

ADVANCED MATH CLASSES

@ Think Academy, Najafgarh
(For Mid-Term Exam. Paper)

Standard : X
Subject : Mathematics

Half Syllabus Test
PRACTICE PAPER

Maximum Marks : 80
Time : 3 Hours

General Instructions :

- All questions are compulsory.
- This question paper consists of **38 questions** divided into **five sections A, B, C, D and E**.
- Section A comprises of **20 questions of one mark** each (from Q01 - 20).
Section B comprises of **05 questions of two marks** each (from Q21 - 25).
Section C comprises of **06 questions of three marks** each (from Q26 - 31).
Section D comprises of **04 questions of five marks** each (from Q32 - 35).
Section E comprises of **03 Case-study questions of four marks** each (from Q36 - 38).
- There is no overall choice. However, **internal choice** has been provided in
 - **02 Questions of Section B**
 - **03 Questions of Section C**
 - **02 Questions of Section D**
 - **03 Questions of Section E**

You have to attempt only one of the alternatives in all such questions.

SECTION A

(Question numbers 01 to 20 carry **1 mark** each.)

Followings are **multiple choice questions**. Select the correct option.

- If α and β are the zeroes of the polynomial $p(x) = kx^2 - 30x + 45k$ and $\alpha + \beta = \alpha\beta$, then the value of $(3k - 1) =$
 - $\frac{2}{3}$
 - 0
 - 1
 - 1
- If $a = 2^2 \times 3^x$, $b = 2^2 \times 3 \times 5$, $c = 2^2 \times 3 \times 7$ and $\text{LCM}(a, b, c) = 3780$, then x is equal to
 - 1
 - 2
 - 3
 - 0
- The pair of equations $3x + 4y = 18$, $4x + \frac{16}{3}y = 24$ has
 - no solution
 - unique solution
 - infinitely many solutions
 - can't say
- If $\cot A = 3 \tan A$, then the measure of the angle A is
 - 15°
 - 30°
 - 45°
 - 60°
- Graph of $ax^2 + bx + c$ intersects x -axis at two distinct points if
 - $b^2 - 4ac \leq 0$
 - $b^2 - 4ac < 0$
 - $b^2 - 4ac > 0$
 - $b^2 - 4ac \geq 0$
- In $\triangle ABC$, $A = x^\circ$, $B = 3x^\circ$, $C = y^\circ$, if $3y^\circ - 5x^\circ = 30^\circ$, then $\triangle ABC$ is
 - acute angled
 - right angled
 - obtuse angled
 - equilateral triangle
- The next (4^{th}) term of the A.P. $\sqrt{18}, \sqrt{50}, \sqrt{98}, \dots$ is
 - $\sqrt{128}$
 - $\sqrt{140}$
 - $\sqrt{162}$
 - $\sqrt{200}$

08. If $\cos(\alpha + \beta) = 0$, then the value of $\sin\left(\frac{\alpha + \beta}{2}\right)$ is equal to
 (a) 1 (b) $\frac{1}{2}$ (c) 0 (d) $\frac{1}{\sqrt{2}}$
09. If $\tan \theta = \frac{1}{\sqrt{3}}$, then $\frac{1 - \tan^2 \theta}{1 + \tan^2 \theta} =$
 (a) $\frac{3}{4}$ (b) 2 (c) $\frac{2}{3}$ (d) $\frac{1}{2}$
10. The perimeters of two similar triangles ABC and PQR are 56 cm and 48 cm respectively.
 Then $\frac{PQ}{AB} =$
 (a) $\frac{7}{8}$ (b) $\frac{6}{7}$ (c) $\frac{7}{6}$ (d) $\frac{8}{7}$
11. The HCF of smallest 2-digit number and the smallest composite number is
 (a) 2 (b) 20 (c) 40 (d) 4
12. If $1080 = 2^x \times 3^y \times 5$, then $(x - y)$ is equal to
 (a) 6 (b) -1 (c) 1 (d) 0
13. The value of y obtained on solving the equations $2x + y = 2x - y = \sqrt{8}$ is
 (a) 0 (b) $\frac{1}{4}$ (c) $\frac{1}{2}$ (d) $\frac{3}{4}$
14. If x is a whole number, then 8^x ends with an even digit, except for which value of x?
 (a) 6 (b) 4 (c) 2 (d) 0
15. The zeroes of the polynomial $7y^2 - \frac{11}{3}y - \frac{2}{3}$ are
 (a) $-\frac{2}{3}, -\frac{1}{7}$ (b) $-\frac{2}{7}, -\frac{1}{3}$ (c) $\frac{2}{3}, \frac{1}{7}$ (d) $\frac{2}{3}, -\frac{1}{7}$
16. Three numbers in A.P. have the sum 30.
 What is its middle term?
 (a) 4 (b) 10 (c) 15 (d) 8
17. The Discriminant (D) of the equation $4x^2 - 3x + 2 = 0$ is
 (a) 23 (b) $\sqrt{23}$ (c) -23 (d) $\pm\sqrt{23}$
18. The common difference of an A.P. in which $a_{15} - a_{11} = 48$, is
 (a) 12 (b) 16 (c) -12 (d) -16

