

**CLASS: 10****MATHS – IMPORTANT FIVE MARKS****UNIT I – RELATIONS AND FUNCTIONS: (ALL CAN ATTEND TWO FIVE MARKS AS PER MODEL QP)**

- Let  $f$  be a function  $f: \mathbb{N} \rightarrow \mathbb{N}$  be defined by  $f(x) = 3x + 2$ ,  $x \in \mathbb{N}$ 
  - Find the images of 1, 2, 3
  - Find the images of 29, 53
  - Identify the type of function
- Let  $f: A \rightarrow B$  be a function defined by  $f(x) = \frac{x}{2} - 1$ , where  $A = \{2, 4, 6, 10, 12\}$ ,  $B = \{0, 1, 2, 4, 5, 9\}$ . Represent  $f$  by
  - set of ordered pairs
  - a table
  - an arrow diagram
  - a graph
- In each of the following cases state whether the function is bijective or not. Justify your answer.
  - $f: \mathbb{R} \rightarrow \mathbb{R}$  defined by  $f(x) = 2x + 1$
  - $f: \mathbb{R} \rightarrow \mathbb{R}$  defined by  $f(x) = 3 - 4x^2$ .
- Let  $A, B, C \subseteq \mathbb{N}$  and a function  $f: A \rightarrow B$  be defined by  $f(x) = 2x + 1$  and  $g: B \rightarrow C$  be defined by  $g(x) = x^2$ . Find the range of  $f \circ g$  and  $g \circ f$ .
- Let  $A =$  The set of all natural numbers less than 8,  $B =$  The set of all prime numbers less than 8,  $C =$  The set of even prime numbers. Verify that
  - $(A \cap B) \times C = (A \times C) \cap (B \times C)$
  - $A \times (B - C) = (A \times B) - (A \times C)$
- Find the value of  $k$ , such that  $f \circ g = g \circ f$ .
  - $f(x) = 3x + 2$ ,  $g(x) = 6x - k$
  - $f(x) = 2x - k$ ,  $g(x) = 4x + 5$ .
- The distance  $S$  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 constants. Check if function  $S(t)$  is one-one.
- Let  $A = \{x \in \mathbb{W} / x < 2\}$ ,  $B = \{x \in \mathbb{N} / 1 < x \leq 4\}$  and  $C = \{3, 5\}$ . Verify that
  - $A \times (B \cup C) = (A \times B) \cup (A \times C)$
  - $A \times (B \cap C) = (A \times B) \cap (A \times C)$
  - $(A \cup B) \times C = (A \times C) \cup (B \times C)$
- The function ' $t$ ' which maps temperature in Celcius ' $C$ ' into temperature ' $F$ ' is denoted by  $t(C) = F$  where  $F = \frac{9}{5}C + 32$ . Find
  - $t(0)$
  - $t(28)$
  - $t(-10)$
- The value of  $C$  when  $t(C) = 212$ 
  - the temperature when  $C$  is equal to  $F$ .
- Forensic scientists can determine the height (in cms) of a person based on the length of their thigh bone. They usually do so using the function  $h(b) = 2.47b + 54.10$  where  $b$  is the length of their bone.
  - Check if the function  $h$  is one-one.
  - Also find the height of a person if the length of his thigh bone is 50cms.
  - Find the length of the thigh bone if the height of a person is 147.96cms.
- Show that  $(f \circ g) \circ h = f \circ (g \circ h)$  if  $f(x) = x - 1$ ,  $g(x) = 3x + 1$  and  $h(x) = x^2$ .
- If  $f: \mathbb{R} \rightarrow \mathbb{R}$  and  $g: \mathbb{R} \rightarrow \mathbb{R}$  are defined by  $f(x) = x^5$  and  $g(x) = x^4$  then check if  $f, g$  are one-one and  $f \circ g$  is one-one.
- Find  $x$  if  $g \circ f(x) = f \circ g(x)$ , given  $f(x) = 3x + 1$  and  $g(x) = x + 3$ .
- A function  $f: [-5, 9] \rightarrow \mathbb{R}$  is defined as follows:
 

