UNIT TEST-1
X-STD

TIME: 3.00 HOURS **MATHEMATICS** **MARKS: 100**

ALPHA MATHS ACADAMY

JEE, CBSE AND BOARD EXAMINATION COACHING CENTER
TENKASI
MOBILE: 9489006077, 8778733955

Instructions: **1)** ***Check the question paper for fairness of printing. If there is any lack of fairness, inform the Hall Supervisor immediately.***

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

PART-A **$14 \times 1 = 14$**

Note: **i)** ***Answer all the questions.***

ii) ***Choose the most appropriate answer from the given four alternatives and write the option code and the corresponding answer.***

1. If there are 1024 relation from a set $A = \{1,2,3,4,5\}$ to a set B, then the number of elements in B is

   (a) 3 (b) 2 (c) 4 (d) 8

2. $f(x) = (x+1)^3 - (x-1)^3$ represents a function which is

   (a) linear (b) cubic (c) reciprocal (d) quadratic

3. If $f(x) = 2x^2$ and $g(x) = \frac{1}{3x}$, then $f \circ g$ is

   (a) $\frac{3}{2x^2}$ (b) $\frac{2}{3x^2}$ (c) $\frac{2}{9x^2}$ (d) $\frac{1}{6x^2}$

4. If A and B are finite sets such that $n(A) = p$; $n(B) = q$, then the total number of functions that exist from A to B is

   (a) p^q (b) p (c) q^p (d) q

5. If $g = \{(1,1),(2,3),(3,5),(4,7)\}$ is a function given by $g(x) = \alpha x + \beta$ then the values of α and β are

   (a) $(-1, 2)$ (b) $(2, -1)$ (c) $(-1, -2)$ (d) $(1, 2)$

6. If $n(A \times B) = 9$ and $B = \{1,2,3\}$ then $n(A)$ is

   (a) 2 (b) 27 (c) 3 (d) 4

7. If the ordered pairs $(a+3,5)$ and $(7,3a+b)$ are equal then (a,b) is

   $(a)(-7,4)$ $(b)(-4,7)$ $(c)(4,-7)$ $(d)(7,-4)$

8. If $A = \{1,2\}, B = \{1,2,3,4\}, C = \{5,6\}$ and $D = \{5,6,7,8\}$ then the state which of the following statement is true

$(a)(A \times C) \subset (B \times D)$ $(b)\ (B \times D) \subset (A \times C)$

$(c)\ (A \times B) \subset (A \times D)$ $(d)\ (D \times A) \subset (B \times A)$

9. Composition of three function is always

(a)Commutative (b) Associative (c) Linear (d) Non of these

10. If $f: A \longrightarrow B$ is a constant function, then the range of f will have _____ elements.

(a) 2 (b)1 (c) 3 (d) 4

11. The range of a function is a subset of it's

(a) Domain (b) Co domain (c)Pre image (d) Image

12. If $f: A \longrightarrow B$ is a bijective function .If $n(A) = 9$, then $n(B)$ is equal to

(a) 7 (b) 8 (c) 9 (d) 18

13. The range of the relation $R = \{(x, x^2)/x\ is\ a\ prime\ number\ less\ than\ 13\}$ is

$(a)\{2,3,5,7\}$ $(b)\{4,9,25,49,121\}$ $(c)\{2,3,5,7,11\}$ $(d)\{1,4,9,25,49,121\}$

14. The set of all images of the elements of x under f is called _____ of 'f'.

(a) subset (b) range (c) function (d) relation

PART-B **$10 \times 2 = 20$**

Note: **i) *Answer any TEN questions.***

ii) *Question No.28 is compulsory.*

15. If $A = \{1,3,5\}$ and $B = \{2,3\}$. Show that $n(A \times B) = n(B \times A)$

16. Find $A \times B$ and $B \times A$ if $A = \{m, n\};\ B = \emptyset$.

17. Let $A = \{1,2,3,4, \ldots \ldots \ldots, 45\}$ and R be the relation defined as "$is\ square\ of\ a\ number$" on A write R as a subset of $A \times A$. Also find the domain and range of R.

18. Find k if $f \circ f(k) = 5$ when $f(k) = 2k - 1$.

19. Let $A = \{-1,1\}$ and $B = \{0,2\}$.If the function $f: A \longrightarrow B$ defined by $f(x) = ax + b$ is onto function? Find a and b.

20. Represent the function $f(x) = \sqrt{2x^2 - 5x + 3}$ as a composition of two functions.

21. A function f is defined by $f(x) = 3 - 2x$. Find x such that $f(x^2) = [f(x)]^2$

22. Let $f(x) = x^2 - 1$ .Find $(i)\ f \circ f$ $(ii)\ f \circ f \circ f$

23. The Cartesian product $A \times A$ has 9 elements among which $(-1,0)$ and $(0,1)$ are found. Find the set A and find remaining elements of $A \times A$.

24. Given the function $f: x \to x^2 - 5x + 6$. Evaluate $(i)\ f(2a)$ $(ii)\ f(x-1)$

25. Let $X = \{1,2,3,4\}$ and $Y = \{2,4,6,8,10\}$ and $R = \{(1,2)(2,4)(3,6)(4,8)\}$. Show that R is a function and find its domain, Co-domain and Range.

