First Term Examination(2017 – 2018)

Class: X

M. Marks: 80

Subject: Mathematics

Time: 3hrs

SET-A

INSTRUCTIONS

- *All Questions to be answered in the Answer Script only*
- *All questions are compulsory and statements should be systematic as per requirement.*
- *The paper is of four pages and consists of 28 questions divided into four sections A, B, C and D.*
- *Section A consists 4 questions of 1mark each*
- *Section B consists of 5 questions of 2 marks each*
- *Section C consists of 10 questions of 3 marks each*
- *Section D consists of 9 questions of 4 marks each.*
- *One graph sheets will be provided with this paper.*
- *All figures given in the question paper are " Not to the scale".*
- *Use of Calculators is not permitted.*

Section A

1. If the prime factorization of a natural number n is $2^4 \times 3^4 \times 5^3 \times 7$, write the number of zeroes in the end of n.

2. If $p(x) = \sqrt{3}x^2 - 2x - \sqrt{3}$ is a polynomial, then find one of its zeroes.

3. How many solutions can the following system of equations: $ax + by = 3$ and $3ax + 3by = 4$ possibly have for any non-zero real value of a and b.

4. Find the coordinates of the point on the x-axis which is equidistant from the points (5, -2) and (-3, 2).

Section B

5. Is it possible to design a rectangular park of perimeter 80 m and area 300 m^2. Explain mathematically.

6. Find 'k' so that the quadratic equation $(k+1)x^2 - 2(k+1)x + 1 = 0$ has equal roots.

7. Prove the identity $\sqrt{(1 - Cos^2\theta)Sec^2\theta} = tan\theta$

8. Corresponding sides of two similar triangles are in the ratio **2:3**. If the area of the smaller triangle is **48cm²**, find the area of the larger triangle.

9. Solve for x and y :

$$\frac{2}{\sqrt{x}} + \frac{3}{\sqrt{y}} = 2$$

$$\frac{4}{\sqrt{x}} - \frac{9}{\sqrt{y}} = -1$$

Section C

10. Anya takes **32** minutes to complete one round of cycling around a circular biking path. Vidisha takes **24** minutes for the same. Both of them start at the same point at **6:00 am**. After how many rounds will the two cyclists meet again at the starting point?

11. If α and β are the zeroes of the polynomial $2x^2 - 6x + k$ and $2\alpha + 5\beta = 12$, find the value of k.

12. If D (3,-2), E (-3,1) and F(4,-3) be the midpoints of sides BC, CA and AB respectively of $\triangle ABC$. Then find the coordinates of the vertices A, B and C.

13. In $\triangle ABC$, D and E are points on AB and AC such that DE // BC and AD= (4x-3) cm, AE= (8x-7) cm, BD = (3x-1) cm and CE = (5x-3) cm. Find the value of x.

14. If PA // RC, are separated at a distance of $(a + b)$ and are both perpendicular to line AC. On joining, PC and RA intersect at point Q. Also QB is perpendicular to AC. If PA= x, RC= y, QB= z, AB= a and BC= b, prove that: $\dfrac{1}{x} + \dfrac{1}{y} = \dfrac{1}{z}$
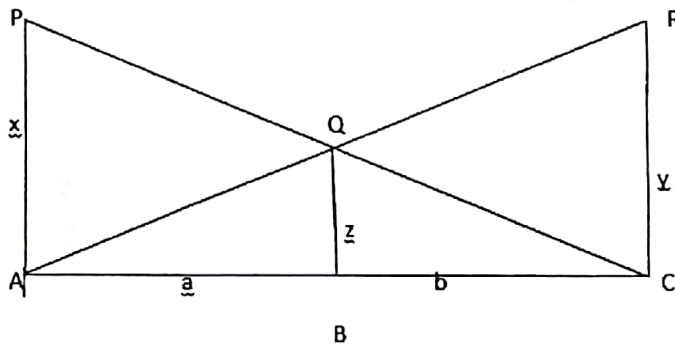
15. Find the value of θ, if $2Sin^2\theta - Cos^2\theta = 2$.

16. Prove the identity: $\dfrac{Sin\theta}{1 + Cos\theta} + \dfrac{1 + Cos\theta}{Sin\theta} = 2Cosec\theta$

17. Draw the graphs of the equations $5x - y = 5$ and $3x - y = 3$. Determine the coordinates of the vertices of the triangle formed by these lines and the y axis.

18. If 9th term of an A.P. is zero, prove that its 29th term is double the 19th term.

19. Find the three numbers in an arithmetic progression whose sum is 48 and the sum of their squares is 800.

Section D

20. A trader bought a number of articles for ₹ 900, five were damaged and he sold each of the rest at ₹ 2 more than what he paid for it, thus getting a profit of ₹ 80 on the whole transaction. Find the number of articles he bought.

21. Find the area of triangle formed by joining the midpoints of the sides of the triangle whose vertices are (2 , 2), (4 , 4) and (2 , 6).

22. If $1 + Sin^2\theta = 3Sin\theta Cos\theta$, then prove that $tan\theta = 1$ or $\frac{1}{2}$

23. The pilot of an aircraft flying horizontally at a speed of 1200 Km/hr observes that the angle of depression of a point on the ground changes from 30° to 45° in 15 seconds. Find the height at which the aircraft is flying.

24. A vertical tower stands on a horizontal plane and is surmounted by a vertical flag staff of height h. At a point on the plane, the angles of elevation of the bottom and the top of the flag staff are α and β, respectively. Prove that the height of the tower is $\left(\dfrac{htan\alpha}{tan\beta - tan\alpha}\right)$

25. Prove that $\sqrt{3}$ is an irrational number. Use this to show that $\dfrac{2}{2+\sqrt{3}}$ is irrational.

26. In $\triangle ABC$, $\angle ABC > 90°$ and $AD \perp CB$. Prove that $AC^2 = AB^2 + BC^2 + 2BC.BD$

27. A train covered a certain distance at a uniform speed. If the train would have been 10 km/h faster, it would have taken 2 hours less than the scheduled time. And if the train were slower by 10 km/h; it would have taken 3 hours more than the scheduled time. Find the distance covered by the train.

28. The coefficients a, b, c of the quadratic equation $ax^2 + bx + c = 0$ form an arithmetic progression. If one root of this equation is 2. Find the other root.