MATHS MASTERS VIRUDHUNAGAR DISTRICT

| STATE PARENT TEACHER'S ASSOCIATION, TAMILNADU – MODEL QUESTION PAPER - 1		
Time : 3.15 Hours	STD - 10 – MATHEMATICS	MARKS : 100

PART - I

Note: (i) Answer all the 14 questions.

(ii) Choose the most suitable answer from the given four alternatives and write the option code with the corresponding answer.   **(14 x 1 = 14)**

1) If $\{(a, 8), (6, b)\}$ represents an identity function, then the value of a and b are respectively
   (1) (8, 6)   (2) (8, 8)   (3) (6, 8)   (4) (6, 6)

2) $7^{4k} \equiv$ _____ $(mod\ 100)$
   (1) 1   (2) 2   (3) 3   (4) 4

3) A system of three linear equations in three variables is inconsistent if their planes
   (1) intersect only at a point   (2) intersect in a line
   (3) coincides with each other   (4) do not intersect

4) In the adjacent figure, $\angle BAC = 90^o$ and $AD \perp BC$ then
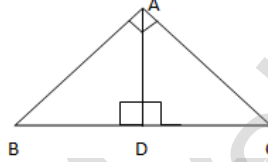
   (1) $BD \cdot CD = BC^2$ (2) $AB \cdot AC = BC^2$ (3) $BD \cdot CD = AD^2$ (4) $AB \cdot AC = AC^2$

5) The straight line given by the equation $x = 11$ is
   (1) parallel to X - axis   (2) parallel to Y - axis
   (3) passing through the origin   (4) passing through the point $(0, 11)$

6) If $(sin\alpha + cosec\alpha)^2 + (cos\alpha + sec\alpha)^2 = k + tan^2\alpha + cot^2\alpha$, then k is equal to
   (1) 9   (2) 7   (3) 5   (4) 3

7) The total surface area of a cylinder whose radius is $\frac{1}{3}$ of its height is
   (1) $\frac{9\pi h^2}{8}$ sq.units   (2) $24\pi h^2$ sq.units (3) $\frac{8\pi h^2}{9}$ sq.units   (4) $\frac{56\pi h^2}{9}$ sq.units

8) Which of the following is incorrect?
   (1) $P(A) > 1$ (2) $0 \leq P(A) \leq 1$ (3) $P(\varphi) = 0$ (4) $P(A) + P(\bar{A}) = 1$

9) The sequence $-3, -3, -3, ...$ is
   (1) an A.P only   (2) a G.P only   (3) neither A.P nor G.P   (4) both A.P and G.P

10) The L.C.M of $x^3 - a^3$ and $(x - a)^2$ is
    (1) $(x^3 - a^3)(x + a)$ (2) $(x^3 - a^3)(x - a)^2$
    (3) $(x - a)^2(x^2 + ax + a^2)$ (4) $(x + a)^2(x^2 + ax + a^2)$

11) Let $n(A) = p$ and $n(B) = q$ then the total number of relations that exist between A and B is
    (1) 2^p (2) 2^q (3) 2^{p+q} (4) 2^{pq}

12) If the HCF of 65 and 117 is expressible in the form of $65m - 117$, then the value of m is
    (1) 4   (2) 2   (3) 1   (4) 3

13) The sum of all deviations of the data from its mean is
    (1) Always positive   (2) Always negative
    (3) zero   (4) non-zero integer

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14) The angle of elevation and depression are usually measured by a device called
   (1) Theodolite   (2) Kaleidoscope   (3) Periscope   (4) Telescope

PART - II

Note: (i) Answer 10 questions.
      (ii) Question Number 28 is compulsory.   (10 x 2 = 20)

15) A man has 532 flower pots. He wants to arrange them I rows such that each row contains 21 flower pots. Find the number of completed rows and how many flower pots are left over.

16) Solve: $x^4 - 13x^2 + 42 = 0$.

17) If A is order of p x q and B is of order q x r, what is the order of AB and BA.

18) A relation f is defined by $f(x) = x^2 - 2$ where $x \epsilon \{-2, -1, 0, 3\}$. (i) List the elements of f (ii) Is f a function?

19) Show that $\Delta PST \sim \Delta PQR$.
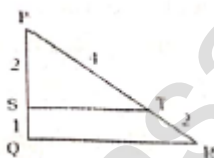
20) A tower stands vertically on the ground. From a point on the ground, which is 48 m away from the foot of the tower, the angle of elevation of the top of the tower is 30°. Find the height of the tower.

21) The volume of a solid right circular cone is 11088 cm^3 . If its height is 24 cm, then find the radius of the cone.

22) $P(A) = \frac{2}{3}, \ P(B) = \frac{2}{5}, \ P(A \cup B) = \frac{1}{3}$ then find $P(A \cap B)$.

23) Find (i) A X B and (ii) A X A for $A = \{m, n\}$ and $B = \emptyset$.

24) Find the middle term(s) of an A.P $5, 21, 27, ..., 183$.

25) The product of Kumaran's age (in years) two years ago and his age four years from now is one more than twice his present age. What is his present age?

26) Find the equation oa a line passing through the point $(-4, 3)$ and having slope $\frac{-7}{5}$.

27) The standard deviation of 20 observations is $\sqrt{6}$. If each observation is multiplied by 3, find the standard deviation and variance of the resulting observations.

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28) An organization plans to plant saplings in 2 streets in a town in such a way that one sapling for the first street, three for the second, nine for the third and so on. How many saplings are needed to complete the work?

PART - III

Note: (i) Answer 10 questions.
(ii) Question Number 42 is compulsory.   (10 x 5 = 50)

29) The function $'t'$ which maps temperature in Celsius (C) into temperature (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 is equal to the Fahrenheit value.

30) Rekha has 15 square colour papers of sizes 10cm, 11 cm, 12 cm, . . . , 24 cm. How much area can be decorated with these colour papers?

31) If $A = \begin{pmatrix} 1 & 1 \\ -1 & 3 \end{pmatrix}$, $B = \begin{pmatrix} 1 & 2 \\ -4 & 2 \end{pmatrix}$ and $C = \begin{pmatrix} -7 & 6 \\ 3 & 2 \end{pmatrix}$ verify that $A(B + C) = AB + AC$

32) State and prove Pythagoras theorem.

33) As observed from the top of a 60 m high light house from the sea level, the angles of depression of two ships are 28° and 45°. If one ship is exactly behind the other on the same side of the light house, find the distance between the two ships. ($tan28^o = 0.5317$)

34) Find the number of coins, 1.5 cm in diameter and 2 mm thick, to be melted to form a right circular cylinder of height 10 cm and diameter 4.5 cm.

35) The marks scored by the students in a slip test are given below.

x	4	6	8	10	12
f	7	3	5	9	5

Find the standard deviation of their marks.

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

37) If $S_n = (x + y) + (x^2 + xy + y^2) + (x^3 + x^2y + xy^2 + y^3) + \cdots \dots n$ terms,   then prove that $(x - y)S_n = \left[\frac{x^2(x^n-1)}{x-1} - \frac{y^2(y^n-1)}{y-1}\right]$.