26. If $f(x) = 2x^2$ and $g(x) = \frac{1}{3x}$. Find $f \circ g$.

27. Find the domain of the function $f(x) = \sqrt{1 + \sqrt{1 - \sqrt{1 - x^2}}}$

28. If $f(x) = \frac{x-1}{x+1}, x \neq -1$ Show that $f\big(f(x)\big) = -\frac{1}{x}$ provided $x \neq 0$.

PART-C

$10 \times 5 = 50$

Note: **i)** ***Answer any TEN questions.***

ii) ***Question No.42 is compulsory.***

29. The function 't' which maps temperature in Celsius (c) into temperature in Fahrenheit F is defined by $t(\ c\ ) = F$ Where $F = \frac{9}{5}c + 32$. Find

$(i)\ \ t\ (0\ )$ $(ii)\ t\ (28\ )$ $(iii)\ \ t(-10)$ (iv) the value of c when $t(c) = 212$

(v) the temperature when the Celsius value in equal to the Fahrenheit value.

30. If $f(x) = x^2\ ;\ g(x) = 3x \quad and \quad h(x) = x - 2$. Prove that $(f \circ g) \circ h = f \circ (g \circ h)$.

31. The data in the adjacent table depicts the length of a person forehand and their corresponding height. Based on this data, a student finds a relationship between the height (y) and the forehand length (x) as $y = ax + b$. Where a, b are constants. (i) Check if this relation is a function (ii) Find a and b

Length 'x' of forehand (in cm)	Height 'y'(in inches)
35	56
45	65
50	69.5
55	74

32. Let f be function $f: N \to N$ be defined by$f(x) = 3x + 2, x \in N$.

(i) Find the images of 1,2,3 (ii) Find the pre images of 29,53. (iii) Identify the type of the function.

33. Forensic scientist can determine on the height $(in\ cm)$ of a person based on the length of the thigh bone. They usually do so using the function $h(b) = 2.47b + 54.10$ Where b is the length of the thigh bone

(*i*) Verify the function h is $1-1$ or not

(*ii*) Also find the height of a person if the length of his thigh bone is $50cm$.

(*iii*) Find the length of the thigh bone if the height of a person is $147.96cm$.

34. State and prove Angle bisector theorem.

35. Let $A =$ The set of all natural numbers less than 8, $B =$ The set of all prime number less than 8 and $C =$ The set of even prime number. Verify that $A \times (B - C) = (A \times B) - (A \times C)$.

36. If the ordered pairs $(x^2 - 3x, y^2 + 4y)$ and $(-2,5)$ are equal then find x and y.

37. If the function f is defined by $f(x) = \begin{cases} x+2 & ; x > 1 \\ 2 & ; -1 \le x \le 1 \\ x-1 & ; -3 < x < -1 \end{cases}$, find the value of

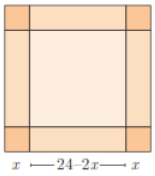
(*i*) $f(3)$ (*ii*) $f(0)$ (*iii*) $f(-1.5)$ (*iv*) $f(2) + f(-2)$.

38. Find x if $gff(x) = fgg(x)$ given $f(x) = 3x + 1$ and $g(x) = x + 3$.

39. Let $A = \{1,2,3,4\}$ and $B = \{2,5,8,11,14\}$ be two sets. Let $f: A \to B$ be a function given by $f(x) = 3x - 1$. Represent this function (*i*) by Arrow diagram (*ii*) in a table form

(*iii*) as a set of ordered pairs (*iv*) in a graphical form

40. An open box is to be made from a square piece of material, $24cm$ on a side, by cutting equal squares from the corners and turning up the sides as shown figure. Express the volume V of the box as a function of x.



41. A company has four categories of employees given by Assistants (A), Clerks(C), Managers (M) and an Executive Officer (E). The company provide ₹10,000 , ₹25,000, ₹50,000 and ₹1,00,000 as salaries to the people who work in the categories A, C, M and E respectively. If $A_1, A_2, A_3, A_4$and A_5were Assistants; C_1, C_2, C_3, C_4were clerks; M_1, M_2, M_3were managers and E_1, E_2were Executive Officers and if the relation R is defined by xRy, where x is the salary given to person y, express the relation R through an ordered pair and an arrow diagram.

42. Given $f(x) = \begin{cases} \sqrt{x-1}, & x \ge 1 \\ 4 & , x < 1 \end{cases}$. Find (*i*) $f(0)$ (*ii*) $f(3)$ (*iii*) $f(a+1)$ in terms of a (Given that a≥ 0).

PART-D **$2 \times 8 = 16$**

Note:* *Answer ALL the questions.

43. (a) Construct a ΔPQR in which $PQ = 8cm$; ∠R= 60° and the median RG from R to PQ is $5.8cm$. Find the length of the

attitude from R to PQ. **(or)**

(b) Construct a triangle similar to given triangle LMN with its sides equal to $\frac{4}{5}$ of the corresponding sides of the triangle LMN (scale factor $\frac{4}{5} < 1$).

