

**NORTH EX PUBLIC SCHOOL**  
**(SENIOR SECONDARY, AFFILIATED TO CBSE)**  
**SCHOOL BLOCK, JAIN NAGAR, SECTOR-38, ROHINI, DELHI-81**  
**HALF YEARLY EXAMINATION , 2023-24**  
**SUBJECT- MATHEMATICS(041)**  
**CLASS-X**

Time Allowed: 3 Hours

Maximum Marks: 80

General Instructions :

1. This Question paper contains - five sections A, B, C, D and E. Each section is compulsory. However, there are internal choices in some questions.
2. Section A has 18 MCQ's and 02 Assertion-Reason based questions of 1 mark each.
3. Section B has 5 Very Short Answer (VSA)-type questions of 2 marks each.
4. Section C has 6 Short Answer (SA)-type questions of 3 marks each.
5. Section D has 4 Long Answer (LA)-type questions of 5 marks each.
6. Section E has 3 source based/case based/passage based/integrated units of assessment (4 marks each) with sub parts.

**SECTION A**

1. Find the 12<sup>th</sup> term of the A and P: 5,8,11,14,.....?  
a)30                      b)38                      c)40                      d) none
2. A die thrown once, the probability of getting a prime number is?  
a)  $\frac{1}{2}$                       b)  $\frac{1}{3}$                       c) 1                      d) 0
3. Find the area of sector of central angle  $x^\circ$  of a circle with radius  $4r$ ?  
a)  $2x^0\pi r^2/45$       b)  $2x^0r^2/45$                       c)  $4x^0\pi r^2/45$       d)none
4. If  $\alpha$  and  $\beta$  are the zeros of a polynomial  $f(x) = 2x^2 + 7x + 5$  then the value of  $\alpha + \beta + \alpha\beta$ , is  
(a)-1                      (b) 0                      (c) 1                      (d) 2
5. If the system of equations  $3x+y=1$  and  $(2k-1)x+(k-1)y=2k+1$  is inconsistent, then  $k =$   
(a) -1                      (b) 0                      (c) 1                      (d) 2
6. If  $x \tan 60^\circ \cos 60^\circ = \sin 60^\circ \cot 60^\circ$ , then  $x =$   
(a)  $\cos 30^\circ$                       (b)  $\tan 30^\circ$                       (c)  $\sin 30^\circ$                       (d)  $\cot 30^\circ$
7. If  $15 \cot A = 8$ , find  $\sin A$ .  
(a)  $\frac{17}{5}$                       (b)  $\frac{12}{5}$                       (c)  $\frac{15}{17}$                       (d)  $\frac{15}{12}$
8. If  $a$ ,  $(a-2)$  and  $3a$  are in A.P, what is the value of  $a$ .  
(a) -2                      (b) 2                      (c) 3                      (d) 4
9. If in the two triangles ABC and PQR,  $\frac{AB}{QR} = \frac{BC}{PR} = \frac{CA}{PQ}$ ?  
(a)  $\Delta PQR \sim \Delta ABC$       (b)  $\Delta PQR \sim \Delta CAB$       (c)  $\Delta CBA \sim \Delta PQR$       (d)  $\Delta BCA \sim \Delta PQR$
10. If the vertices of a parallelogram PQRS taken in order are P(3,4), Q(-2,3) and R(-3,-2), then the coordinates of its fourth vertex S are  
(a) (-2,-1)                      (b) (-2,-3)                      (c) (2,-1)                      (d) (1,2)
11. Value of K for which the quadratic equation  $2x^2 - kx + k = 0$  has equal roots is/are  
(a) 0                      (b) 4                      (c) 8,2                      (d) 0
12. The number of revolutions made by a circular wheel of radius 0.25 in rolling a distance of 11 km is  
(a) 2800      (b) 4000      (c) 5500      (d) 7000
13. If the point P(x,4) lies on a circle whose centre is at origin and radius is 5 units, then the values of x are  
(a)  $\pm 2$                       (b)  $\pm 3$                       (c)  $\pm 4$                       (d)  $\pm 5$
14. The pair  $3x + 2 = 0$  and  $2x - 3y - 7 = 0$  of linear equations has  
(a) no solution      (b) one solution      (c) two solutions      (d) infinite solutions

15. Which of the following number is a prime number?  
 (a) 105            (b) 109            (c) 117            (d) 119
16. A card is selected at random from a pack of 52 cards . The probability of its being a red face card is  
 (a)  $3/26$             (b)  $3/13$             (c)  $2/13$             (d)  $1/2$
17. If a pair of linear equations in two variables is inconsistent , then the lines are  
 (a) coincident      (b) parallel      (c) intersecting      (d) coincident or intersecting
18. If p, q are two consecutive natural numbers , then LCM (p,q) is  
 (a) q                (b) p                (c) 1                (d) pq

**DIRECTION:** In the question number 19 and 20, a statement of **assertion (A)** is followed by a statement of **Reason (R)**.