38) Solve: $\frac{1}{2x} + \frac{1}{4y} - \frac{1}{3z} = \frac{1}{4}$; $\frac{1}{x} = \frac{1}{3y}$; $\frac{1}{x} - \frac{1}{5y} + \frac{4}{z} = 2\frac{2}{15}$

39) A funnel consists of a frustum of a cone attached to a cylindrical portion 12 cm long attached at the bottom. If the total height be 20 cm, diameter of the cylindrical portion

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be 12 cm and the diameter of the top of the funnel be 24 cm. Find the outer surface area of the funnel.

40) In a class of 50 students, 28 opted for NCC, 28 opted for NSS and 10 opted for both NCC and NSS. One of the students is selected at random. Find the probability that (i) the student opted for NCC but not NSS (ii) The student opted for NSS but not NCC (iii) the student opted for exactly one of them.

41) The base of a triangle is 4 cm longer than its altitude. If the area of the triangle is 48 sq.cm, then find its base and altitude..

42) The area of a triangle is 5 sq.units. Two of its vertices are $(2, 1)$ and $(3, -2)$. The third vertex lies on the line $y = x + 3$. Find the third vertex.

PART - IV

Note: (i) This section contains two questions. Each with two alternatives.
(ii) Answer both the questions choosing either of the alternatives. **(2 x 8 = 16)**

43) a) Draw the graph of $y = x^2 + x - 2$ and hence use it to solve the equation $x^2 + x - 2 = 0$.

(OR)

b) Solve: $2x + y + 4z = 15, x - 2y + 3z = 13, 3x + y - z = 2$.

44) a) Construct a triangle similar to a given triangle ABC with its sides equal to $\frac{6}{5}$ of the corresponding sides of the triangle ABC. (Scale factor $\frac{6}{5}$)

(OR)

b) ABC is a triangle with $\angle B = 90^o$, $BC = 3$ cm and $AB = 4$ cm. D is a point on AC such that $AD = 1$ cm and E is the mid point of AB. Join D and E and extend DE to meet CB at F. Find BF.
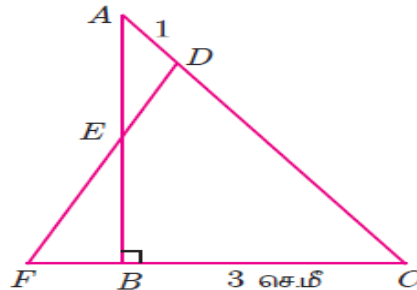
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STATE PARENT TEACHER'S ASSOCIATION, TAMILNADU – MODEL QUESTION PAPER - 2		
Time : 3.15 Hours	STD - 10 – MATHEMATICS	MARKS : 100

PART - I

Note: **(i)** Answer all the 14 questions.

(ii) Chose the correct answer from the give four alternatives and write the option code and the corresponding answer   .   **(14 x 1 = 14)**

1) $f: A \longrightarrow B$ is a bijective function and if $n(B) = 7$, then $n(A)$ is equal to
   (1) 7   (2) 49   (3) 1   (4) 14

2) If there are 1024 relations from a set $A = \{1, 2, 3, 4, 5\}$ to a set B, then the number of elements in B is
   (1) 3   (2) 2   (3) 4   (4) 8

3) The next term of the sequence $\frac{3}{16}, \frac{1}{8}, \frac{1}{12}, \frac{1}{18}, \ldots$ is
   (1) $\frac{1}{24}$ (2) $\frac{1}{27}$ (3) $\frac{2}{3}$ (4) $\frac{1}{81}$

4) Which of the following should be added to make $x^4 + 64$ a perfect square?
   (1) $4x^2$ (2) $16x^2$ (3) $8x^2$ (4) $-8x^2$

5) The excluded value of the rational expressions $\frac{x^3+8}{x^2-2x-8}$ is
   (1) 8   (2) 2   (3) 4   (4) 1

6) Graph of a linear polynomial is a
   (1) straight line   **(2)** circle   **(3)** parabola **(4)** hyberbola

7) A tangent is perpendicular to the radius at the
   (1) centre   **(2)** point of contact   **(3)** infinity   **(4)** chord

8) The Area of a triangle formed by the points $(-5, 0), (0, -5)$ and $(5, 0)$ is
   (1) 0 Sq. units   (2) 25 Sq. units   (3) 5 Sq. units   (4) None of these

9) The point of intersection of $3x - y = 4$ and $x + y = 8$ is
   (1) $(5, 3)$ (2) $(2, 4)$ (3) $(3, 5)$ (4) $(4, 4)$

10) If $5x = sec\theta$ and $\frac{5}{x} = tan\theta$, then $x^2 - \frac{1}{x^2}$ is equal to
   (1) 25   (2) $\frac{1}{25}$ (3) 5   (4) 1

11) $\frac{sin(90^o - \theta) \, sin\theta}{tan\theta} + \frac{cos(90^o - \theta) \, cos\theta}{cot\theta} =$
   (1) $tan\theta$ (2) **1**   (3) **-1**   (4) $sin\theta$

12) The height and the radius of the cone of which the frustum is a part are h_1 units and r_1 units respectively. Height of the frustum is h_2 units and radius of the smaller base is r_2 units. If $h_2 : h_1 = 1 : 2$ then $r_1 : r_2$ is
   (1) 1 : 3   **(2) 1 : 2**   **(3) 2 : 1**   **(4) 3 : 1**

13) The range of first 10 prime numbers is
   (1) 9   **(2) 20**   **(3) 27**   **(4) 5**

14) The average of the first $'n'$ natural numbers is
   (1) $\frac{n(n+1)}{2}$ **(2)** $\frac{n}{2}$ **(3)** $\frac{(n+1)}{2}$ **(4) n**

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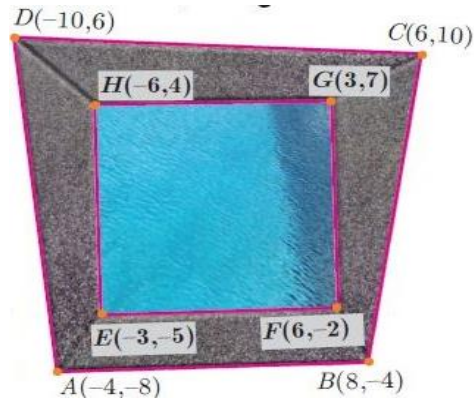
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PART - II

Note: (i) Answer 10 questions.

(ii) Question Number 28 is compulsory.   (10 x 2 = 20)

15) A relation R is given by the set $\{(x, y)/\ y = x^2 + 3, x \in \{0, 1, 2, 3, 4, 5\}\}$. Determine its domain and range.

16) If $f(x) = x^2 - 1, g(x) = x - 2$, find a if $gof(a) = 1$.

17) If A and B are mutually exclusive events of a random experiment and $(not\ A) = 0.45, P(A \cup B) = 0.65$ then find $P(B)$

18) Dividing the polynomial $p(x) = x^2 - 5x - 14$ by another polynomial $q(x)$ yields $\frac{x-7}{x+2}$ then find $q(x)$.

19) If $A = \begin{pmatrix} \sqrt{7} & -3 \\ -\sqrt{5} & 2 \\ \sqrt{3} & -5 \end{pmatrix}$ then find the transpose of $-A$.

