THE OPGUPTA

PAPER CODE
TOPGAMC-10-HYE-01A

ADVANCED MATH CLASSES

@ Think Academy, Najafgarh

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(For Mid-Term Exam. Paper)

Standard : X
Subject : Mathematics

Half Syllabus Test
PRACTICE PAPER

Maximum Marks : 80
Time : 3 Hours

General Instructions :

(a) All questions are compulsory.

(b) This question paper consists of **38 questions** divided into **five sections A, B, C, D and E**.

(c) 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).

(d) 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.*

01. Zeroes of a polynomial $4x^2 - 1$ are
(a) $\frac{1}{2}, \frac{1}{2}$ (b) $\frac{1}{2}, -\frac{1}{2}$ (c) $-\frac{1}{2}, -\frac{1}{2}$ (d) $\frac{1}{\sqrt{2}}, -\frac{1}{\sqrt{2}}$

02. If p and q are two consecutive natural numbers, then HCF (p, q) is
(a) q (b) p (c) 1 (d) pq

03. If the lines given by $3x + 2ky = 2$ and $2x + 5y + 1 = 0$ are parallel, then the value of k is
(a) $-\frac{5}{4}$ (b) $\frac{2}{5}$ (c) $\frac{15}{4}$ (d) $\frac{3}{2}$

04. If $\sec\theta + \tan\theta = x$, then $\tan\theta$ equals
(a) $\frac{2}{x}$ (b) $\frac{1}{2x}$ (c) $\frac{x^2 - 1}{2x}$ (d) $\frac{2x}{x^2 - 1}$

05. A pair of irrational numbers whose product is a rational number is
(a) $\sqrt{3}, \sqrt{6}$ (b) $\sqrt{25}, \sqrt{4}$ (c) $3\sqrt{5}, 5\sqrt{3}$ (d) $\sqrt{3}, \sqrt{12}$

06. The lines $2x + 3y = 8$ and $16x + 24y = 64$ are
(a) parallel (b) intersecting (c) overlapping (d) None of these

07. If ABCD is parallelogram, P is a point on side BC and DP when produced meets AB produced at L, then select the correct option.
(a) $\frac{DP}{BL} = \frac{DC}{PL}$ (b) $\frac{DP}{PL} = \frac{DC}{BL}$ (c) $\frac{DP}{PL} = \frac{BL}{DC}$ (d) $\frac{DP}{PL} = \frac{AB}{DC}$

08. The value of $(1-\tan\theta+\sec\theta)(1-\cot\theta+\text{cosec}\,\theta)$ is
(a) 1 (b) –1 (c) –2 (d) 2

09. If $\tan\theta=\frac{1}{\sqrt{7}}$, then $\frac{\text{cosec}^2\theta-\sec^2\theta}{\text{cosec}^2\theta+\sec^2\theta}=$
(a) $-\frac{2}{3}$ (b) $-\frac{3}{4}$ (c) $\frac{2}{3}$ (d) $\frac{3}{4}$

10. D and E are respectively the midpoint on the sides AB and AC of a ΔABC and $BC=6$ cm. If $DE \parallel BC$, then the length of DE (in cm) is
(a) 2.5 (b) 3 (c) 5 (d) 6

11. The least number that is divisible by all the numbers from 1 to 10 (both included) is
(a) 2250 (b) 1000 (c) 2500 (d) 2520

12. What is the HCF of two consecutive even numbers?
(a) 8 (b) 4 (c) 2 (d) 1

13. The sum of the digit of a two digit number is 9. If 27 is added to it, the digits of the number get reversed. The number is
(a) 25 (b) 72 (c) 60 (d) 36

14. Two positive integers expressed as $p=ab^2$ and $q=a^2b$, where a and b are prime numbers. Then the LCM of p and q is
(a) b^2 (b) ab (c) a^3b^3 (d) a^2b^2

15. If one zero of the polynomial $3x^2+8x+k$ is the reciprocal of the other, then the value of k is
(a) 3 (b) 83 (c) $\frac{1}{3}$ (d) $-\frac{1}{3}$

16. The next term of the A.P. : $3, 1, -1, -3, \ldots$ is
(a) 5 (b) –4 (c) –5 (d) 0

17. If the Discriminant (D) of the equation $6x^2-bx+2=0$ is 1, then the value of 'b' is
(a) 7 (b) –7 (c) ± 7 (d) $\pm\sqrt{7}$

18. If 18, x, y, –3 are in A.P., then value of $(x+y)$ is
(a) 12 (b) 15 (c) 16 (d) 11

*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) :** $\sqrt{2}(5-\sqrt{2})$ is an irrational number.
Reason (R) : Product of two irrational numbers is always irrational.

20. **Assertion (A) :** The point (0, –8) lies on y-axis.
Reason (R) : The x coordinate of any point on y-axis is always zero.

SECTION B

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

21. Prove that : $\tan^2\theta+\cot^2\theta+2=\sec^2\theta.\text{cosec}^2\theta$.

22. The first term of an A.P. of 20 terms is 2 and the last term is 59. Find its 6^{th} term from the end.

OR

Find the sum of first 22 terms of an A.P. in which $d=7$ and 22^{nd} term is 149.