44. (a) A bus is travelling a uniform speed if $50km/hr$. Draw the distance-time graph and hence find.

(i) the constant of variation (ii) how far will it travel in 90 minutes?

(iii) the time required to cover a distance of 300km from the graph. **(or)**

(b) Draw the graph of $y = 2x^2$ and hence solve $2x^2 - x - 6 = 0$.

********** ***ALL THE BEST*** **********

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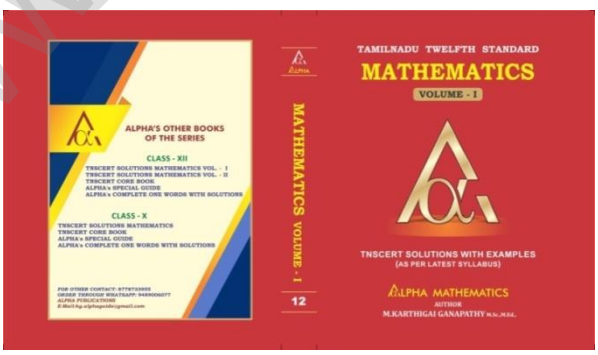

UNIT TEST-2
X-STD

TIME: 3.00 HOURS **MATHEMATICS** **MARKS: 100**

ALPHA MATHS ACADAMY

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

PART-A $\mathbf{14 \times 1 = 14}$

Note: **i)** ***Answer all the questions.***

ii) ***Choose the most appropriate answer from the given four alternatives and write the option code and the corresponding answer.***

1. An A.P consists of 31 terms. If its 16th term is m then the sum of all the terms of this AP is

   $(a)\ 16m$ $(b)\ 62m$ $(c)\ 31m$ $(d)\ \frac{31}{2}m$

2. If $A = 2^{64}$ and $B = 2^{64} + 2^{63} + 2^{62} + \ldots\ldots\ldots + 2^0$ which of the following is true?

   (a) B is 2^{64}more than A (b) A and B are equal

   (c) B is larger than A by 1 (d) A is larger than B by 1

3. If 6 times of 6^{th} term of an AP is equal to the 7 times the 7th term, then the 13th term of the AP is

   $(a)\ 0$ $(b)\ 6$ $(c)\ 7$ $(d)\ 13$

4. The next term of the sequence $\frac{3}{16}, \frac{1}{8}, \frac{1}{12}, \frac{1}{18}, \ldots\ldots\ldots\ldots$ is

   $(a)\ \frac{2}{3}$ $(b)\ \frac{1}{24}$ $(c)\ \frac{1}{27}$ $(d)\ \frac{1}{81}$

5. $10^4 \equiv$ _____ (mod 19)

   $(a)\ 5$ $(b)\ 6$ $(c)\ 7$ $(d)\ 4$

6. The value of $(1 + 2 + 3 + \cdots\ldots\ldots + 75) - (1 + 2 + 3 + \cdots\ldots\ldots + 15)$

   $(a)\ 2030$ $(b)\ 2370$ $(c)\ 2730$ $(d)\ 2703$

7. Given $F_1 = 1;\ F_2 = 3$ and $F_n = F_{n-1} + F_{n-2}$ then F_5 is

   $(a) 11$ $(b) 3$ $(c)\ 8$ $(d)\ 5$

8. If the sequence $t_1, t_2, t_3 \ldots\ldots$ are in AP, then the sequence $t_6, t_{12}, t_{24}, \ldots\ldots\ldots$ is

   (a) Geometric Progression (b) an Arithmetic Progression

(c) Neither Arithmetic nor Geometric Progression (d) a constant sequence

9. The difference between any two consecutive term of an AP is

(a) odd (b) even (c) constant (d) none of these

10. The first term of an arithmetic progression is unity and common difference is 4 which of the following will be a term of this AP

(a) 4551 (b) 10091 (c) 7881 (d)13531

11. If the HCF of 65 and 117 is expressible in the form of $65m - 117$, then the value of m is

(a) 4 (b) 2 (c) 1 (d) 3

12. The sum of the exponents of the prime factors in the prime factorization of 1729 is

(a) 3 (b) 2 (c) 4 (d) 1

13. In an AP, the first term is 1 and the common difference is 4. How many terms of an AP must be taken for their sum to be equal to 120

(a) 7 (b) 6 (c) 9 (d) 8

14. The sum of cubes of the first $'n'$ natural number is always _____ of a first $'n'$ natural number.

(a) cube (b) square (c) square root (d) cube root

PART-B **$10 \times 2 = 20$**

Note: **i)** ***Answer any TEN questions.***

ii) ***Question No.28 is compulsory.***

15. Find the sum of all natural numbers between 300 and 600 which are divisible by 7.

16. How many terms of the series $1 + 5 + 9 + \cdots$ must be taken so that their sum is 190.

17. Solve $8x \equiv 1(mod\ 11)$

18. If $P_1^{x_1} \times P_2^{x_2} \times P_3^{x_3} \times P_4^{x_4} = 113400$, where P_1, P_2, P_3, P_4 are primes in ascending order x_1, x_2, x_3, x_4 are integers. Find the value of $P_1, P_2, P_3, P_4\ and\ x_1, x_2, x_3, x_4$.