Followings are **Assertion-Reason based questions** (from Q19 - Q20).

Read the following statements carefully to mark the correct option out of the options given below.

- (a) Assertion (A) is true, Reason (R) is true; Reason (R) is a correct explanation for Assertion (A).
 (b) Assertion (A) is true, Reason (R) is true; Reason (R) is not a correct explanation for Assertion (A).
 (c) Assertion (A) is true, Reason (R) is false.
 (d) Assertion (A) is false, Reason (R) is true.
19. **Assertion (A)** : The number 5^n cannot end with the digit 0, where n is a natural number.
Reason (R) : Prime factorisation of 5 has only two factors, 1 and 5.
20. **Assertion (A)** : If the point A(4, 3) lies on a circle with centre O(2, 3), then the radius is of 2 units.
Reason (R) : Centre of a circle is the mid-point of each chord of the circle.

SECTION B

(Question numbers 21 to 25 carry 2 marks each.)

21. If $\tan A + \cot A = 6$, then find the value of $\tan^2 A + \cot^2 A - 4$.

22. If the sum of first 6 terms of an A.P. is 36 and that of the first 16 terms is 256, find the sum of first 10 terms.

OR

If p^{th} term of an A.P. is q and q^{th} term is p , then prove that its n^{th} term is $(p+q-n)$.

23. Draw the graphs of the equations: $x+2y-4=0$ and $2x+4y-12=0$.
24. A line intersects y-axis and x-axis at P and Q, respectively. If R(2, 5) is the mid-point of line segment PQ, then find the coordinates of P and Q.
25. The sum of two numbers is 588 and their HCF is 49. How many such pairs of numbers can be formed?

OR

Find the greatest number which divides 85 and 72 leaving remainders 1 and 2 respectively.

SECTION C

(Question numbers 26 to 31 carry 3 marks each.)

26. In ΔPQR , S and T are the points on PQ and PR respectively. Also it is given that $\frac{PS}{SQ} = \frac{PT}{TR}$ and $\angle PST = \angle PRQ$. Prove that PQR is an isosceles triangle.
27. Find the value of k , for which the pair of linear equations $kx + (k-2)y = 1$ and $3x + y = 5$ has no solutions.

OR

Solve the system of equations by substitution method $2x + y = 7$, $3x + 2y = 12$. Also find the value of $2026^{2025x-1350y}$.

28. Solve for x : $\frac{2x}{x-3} + \frac{1}{2x+3} + \frac{3x+9}{(x-3)(2x+3)} = 0$; $x \neq 3, -\frac{3}{2}$.

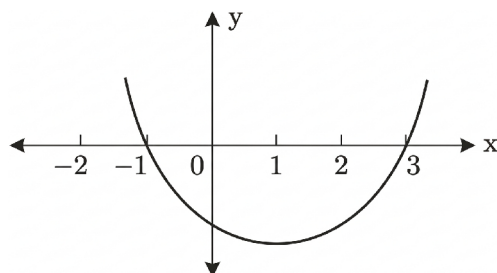
OR

At t minutes past 2 p.m., the time needed by the minute hand of a clock to show 3 p.m. was found to be 3 minutes less than $\frac{t^2}{4}$ minutes. Find the value of t .