20) If ΔABC is similar to ΔDEF such that $BC = 3$ cm, $EF = 4$ cm and area of $\Delta ABC = 54$ cm^2. Find the area of ΔDEF.

21) Find the slope of the line joining the points $(sin\theta, -cos\theta)$ and $(-sin\theta, cos\theta)$.

22) The hill in the form of a right triangle has its foot at $(19, 3)$. The inclination of the hill to the ground 45°. Find the equation of the hill joining the foot and top.

23) Find x so that $x + 6, x + 12$ and $x + 15$ are three consecutive terms of a Geometric Progression.

24) If $1 + 2 + 3 + \cdots \ldots + n = 666$, then find n.

25) Find the angle of elevation of the top of a tower from a point on the ground, which is 30m away from the foot of a tower of height $10\sqrt{3}$m.

26) The ratio of the radii of two right circular cones of same height is 1:3. Find the ratio of their curved surface area when the height of each cone is 3 times the radius of the smaller cone?

27) If two positive integers p and q are written as $p = a^2 b^3$ and $q = a^3 b$; a, b are prime numbers, then verify $LCM(p, q) \times HCF(p, q) = pq$.

28) Find the number of spherical lead shots, each of diameter 6 cm that can be made from a solid cuboids of lead having dimensions $24cm \times 22cm \times 12cm$.

PART - III

Note: (i) Answer 10 questions.

(ii) Question Number 42 is compulsory.   (10 x 5 = 50)

29) In the figure, the quadrilateral swimming pool shown is surrounded by concrete patio. Find the area of the patio.

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30) State and prove Thales theorem.

31) If $f(x) = x - 4$, $g(x) = x^2$ and $h(x) = 3x - 5$ then show that $(fog)oh = fo(goh)$.

32) (i) Find the least positive value of x such that $67 + x \equiv 1(mod\ 4)$.
    (ii) Solve $5x \equiv 4(mod\ 6)$.

33) The house of the street are numbered from 1 to 49. Senthil's house numbered such that the sum of the numbers of the houses prior to Senthil's house equal to the sum of numbers of the houses following Senthil's house. Find Senthil's house number.

34) A coin is tossed thrice. Find the probability of getting exactly two heads or atleast on tail or two consecutive heads.

35) The temperature of two cities A and B in a winter seson are given below.

Temperature of city A(in degree Celsius)	18	20	22	24	26
Temperature of city B(in degree Celsius)	11	14	15	17	18

Find which city is more consistent in temperature changes?

36) Let $A = \{x \in \mathbb{W}/\ x < 2\ \}$, $B = \{x \in \mathbb{N}/\ 1 \le x \le 4\}$ and $C = \{3, 5\}$, verify that $A \ X\ (B \cup C) = (A \ X\ B) \cup (A \ X\ C)$.

37) Vani, her father and her grand father have an average age of 53. One half of her grand father's age plue one-third of her father's age plus one-fourth of Vani's age is 65. Four years ago if Vani's grandfather was four times as old as Vani then how old are they all now?

38) If $A = \begin{pmatrix} \cos\theta & 0 \\ 0 & \cos\theta \end{pmatrix}$, $B = \begin{pmatrix} \sin\theta & 0 \\ 0 & \sin\theta \end{pmatrix}$ then show that $A^2 + B^2 = I_2$.

39) A metallic sheet in the form of a sector of a circle of radius 21 cm has central angle of 216°. The sector is made into a cone by bringing the bounding radii together. Find the volume of the cone formed.

40) A shuttle cock used for playing badminton has the shape of a frustum of a cone is mounted on a hemisphere. The diameters of the frustum are 5 cm and 2 cm. the height of the entire shuttle cock is 7 cm. find its external surface area.

41) A motor boat whose speed is 18 km/hr in still water takes 1 hour more to go to. 24 km upstream than to return downstream to the same spot. Find the speed of the stream.

42) A 1.2 m tall girl spots a balloon moving with the wind in a horizontal line at a height of 88.2 m from the ground. The angle of elevation of the balloon from the eyes of the girl at an instant 60°. After some time the angle of elevation reduces to 30°. Find the distance travelled by the balloon during the interval.

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PART - IV

Note: **(i)** This section contains two questions. Each with two alternatives.
(ii) Answer both the questions choosing either of the alternatives.**(2 x 8 = 16)**

43) a) Draw the graph of $y = x^2 - 5x - 6$ and hence solve $x^2 - 5x - 14 = 0$.

(OR)

b) Find the values of a , b if $16x^4 - 24x^3 + (a-1)x^2 + (b+1)x + 49$ is a perfect square.

44) a) Take a point which is 11 cm away from the centre of a circle of radius 4 cm and draw two tnagents to the circle from that point.

(OR)

b) In figure $\angle QPR = 90^o$, PS is its bisector. If $ST \perp PR$ prove that $ST \times (PQ + PR) = PQ \times PR$.
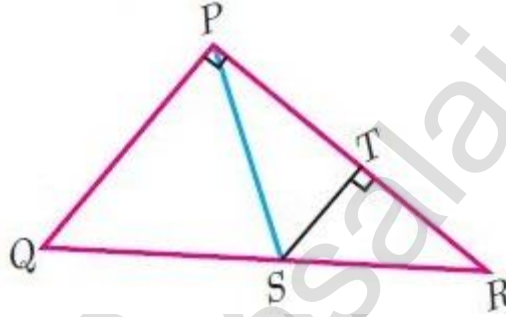
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STATE PARENT TEACHER'S ASSOCIATION, TAMILNADU – MODEL QUESTION PAPER - 3		
Time : 3.15 Hours	STD - 10 – MATHEMATICS	MARKS : 100

PART - I

Note: **(i)** Answer all the 14 questions.

(ii) Chose the correct answer from the give four alternatives and write the option code   and the corresponding answer. **(14 x 1 = 14)**

1) $A = \{a, b, p\}, B = \{2, 3\}, C = \{p, q, r, s\}$ then $n[(A \cup C) \times B]$
   (1) 8   (2) 20   (3) 12   (4)16

2) Given $f(x) = (-1)^x$ is a function from $\mathbb{N}$ to $\mathbb{Z}$. Then the range of f is
   (1) $\{1\}$ (2) $\mathbb{N}$ (3) $\{1, -1\}$ (4) $\mathbb{Z}$

3) The value of $(1^3 + 2^3 + 3^3 + ... + 15^3) - (1 + 2 + 3 + \cdots + 15)$ is
   (1) 14400   (2) 14200   (3) 14280   (4) 14520

4) If $2 + 4 + 6 + \cdots + 29k = 90$ then the value of k is
   (1) 8   (2) 9   (3) 10   (4) 11

5) A straight line has equation $8y = 4x + 21$. Which of the following is true?
   (1) The slope is 0.5 and the y- intercept 2.6   (2) The slope is 5 and the y- intercept 1.6
   (3) The slope is 0.5 and the y- intercept 1.6   (4) The slope is 5 and the y- intercept 2.6

6) GCD of $6x^2y, 9x^2yz, 12x^2y^2z$ is
   (1) $36xy^2z^2$ (2) $36x^2y^2z$ (3) $36x^2y^2z^2$ (4) $3x^2y$