19. Prove that two consecutive positive integers are always co-prime.

20. The sum of cube of the first 'n' natural numbers is 2025, then find the value of $'n'$.

21. Find the rational form of the number $0.\overline{123}$.

22. If the first term of an infinite $G.P$ is 8 and its sum to infinity is $\frac{32}{3}$. Find the common ratio.

23. How many terms of the series $1 + 4 + 16 + \cdots$ make the sum 1365?

24. If a, b, c are in $A.P$, then show that $3^a, 3^b, 3^c$ are in $G.P$.

25. If the highest common factor of 210 and 55 is expressible in the form of $55x - 325$ .Find the value of x.

26. If $3 + k, 18 - k, 5k + 1$ are in $A.P$ find K.

27. Find the Least Positive integer n such that $1 + 6 + 6^2 + \ldots\ldots + 6^n > 5000$.

28. Show that 107 is of the form $4q + 3$ for any integer q.

PART-C **$10 \times 5 = 50$**

Note: **i)** ***Answer any TEN questions.***

ii) ***Question No.42 is compulsory.***

29. A person saved money every year, half as much as he could in the previous year. If he had totally saved ₹. 7875 in years then how much did he save in the first year?

30. Find the HCF of $396, 504, 636$.

31. Prove that $2^n + 6 \times 9^n$ is always divisible by 7 for any positive integer n.

32. Find the first five terms of the following sequence $a_1 = 1, a_2 = 1, a_n = \frac{a_n - 1}{a_{n-2} + 3}, n \geq 3, n \in N$

33. If l^{th}, m^{th} and n^{th} terms of an $A.P$ are x, y, z respectively then shows that

(i) $x(m - n) + y(n - l) + z(l - m) = 0$ $(ii)(x - y)n + (y - z)l + (z - x)m = 0$

34. If $(m + 1)^{th}$ term of an $A.P$ is twice the $(n + 1)^{th}$ term then prove that $(3m + 1)^{th}$ term is twice the $(m + n + 1)^{th}$ term.

35. The ratio of 6^{th} and 8^{th} term of an $A.P$ is $7:9$. Find the ratio of 9^{th} term to 13^{th} term.

36. The sum of first $n, 2n$ and $3n$ terms of an A.P are S_1, S_2 and S_3 respectively Prove that S_3=3($S_2 - S_1$)

37. Find the sum $\left[\frac{a-b}{a+b} + \frac{3a-2b}{a+b} + \frac{5a-3b}{a+b} + \ldots . to\ 12\ terms\right]$

38. In an $G.P$ the product of three consecutive term is 27 and the sum of the product of two terms taken at a time is $\frac{57}{2}$. Find the three terms.

39. Find the sum of the series $(2^3 - 1^3) + (4^3 - 3^3) + (6^3 - 5^3) + \ldots\ldots\ldots to$

(i) n terms (ii) 8 terms

40. A brick staircase has a total of 30 steps the bottom step require 100 bricks. Each successive step requires two bricks less than the previous step

(i) How many bricks are required for the top must step?

(ii) How many bricks are required to build the stair case.

41. State and prove Thales theorem.

42. If $S_n = (x+y) + (x^2+xy+y^{2)} + (x^3+x^2y+xy^2+y^3)$+…n terms, then prove that

$$(x-y)S_n = \left[\frac{x^2(x^n-1)}{x-1} - \frac{y^2(y^n-1)}{y-1}\right]$$

PART-D **$2 \times 8 = 16$**

Note: ***Answer ALL the questions.***

43. (a) Draw a tangent to the circle from the point P having radius $3.6cm$ and centre at 0 point P is at a distance $7.2cm$ from the centre. $(\boldsymbol{or})$

(b) Construct a triangle similar to a given triangle PQR with its sides equal to $\frac{3}{5}$ of the corresponding sides of the triangle PQR (scale factor $\frac{3}{5} < 1$)

44. (a) Graph the quadratic equation and state their value of solution $(2x-3)(x+2) = 0$ $(\boldsymbol{or})$

(b) Varshika drew 6 circles with different sizes. Draw a grah for the relationship between the diameter and circumference of each circle as shown in the table and use it to find the circumference of a circle when its diameter is 6cm.

