COMMON QUARTERLY EXAMINATION - 2024

Standard X

Reg.No. | | | | | | |

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MATHEMATICS

Time : 3.00 hrs | **Part - I** | *Marks : 100*

I. Choose the correct answer: **14 x 1 = 14**

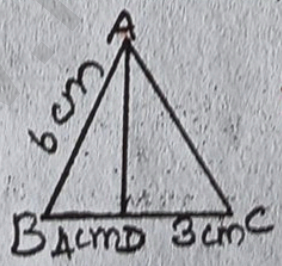
1. A = {a,b,p}, B = {2,3}, C = {p,q,r,s} then n[(A ∪ C) x B] is
   a) 8 b) 20 c) 12 d) 16
2. $f(x) = (x + 1)^3 - (x - 1)^3$ represents a function which is
   a) linear b) cubic c) reciprocal d) quadratic
3. If n(A) = p, n(B) = q, then the total number of relations that exist from A to B is _____.
   a) p^q b) q^p c) $2^{pq} - 1$ d) 2^{pq}
4. The sum of the exponents of the prime factors in the prime factorisation of 1729 is
   a) 1 b) 2 c) 3 d) 4
5. An A.P consists of 31 terms. If its 16^{th} term is m, then the sum of all the terms of this A.P is
   a) 16 m b) 62 m c) 31 m d) $\frac{31}{2}$m
6. The value of $(1^3 + 2^3 + 3^3 + \ldots\ldots + 15^3) - (1 + 2 + 3 + \ldots\ldots + 15)$ is
   a) 14400 b) 14200 c) 14280 d) 14520
7. $\frac{3y-3}{y} \div \frac{7y-7}{3y^2}$ is
   a) $\frac{9y}{7}$ b) $\frac{9y^2}{(21y-21)}$ c) $\frac{21y^2-42y+21}{3y^3}$ d) $\frac{7(y^2-2y+1)}{y^2}$
8. The square root of $\frac{256x^8y^4z^{10}}{25x^6y^6z^6}$ is 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) $\frac{16}{5}\left|\frac{y}{xz^2}\right|$ d) $\frac{16}{5}\left|\frac{xz^2}{y}\right|$
9. The solution of $(2x - 1)^2 = 9$ is equal to
   a) –1 b) 2 c) –1,2 d) none of these
10. If in ΔABC, DE||BC, AB = 3.6 cm, AC = 2.4 cm and AD = 2.1 cm then the length of AE is
    a) 1.4 cm b) 1.8 cm c) 1.2 cm d) 1.05 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. When proving that a quadrilateral is a parallelogram by using slopes you must find
    a) the slopes of 2 sides b) the slopes of two pair of opposite sides
    c) the lengths of all sides
    d) both the lengths and slopes of 2 sides
13. The area of triangle formed by the points (–2,0), (0,–2) and (2,0) is
    a) 0 sq.units b) 4 sq.units c) 2 sq.units d) none of these
14. If $(\sin\alpha + \operatorname{cosec}\alpha)^2 + (\cos\alpha + \sec\alpha)^2 = k + \tan^2\alpha + \cot^2\alpha$, then the value of k is equal to
    a) 9 b) 7 c) 5 d) 3

Part - II

II. Answer any 10 questions. (Q.No.28 is compulsory) 10 x 2 = 20

15. If A x B = {(3,2), (3,4), (5,2), (5,4)}, then find A and B.
16. 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.
17. Find the 8th term of the G.P. 9,3,1, ...
18. Find the LCM of $5x - 10$, $5x^2 - 20$
19. Simplify : $\frac{4x^2y}{2z^2} \times \frac{6xz^3}{20y^4}$
20. In the figure, AD is the bisector of $\angle A$. If BD = 4 cm, DC = 3 cm and AB = 6 cm, find AC.



21. A vertical stick of length 6 m casts a shadow 400 cm long on the ground and at the same time a tower casts a shadow 28 m long. Using similarity, find the height of the tower.
22. Show that the points P(–1.5,3), Q(6,–2), R(–3,4) are collinear.
23. Find the slope of a line joining the given points (–6,1) and (14,10)
24. Show that the straight lines $2x + 3y - 8 = 0$ and $4x + 6y + 18 = 0$ are parallel.
25. Given the function $f : x \to x^2 - 5x + 6$, evaluate i) f(–1) and ii) f(2)

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

27. Prove that $\sqrt{\frac{1+\cos\theta}{1-\cos\theta}} = \operatorname{cosec}\theta + \cot\theta$

28. Find the sum of $1 + 3 + 5 + \ldots\ldots + 51$

Part - III

III. Answer any 10 questions. (Q.No.42 is compulsory) $10 \times 5 = 50$

29. Let $f : A \to B$ 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
    i) Set of ordered pairs
    ii) A table
    iii) An arrow diagram
    iv) A graph

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

31. 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 and x_1, x_2, x_3, x_4 are integers in ascending order. Find the values of p_1, p_2, p_3, p_4 and x_1, x_2, x_3, x_4.

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

33. In an A.P, sum of 4 consecutive terms is 28 and the sum of their squares is 276. Find the four numbers.

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

35. There are 12 pieces of five, ten and twenty rupee currencies whose total value is ₹105. When first 2 sorts are interchanged in their numbers its value will be increased by ₹20. Find the number of currencies in each sort.

36. State and prove Basic Proportionality Theorem.

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

38. A cat is located at the point (–6,–4) in xy plane. A bottle of milk is kept at (5,11). The cat wish to consume the milk travelling through shortest possible distance. Find the equation of the path it needs to take milk.

39. Let A(3,–4), B(9,–4), C(5,–7) and D(7,–7). Show that ABCD is a trapezium.

40. Simplify : $\frac{b^2+3b-28}{b^2+4b+4} \div \frac{b^2-49}{b^2-5b-14}$

41. Prove the following identity.

$$\frac{\sin^3 A + \cos^3 A}{\sin A + \cos A} + \frac{\sin^3 A - \cos^3 A}{\sin A - \cos A} = 2$$

42. 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
$A \times (B - C) = (A \times B) - (A \times C)$

Part - IV

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

43. a) 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 $\frac{7}{3} > 1$)

(OR)

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

44. a) A bus is travelling at a uniform speed of 50 km/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 300 km from the graph.

(OR)

b) A school announces that for a certain competitions, the cash price will be distributed for all the participants equally as shown below.

No. of Participants (X)	2	4	6	8	10
Amount for each participant in Rs. (y)	180	90	60	45	36

   i) Find the constant of variation
   ii) Graph the above data and hence, find how much will each participant get if the number of participants are 12.

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