7) In ΔABC, DE ∥ BC, AB $= 3.6cm, AC = 2.4cm, AD = 2.1cm$, then the length of AE is
   (1) 1.4 cm   (2) 1.8 cm   (3) 1.2 cm   (4) 1.05 cm

8) The slope of the line joining $(12, 3), (4, a)$ is $\frac{1}{8}$, the value of $'a'$ is
   (1) 1   (2) 4   (3) – 5   (4) 2

9) $(2, 1)$ is the point of intersection of two lines
   (1) $x - y - 3 = 0 ; 3x - y - 7 = 0$ (2) $x + y = 3 ; 3x + y = 7$
   (3) $3x + y = 3 ; x + y = 7$ (4) $x + 3y - 3 = 0 ; x - y - 7 = 0$

10) $tan\theta \, cosec^2\theta - tan\theta$ is equal to
   (1) $sec\theta$ (2) $cot^2\theta$ (3) $sin\theta$ (4) $cot\theta$

11) The total surface area of a hemisphere is how much times the square of its radius?
   (1) π (2) 4π (3) 3π (4) 2π

12) If the volume of sphere is 36π cm^3, then its radius is equal to
   (1) 3 cm   (2) 2 cm   (3) 5 cm   (4) 10 cm

13) The range of the data 8, 8, 8, 8, 8, . . . , 8 is
   (1) 0   **(2) 1**   **(3) 8**   **(4) 3**

14) If a letter is chosen at random from the English alphabets, then the probability that the letter chosen precedes x
   (1) $\frac{12}{13}$ **(2)** $\frac{1}{13}$ **(3)** $\frac{23}{26}$ **(4)** $\frac{3}{26}$

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MATHS MASTERS VIRUDHUNAGAR DISTRICT

PART - II

Note: (i) Answer 10 questions.
(ii) Question Number 28 is compulsory.   (10 x 2 = 20)

15) Let f be the function $f : \mathbb{N} \longrightarrow \mathbb{N}$ defined by $f(x) = 3x + 2, x \in N$. Find the pre-image of 29,53.

16) Is 7 x 5 x 3 x 2 + 3, composite number? Justify your answer.

17) If $3 + k, 18 - k, 5k + 1$ are in A.P, then find k.

18) If $1^3 + 2^3 + 3^3 + \ldots + k^3 = 16900$, then find $1 + 2 + 3 + \ldots + k$.

19) If $A = \begin{pmatrix} 7 & 8 & 6 \\ 1 & 3 & 9 \\ -4 & 3 & -1 \end{pmatrix}, B = \begin{pmatrix} 4 & 11 & -3 \\ -1 & 2 & 4 \\ 7 & 5 & 0 \end{pmatrix}$ then find $2A + B$.

20) If one root of the equation $3x^2 + kx + 81 = 0$(having real roots) is the square of the other, then find k.

21) 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 $x^2 y^{-2}$.

22)
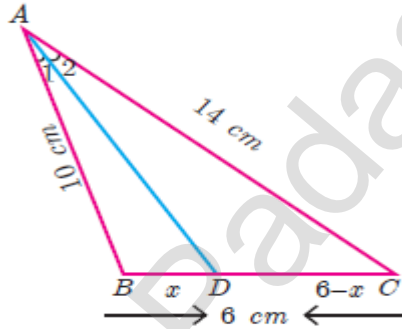
In the above figure AD is the bisector of $\angle BAC$, if $AB = 10$ cm, $AC = 14$ cm and $BC = 6$ cm find BD and DC.

23) What is the inclination of a line whose slope is 1?.

24) A player sitting on the top of a tower of height 20 m, observes the angle of depression of a bell lying on the fround as 60^0. Find the distance between the foot of the tower and the ball $\left(\sqrt{3} = 1.732\right)$.

25) A cone of height 24 cm is made up of modelling clay. A child reshapes it in the form of a cylinder of same radius as cone. Find the height of the cylinder.

26) If A is an event of a random experiment such that $P(A) : P(\bar{A}) = 17 : 15$ and $n(S) = 640$ then find $P(\bar{A})$.

27) The mean of a data is 25.6 and its coefficient of variation is 18.75. Find the standard deviation.

28) Show that the straight line $3x - 5y + 7 = 0$ and $15x + 9y + 4 = 0$ are perpendicular.

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PART - III

Note: **(i) Answer 10 questions.**

(ii) Question Number 42 is compulsory.   **(10 x 5 = 50)**

29) Let $A = \{1, 2, 3, 4\}$ and $B = \{2, 5, 8, 11, 14\}$ be two sets. Let $f : A \longrightarrow B$ 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.

30) An object travels under the influence of gravity in time t seconds is given by $s(t) = \frac{1}{2}gt^2 + at + b$, where ($g$ is the acceleration due to gravity), a, b are the constants. Check is the function $S(t)$ is one-one.

31) Let $A = \{x \in \mathbb{W}/\ 0 < x < 5 \}$, $B = \{x \in \mathbb{W}/0 \leq x \leq 2\}$ and $C = \{x \in \mathbb{W}/x < 3\}$ then verify that $A \text{ X } (B \cap C) = (A \text{ X } B) \cap (A \text{ X } C)$.

32) Find the sum of Geometric series $3 + 6 + 12 + \cdots + 1536$.

33) Find the sum of all 3 digit natural numbers which are divisible by 9.

34) Find the square root of the expression $\frac{4x^2}{y^2} + \frac{20x}{y} + 13 - \frac{30y}{x} + \frac{9y^2}{x^2}$.

35) Solve the quadratic equation by completing the square method $\frac{5x+7}{x-1} = 3x + 2$.

36) If $A = \begin{pmatrix} 5 & 2 & 9 \\ 1 & 2 & 8 \end{pmatrix}$ and $B = \begin{pmatrix} 1 & 7 \\ 1 & 2 \\ 5 & -1 \end{pmatrix}$, verify that $(AB)^T = B^T A^T$.

37) The hypotenuse of a right triangle is 6 m more than twice of the shortest side. If the third side is 2 m less the hypotenuse, find the sides of the triangle.

38) Find the equation of a straight line joining the point of intersection $7x - 3y = -12$ and $2y = x + 3$ to the point of intersection of $3x + y + 2 = 0$ and $x - 2y - 4 = 0$.

39) If $\sqrt{3}sin\theta - cos\theta = 0$, then show that $tan3\theta = \frac{3tan\theta - tan^3\theta}{1 - 3\,tan^2\theta}$.

40) The radius of a conical tent is 7 cm and the height is 24 m. Calculate the length of the canvas used to make the tent. If the width of the rectangular canvas is 4m.

41) A card is drawn from a pack of 52 cards. Find the probability of getting a king or a heart or a red card.

42) Find the coefficient of variation of the data $18, 20, 15, 12, 25$.

PART - IV

Note: (i) This section contains two questions. Each with two alternatives.

(ii) Answer both the questions choosing either of the alternatives.**(2 x 8 = 16)**

43) a) Draw the graph of $y = 2x^2 - 3x - 5$ and hence solve $2x^2 - 4x - 6 = 0$.

(OR)

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b) Solve the equation $\frac{1}{x+1} + \frac{2}{x+2} = \frac{4}{x+4}$, where $x + 1 \neq 0, x + 2 \neq 0$ and $x + 4 \neq 0$ using quadratic formula.