Diameter	(x) cm	1	2	3	4	5
Circumference	(y) cm	3.1	6.2	9.3	12.4	15.5

********** *ALL THE BEST* **********

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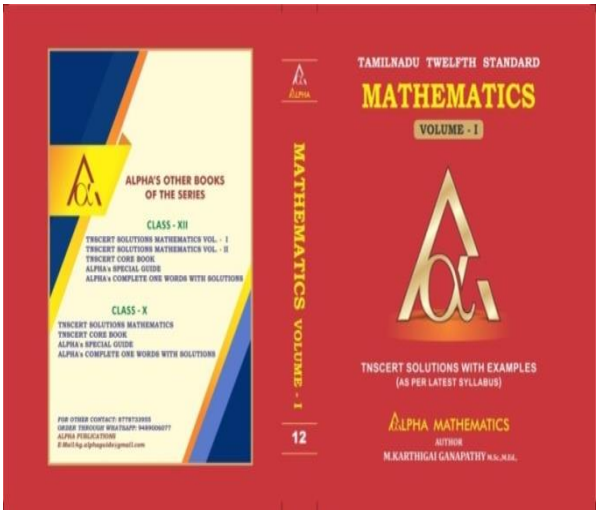

UNIT TEST-3
X-STD

TIME: 3.00 HOURS **MATHEMATICS** **MARKS: 100**

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PART-A **$14 \times 1 = 14$**

Note: **i)** ***Answer all the questions.***

ii) ***Choose the most appropriate answer from the given four alternatives and write the option code and the corresponding answer.***

1. $\frac{14x^4}{y} \div \frac{7x}{3y^4}$ is

   $(a) 7x^3y^3$ $(b)\ 6x^3y^3$ $(c)\ 3xy^4$ $(d)\ 3x^4y$

2. If $(x-6)$ is the HCF of $x^2-2x-24$ and x^2-kx-6, then the value of k is

   $(a)\ 3$ $(b)\ 5$ $(c)\ 6$ $(d)\ 8$

3. Transpose of a row matrix is

   (a) Unit matrix (b) diagonal matrix (c) row matrix (d) column matrix

4. The solution of $(2x-1)^2 = 4$

   $(a)\ \frac{3}{2}$ $(b)\ \frac{-1}{2}$ $(c)\ \frac{3}{2}, \frac{1}{2}$ $(d)\ \frac{3}{2}, \frac{-1}{2}$

5. Graph of an Equation is

   (a) Parabola (b) hyperbola (c) circle (d) straight line

6. The number of points of intersection of the quadratic polynomial x^2+4x+4 with the x axis is

   $(a) 1$ $(b) 0$ $(c) 0\ or\ 1$ $(d) 2$

7. If A is a 2×3 matrix and B is a 3×4 matrix how many column does BA have

   $(a) 3$ $(b) 4$ $(c)\ 2$ (d) does not exist

8. Which of the following should be added to make x^4+64 a perfect square

   $(a) 4x^2$ $(b) 16x^2$ $(c) 8x^2$ $(d) -8x^2$

9. A system of three Linear equations in three variable is inconsistent if their plane

(a) intersect only at a point (b) do not Intersect

(c) coincides with each other (d) intersect in a line

10. If the roots of the equation $q^2x^2 + p^2x + r^2 = 0$ are the squares of the roots of the equation $qx^2 + px + r = 0$ then q, p, r are in

(a) $A.P$ (b) $G.P$ (c) both $A.P$ and $G.P$ (d) none of these

11. The solution of the system $x + y - 3z = -6, -7y + 7z = 7, 3z = 9$ is

$(a) x = -1 \;\; y = 2 \;\; z = 3$ $(b) x = 1 \;\; y = 2 \;\; z = 3$

$(c) x = -1 \;\; y = -2 \;\; z = 3$ $(d) x = 1 \;\; y = -2 \;\; z = 3$

12. For a quadratic equation, the axis is given by $x = \frac{-b}{2a}$ and vertex is given by

$(a)\ \frac{b}{2a}, \frac{-\Delta}{4a}$ $(b)\ \frac{-b}{2a}, \frac{-\Delta}{4a}$ $(c)\ \frac{b}{4a}, \frac{-\Delta}{2a}$ $(d)\ \frac{b}{4a}, \frac{\Delta}{2a}$

13. The excluded value of $\frac{7p+2}{8p^2+13p+5}$ is

$(a)\ \frac{8}{5}, 1$ $(b)\ \frac{-5}{8}, 1$ $(c)\ \frac{-5}{8}, -1$ $(d)\ \frac{5}{8}, 1$

14. If the number of column and rows are equal in a matrix then it is said to be a

(a) diagonal matrix (b) rectangular matrix (c) square matrix (d) identity matrix

PART-B $10 \times 2 = 20$

Note: **i)** ***Answer any TEN questions.***

ii) ***Question No.28 is compulsory.***

15. Solve $2x - 3y = 6, x + y = 1$

16. Find the $L.C.M$ of $x^3 - 27, (x-3)^2, x^2 - 9$.

17. Simplify $\frac{b^2+3b-28}{b^2+4b+4} \div \frac{b^2-49}{b^2-56-14}$

18. Solve by factorization method $4x^2 - 7x - 2 = 0$.

19. A ball rolls down a slope and travels a distance $d = t^2 - 0.75t$ feet int seconds. Find the time when the distance travelled by the ball is $11.25\ feet$.

20. If the difference between a number and its reciprocal in $\frac{24}{5}$. Find the number.

21. Find the value of 'k' for which the quadratic equation $kx^2 - (8k + 4)x + 81 = 0$ has real and equal roots.

22. Define unit matrix, Give one example.

23. Find the value of x, y, z if $\begin{bmatrix} x-3 & 3x-z \\ x+y+7 & x+y+z \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 1 & 6 \end{bmatrix}$.