29. Two people are 16 km apart on a straight road. They start walking at the same time. If they walk towards each other with different speeds, they will meet in 2 hours. Had they walked in the same direction with the same speeds as before, they would have met in 8 hours. Find their walking speeds.
30. Prove that: $\sin^2 \theta \tan \theta + \cos^2 \theta \cot \theta + 2 \sin \theta \cos \theta = \tan \theta + \cot \theta$.
31. If the zeroes of the polynomial $x^2 + ax + b$ are in the ratio 3:4, then prove that $12a^2 = 49b$.

OR

The graph of a quadratic polynomial $p(x)$ is shown in the figure.



Answer the questions on the basis of shown graph.

- Find the zeroes of $p(x)$.
- Write the sum and product of zeroes of $p(x)$.
- Write the polynomial $p(x)$.

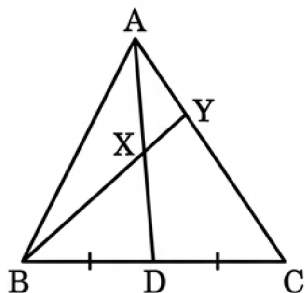
SECTION D

(Question numbers 32 to 35 carry 5 marks each.)

32. Through the vertex P of a parallelogram PQRS, a line is drawn to intersect the sides RQ and RS produced to T and U respectively. Prove that $\frac{SP}{US} = \frac{QT}{PQ} = \frac{RT}{UR}$.

OR

In $\triangle ABC$, AD is a median. X is a point on AD such that $AX : XD = 2 : 3$. BX is extended so that it intersects AC at Y . Prove that $BX = 4XY$.



33. Mohini claimed that there are no irrational numbers between the integers 2 and 3 because they are consecutive. But her sister Ishanvi disagreed, claiming that $\sqrt{7}$ is an irrational number that lies between 2 and 3. Who do you think is correct? Justify by proving either $\sqrt{7}$ as an irrational number or otherwise and showing its position relative to 2 and 3.
34. If $\cot \theta = \sqrt{1-k^2}$, then show that the value of $\operatorname{cosec} \theta + \cot^3 \theta \sec \theta$ is $(2-k^2)^{3/2}$.

OR

If $\sin \theta + 2 \cos \theta = 1$, prove that $2 \sin \theta - \cos \theta = \pm 2$.

35. A spherical balloon of radius r subtends an angle of 60° at the eye of an observer. If the angle of elevation of its centre is 45° from the same point, then prove that height of the centre of the balloon is $\sqrt{2}$ times its radius.

SECTION E

(Question numbers 36 to 38 carry 4 marks each.)

This section has **three Case-study / Passage-based questions**.

First two questions have **three sub-parts (i), (ii) and (iii) of marks 1, 1 and 2 respectively**.

Third question has **two sub-parts of 2 marks each**.

36. A school decides to start a **SAVE FOR A BETTER FUTURE** campaign. Each student is encouraged to save a fixed amount every month, but the school increases the suggested monthly saving by ₹20 every month. A student Ramjee starts by saving ₹100 in the first month, ₹120 in the second month, ₹140 in the third month, and so on.



Based on the above information, answer the following questions.

- (i) What is the amount saved by the student Ramjee in the 12th month?
- (ii) In which month will the student's monthly saving become ₹500?
- (iii) Find the total amount saved during the first 21 months.

OR

- (iii) If the student Ramjee continues this saving plan for 24 months, then what is his saving in the 24th month alone? Also find the total amount saved during these 24 months.

37. A school canteen sells sandwiches and fruit juices during the lunch break. On a particular day, a student bought 2 sandwiches and 3 fruit juices for ₹180. Another student bought 3 sandwiches and 2 fruit juices for ₹190.