Choose the correct option

- (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A)  
 (b) Both assertion (A) and reason (R) are true and reason (R) is not the correct explanation of assertion (A)  
 (c) Assertion (A) is true but reason (R) is false.  
 (d) Assertion (A) is false but reason (R) is true

**19 .Statement A (Assertion):** The H.C.F of two numbers is 16 and their product is 3072. Then there is L.C.M = 162.

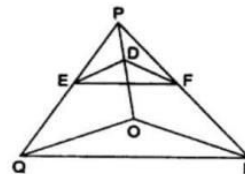
**Statement R( Reason) :** If a and b are two positive integers then  $H.C.F \times L.C.M = a \times b$

**20. Statement A (Assertion):** the mid- point of the line segment (4,6) and (2,-6) is (3,0).

**Statement R( Reason) :** section formula =  $((x_1+x_2)/2), ((y_1+y_2)/2)$

### SECTION B

21. In figure, DE || OQ and DF || OR. Show that EF|| QR.



- 22.If  $\sin(A+B) = 1$  and  $\cos(A-B) = \sqrt{3}/2$ ,  $0^\circ < A+B \leq 90^\circ$  and  $A > B$ , then find the measures of angles A and B.
- 23.For what value of k, will the following pair of linear pair have infinitely many solution  $2x + 3y = 4$  and  $(k + 2)x + 6y = 3k + 2$ .
- 24.Evaluate  $4/3 \tan^2 30^\circ + \sin^2 60^\circ - 3\cos^2 60^\circ + 3/4 \tan^2 60^\circ - 2\tan^2 45^\circ$ .
- 25.Diagonals AC and BD of a trapezium ABCD with AB || DC intersersect each other at the point O.  
 Using a similarity criterion for two triangles ,show that  $\frac{OA}{OC} = \frac{OB}{OD}$  .

### SECTION C

- 26.A card is drawn at random from a well shuffled deck of playing cards. Find the probability that the card drawn is  
 (i) A card of spades of an ace  
 (ii) A red king  
 (iii) Neither a king nor a queen  
 OR  
 A coin is tossed 3 times. Find the probability of getting  
 i)Atmost two heads  
 ii) At least two heads
27. Two APs have the same common difference. The difference between their 100<sup>th</sup> terms in 100. What is the difference between their 1000<sup>th</sup> term?
- 28.Prove that  $\sqrt{5}$  is an irrational number.
- 29.Five year hence, the age of Jacob will be three times that of his son. Five years ago, Jacob's age was seven times that of his son. What are their present ages?.
30. The sum of the 4<sup>th</sup> and 8<sup>th</sup> terms of an A.P is 24 and the sum of the 6<sup>th</sup> and 10<sup>th</sup> term is 44. Find the first three terms of the A.P. of

31. If  $\alpha$  and  $\beta$  are the zeroes of the quadratic polynomial  $f(x) = x^2 - 4x + 3$ , what is the value of
- $\alpha^4 \beta^3 + \alpha^3 \beta^4$
  - $\alpha^2 + \beta^2$

### SECTION D

32. Find the relation between  $x$  and  $y$  such that the point  $(x, y)$  is equidistant from the points  $(7, 1)$  and  $(3, 5)$ .
33. Prove the following identity, where the angles involved are acute angles for which the expressions are defined  $\frac{\cos A}{1 + \sin A} + \frac{1 + \sin A}{\cos A} = 2 \sec A$

