VILLUPURAM DIST.

CLASS : 10

Register Number

COMMON QUARTERLY EXAMINATION-2024-25
MATHEMATICS

Time Allowed : 3.00 Hours]   [Max. Marks : 100

PART - I

Note: (i) Answer all the questions.   14×1=14
      (ii) Choose the most appropriate answer from the given four alternatives and write the option code and the corresponding answer.

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

2. A function $f : R \to R$ defined by $f(x) = c, \forall x \in R$
   a) one to one function   b) onto function   c) constant function   d) identify function

3. Let A = {1, 2, 3, 4} and B = {4, 8, 9, 10}. A function $f : A \to B$ given by
   $f = \{(1, 4), (2, 8), (3, 9), (4, 10)\}$ is a
   a) Many-one function   b) Identity function   c) One-to-one function   d) Into function

4. Euclid's division lemma states that for positive integers a and b, there exist unique integers q and r such that $a = bq + r$, where r must satisfy.
   a) $1 < r < b$ b) $0 > r > b$ c) $0 \leq r < b$ d) $0 < r \leq b$

5. The sum of the exponents of the prime factors in the prime factorization of 1729 is
   a) 1   b) 2   c) 3   d) 4

6. The next term of the sequence $\frac{3}{16}, \frac{1}{8}, \frac{1}{12}, \frac{1}{18}, \ldots\ldots$ is
   a) $\frac{1}{24}$ b) $\frac{1}{27}$ c) $\frac{2}{3}$ d) $\frac{1}{81}$

7. $\frac{3y-3}{y} \div \frac{7y-7}{3y^2}$ is   a) $\frac{9y}{7}$ b) $\frac{9y^3}{(21y-21)}$ c) $\frac{21y^2 - 42y + 21}{3y^2}$ D) $\frac{7(y^2 - 2y + 1)}{y^2}$

8. The square root of $\frac{256x^8y^4z^{10}}{25x^6y^6z^6}$ equal to   a) $\frac{16}{5}\left|\frac{x^2z^4}{y^2}\right|$ b) $16\left|\frac{y^2}{x^2z^4}\right|$ c) $\frac{16}{5}\left|\frac{y}{z^2}\right|$ d) $\frac{16}{5}\left|\frac{z^2}{y}\right|$

9. If a polynomial is a perfect square then it's factors will be repeated _____.
   a) prime number   b) odd number   c) even number   d) zero

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

11. The point of intersection of $3x - y = 4$ and $x + y = 8$ is
    a) (5, 3)   b) (2, 4)   c) (3, 5)   d) (4, 4)

12. The inclination of y axis and every line parallel to y axis is
    a) 0°   b) 30°   c) 60°   d) 90°

13. The equation of a line passing through the origin and perpendicular to the line $7x - 3y + 4 = 0$ is
    a) $7x - 3y + 4 = 0$ b) $3x - 7y + 4 = 0$ c) $3x + 7y = 0$ d) $7x - 3y = 0$

14. If $x = a \tan\theta$ and $y = b \sec\theta$ then   a) $\frac{y^2}{b^2} - \frac{x^2}{a^2} = 1$ b) $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ c) $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ d) $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 0$

PART - II

Answer any 10 questions. Question No. 28 is compulsory.   10×2=20

15. Let A = {3, 4, 7, 8} and B = {1, 7, 10}. Which of the following sets are relations from A to B?
    (i) R_1 = {(3, 7), (4, 7), (7, 10), (8, 1)}   (ii) R_2 = {(3, 1), (4, 12)}

16. Represent the function f = {(1, 2), (2, 2), (3, 2), (4, 3), (5, 4)} through (i) an arrow diagram (ii) a table form

17. If $f(x) = x^2 - 1$, $g(x) = x - 2$ find a, if $g \circ f(a) = 1$.

18. If $13824 = 2^a \times 3^b$ then find a and b.

19. Determine the value of d such that $15 \equiv 3 \pmod{d}$.

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20. Find the sum of $1^2 + 2^2 + \ldots + 19^2$