23. Solve for x and y : $21x+47y=110$, $47x+21y=162$.

24. Find the fourth vertex D of a parallelogram ABCD whose three vertices are A(–2, 3), B(6, 7) and C(8, 3).

25. If $17+3\sqrt{5}$ is an irrational number, then prove that $\sqrt{5}$ is also irrational.

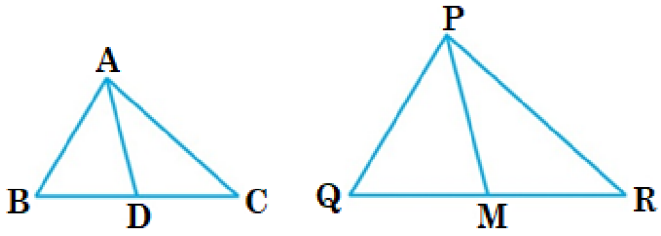
OR

Prove that $(\sqrt{2}+\sqrt{3})^2$ is an irrational number, given that $\sqrt{6}$ is an irrational number.

SECTION C

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

26. Sides AB and AC and median AD of a triangle ABC are respectively proportional to sides PQ and PR and median PM of another triangle PQR. Show that $\Delta ABC \sim \Delta PQR$.



27. What are the values of 'a' and 'b' if the pair of linear equations given by $2x-3y=7$ and $(a+b)x-(a+b-3)y=4a+b$ have infinite number of solutions?

OR

Room A has 12 chairs, B has 18 chairs and C has 24 chairs. In each room, the chairs are arranged in rows with the same number of chairs in each row. What is the greatest possible number of chairs in each row in the 3 rooms?

28. Solve for x : $2\left(\frac{2x+3}{x-3}\right)-25\left(\frac{x-3}{2x+3}\right)=5$.

OR

Divide 29 into two parts so that the sum of the squares of the two parts is 425.

29. Draw the graphs of the pair of linear equations $5x-y=5$ and $3x-y=3$.

Determine the coordinates of the vertices of the triangle formed by these lines and the y axis.

30. (i) Evaluate : $\frac{\cos 45^\circ}{\sec 30^\circ+\operatorname{cosec} 30^\circ}$.

(ii) Express $\sin A$, $\sec A$ and $\tan A$ in terms of $\cot A$.

31. If α and β are the zeroes of a polynomial $f(x)$ given by $f(x)=25x^2-15x+2$, then find a quadratic polynomial whose zeroes are $\frac{1}{2\alpha}$ and $\frac{1}{2\beta}$.

OR

Find the zeroes of the polynomial $p(x)=2x^2-7x-15$ and verify the relationship between its coefficients and zeroes.

SECTION D

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

32. State and prove Thales theorem.

OR

Through the mid-point M of the side CD of a parallelogram ABCD, the line BM is drawn intersecting AC in L and AD (produced) in E. Prove that $EL=2BL$.

33. (i) A shopkeeper buys a number of books for ₹80. If he had bought 4 more books for the same amount, each would have cost him ₹1 less. How many books did he buy?

(ii) For an A.P., if $S_n=3n^2+5n$ and k^{th} term is 164, then find the value of k.

34. Prove that : $\frac{\tan\theta}{1-\cot\theta}+\frac{\cot\theta}{1-\tan\theta}=1+\sec\theta.\operatorname{cosec}\theta$.

OR

Prove that : $\frac{\sin\theta-\cos\theta+1}{\sin\theta+\cos\theta-1}=\frac{1}{\sec\theta-\tan\theta}$.

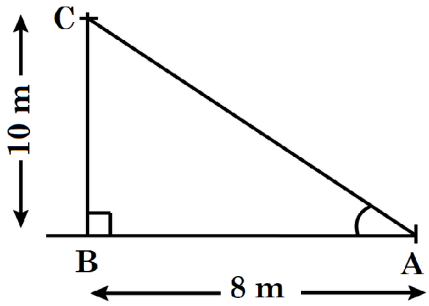
35. A man standing on the deck of a ship, which is 10 m above water level, observes the angle of elevation of the top of a hill as 60° and angle of depression of the base of the hill as 30°. Find the distance of the hill from the ship and the height of the hill.

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. BSES is an electricity services provider in Delhi.

It received a complaint regarding a fault.
A technician Mr Pandey was sent to attend the complaint.
He observed that the electric pole is of height 10 m.
The techincian placed his ladder such that its foor is 8 m away from the foot of pole.



Based on the information supplied to you above, answer the following questions.

(i) Find the value of $\sin A$.
(ii) Find the value of $\cos A$.
(iii) Determine the value of $\sin^2 A - \cos^2 A$.

OR

(iii) Determine the value of $\cot^2 A - \tan^2 C$.

37. A coaching institue of Mathematics conducts classes in two batches I and II and fees for rich and poor children are different.

In batch I, there are 20 poor and 5 rich children, whereas in batch II, there are 5 poor and 25 rich children.

The total monthly collection of fees from batch I is ₹9000 and from batch II is ₹26000.