44) a) Construct a ΔPQR in which $PQ = 8cm$, $\angle R = 60^o$ and the median RG from R to $PQ = 5.8cm$. Find the length of the altitude from R to PQ.

<div align="center">(OR)</div>

b) State and prove converse of angel bisector theorem.

<div align="center">**********</div>

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STATE PARENT TEACHER'S ASSOCIATION, TAMILNADU – MODEL QUESTION PAPER - 4		
Time : 3.15 Hours	STD - 10 – MATHEMATICS	MARKS : 100

PART - I

Note: **(i)** Answer all the 14 questions.

(ii) Chose the correct answer from the give four alternatives and write the option code and the corresponding answer. **(14 x 1 = 14)**

1) The range of the relation $R = \{(x, x^2)/ \ x \ is \ a \ prime \ number \ less \ than \ 13\}$ is
   (1) $\{2, \ 3, \ 5, \ 7\}$ (2) $\{2, 3, 5, 7, 11\}$ (3) $\{4, 9, 25, 49, 121\}$ (4) $\{1, 4, 9, 25, 49, 121\}$

2) Let $A = \{1, 2, 3, 4\}, B = \{4, 8, 9, 10\}$. A function $f: A \longrightarrow B$ given by $f = \{(1, 4), (2, 8), (3, 9), (4, 10)\}$ is a / an
   (1) many - one function   (2) identity function
   (3) one - one function   (4) into function

3) If 6 times of 6th term of an A.P is equal to 7 times of the 7th term, then the 13th term of an A.P is
   (1) 0   (2) 6   (3) 7   (4) 13

4) The sum of the exponents of the prime factors in the prime factorization of 1729 is
   (1) 1   (2) 2   (3) 3   (4) 4

5) If a and b are two positive integers where $a > 0$ and b is a factor of a, then HCF of a and b is
   (1) b (2) a (3) $3ab$ (4) $\frac{a}{b}$

6) If $(x - 6)$ is the HCF of $x^2 - 2x - 24$ and $x^2 - kx - 6$ then the value of k is
   (1) 3   (2) 5   (3) 6   (4) 8

7) If a polynomial is a perfect square then its factors will be repeated _____ number of times
   (1) odd   (2) zero   (3) even   (4) none of the above

8) If ΔABC is an isosceles triangle with $\angle C = 90^o$ and $AC = 5 \ cm$, then AB is
   (1) 2.5 cm   (2) 5 cm   (3) 10 cm   (4) $5\sqrt{2}$ cm

9) When proving that a quadrilateral is a trapezium it is necessary to show
   (1) Two sides are parallel   (2) Two sides are parallel and other two sides are non-parallel
   (3) opposite sides are parallel (4) all sides are of equal length

10) The equation of the line passing through the oigin and perpendicular to the line $7x - 3y + 4 = 0$ is
   (1) $7x - 3y + 4 = 0$ (2) $3x - 7y + 4 = 0$ (3) $3x + 7y = 0$ (4) $7x - 3y = 0$

11) If $sin\theta = cos\theta$ then $2tan^2\theta + sin^2\theta - 1$ is equal to
   (1) $\frac{-3}{2}$ (2) $\frac{3}{2}$ (3) $\frac{2}{3}$ (4) $\frac{-2}{3}$

12) In a hollow cylinder, the sum of the external and internal radii is 14 cm and the width is 4 cm. If its height is 20 cm, the volume of the material in it is
   (1) 5600π cm³   (2) 1120π cm³   (3) 56π cm³   (4) 3600π cm³

13) Which of the following is incorrect?
   (1) $P(A) > 1$ (2) $0 \leq P(A) \leq 1$ (3) $P(\varphi) = 0$ (4) $P(A) + P(\bar{A}) = 1$

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14) Probability of getting 3 heads or 3 balls in tossing a coin 3 times is

(1) $\frac{1}{8}$ (2) $\frac{1}{4}$ (3) $\frac{3}{8}$ (3) $\frac{1}{2}$

PART - II

Note: (i) Answer 10 questions.
(ii) Question Number 28 is compulsory.   (10 x 2 = 20)

15) Find k if $fof(k) = 5$ where $f(k) = 2k - 1$.

16) Let $A = \{1, 2, 3, \dots, 100\}$ and R be the relation defined as "is cube of" on A. Find the domain and range of R.

17) In a theatre, there are 20 seats in the front row and 30 seats were allotted. Each successive row contains two additional seats than its front row. How many seats are there in the last row?

18) In a G.P $\frac{1}{4}, \frac{-1}{2}, -1, -2, \ \dots$, find the 10th term.

19) Which rational expression should be subtracted from $\frac{x^2+6x+8}{x^8+8}$ to get $\frac{3}{x^2-2x+4}$.

20) Determine the quadratic equation, whose sum and product of roots are $\frac{-3}{2}$ and -1.

21) State Pythagoras theorem.

22) In the figure $DE \ || \ AC$ and $DC \ || \ AP$. Prove that $\frac{BE}{EC} = \frac{BC}{CP}$.

23) Show that the points $P(-1.5, 3), 14Q(6, -2), R(-3, 4)$ are collinear.

24) Prove that $\frac{cotA - cosA}{cotA + cosA} = \frac{cosecA - 1}{cosecA + 1}$.

25) The volumes of two cones of same base radius are 3600 cm^3 and 5040 cm^3. Find the ratio of their heights.

26) The range of a set of data is 13.67 and the largest value is 70.08. find the smallest value.

27) Write the sample space for selecting two balls from a bag contains 6 balls numberd 1 to 6 using tree diagram(with replacement).

28) Find the sum and product of the roots of equation $8x^2 - 25 = 0$.

PART - III

Note: (i) Answer 10 questions.
(ii) Question Number 42 is compulsory.   (10 x 5 = 50)

29) The data in the adjacent table depicts the length of a woman's forehead and her corresponding height. Based on their data, a student finds a relationship between the height(y) and the forehead length(x) as $y = ax + b$, where a, b are contants

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

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    (i)   Check if this relation is a function.

    (ii)   Find a and b.

    (iii)   Find the height of a woman whose forehead length is 40 cm.

    (iv)   Find the length of forehead of a woman if her height is 53.3 inches.

30) A function $f:[-5, 9] \to \mathbb{R}$ is defined as follows $f(x) = \begin{cases} 6x + 1 & ; \quad -5 \le x < 2 \\ 5x^2 - 1 & ; \quad 2 \le x < 6 \\ 3x - 4 & ; \quad 6 \le x \le 9 \end{cases}$ find

    (i) $f(7) - f(1)$ (ii) $\dfrac{2f(-2) - f(6)}{f(4) + f(-2)}$

31) Find the sum to n tems of the series $5 + 55 + 555 + \cdots$

32) A girl is twice as old as her sister. Five years hence, the product of their ages (in years) will be 375. Find their present ages.

33) Find the non-zero values of x satisfying the matrix equation $x\begin{pmatrix} 2x & 2 \\ 3 & x \end{pmatrix} + 2\begin{pmatrix} 8 & 5x \\ 4 & 4x \end{pmatrix} = 2\begin{pmatrix} x^2 + 8 & 24 \\ 10 & 6x \end{pmatrix}$.