24. A has 'a'row and $a + 3$ columns B has 'b' rows and '$17 - b$' columns and if both products AB and BA exist find a, b?

25. If $\alpha \; and \; \beta$ are the roots of $x^2 + 7x + 10 = 0$ find the value of $(i)\alpha^2+\beta^2$ $(ii)\frac{\alpha}{\beta}+\frac{\beta}{\alpha}$

26. Solve $2x^2 - 3x - 3 = 0$ by formula method.

27. Find the square root of $16x^2 + 9y^2 - 24xy + 24x - 18y + 9$

28. At t minutes past $2pm$, the time needed to $3pm$ is a minute less than $\frac{t^2}{4}$ find t.

PART-C **$10 \times 5 = 50$**

Note: **i)** ***Answer any TEN questions.***

ii) ***Question No.42 is compulsory.***

29. Solve the following system of Linear Equation in three variables $3x - 2y + z = 2,\ 2x + 3y - z = 5,$ $x + y + z = 6$

30. Find the $G.C.D$ of the given polynomial $3x^3 + 3x^2 + 3x + 3, 6x^3 + 12x^2 + 6x + 12$.

31. If $x = \frac{a^2+3a-4}{3a^2-3}$ and $y = \frac{a^2+2a-8}{2a^2-2a-4}$ find the value of x^2y^{-2}.

32. Find the value of m and n if the polynomials are perfect square $x^4 - 8x^3 + mx^2 + nx + 16$.

33. Solve $pqx^2 - (p + q)^2x + (p + q)^2 = 0$.

34. A flock of swans contained x^2 members as the clouds gathered $10x$ went to a lake and one eights of the members flew away to a garden. The remaining three pairs played about in the water. How many swans were there in total?

35. If the roots of the equation $(c^2 - ab)x^2 - 2(a^2 - bc)x + b^2 - ac = 0$ are real and equal Prove that

$a = 0\ (or)\ a^3 + b^3 + c^3 = 3abc$

36. If $A = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$ and $I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ show that $A^2 - (a+d)A = (bc - ad)I_2$.

37. If α and β are the roots of the polynomial $f(x) = x^2 - 2x + 3$, find the polynomial whose roots are

$(i)\alpha + 2, \beta + 2 \quad (ii)\frac{\alpha-1}{\alpha+1} + \frac{\beta-1}{\beta+1}$

38. Find $X$and $Y$of $X + Y = \begin{bmatrix} 7 & 0 \\ 3 & 5 \end{bmatrix}$ and $X - Y = \begin{bmatrix} 3 & 0 \\ 0 & 4 \end{bmatrix}$

39. State and prove Pythagoras theorem.

40. Simplify $\frac{1}{x^2-5x+6} + \frac{1}{x^2-3x+2} - \frac{1}{x^2-8x+15}$

41. Prove that the equation $x^2(p^2 + q^2) + 2x(pr + qs) + r^2 + s^2 = 0$ has no real roots. If $ps = qr$ then show that the roots are real and equal.

42. A boat takes $1.6\ hour$ longer to go $36kms$ up a river than down the river. If the speed of the water current is $4km\ per\ hr$. What is the speed of the boat in still water.

PART-D **$2 \times 8 = 16$**

Note: ***Answer ALL the questions.***

43. (a) Draw a triangle ABC of base $BC = 5.6cm, \angle A = 40°$ and the bisector of $\angle A$ meets BC at D such that $CD = 4cm$. $(\boldsymbol{or})$

(b) Construct a triangle similar to a given triangle PQR with its sides equal to $\frac{7}{3}$ of the corresponding sides of the triangle PQR (scale factor $\frac{7}{3}$).

44. (a) Draw the graph of $y = x^2 - 4x + 3$ and use it to solve $x^2 - 6x + 9$. $(\boldsymbol{or})$

(b) A school announces that for a certain competition, the cash price will be distributed for all the participation equally as show below

No. of participants (x)	2	4	6	8	10
Amount for each participants in ₹(y)	180	90	60	45	36

(i) Find the constant of variation

(ii) Graph the above data. Hence, find how much will each participants get if the number of participants are 12.

********** *ALL THE BEST* **********

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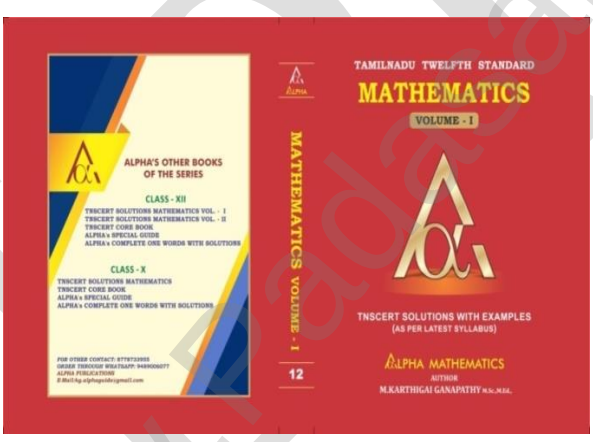