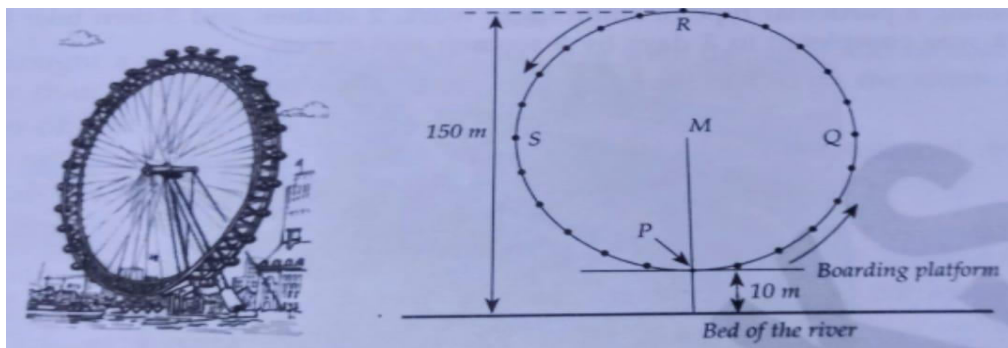
OR

Prove:  $(\sin A + \operatorname{cosec} A)^2 + (\cos A + \sec A)^2 = 7 + \tan^2 A + \cot^2 A$

34. Prove that if a line is drawn parallel to one side of a triangle intersecting the other two sides in distinct points, then the other two sides are divided in the same ratio.
35. In a circle of radius 21 cm, an arc subtends an angle of  $60^\circ$  at the centre. Find
- the length of the arc
  - area of the sector formed by the arc
  - area of the segment formed by the corresponding chord.

### SECTION E

**36. CASE STUDY-1 :** In a fair, a giant wheel was fixed. The giant wheel is in the shape of a circle divided into 12 equal sectors as shown in the diagram below. Based on this, answer the following questions



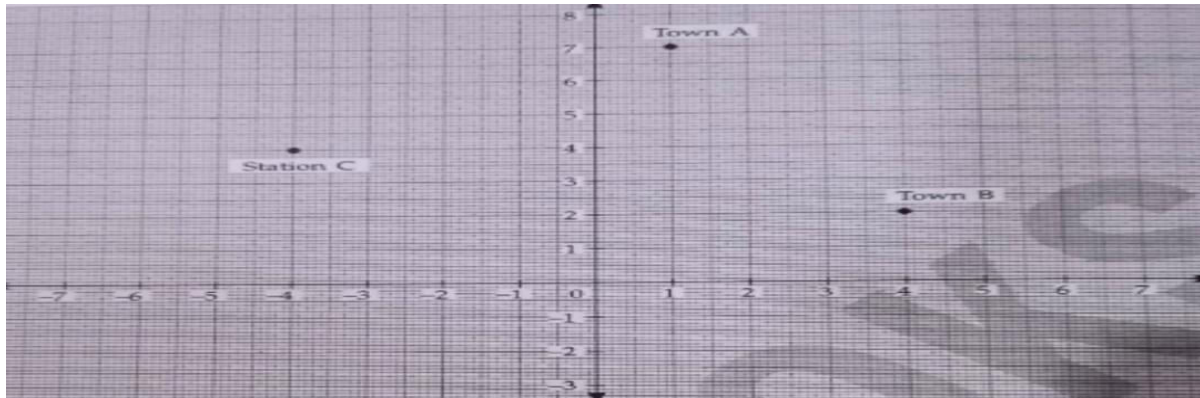
- Find the radius of the circular wheel.
- Find the angle formed by each sector at the centre.
- Find the area of each sector of the circle.

**37. CASE STUDY-2:** Shown below is the growth of a sapling. If you observe carefully it is growing in an AP Its height in the third week was 7 cm and in the 7th week it was 19 cm. Based on the above information, answer the following questions.



- What is the growth of the sapling per week?
- In which week will the sapling grow up to a height of 31 cm?
- What will be the height (in cm) of the plant in the 25th week?

**38.CASESTUDY-3:** Two friends Seema and Aditya work in the same office at Delhi. In the Christmas vacations, both decided to go to their hometowns represented by Town A and Town B respectively in the figure given below. Town A and B are connected by trains from the same station C (in the given figure) in Delhi. Based on the given situation, answer the following questions:



- I. Who will travel more distance, Seema or Aditya, to reach to their hometown?
- II. Seema and Aditya planned to meet at a location D situated at a point D represent the mid-point of the line joining the points represented by Town A and Town B.  
Find coordinates of the point represented by the point D.
- III. Find the area of the triangle formed by joining the points represented by A, B and C.