

# Iit Jee Math Questions

## Mathematics

Time: 2 hours

Marks: 60

1. Let  $a, b$  be positive real numbers. If  $a, A_1, A_2, b$  are in arithmetic progression,  $a, G_1, G_2, b$  are in geometric progression and  $a, H_1, H_2, b$  are in harmonic progression, show that

$$\frac{G_1 G_2}{H_1 H_2} = \frac{A_1 + A_2}{H_1 + H_2} = \frac{(2a+b)(a+2b)}{9ab}.$$

2. Use mathematical induction to show that  $(25)^n - 24n + 5735$  is divisible by  $(24)^2$  for all  $n = 1, 2, \dots$

3. Prove that  $\cos^{-1} \sin \cot^{-1} x = \sqrt{\frac{x^2 + 1}{x^2 + 2}}$

4. A box contains  $N$  coins,  $m$  of which are fair and the rest are biased. The probability of getting a head when a fair coin is tossed is  $\frac{1}{2}$ , while it is  $\frac{2}{3}$  when a biased coin is tossed. A coin is drawn from the box at random and is tossed twice. The first time it shows head and the second time it shows tail. What is the probability that the coin drawn is fair?

5. Let a complex number  $\alpha, \alpha \neq 1$ , be a root of the equation  $z^{p+q} - z^p - z^q + 1 = 0$ , where  $p, q$  are distinct primes. Show that either  $1 + \alpha + \alpha^2 + \dots + \alpha^{p-1} = 0$  or  $1 + \alpha + \alpha^2 + \dots + \alpha^{q-1} = 0$ , but not both together.

6. A straight line  $L$  through the origin meets the lines  $x + y = 1$  and  $x + y = 3$  at  $P$  and  $Q$  respectively. Through  $P$  and  $Q$  two straight lines  $L_1$  and  $L_2$  are drawn, parallel to  $2x - y = 5$  and  $3x + y = 5$  respectively. Lines  $L_1$  and  $L_2$  intersect at  $R$ . Show that the locus of  $R$ , as  $L$  varies, is a straight line.

7. A straight line  $L$  with negative slope passes through the point  $(8, 2)$  and cuts the positive coordinate axes at points  $P$  and  $Q$ . Find the absolute minimum value of  $OP + OQ$ , as  $L$  varies, where  $O$  is the origin.

8. Prove that, in an ellipse, the perpendicular from a focus upon any tangent and the line joining the centre of the ellipse to the point of contact meet on the corresponding directrix.

9. Find the area of the region bounded by the curves  $y = x^2$ ,  $y = |2 - x^2|$  and  $y = 2$ , which lies to the right of the line  $x = 1$ .

**IIT JEE Math Questions** are a significant aspect of the Joint Entrance Examination (JEE), which is one of the most competitive engineering entrance exams in India. The Indian Institutes of Technology (IITs) conduct the JEE Advanced, while JEE Main is organized by the National Testing Agency (NTA). Mathematics forms a crucial part of the syllabus for these exams, and proficiency in this subject is essential for aspirants hoping to secure a spot in prestigious engineering colleges. This article will explore the types of math questions encountered in the IIT JEE, their importance, preparation strategies, and tips for success.

# Understanding IIT JEE Math Questions

The math section of the IIT JEE is designed to test a candidate's analytical skills, problem-solving abilities, and conceptual understanding. The questions are categorized into various topics, each requiring a different approach and level of understanding. The main topics covered in IIT JEE Math include:

- Algebra
- Calculus
- Coordinate Geometry
- Trigonometry
- Statistics and Probability
- Vectors and 3D Geometry

## Types of Questions

IIT JEE Math questions can be broadly classified into several types:

1. **Multiple Choice Questions (MCQs):** These questions provide four options, and candidates must choose the correct one. Some MCQs may have more than one correct answer.
2. **Numerical Value Questions:** Candidates must calculate and enter a numerical answer. These questions do not provide options.
3. **Assertion and Reasoning Questions:** In these questions, candidates are presented with an assertion and a reason. They must determine whether both statements are true and if the reason correctly explains the assertion.
4. **Match the Following:** Candidates must match items in one list to items in another list correctly.

## Importance of Math in IIT JEE

Mathematics is not just a subject; it is a tool that helps students develop logical reasoning and analytical skills. Here are some reasons why mastering math is crucial for IIT JEE aspirants:

## **Building a Strong Foundation**

A solid understanding of mathematical concepts lays the groundwork for advanced studies in engineering and technology. Topics like calculus and algebra are fundamental in various engineering fields.

