Tamilnadu Board Class 11 Maths Sample Paper

HIGHER SECONDARY FIRST YEAR

MATHEMATICS

QUARTERLY MODEL QUESTION PAPER – 1

Time Allowed: 2.30 Hours] **[Maximum Marks:90**

Instructions: (a) Check the question paper for fairness of printing. If there is any lack of fairness, inform the Hall Supervisor immediately.

(b) Use **Blue** or **Black** ink to write and underline and pencil to draw diagrams.

SECTION – I

Note: (i) **All** questions are **compulsory.** $20\times1=20$

(ii) Choose the correct or most suitable answer from the given **four** alternatives. Write the option code and the corresponding answer.

1. If $A=\{(x,y):y=sinx,x\in\mathbb{R}\}$ and $B=\{(x,y):y=cosx,x\in\mathbb{R}\}$ then $A\cap B$ contains

(1) no element (2) infinitely many elements

(3) only one element (4) cannot be determined.

2. The number of relations on a set containing 3 elements is

(1) 9 (2) 81 (3) 512 (4) 1024

3. The function $f:[0,2\pi]\to[-1,1]$ defined by $f(x)=\sin x$ is

(1) one-to--one (2) onto

(3) bijection (4) cannot be defined

4. Let $f:\mathbb{R}\to\mathbb{R}$ be defined by $f(x)=1-|x|$. Then the range of f is

(1) $\mathbb{R}$ (2) $(1,\infty)$ (3) $(-1,\infty)$ (4) $(-\infty,1]$

5. If a quadratic equation with real co-efficient has no real roots,then its discriminant is

(1) 0 (2) <0 (3) >0 (4) 1

6. If $|x+2|\leq 9$, then x belongs to

(1) $(-\infty,-7)$ (2) $[-11,-7]$ (3) $(-\infty,-7)\cup[11,\infty)$ (4) $(-11,7)$

7. If a and b are the roots of the equation $x^2 - kx + 16 = 0$ and satisfy $a^2 + b^2 = 32$, then the value of k is/are

(1)10 (2) –8 (3) –8,8 (4) 6

8. If $\sqrt{x+14} < 2$ then x belongs to

(1) $[-14,-10)$ (2) $(-14,-10)$

(3) $(-\infty,-10)$ (4) $[-14,-10)$

9. $\cos 1 + \cos 2 + \cos 3 + \ldots + \cos 179$ is

(1) 0 (2)1 (3) –1 (4) 89

10. Which one of the following is not true for any θ?

(1) $\sin\theta = -\frac{3}{4}$ (2) $\cos\theta = -1$ (3) $\tan\theta = 25$ (4) $\sec\theta = \frac{1}{4}$

11. A wheel is spinning at 2 radians/second. How many seconds will it take to make 10 complete revolutions?

(1) 10π seconds (2) 20π seconds

(3) 5π seconds (4) 15π seconds

12. $\frac{\sin 10^\circ - \cos 10^\circ}{\cos 10^\circ + \sin 10^\circ}$ is

(1) $\tan 35^\circ$ (2) $\sqrt{3}$ (3) $\tan 75^\circ$ (4) 1

13. The product of r consecutive positive integers is divisible by

(1) $r!$ (2) $(r-1)!$ (3) $(r+1)!$ (4) r^r

14. The number of sides of a polygon having 44 diagonals is

(1) 4 (2) 4! (3) 11 (4) 22

15. If ${}^nC_4, {}^nC_5, {}^nC_6$ are in AP then the value of n is

(1) 14 (2) 11 (3) 9 (4) 5

16. The sum of the digits in the unit's place of all the 4-digit numbers formed by 3, 4, 5 and 6 , without repetition, is

(1) 432 (2) 108 (3) 36 (4) 72

17. If a is the arithmetic mean and g is the geometric mean of two numbers, then

(1) $a \le g$ (2) $a \ge g$ (3) $a = g$ (4) $a > g$

18. The coefficient of $x^8 y^{12}$ in the expansion of $(2x+3y)^{20}$ is

(1) 0 (2) $2^8 3^{12}$ (3) $2^8 3^{12} + 2^{12} 3^8$ (4) ${}^{20}C_8 2^8 3^{12}$

19. The value of $\frac{1}{2!} + \frac{1}{4!} + \frac{1}{6!} + \cdots$ is

(1) $\frac{e^2+1}{2e}$ (2) $\frac{(e+1)^2}{2e}$ (3) $\frac{(e-1)^2}{2e}$ (4) $\frac{e^2+1}{2e}$

20. The remainder when 52^{40} is divided by 17 is

(1) 1 (2) 3 (3) 5 (4) 6

SECTION – II

Note: (i) Answer any **SEVEN** questions. $7 \times 2 = 14$

(ii) Question number **30 is compulsory.**

21. If $A = \{1,2,3,4\}$ and $B = \{3,4,5,6\}$, find $n\big((A \cup B) \times (A \cap B) \times (A \Delta B)\big)$.

22. In the set $\mathbb{Z}$ of integers, define mRn if $m-n$ is a multiple of 12. Prove that R is an equivalence relation.

23. If $A \times A$ has 9 elements $S = \{(a,b) \in A \times A : a > b\}$, where $(2,-1)$ and $(2,1)$ are two elements, then find the remaining elements of S.