21. Find the LCM of the given polynomials $p^2 - 3p + 2$, $p^2 - 4$.

22. Simplify: $\dfrac{x+2}{4y} \div \dfrac{x^2-x-6}{12y^2}$

23. Determine the nature of roots for the following quadratic equation $2x^2 - 2x + 9 = 0$.

24. If $\triangle ABC$ is similar to $\triangle DEF$ such that $BC = 3$ cm, $EF = 4$ cm and area of $\triangle ABC = 54$ cm². Find the area of $\triangle DEF$.

25. Show that the given points are collinear: $(-3, -4)$, $(7, 2)$ and $(12, 5)$.

26. Find the intercepts made by the line $4x - 9y + 36 = 0$ on the coordinate axes.

27. Prove the following identities. $\sqrt{\dfrac{1+\sin\theta}{1-\sin\theta}} = \sec\theta\,\tan\theta$

28. If the straight lines $12y = -(p + 3)x + 12$, $12x - 7y = 16$ are perpendicular then find 'p'.

PART - III

Answer any 10 questions. Question No. 42 is compulsory. $10 \times 5 = 50$

29. Let $A = \{x \in N \mid 1 < x < 4\}$, $B = \{x \in W \mid 0 \le x < 2\}$ and $C = \{x \in N \mid x < 3\}$. Then verify that
    $A \times (B \cap C) = (A \times B) \cap (A \times C)$

30. Let f be a 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 (ii) Identify the type of function

31. Consider the functions $f(x)$, $g(x)$, $h(x)$ as given below. Show that $(fog)oh = fo(goh)$ in the case.
    $f(x) = x - 4$, $g(x) = x^2$ and $h(x) = 3x - 5$

32. The sum of three consecutive terms that are in A.P. is 27 and their product is 288. Find the three terms.

33. Find the sum to n terms of the series $3 + 33 + 333 + \ldots$ to n terms.

34. Find the G.P. in which the 2nd term is $\sqrt{6}$ and the 6th term is $9\sqrt{6}$.

35. Solve: $x + 2y - z = 5$; $x - y + z = -2$; $-5x - 4y + z = -11$

36. 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?

37. If $\sqrt{3}\sin\theta - \cos\theta = 0$, then show that $\tan 3\theta = \dfrac{3\tan\theta - \tan^3\theta}{1 - 3\tan^2\theta}$

38. State and prove Angle bisector theorem.

39. Find the area of the quadrilateral formed by the points $(8, 6)$, $(5, 11)$, $(-5, 12)$ and $(-4, 3)$.

40. Prove analytically that the line segment joining the mid-points of two sides of a triangle is parallel to the third side and is equal to half of its length.

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

42. Find the square root of $(x^2 + 5x + 6)(x^2 - 2x - 8)(x^2 - x - 12)$.

PART - IV

Answer all the questions. $2 \times 8 = 16$

43. a) Construct a triangle similar to a given triangle ABC with its sides equal to $\dfrac{6}{5}$ of the corresponding sides of the triangle ABC (scale factor $\dfrac{6}{5} > 1$).   **(OR)**
    b) Draw a triangle ABC of base BC = 8 cm, A = 60° and the bisector of $\angle A$ meets BC at D such that BD = 6 cm.

44. a) A company initially started with 40 workers to complete the work by 150 days. Later, it decided to fasten up the work increasing the number of workers as shown below.

Number of workers (x)	40	50	60	75
Number of days (y)	150	120	100	80

   (i) Graph the above data and identify the type of variation.
   (ii) From the graph, find the number of days required to complete the work if the company decides to opt for 120 workers?
   (iii) If the work has to be completed by 30 days, how many workers are required?   **(OR)**

   b) Graph the following linear function $y = \dfrac{1}{2} x$. Identify the constant of variation and verify it with the graph. Also (i) find y when $x = 9$ (ii) find x when $y = 7.5$.

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