5

26. Rs. 6500 were divided equally among a certain number of persons. Had there been 15 more persons each would have got Rs. 30 less. Find the original number of persons.
27. If the angle of elevation of a cloud from a point h metres above a lake is  $\alpha$  and the angle of depression of its reflection in the lake is  $\beta$ , prove that the height of the cloud is

$$\frac{h (\tan \beta + \tan \alpha)}{\tan \beta - \tan \alpha}$$

28. On the disc shown below, a player spins the arrow twice. The fraction  $\frac{a}{b}$  is formed where a is the number of the sector where the arrow stops after the first spin and b is the number of the sector where the arrow stops after the second spin. On every spin each of the numbered sector has an equal probability of being the sector on which the arrow stops. What is the probability that the fraction  $\frac{a}{b}$  is greater than 1?