$f(x) = \begin{cases} 6x+1, & -5 \leq x < 2 \\ 5x^2-1, & 2 \leq x < 6 \\ 3x-4, & 6 \leq x \leq 9 \end{cases}$	find	i) $f(-3) + f(2)$	ii) $f(7) - f(1)$
		iii) $2f(4) + f(8)$	iv) $\frac{2f(-2) - f(-6)}{f(4) + f(-2)}$
- Represent the function  $f = \{(1, 2), (2, 2), (3, 2), (4, 3), (5, 4)\}$  through
  - an arrow diagram
  - a table form
  - a graph

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## IMPORTANT QUESTIONS

## I. ANSWER THE FOLLOWING:

- If  $f(x) = x^2 - 1$ , find i) fof ii) fof
- Solve  $5x \equiv 4 \pmod{6}$
- First term **a** and common difference **d** are given below. Find the corresponding AP. **a= 5, d= 6.**
- Simplify:  $\frac{x^3}{x-y} + \frac{y^3}{y-x}$ .
- Solve the following equation by factorisation method:  $4x^2 - 7x - 2 = 0$ .
- Find the order of the product matrix AB if order of A=  $4 \times 2$ , order of B=  $2 \times 2$ .
- Two circles intersect at A and B. From a point P on one of the circles lines PAC and PBD are drawn intersecting the second circle at C and D. Prove that CD is parallel to the tangent at P.
- Find the equation of a line whose inclination is  $30^\circ$  and making an intercept -3 on the Y axis.
- Prove that  $\sec \theta - \cos \theta = \tan \theta \sin \theta$
- Write the formula for finding the surface area of a hollow cylinder?
- The radius of a spherical balloon increases from 12cm to 16cm air being pumped into it. find the ratio of the surface area of the balloons in the two cases.
- Two coins are tossed together. What is the probability of a getting different faces on the coins?
- What is the probability that a leap year selected at random will contain 53 Sundays. (Hints:  $366 = 52 \times 7 + 2$ ).
- Define probability of an event.
- Find the value of K, such that  $fof = gof$ ,  $f(x) = 3x + 2$ ,  $g(x) = 6x - k$ .
- Solve  $78 + x \equiv \text{ (mod } 5)$ .
- Check whether the following sequences are in AP?  $a-3, a-5, a-7, \dots$
- Simplify:  $\frac{x+2}{4y} \div \frac{(x^2-x-6)}{12y^2}$  Find the sum and product of the roots for quadratic equation  $x^2 + 3x - 28 = 0$
- Find the value of the x, y and z from the following equations  $\begin{pmatrix} 12 & 3 \\ x & \frac{3}{2} \end{pmatrix} = \begin{pmatrix} y & z \\ 3 & 5 \end{pmatrix}$
- The length of the tangent to a circle from a point, which is 25 cm away from the centre is 24cm. What is the radius of the circle?
- Find the slope of a line joining the points  $(\sin \theta, -\cos \theta)$  and  $(-\sin \theta, \cos \theta)$ .
- State the condition for checking the points of collinear.
- Find the angle of elevation of the top of a tower from a point on the ground, which is 30cm away from the foot of a tower of height  $10\sqrt{3}$ m.
- Write the formula for CSA of cone and volume of cone.
- Find the diameter of a sphere whose surface area is  $154\text{cm}^2$ .
- If the standard deviation of a data is 3.6cm and each value of the data is divided by 3, then find the new variance and new standard deviation.
- If the mean and coefficient of variation of a data are 15 and 48 respectively, then find the value of standard deviation.
- A coin is tossed thrice. What is the probability of getting two consecutive tails?
- Let  $f(x) = 2x + 5$ . If  $x \neq 0$  then find  $f(x + 2) - f(2)/x$
- If  $13824 = 2^a \times 3^b$ , then find **a** and **b**.
- Find the nth term of the following sequences 2, 5, 10, 17.
- Simplify:  $\frac{4x^2y}{2z^2} \times \frac{6xz^3}{20y^4}$
- Frame the quadratic equations, whose sum and product of roots are -9, 20.
- If  $A = \begin{bmatrix} 5 & 4 & 3 \\ 1 & -7 & 9 \\ 3 & 8 & 2 \end{bmatrix}$  then find the transpose of A.
- A man goes 18m due east and then 24m due north. Find the distance of his current position from the starting point.
- What is the inclination of a line whose slope is (i) 0 (ii) 1.
- State the condition for the two straight lines perpendicular to be and parallel.
- If  $\sin \theta + \cos \theta = p$  and  $\sec \theta + \text{cosec } \theta = q$  then prove that  $q(p^2 - 1) = 2p$ .
- If the total surface area of a cone of radius 7 cm is  $704 \text{ cm}^2$  then find its slant height.
- Find the maximum volume of a cone that can be carved out of a solid hemisphere of radius r units.
- If the mean and coefficient of variation of a data are 15 and 48 respectively, then find value of standard deviation.
- If A and B are two mutually exclusive events of a random experiments and  $P(\text{not } A) = 0.45$ ,  $P(A \cup B) = 0.65$  then find  $P(B)$ .
- Let  $f = \{(x, y)/x, y \in \mathbb{N} \text{ and } y = 2x\}$  be a relation on  $\mathbb{N}$ . Find the domain, Co domain and Range. Is this function?
- Prove that two consecutive positive integers are always co prime.
- Find the next three terms of the sequences 8, 24, 72, .....
- Find the excluded values, if any of the following expressions  $\frac{1}{(t^2 - 5t + 6)}$
- Find the square root of the following polynomial by division method.  $x^4 - 12x^3 + 42x^2 - 36x + 9$ .