34) Find the values of a and b if the polynomial $4x^4 - 12x^3 + 37x^2 + bx + a$ is a perfect square.

35) State and prove alternate segment theorem.

36) $PQRS$ is a rhombus. Its diagonals PR and QS intersect at the point M and satisfy $QS = 2PR$. If the coordinates of S and M are $(1, 1)$ and $(2, -1)$ respectively, find the coordinates of P.

37) A building and a statue are in opposite side of a street from each other 35 m apart. From a point on the roof of building the angle of elevation of the top of statue is 24^0 and the angle of depression of base of the statue is 34^0. Find the height of the statue. $[\tan 24^o = 0.4452, \tan 34^o = 0.6745]$

38) A cylindrical bucket, $32 cm$ high and with radius of base $18 cm$, is filled with sand completely. This bucket is emptied on the ground and a conical heap of sand is formed. If the height of the conical heap is $24 cm$, find the radius and slant height of the heap.

39) The consumption of number of guava and orange by family on a particular week are given below

Number of Guavas	3	5	6	4	3	5	4
Number of Oranges	1	3	7	9	2	6	2

     Which fruit is consistently consumed by the family?

40) In class of 50 students, 28 opted for NCC, 30 opted for NSS and 18 opted for NCC and NSS. One of the students is selected at random. Find the probability that

    (i)   The selected student opted for NCC but not NSS

    (ii)   The selected student opted for NSS but not NCC

    (iii)   The selected student opted for exactly one of them.

41) By using slopes, show that the points $(1, -4), (2, -3)$ and $(4, -7)$ form a right angled triangle.

42) A man saved ₹16500 in ten years. In each year after the first he saved ₹100 more than he did in the preceding year. How much did he save the first year?

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PART - IV

Note: **(i) This section contains two questions. Each with two alternatives.**

(ii) Answer both the questions choosing either of the alternatives.(2 x 8 = 16)

43) a) Draw the graph of $y = 2x^2$ and hence solve $2x^2 - x - 6 = 0$

(OR)

b) Simplify $\frac{a^2-16}{a^3-8} \times \frac{2a^2-3a-2}{2a^2+9a+4} \div \frac{3a^2-11a-4}{a^2+2a+4}$

44) a) Draw ΔPQR such that $PQ = 6.8cm$, vertical angle is 50° and the bisector of the vertical angle meets the base at D, where $PD = 5.2cm$.

(OR)

b) show that the angle bisector of a triangle are concurrent.

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STATE PARENT TEACHER'S ASSOCIATION, TAMILNADU – MODEL QUESTION PAPER - 5		
Time : 3.15 Hours	STD - 10 – MATHEMATICS	MARKS : 100

PART - I

<u>Note:</u> **(i) Answer all the 14 questions.**
(ii) Chose the correct answer from the give four alternatives and write the option code and the corresponding answer. **(14 x 1 = 14)**

1) $f(x) = (x + 1)^3 - (x - 1)^3$ represents a function which is
   (1) linear   **(2)** cubic   **(3)** reciprocal   **(4)** quadratic

2) Using Euclid's division lemma, if the cube of any positive integer is divided by 9 then the possible remainders are
   (1) $0, 1, 8$ (2) $1, 4, 8$ (3) $0, 1, 3$ (4) $1, 3, 5$

3) An A.P consists of 31 terms. If its 16th term is m, then the sum of all the terms of this A.P is
   (1) 16m   (2) 62m   (3) 31m   (4) $\frac{31}{2}m$

4) $\frac{3y-3}{y} \div \frac{7y-7}{3y^2}$ is
   (1) $\frac{9y}{7}$ (2) $\frac{9y^3}{(21y-21)}$ (3) $\frac{21y^2-42y+21}{3y^3}$ (4) $\frac{7(y^2-2y+1)}{y^2}$

5) The solution of $x^2 - 25 = 0$ is
   (1) no real roots   **(2)** real and equal roots
   (3) real and unequal roots   **(4)** imaginary roots

6) For the given matrix $A = \begin{pmatrix} 1 & 3 & 5 \\ 2 & 4 & 6 \end{pmatrix}$ the order of the matrix $(A^T)^T$ is
   (1) 2 x 3   (2) 3 x 2   (3) 3 x 4   (4) 4 x 3

7) The perimeters of two similar triangles ΔABC and ΔPQR are 36 cm and 24 cm respectively. If $PQ = 10$ cm, then the length of AB is
   (1) $6\frac{2}{3}$ cm   (2) $\frac{10\sqrt{6}}{3}$ cm   (3) $66\frac{2}{3}$ cm   (4) 15 cm

8) If $(5, 7), (3, p)$ and $(6, 6)$ are collinear, then the value of p is
   (1) 3   (2) 6   (3) 9   (4) 12

9) If the points $A(6, 1), B(8, 2), C(9, 4)$ and $D(p, 3)$ are the vertices of parallelogram, taken in order then the value of p is
   (1) -7 (2) 7   (3) 6   (4) -6

10) If $a\cot\theta + b\csc\theta = p$ and $b\cot\theta + a\csc\theta = q$, then $p^2 - q^2$ is equal to
   (1) $a^2 - b^2$ (2) $b^2 - a^2$ (3) $a^2 + b^2$ (4) $b - a$

11) The ratio of the volumes of a cylinder, a cone and a sphere, if each has the same diameter and same height is
   (1) $1 : 2 : 3$ (2) $2 : 1 : 3$ (3) $1 : 3 : 2$ (4) $3 : 1 : 2$

12) C.S.A of solid sphere is equal to
   (1) T.S.A of solid sphere   **(2)** T.S.A of hemisphere
   (3) C.S.A of hemisphere   **(4)** none of these

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13) Variance of first 20 natural numbers is
   (1) 32.25   (2) 44.25   (3) 33.25   (4) 30

14) Which of the following is incorrect?
   (1) $P(A) > 1$ (2) $0 \leq P(A) \leq 1$ (3) $P(\varphi) = 0$ (4) $P(A) + P(\bar{A}) = 1$

PART - II

Note: (i) Answer 10 questions.
(ii) Question Number 28 is compulsory.   (10 x 2 = 20)

15) Let $A = \{1, 2, 3, 4\}$ and $B = \mathbb{N}$. Let $f : A \to B$ be defined by $f(x) = x^2$. Find (i) the range of f (ii) identify the type of function.

16) If $3 + k, 18 - k, 5k + 1$ are in A.P, then find k.

17) Find the geometric progression whose first term $a = -7$ and common ratio $r = 6$.

18) Find the square root of $\dfrac{144 \, a^8 b^{12} c^{16}}{81 \, f^{12} g^4 h^{14}}$

19) Which term of the A.P $21, 18, 15, \ldots$ is -81? State with reason is there any term 0 in this A.P?

20) A relation R is given by the set $\{(x, y)/\, y = x + 3, x \in \{0, 1, 2, 3, 4, 5\}\}$. Determine its domain and range.

21) If $A = \begin{pmatrix} 0 & 4 & 9 \\ 8 & 3 & 7 \end{pmatrix}, B = \begin{pmatrix} 7 & 3 & 8 \\ 1 & 4 & 9 \end{pmatrix}$, find the value of $3A - 9B$.