Let the cost of one sandwich be ₹ x and the cost of one fruit juice be ₹ y .

Based on the above information, answer the following questions.

- (i) Form a pair of linear equations in x and y using the given information.
- (ii) Determine whether the pair of linear equations obtained in above sub-part (i) is consistent or inconsistent. Give a reason.
- (iii) Find the cost of one sandwich and one fruit juice by solving the pair of equations.

OR

- (iii) If a student buys 4 sandwiches and 5 fruit juices, how much money will he have to pay?

38. A city is planning a park for a newly-planned colony. Two entrances of the park are represented by the points $A(2, 3)$ and $B(8, 9)$. A water fountain is to be placed at a point P that divides the line segment AB internally in the ratio 1:2.



Observe this situation and answer the following questions.

- (i) Find the distance between the two entrances A and B.
- (ii) Find the coordinates of the fountain P, which divides AB internally in the ratio 1:2.
- (iii) Find the distance between entrance A and the fountain P. Also write the mid-point of AB.

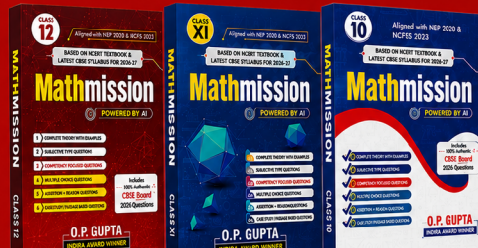
OR

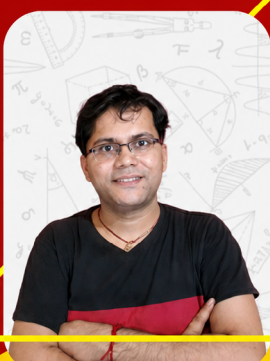
- (iii) If another point Q divides AB internally in the ratio 2:1, find the coordinates of Q. Also find the distance AQ.

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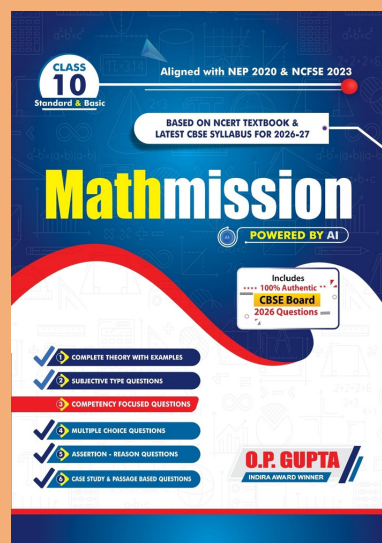
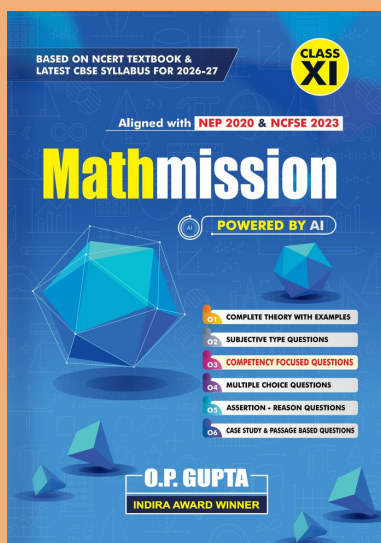
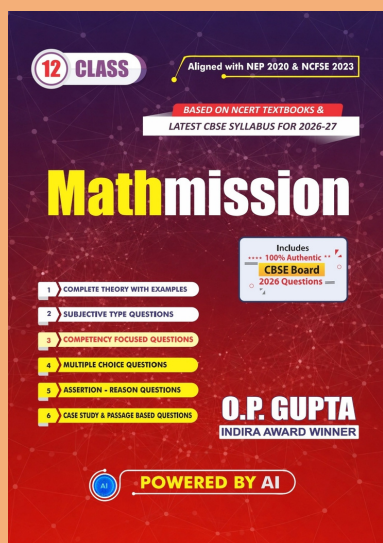
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