48. Write each of the following expression in terms of  $\alpha + \beta$  and  $\frac{\alpha}{3\beta} + \frac{\beta}{3\alpha}$ .
49. Check whether AD is a bisector of  $\angle A$  of  $\triangle ABC$  if  $AB=4\text{cm}$ ,  $AC=6\text{cm}$ ,  $BD=1.6\text{cm}$  and  $CD=2.4\text{cm}$ .
50. Find the slope of a line joining the points  $(5, \sqrt{5})$  with the origin.
51. Prove that following identities  $\tan^4\theta + \tan^2\theta = \sec^4\theta - \sec^2\theta$ .
52. A garden roller whose length is 3m long and whose diameter is 2.8m is rolled to level a garden. How much area will it cover in 8 revolutions?
53. An aluminium sphere of radius 12 cm is melted to make a cylinder of radius 8 cm. Find the height of the cylinder.
54. If the range and the smallest value of a set of data are 36.8 and 13.4 respectively, then find the largest value.
55. The standard deviation and coefficient of variation of a data are 1.2 and 25.6 respectively. Find the value of mean.
56. 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.
57. Use Euclid's division algorithm to find the Highest Common Factor of 340 and 412.
58. Find the remainder when  $2^{61}$  is divided by 17?
59. Reduce each of the following rational expressions to its lowest form.  $\frac{x^2-1}{x^2+x}$
60. Find the square root of  $9x^2 - 24xy + 30xz - 40yz + 25z^2 + 16y^2$ .
61. Determine the nature of the roots for the following quadratic equations.  $15x^2 + 11x + 2$ .
62. In trapezium ABCD,  $AB \parallel DC$ , E and F are points of non-parallel sides AD and BC respectively such that  $EF \parallel AB$ . Show that  $\frac{AE}{ED} = \frac{BF}{FC}$ .
63. A triangular shaped glass with vertices at  $A(-5, -4)$ ,  $B(1, 6)$ ,  $C(7, -4)$  has to be painted. If one can of paint covers 6 squares feet, how many cans of paint will be required to paint the whole glass, if only one coat of paint is required?
64. Find the slope of the following straight line  $7x - \frac{3}{17} = 0$ .
65. Prove that the following identities  $\cot \theta + \tan \theta = \sec \theta \operatorname{cosec} \theta$ .
66. The curved surface area of a right circular cylinder of height 14cm is  $88\text{cm}^2$ . Find the diameter of the cylinder.
67. The volume of a solid right circular cone is  $11088\text{cm}^3$ . If its height is 24cm find the radius of the cone.
68. If the circumference of a conical wooden piece is 484cm then find its volume when its height is 105cm.
69. The range of a set of data is 13.67 and the largest value is 70.08. find the smallest value.
70. Define function.
71. Compute x such that  $10^4 \equiv x \pmod{19}$ .
72. Simplify:  $\frac{4x^2y}{2z^2} \times \frac{6xz^3}{20y^4}$
73. Pair needs 4 hours to complete the work. His friend Yuvan needs 6 hours to complete the work. How long will it take to complete if they work together?
74. What length of ladder is needed to reach a height of 7ft along the wall when the base of the ladder is 4 ft from the wall?
75. Prove that  $\sqrt{\frac{1+\cos\theta}{1-\cos\theta}} = \operatorname{cosec} \theta + \cot \theta$
76. The radius of a sphere increases by 25%. Find the percentage increase of in its surface area.
77. The Standard deviation and mean of a data are 6.5 and 12.5 respectively. Find the coefficient of variation.
78. An organisation plans to plants saplings in 25 streets in a town in such a way that one sapling for the first street, three for the second and nine for the third and so on. How many saplings are needed to complete the work?
79. Find the 19<sup>th</sup> term of an AP -11, -15, -19 .....
80. Find the value of  $\angle ABC$  in the given triangle.
81. The vertices of a triangle are  $A(-1,3)$ ,  $B(1,-1)$ ,  $C(5,1)$ . Find the Length of the median through The vertex C.
82. How can a function be represented?
83. If  $A = \{1,3,5\}$  and  $B = \{2,3\}$  then find  $A \times B$  and  $B \times A$ .
84. 'a' and 'b' are two positive integers such that  $a^b \times b^a = 800$ . Find 'a' and 'b'.
85. Determine the value of d such that  $15 \equiv 3 \pmod{d}$ .
86. Find the square root of the expression  $\frac{144a^8b^{12}c^{16}}{81f^{12}g^4h^{14}}$
87. What is called a square matrix?
88. State Menelaus theorem.
89. Show that the points  $P(-1.5, 3)$ ,  $Q(6, -2)$ ,  $R(-3, 4)$  are collinear..
90. Find the equation of a straight line which is parallel to the line  $3x-7y=12$  and passing through the point  $(6, 4)$ .
91. Prove that  $\tan^2 \theta - \sin^2 \theta = \tan^2 \theta \sin^2 \theta$
92. If the base area of a hemispherical solid is  $1386\text{sq.m}$  then find its total surface area.