24. Prove that $\log a + \log a^2 + \log a^3 + \cdots + \log a^n = \frac{n(n+1)}{2} \log a$.

25. Solve: $(x-2)(x+3)^2 < 0$.

26. If $A + B = 45$, show that $(1+\tan A)(1+\tan B) = 2$

27. Prove that $\frac{\sin 4x + \sin 2x}{\cos 4x + \cos 2x} = \tan 3x$

28. Out of the 6 consonants and 4 vowels, how many strings of 3 consonants and 2 vowels can be formed?

29. Show that $\sum_{k=1}^{n} \frac{1}{k(k+1)} = 1 - \frac{1}{n+1}$

30. Prove that $\log_4 2 - \log_8 2 + \log_{16} 2 - \cdots = 1 - \log_e 2$.

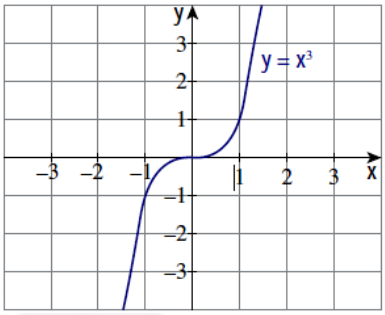
SECTION – III

Note: (i) An r **SEVEN** questions. $7\times3=21$

(ii) Qu umber **40 is compulsory.**

31. If $f:\mathbb{R}\to\mathbb{R}$ by $f(x)=3x-5$, prove that f ction and find its inverse.

32. Using the given curve $=x^3$, draw $y=(x+1)^3$ with the same scale.



33. If one root of x $5x-7$ is double the other root, show that $k=2$ or $-$.

34. R ol e a r t ons : $\dfrac{10x+30}{(x^2-9)(x+7)}$.

35. Suppose that a boat trave m r t wa a d then turns 60° to its left. If the boat travels r he boat?

36. If $A+B+C=\dfrac{\pi}{2}$, prove hat n $A+$ s $B+$ in $2C=4\cos A$ co $B\cos C$.

37. How many different selec ti 5 de ifferent books if

(i) T ti ula ks are always selected?

(ii) T ti ula ks are never selected?

38. Ho a r there between 100 ts 0, 1, 2, 3, 4, 5 if t e d not allowed?

39. Find the coefficient of ^{5} in the expansion $\left(x^2+\dfrac{1}{x^3}\right)^{10}$.

40. In a ΔABC, if $\tan\dfrac{A}{}=-$ and $\tan\dfrac{C}{2}=\dfrac{2}{5}$, then show that a,b,c a e in A.P.

SECTION – IV

Note: Answer **all** the questions. $7\times5=35$

41. (a) Show that the range of the function $\frac{1}{2cosx-1}$ is $\left(-\infty,-\frac{1}{3}\right]\cup[1,\infty)$.

(OR)

(b) Let $f,g:\mathbb{R}\to\mathbb{R}$ be defined as $f(x)=2x-|x|$ and $g(x)=2x+|x|$. Find $f\circ g$.

42. (a) Prove that the solution of $\frac{x+1}{x+3}<3$ is $(-\infty,-4)\cup(-3,\infty)$.

(OR)

(b) Determine the region in the plane determined by the inequalities $2x+3y\le35,\ y\ge2,\ x\ge5$.

43. (a) If $x\cos\theta=y\cos\left(\theta+\frac{2\pi}{3}\right)=z\cos\left(\theta+\frac{4\pi}{3}\right)$, then prove that $xy+yz+zx=0$.

(OR)

(b) Solve $\sqrt{3}\tan^2\theta+\left(\sqrt{3}-1\right)\tan\theta-1=0$.

44. (a) If the letters of the word APPLE are permuted in all possible ways and the strings then formed are arranged in the dictionary order, show that the rank of the word APPLE is 12.

(OR)

(b) A van has 8 seats. It has two seats in the front with two rows of three seats behind. The van belongs to a family, consisting of seven members, F,M, S_1, S_2, S_3, D_1,D_2. How many ways can the family sit in the van if

(i) There are no restriction?

(ii) Either F or M drives the van?

(iii) D_1,D_2 sits next to a window and F is driving?

45. (a) Using Mathematical Induction, show that for any natural number n ,

$$\frac{1}{1\cdot 2}+\frac{1}{2\cdot 3}+\frac{1}{3\cdot 4}+\ldots+\frac{1}{n(n+1)}=\frac{n}{n+1}$$

(OR)

(b) Prove that $\sqrt[3]{x^3+7}-\sqrt[3]{x^3+4}$ is approximately equal to $\frac{1}{x^2}$ when x is large.

46. (a) Find the sum up to the 17^{th} term of the series $\frac{1^3}{1}+\frac{1^3+2^3}{1+3}+\frac{1^3+2^3+3^3}{1+3+5}+\ldots$

(OR)

(b) Show that $\frac{5}{1\times 3}+\frac{5}{2\times 4}+\frac{5}{3\times 5}+\ldots = \frac{15}{4}$

47. (a) Let $A=\{2,3,5\}$ and the relation $R=\{(2,5)\}$,write down the minimum number of ordered pairs to be included to R to make it an equivalence relation.

(OR)

(b) If $x=\sum_{n=0}^{\infty}\cos^{2n}\theta$, $y=\sum_{n=0}^{\infty}\sin^{2n}\theta$ and $z=\sum_{n=0}^{\infty}\cos^{2n}\theta\sin^{2n}\theta$, $0<\theta<\frac{\pi}{2}$ then show that $xyz=x+y+z$.

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