22) In the figure, AD is the bisector of A. If $BD = 4cm, DC = 3cm$ and $AB = 6cm$. Find AC.
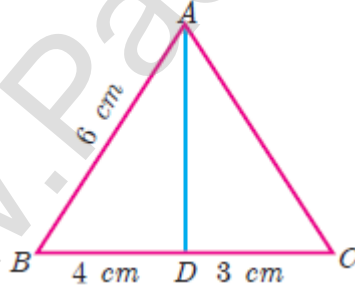
23) Show that the straight lines $x - 2y + 3 = 0$ and $6x + 3y + 8 = 0$ are perpendicular.

24) Show that $\sqrt{\dfrac{sec\theta - tan\theta}{sec\theta + tan\theta}} = \dfrac{1 - sin\theta}{cos\theta}$

25) If the radii of the circular ends of a frustum which is $45cm$ high are $28cm$ and $7cm$, find the volume of the frustum.

26) Find the range of the following distribution

Age (in years)	16 – 18	18 – 20	20 – 22	22 – 24	24 – 26	26 – 28
Number of students	0	4	6	8	2	2

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27) Three fair coins are tossed together. Find the probability of getting
    (i) atleast one tail   (ii) atmost one head

28) Find the value of p, when $px^2 + (\sqrt{3} - \sqrt{2})x - 1 = 0$ and $x = \frac{1}{\sqrt{3}}$ is one root of the equation.

PART - III

Note: (i) Answer 10 questions.
(ii) Question Number 42 is compulsory.   (10 x 5 = 50)

29) Let $A = \{x \in \mathbb{W} / x < 2\}$, $B = \{x \in \mathbb{N} - 1 < x \le 4\}$ and $C = \{3, 5\}$ verify   that
    $A \times (B \cap C) = (A \times B) \cap (A \times C)$.

30) If $f(x) = 2x + 3$, $g(x) = 1 - 2x$ and $h(x) = 3x$, prove that $fo(goh) = (fog)oh$.

31) A man repays a loan of ₹65,000 by paying ₹400 in the first month and then increasing the payment by ₹300 every month. How long will it take for him to clear the loan?

32) Find the sum of $10^3 + 11^3 + 12^3 + \cdots + 20^3$.

33) Solve the system of linear equations in three variables:
    $x + y + z = 5, 2x - y + z = 9, x - 2y + 3z = 16$.

34) If $9x^4 + 12x^3 + 28x^2 + ax + b$ is perfect square, find the value of a and b.

35) If $A = \begin{pmatrix} 1 & -1 \\ 2 & 3 \end{pmatrix}$, show that $A^2 - 4A + 5I_2 = 0$.

36) State and prove Angle Bisector theorem.

37) Find the value of k, if the area of a quadrilateral is 28 sq.units, whose vertices are $(-4, -2), (-3, k), (3, -2)$ and $(2, 3)$.

38) Two ships are sailing in the sea on either sides of a lighthouse. The angle of elevation of the top of the lighthouse as observed from the ships are 30° and 45° respectively. If the lighthouse is $200m$ high, find the distance between the two ships. $(\sqrt{3} = 1.732)$

39) A right circular cylindrical container of base radius $6cm$ and height $15cm$ is full of ice cream. The ice cream is to be filled in cones of height $9cm$ and base radius $3cm$, having a hemispherical cap. Find the number of cones needed to empty the container.

40) A well of diameter $3m$ is dug $14m$ deep. The earth taken out of it has been spread evenly all around it in the shape of a circular ring of width $4m$ to form an embankment. Find the height of the embankment.

41) The time taken by 50 students to complete 100 meter race are given below. Find its standard deviation.

Time taken (Seconds)	8.5 – 9.5	9.5 – 10.5	10.5 – 11.5	11.5 – 12.5	12.5 – 13.5
Number of Students	6	8	17	10	9

42) A card is drawn from a pack 52 cards. Find the probability of getting a Queen or a Diamond of Black card.

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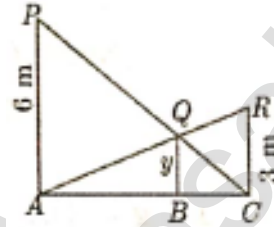
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PART - IV

Note: **(i) This section contains two questions. Each with two alternatives.**
(ii) Answer both the questions choosing either of the alternatives.(2 x 8 = 16)

43) a) Draw the graph of $y = x^2 + 3x + 2$ and use it to solve $x^2 + 2x + 1 = 0$.

(OR)

b) A train covered a certain distance at a uniform speed. If the train would have been 10 km/hr faster it would have taken 2 hour less than the scheduled time and if the train were slower by 10 km/hr, it would have taken 3 hour more than the scheduled time. Find the distance covered by the train.

44) a) Construct a triangle ΔPQR such that $QR = 5cm, \angle P = 30^o$ and the altitude from P to QR is of length $4.2cm$.

(OR)

b) Two vertical poles of heights 6 m and 3 m are erected above a horizontal ground C . find the value of y

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| STATE PARENT TEACHER'S ASSOCIATION, TAMILNADU – MODEL QUESTION PAPER - 6		
Time : 3.15 Hours	STD - 10 – MATHEMATICS	MARKS : 100

PART - I

Note: **(i)** Answer all the 14 questions.

(ii) Chose the correct answer from the give four alternatives and write the option code and the corresponding answer. **(14 x 1 = 14)**

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

2) The given diagram represents
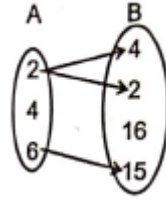
   (1) an onto function   (2) a constant function (3) an one-one function   (4) not a funciton

3) If $A = 2^{65}$ and $B = 2^{64} + 2^{63} + 2^{62} + \ldots + 2^0$ then which of the following is true?
   (1) B is 2^{65} more than A (2) A and B are equal
   (3) B larger than A by 1   (4) A is larger than B by 1

4) If a, b, c are in A.P then $\frac{a-b}{b-c}$ is equal to
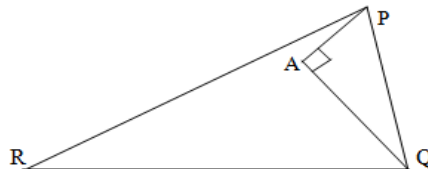   1) $\frac{a}{b}$ 2) $\frac{b}{c}$ 3) $\frac{a}{c}$ 4) 1

5) $y^2 + \frac{1}{y^2}$ is not equal to
   (1) $\frac{y^4+1}{y^2}$ (2) $\left(y + \frac{1}{y}\right)^2$ (3) $\left(y - \frac{1}{y}\right)^2 + 2$ (4) $\left(y + \frac{1}{y}\right)^2 - 2$

6) Find the matrix X if $2X + \begin{pmatrix} 1 & 3 \\ 5 & 7 \end{pmatrix} = \begin{pmatrix} 5 & 7 \\ 9 & 5 \end{pmatrix}$
   (1) $\begin{pmatrix} -2 & -2 \\ 2 & -1 \end{pmatrix}$ (2) $\begin{pmatrix} 2 & 2 \\ 2 & -1 \end{pmatrix}$ (3) $\begin{pmatrix} 1 & 2 \\ 2 & 2 \end{pmatrix}$ (4) $\begin{pmatrix} 2 & 1 \\ 2 & 2 \end{pmatrix}$