Assume that each poor child pays ₹x per month and each rich child pays ₹y per month.

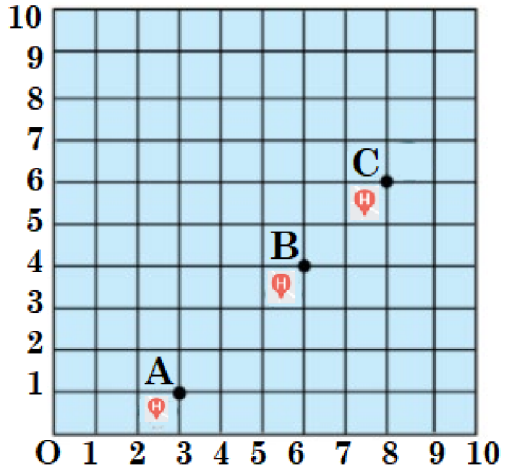
Based on the above information, answer the following questions.
(i) Represent the information given above in terms of x and y.
(ii) Find the monthly fee paid by a poor child.

OR

(ii) Find the difference in the monthly fee paid by a poor child and a rich child.
(iii) If there are 10 poor and 20 rich children in batch II, what is the total monthly collection of fees from batch II?

38. Mr Pankaj Chugh aged 50 years, is a senior Maths teacher and is living in New Delhi. As per the government's directive, he had taken his first dose of COVID-19 vaccine in a city hospital. Now he wants to take his second dose of the vaccine.

The following map is showing three vaccination centers around his home.
Let O represents his home.
Vaccination centers are at A, B and C as shown in the figure below.



Observe this situation and answer the following questions.

(i) According to the figure, find the ratio in which the vaccination center B is dividing the line joining vaccination center A to C.

(ii) Assuming that Mr Chugh went to center B and vaccine doses are finished. Then what is the closest distance he has to cover to reach another vaccination center?

(iii) Find the distance between Mr Chugh's home to the vaccination center C.

OR

(iii) Find the distance between the vaccination centers A and C.

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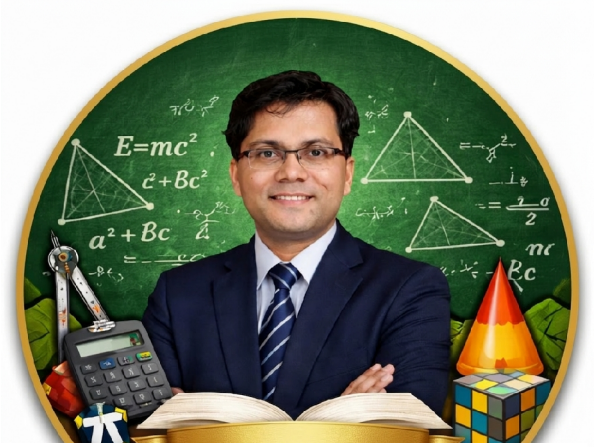

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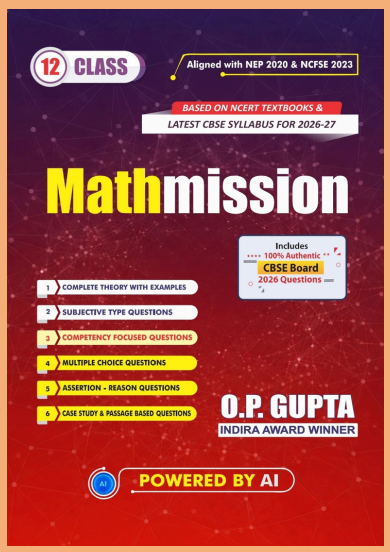

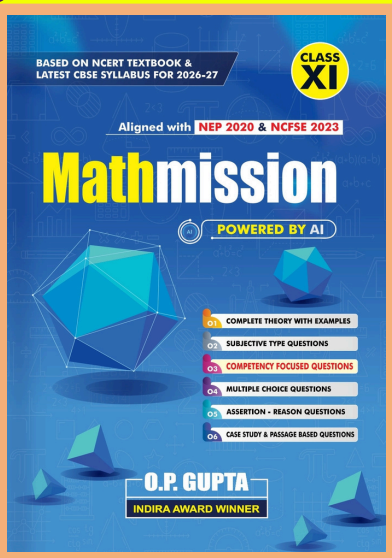

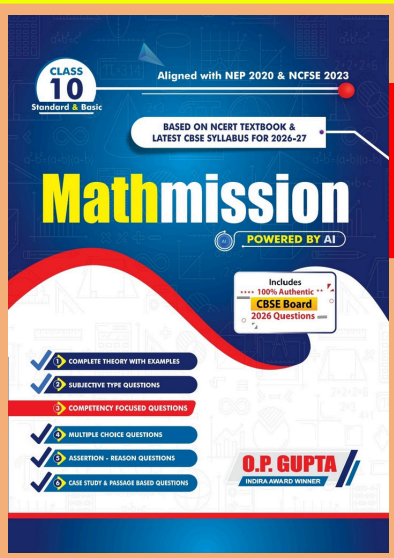

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