93. The mean of a data is 25.6 and its coefficient of variation is 18.75. Find the standard deviation.
94. Find the number of terms in the A.P 3,6,12 ..... ,111.
95. Find AXB, AXA and BXA if  $A=\{2,-2,3\}$  and  $B=\{1,-4\}$ .
96. Is  $7 \times 5 \times 3 \times 2 + 3$  is a composite number? Justify your answer.
97. If m, n are natural numbers for what value of m does  $2^n \times 5^m$  ends in 5?
98. Find the square root of  $\frac{400x^4y^{12}z^{16}}{100x^8y^4z^4}$ .
99. Find the sum and product of roots for each of  $x^2 + 3x - 28 = 0$ .
100. State Pythagoras Theorem.
101. Prove that following identities  $\cot \theta + \tan \theta = \sec \theta \operatorname{cosec} \theta$ .
102. Find the range and coefficient of 63, 89, 98, 125, 79, 108, 117, 68.
103. If  $P(A)=2/3$ ,  $P(B)=2/5$  and  $P(A \cup B)=1/3$  then find  $P(A \cap B)$ .
104. Find the sum of  $1+2+3+\dots+60$ .
105. If  $BXA = \{(-2,3), (-2,4), (0,3), (0,4), (3,3), (3,4)\}$  find A and B.
106. A man have 532 flower pots. He wants to arrange them in rows such that each row contains 21 flower pots. Find the number of completed rows and how many flower pots are left over?
107. What is the time 15 hours before 11 pm?
108. Find the LCM and GCD for the following and verify that  $f(x) \times g(x) = \text{LCM} \times \text{GCD}$  if  $f(x)=21x^2y$ ,  $g(x)=35xy^2$ .
109. Find the square root of  $4x^2+20x+25$ .
110. Solve the following equations by factorisation method  $3(p^2-6)=p(p+7)^3$ .
111. Two triangles QPR and QSR, right angled at P and S respectively are drawing on the same base and on the same side of QR. If PR and SQ intersect at T. Prove that  $PT \times TR = ST \times TQ$ .
112. Write the formula to find the centroid of the triangle.
113. Prove that  $\frac{\sec \theta}{\sin \theta} - \frac{\sin \theta}{\cos \theta} = \cot \theta$ .
114. A cylindrical drum has a height of 20cm and base radius 14cm. Find its CSA and TSA.
115. Find the volume of the iron used to make a hollow cylinder of height 9cm and whose internal and external radii are 21cm and 28cm respectively.

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