UNIT TEST-4
X-STD

TIME: 3.00 HOURS **MATHEMATICS** **MARKS: 100**

ALPHA MATHS ACADAMY

JEE, CBSE AND BOARD EXAMINATION COACHING CENTER
TENKASI
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Instructions: **1)** ***Check the question paper for fairness of printing. If there is any lack of fairness, inform the Hall Supervisor immediately.***

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

PART-A **$14 \times 1 = 14$**

Note: **i)** ***Answer all the questions.***

ii) ***Choose the most appropriate answer from the given four alternatives and write the option code and the corresponding answer.***

1. If $\triangle$ ABC is an isosceles triangle with $\angle C = 90°$ and $AC = 5cm$ then AB is

   $(a)\ 2.5cm$ $(b) 5cm$ $(c) 10cm$ $(d)\ 5\sqrt{2}cm$

2. If in $\triangle$ ABC, DE$\|\ BC, AB = 3.6cm, AC = 2.4cm$ *and* $AD = 2.1cm$ then the length of AE is

   $(a) 1.05cm$ $(b) 1.8\ cm$ $(c)\ 1.04cm$ $(d)\ 1.4cm$

3. Two poles of heights $6m$ and $11m$ stand vertically on a plane ground. If the distance between their feet is $12m$. What is the distance between their tops?

   $(a) 15m$ $(b) 14m$ $(c) 13m$ $(d) 13cm$

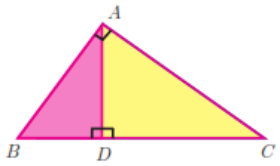
4. A tangent is perpendicular to the radius at the

   (a) centre (b) infinity (c) point of contact (d) chord

5. In the adjacent figure $\angle BAC = 90°$ and $AD \perp BC$ then

   $(a)\ BD.CD = BC^2$ $(b)\ AB.AC = BC^2$

   $(c)\ BD.CD = AD^2$ $(d)\ AB.AC = AD^2$



6. In a right-angled triangle, the side opposite to $90°$ is called

   (a) opposite side (b) adjacent (c) hypotenuse (d) none of these

7. In $\triangle LMN, \angle L = 60°, \angle M = 55°$If $\triangle LMN \sim \triangle PQR$ the value of R is

   $(a) 40°$ $(b) 70°$ $(c)\ 65°$ $(d) 110°$

8. The perimeters of two similar triangle $\triangle ABC$ and $\triangle PQR$ are $36cm$ and $24cm$ respectively. If $PQ = 10cm$ then the length of AB is

$(a) 6\frac{2}{3}cm$ $(b) 15cm$ $(c) \frac{10\sqrt{6}}{3}cm$ $(d) 66\frac{2}{3}cm$

9. If a line touches the given circle at only one point, then it is called

(a) point of contact (b) chord (c) tangent to the circle (d) none of these

10. In the fig O is the centre of a circle. PQ is a chord and the tangent PR at P makes an angle of $50°$ with PQ then $\angle POQ$ is

$(a) 120°$ $(b) 100°$ $(c) 110°$ $(d) 90°$

11. In $\triangle ABC$ and $\triangle EDF$, $\frac{AB}{DE} = \frac{BC}{FD}$ then they will be similar

$(a) \angle B = \angle E$ $(b) \angle A = \angle D$ $(c) \angle A = \angle F$ $(d) \angle B = \angle D$

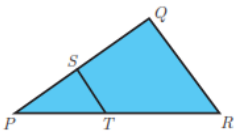
12. How many tangents can be drawn from an interior point of the circle

(a) 1 (b) 2 (c) No tangent (d) 4

13. A man goes $3m$ due west and the $4m$ due north, then the distance of his current position from the starting point is

$(a) 3m$ $(b) 4m$ $(c) 5m$ $(d) 7m$

14. In a given figure $ST \parallel QR, PS = 2cm$ and $SQ = 3cm$. Then the ratio of the area of $\triangle PQR$ to the area of $\triangle PST$ is



$(a) 4:25$ $(b) 25:4$ $(c) 25:13$ $(d) 25:11$

PART-B **$10 \times 2 = 20$**

Note: **i) *Answer any TEN questions.***

ii) *Question No.28 is compulsory.*

15. The length of the tangent to a circle from a point P, which is $25cm$ away from the centre is $24cm$. What is the radius of the circle?

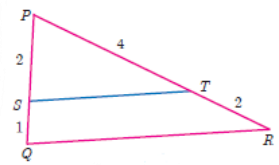
16. What length of ladder is needed to reach a height of $7ft$ along the wall when the base of the Ladder in $4ft$ from the wall? [Round off your answer to the next tenth place]

17. In $\triangle ABC, D$ *and* E are point on the sides AB and AC respectively such that $DE \parallel BC$ if $AD = 8x - 7$, $DB = 5x - 3, AE = 4x - 3$ and $EC = 3x - 1$ find the value of 'x'.