7) On dividing $\frac{x^2-25}{x+3}$ by $\frac{x+5}{x^2-9}$ is equal to
   (1) $(x - 5)(x - 3)$ (2) $(x - 5)(x + 3)$ (3) $(x + 5)(x - 3)$ (4) $(x + 5)(x + 3)$

8) In a ΔABC, AD is the bisector of $\angle BAC$. If $AB = 8\ cm, BD = 6\ cm$ and $DC = 3\ cm$, the length of the side AC is
   (1) 6 cm   (2) 4 cm   (3) 3 cm   (4) 8 cm

9) In a given figure $PR = 26cm, QR = 24cm, \angle PAQ = 90^o, PA = 6cm$ and $QA = 8cm$. Find $\angle PQR$

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(1) 80° (2) 85° (3) 75° (4) 90°

10) If slope of the line PQ is $\frac{1}{\sqrt{3}}$ then slope of the perpendicular bisector of PQ is

   (1) $\sqrt{3}$ (2) $-\sqrt{3}$ (3) $\frac{1}{\sqrt{3}}$ (4) 0

11) If the ratio of the height of a tower and the length of its shadow is $\sqrt{3}:1$, then the angle of elevation of the sun has measure

   (1) 45° (2) 30° (3) 90° (4) 60°

12) A spherical ball of radius r_1 units is melted to make 8 new identical balls each of radius r_2 units. Then $r_1 : r_2$

   (1) 2 : 1   (2) 1 : 2   (3) 4 : 1   (4) 1 : 4

13) A fair die is thrown once. The probability of getting a prime (or) composite number is

   (1) 1   (2) 0   (3) $\frac{5}{6}$ (4) $\frac{1}{6}$

14) Which of the following is not a measure of dispersion?

   (1) range   (2) standard deviation   (3) arithmetic mean   (4) variance

PART - II

 Note: **(i) Answer 10 questions.**

   (ii) Question Number 28 is compulsory.   **(10 x 2 = 20)**

15) Let f be a function from $\mathbb{R}$ to $\mathbb{R}$ defined by $f(x) = 3x - 5$. Find the values of a and b given that $(a, 4)$ and $(1, b)$ belong to f.

16) If $R = \{(x, -2), (-5, y)\}$ represents the identity function, find the values of x and y.

17) Find the common difference of an A.P $t_{18} - t_{14} = 32$.

18) Find the number of integer solutins of $3x \equiv 1 \ (mod \ 5)$.

19) Find the sum of $1 + 3 + 5 + \ldots + 55$.

20) Solve by factorization method $2x^2 - 2\sqrt{6}x + 3 = 0$.

21) If the difference between a number and its reciprocal is $\frac{24}{5}$, find the number.

22) If α, β are the roots of the equation $7x^2 + ax + 2 = 0$ and if $\beta - \alpha = \frac{-13}{7}$, the find the value of a

23) The line through the points $(-2, 6)$ and $(4, 8)$ is perpendicular to the line through the points $(8, 12)$ and $(x, 24)$. Find the value of $'x'$

24) From the top of the rock $50\sqrt{3}m$ high, the angle of depression of a car on the ground is observed to be 30°. Find the distance of the car from the rock.

25) A solid sphere and a solid hemisphere have equal total surface area. Prove that the ratio of their volume is $3\sqrt{3} : 4$.

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26) Find the standard deviation of first 21 natural numbers.

27) A and B are two candidates seeking admission to IIT. The probability the A getting selected is 0.5 and probability that both A and B getting selected is 0.3. Prove that the probability of B being selected is at most 0.8.

28) P and Q are points on sides AB and AC respectively of ΔABC. If AP = 3cm, $PB = 6cm$, AQ $= 5cm$ and QC $= 10cm$. Show that $BC = 3PQ$.

PART - III

Note: **(i) Answer 10 questions.**

   (ii) Question Number 42 is compulsory.   **(10 x 5 = 50)**

29) Write the domain of the following functions

 (i) $f(x) = \frac{2x+1}{x-9}$ (ii) $g(x) = \sqrt{x-2}$

30) If $f : \mathbb{R} \longrightarrow \mathbb{R}$ and $g : \mathbb{R} \longrightarrow \mathbb{R}$ are defined by $f(x) = x^5$ and $g(x) = x^4$ then check if f and g are one – one and $f \, o \, g$ is one-one?

31) If the sum of the first p terms of an A.P is $ap^2 + bp$. find its common difference.

32) A man joined a company as Assistant Manager. The company gave him a starting salary of ₹60,000 and agreed to increase his salary 5% annually. What will be his salary after 5 years?

33) 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 either $a = 0$ or $a^3 + b^3 + c^3 = 3abc$.

34) Find the LCM of the polynomials $a^2 + 4a - 12, a^2 - 5a + 6$ whose GCD is $a - 2$.

35) If A $= \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$, B $= \begin{pmatrix} 0 & 3 \\ -1 & 5 \end{pmatrix}$, C $= \begin{pmatrix} -1 & 5 \\ 1 & 3 \end{pmatrix}$, prove that A(BC) = (AB)C

36) The perpendicular PS on the base QR of a ΔPQR intersectes QR at S, such that $QS = 3SR$. Prove that $2PQ^2 = 2PR^2 + QR^2$.

37) Find the equation of the median and altitude of ΔABC through A where the vertices are $A(6, 2), B(-5, -1)$ and $C(1, 9)$.

38) Prove that $\left(\frac{cos^3 A - sin^3 A}{cos A - sin A}\right) - \left(\frac{cos^3 A + sin^3 A}{cos A + sin A}\right) = 2 sin A \, cos A$.

39) If the slant height of the frustum cone is 10cm and perimeter of its circular base are $18cm$ and $28cm$ respectively. What is the curved surface area of the frustum

40) A right circular cylindrical container of base radius $6cm$ and height $15cm$ is full of ice cream. The ice cream is to be filled in cones of height $9cm$ and base radius $3cm$, having a hemispherical cap. Find the number of cones needed to empty the container.

41) The following table gives the values of mean and variance of heights and weights of the 10th standard students of a school. Which is more varying than the other

	Height	Weight
Mean	155 cm	46.50 kg
Variance	72.55 cm^2	28.09 cm^2

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42) A coin is tossed thrice. Find the probability of getting exactly two heads or at least one tail or two consecutive heads.

PART - IV

Note: **(i) This section contains two questions. Each with two alternatives.**
(ii) Answer both the questions choosing either of the alternatives.(2 x 8 = 16)

43) a) Two triangles QPR and QSR, right angled at P and S respectively are drawn on the same base on thee same side of QR. If PR and SQ intersect at T, prove that $PT \times TR = ST \times TQ$.

(OR)

b) Draw the circle of diameter 6 cm from a point P, which is 8 cm away from its centre. Draw two tangents PA and PB to the circle and measure their lengths.

44) a) Draw the graph $y = x^2 - 5x - 6$ and hence solve $x^2 - 5x - 14 = 0$.

(OR)

b) A car left 30 minutes later than the scheduled time. In order to reach its destination 150 km away in time, it has to increase its speed by 25 km/hr from its usual speed. Find its usual speed.

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