## **Enhancing Problem-Solving Skills**

Math helps improve critical thinking and problem-solving abilities. These skills are not only essential for the JEE but also for real-world applications in engineering, where complex problems need effective solutions.

## **Scoring Potential**

The math section often carries significant weight in the overall examination score. A strong performance in math can boost a candidate's rank and increase their chances of admission to top engineering colleges.

## **Preparation Strategies for IIT JEE Math Questions**

A structured preparation strategy is essential for success in IIT JEE math. Here are some effective tips:

### **1. Understand the Syllabus**

Familiarize yourself with the complete IIT JEE math syllabus. This will help you identify the important topics and allocate your study time effectively.

### **2. Study from Recommended Books**

Choosing the right study material is crucial. Some of the most recommended books for IIT JEE math preparation include:

- **“Objective Mathematics” by R.D. Sharma**
- **“Higher Algebra” by Hall and Knight**
- **“Cengage Mathematics Series”**

- **“Problems in General Physics” by I.E. Irodov (for calculus and physics integration)**

### **3. Practice Regularly**

Consistent practice is key to mastering any subject. Solve a variety of problems daily, including previous years' IIT JEE papers and mock tests. This will not only enhance your problem-solving speed but also familiarize you with the exam pattern.

### **4. Focus on Concepts, Not Just Formulas**

Understanding the underlying concepts is more beneficial than rote memorization of formulas. This conceptual clarity will aid in solving complex problems that require a deeper understanding.

### **5. Time Management**

Learn to manage your time effectively while solving questions. Practice solving problems under timed conditions to simulate the exam environment. This will help you develop the ability to work under pressure.

### **6. Analyze Your Mistakes**

After completing practice tests, review your mistakes thoroughly. Understanding why you got a question wrong is crucial for avoiding similar errors in the future.

## **Tips for Tackling IIT JEE Math Questions**

As you prepare for the IIT JEE, consider the following tips to enhance your performance in the math section:

### **1. Read Questions Carefully**

Take your time to read each question thoroughly. Misinterpreting a question can lead to unnecessary mistakes. Pay attention to keywords and phrases that indicate what is being asked.

## **2. Work on Mental Math**

Improving your mental calculation skills can save valuable time during the exam. Practice basic arithmetic operations without a calculator to enhance your speed and accuracy.

## **3. Use Diagrams and Visuals**

For geometry and trigonometry questions, sketching diagrams can provide a clearer understanding of the problem. Visual aids can help you analyze and solve questions more effectively.

## **4. Stay Calm During the Exam**

Nervousness can hinder performance. Practice relaxation techniques, such as deep breathing, to maintain composure during the exam. A calm mind will help you think clearly and perform better.

## **5. Prioritize Questions**

Tackle questions based on your strengths. Start with the ones you find easier to build confidence, then move on to the more challenging problems.

## **Conclusion**

In conclusion, IIT JEE Math questions are a critical component of the examination that can significantly impact a candidate's overall score. By understanding the types of questions, developing effective preparation strategies, and employing smart test-taking techniques, aspirants can maximize their chances of success. A strong foundation in mathematics not only aids in excelling in the JEE but also prepares students for their future endeavors in engineering and technology. With dedication, consistent practice, and the right approach, achieving mastery in IIT JEE Math questions is within every aspirant's reach.

## **Frequently Asked Questions**

### **What type of math topics are primarily covered in IIT JEE math questions?**

IIT JEE math questions primarily cover topics such as Algebra, Calculus, Coordinate Geometry, Trigonometry, and Vectors.

## **How can students effectively prepare for IIT JEE math questions?**

Students can prepare effectively by practicing previous years' question papers, taking mock tests, and focusing on understanding concepts rather than rote memorization.

## **What is the importance of problem-solving skills in IIT JEE math questions?**

Problem-solving skills are crucial in IIT JEE math questions as they help students apply mathematical concepts to solve complex problems efficiently within a limited time.

## **Are there any specific strategies for tackling difficult IIT JEE math questions?**

Yes, strategies include breaking down the problem into smaller parts, using back-calculation, and drawing diagrams to visualize the problem.

## **How does the IIT JEE math syllabus differ from other competitive exams?**

The IIT JEE math syllabus is more rigorous and requires a deeper understanding of concepts, whereas other competitive exams may focus more on basic problem-solving skills.

## **What role does time management play in solving IIT JEE math questions during the exam?**

Time management is critical, as students must allocate their time wisely across questions to ensure they can attempt all sections without rushing or running out of time.

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