18. If $\triangle ABC \sim \triangle DEF$ such that $BC = 3cm, EF = 4cm$ and area of $\triangle ABC = 54cm^2$. Find the area of $\triangle DEF$.

19. In $\triangle ABC$, AD is the bisector of $\angle BAC$ if $AB = 10cm, AC = 14cm$ and $BC = 6cm$ find BD *and* DC.

20. Show that $\triangle PST \sim \triangle PQR$

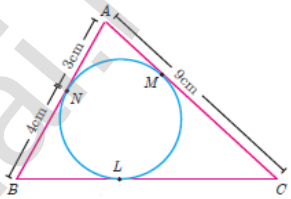


21. A man goes $18m$ due east and then$24m$ due north. Find the distance of his current position from the starting point?

22. Find the length of the tangent drawn from a point whose distance from the centre of a circle is $5cm$ and the radius of the circle is $3cm$.

23. State cava's theorem.

24. In $\triangle ABC$ is circumscribing a circle. Find the length of BC



25. In $\triangle ABC, DE \parallel BC$ *and* $CD \parallel EF$ Prove that $AD^2 = AB \times AF$

26. If O is the centre of the circle. PQ is a chord and the tangent PR at P makes an angle of $60°$ with PQ find $\angle POQ$

27. In two concentric circles, a chord of length $16cm$ of larger circle becomes a tangent to the similar circle whose radius is $6cm$. Find the radius of the larger circle.

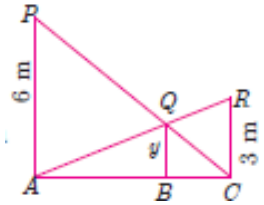
28. State converse of angle bisector theorem (with diagram)

PART-C **$10 \times 5 = 50$**

Note: **i)** ***Answer any TEN questions.***

ii) ***Question No.42 is compulsory.***

29. Two vertical poles of height $6m$ and $3m$ are erected above a horizontal ground AC. Find the value of y.



30. $ABCD$ is a quadrilateral in which $AB = AD$, the bisector of $\angle BAC$ *and* $\angle CAD$ intersect the sides BC and CD at the point E and F respectively prove that $EF \parallel BD$.

31. An insect 8 m away initially from the foot of a lamp post which is 6 m tall, crawls towards it moving through a distance. If its distance from the top of the lamp post is equal to the distance it has moved, how far is the insect away from the foot of the lamp post?

32. In the rectangle $wxyz, xy + yz = 17cm$ and $xz + yw = 26cm$. Calculate the length and breadth of the rectangle?

33. P and Q are the midpoints of the sides CA and CB respectively of a $\triangle ABC$, right angled at C. Prove that $4(AQ^2 + BP^2) = 5AB^2$

34. $5m$ long ladder is placed leaning towards a vertical wall such that it reaches the wall at a point $4m$ high. If the foot of the ladder is moved $1.6m$ towards the wall, then find the distance by which the top of the ladder would slide upwards on the wall.

35. PQ is a chord of length $8cm$ to a circle of radius $5cm$. The tangent at P and Q intersect at a point T. Find the length of the tangent TP?

36. In $\triangle ABC$, points D, E, F lies on BC, CA, AB respectively. Suppose AB, AC and BC have length $13, 14$ respectively. If $\frac{AF}{FB} = \frac{2}{5}$ and $\frac{CE}{EA} = \frac{5}{8}$. Find BD and DC.

37. The perpendicular PS on the base QR of a $\triangle PQR$ intersects QR at S. Such that $QS = 3SR$ prove that $2PQ^2 = 2PR^2 + QR^2$

38. Two poles of height 'a' metres and 'b' metres are 'p' metres apart. Prove that the height of the point of intersection of the lines joining the top of each pole to the foot of the opposite pole is given by $\frac{ab}{a+b} meters$.

39. Two circles with centres O and ¢ $O$of radii $3cm$ and $4cm$, respectively intersect at two points P and Q, such that OP and ¢OP are tangents to the two circles. Find the length of the common chord PQ.

40. Show that the angle bisector of a triangle is concurrent.

41. State and prove Alternate segment theorem.

42. A man whose eye-level is 2 m above the ground wishes to find the height of a tree. He places a mirror horizontally on the ground 20 m from the tree and finds that if he stands at a point C which is 4 m from the mirror B, he can see the reflection of the top of the tree. How height is the tree?

PART-D $2 \times 8 = 16$

Note: ***Answer ALL the questions.***

43. (a) Construct a triangle similar to a given triangle PQR with its sides equal to $\frac{3}{5}$ of the corresponding sides of the triangle PQR [scale factor $\frac{3}{5} < 1$] $(\boldsymbol{or})$

(b) Construct a $\triangle PQR$ such that $QR = 6.5cm$, $\angle P = 60°$ and the attitude from P to QR is of Length$4.5cm$.

44. (a) Draw the graph of $y = x^2 + 3x + 2$ and use it to solve $x^2 + 2x + 1 = 0$. $(\boldsymbol{or})$

(b) Draw the graph of $xy = 24, x, y > 0$. Using the graph find,

(i) y when $x = 3$ and (ii) x when $y = 6$.

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