

FREE PRACTICE PACK · EDITION 1

Class 12 Mathematics Olympiad practice

16 original questions + explained answers

For students preparing for SOF IMO.

Inside this pack

Eight topic-practice questions and an eight-question, 25-minute mini-mock.

Topics selected for practice

- Functions and matrices
- Calculus and applications
- Vectors and 3D geometry
- Probability and statistics

How to use it

Try the practice first. Complete the mini-mock in one sitting. Check the explanations, mark mistakes, and retry them the next day.

This pack covers selected topics. It is original BodhiScore material, independent of SOF, and is not an official paper or a full-length exam. Check the official syllabus for the complete scope.

Topic practice

Work through these eight questions without a timer. Explain your choice before checking the solutions.

1. Functions and matrices

Find the determinant of $\begin{bmatrix} 2 & 1 \\ 3 & 4 \end{bmatrix}$.

- A.** 8 **B.** 11
C. 14 **D.** 5
-

2. Calculus and applications

Differentiate $y = x^3 - 4x + 2$.

- A.** $3x^3 - 4$ **B.** $3x^2 - 4$
C. $3x^2 + 2$ **D.** $x^2 - 4$
-

3. Vectors and 3D geometry

Find the magnitude of vector $(2, -3, 6)$.

- A.** 5 **B.** 6
C. 7 **D.** 11
-

Topic practice (continued)

4. Probability and statistics

A fair coin is tossed 5 times. What is the probability of exactly one head?

- | | |
|-------------------|-------------------|
| A. $\frac{1}{2}$ | B. $\frac{5}{16}$ |
| C. $\frac{1}{32}$ | D. $\frac{5}{32}$ |
-

5. Functions and matrices

If $f(x)=2x+1$, find $f^{-1}(9)$.

- | | |
|------|------|
| A. 3 | B. 4 |
| C. 5 | D. 9 |
-

6. Calculus and applications

Find the x-coordinate of the stationary point of $y=x^2-6x+8$.

- | | |
|----------|----------|
| A. $x=2$ | B. $x=3$ |
| C. $x=6$ | D. $x=8$ |
-

7. Vectors and 3D geometry

What is the dot product of $(1,2,3)$ and $(4,-1,2)$?

- | | |
|-------|-------|
| A. 12 | B. 6 |
| C. 8 | D. 10 |
-

Topic practice (continued)

8. Probability and statistics

Two independent events have probabilities $\frac{1}{3}$ and $\frac{1}{4}$. What is the probability both occur?

A. $\frac{1}{12}$

B. $\frac{1}{7}$

C. $\frac{7}{12}$

D. $\frac{1}{2}$

Timed mini-mock

Set a 25-minute timer for these eight questions. Score 1 point per correct answer; there is no penalty for an incorrect answer. This is BodhiScore's practice scoring.

9. Functions and matrices

The matrix $\begin{bmatrix} 1 & 2 \\ 0 & 1 \end{bmatrix}$ is multiplied by $\begin{bmatrix} 3 & 4 \end{bmatrix}$. What is the result?

- A. $\begin{bmatrix} 3 & 4 \end{bmatrix}$ B. $\begin{bmatrix} 7 & 4 \end{bmatrix}$
C. $\begin{bmatrix} 11 & 3 \end{bmatrix}$ D. $\begin{bmatrix} 11 & 4 \end{bmatrix}$
-

10. Calculus and applications

Evaluate the definite integral of $2x$ from $x=0$ to $x=3$.

- A. 6 B. 9
C. 18 D. 3
-

11. Vectors and 3D geometry

A line has direction vector $(2, -1, 2)$. What is its direction-vector magnitude?

- A. 5 B. 9
C. 3 D. $\sqrt{5}$
-

Timed mini-mock (continued)

12. Probability and statistics

A normal distribution is symmetric with mean 50. What is its median?

- | | |
|-------------------------------|---------------|
| A. Depends on variance | B. 100 |
| C. 25 | D. 50 |
-

13. Functions and matrices

A matrix has rows $[1,2]$ and $[2,4]$. What is its determinant?

- | | |
|-------------|-------------|
| A. 4 | B. 8 |
| C. 0 | D. 2 |
-

14. Calculus and applications

For $y=x^3$, what is the slope of the tangent at $x=2$?

- | | |
|--------------|--------------|
| A. 12 | B. 16 |
| C. 6 | D. 8 |
-

15. Vectors and 3D geometry

Find the distance between points $(1,2,3)$ and $(4,6,3)$.

- | | |
|-------------|-------------|
| A. 5 | B. 6 |
| C. 7 | D. 4 |
-

Timed mini-mock (continued)

16. Probability and statistics

A test has sensitivity 0.9. Among 100 people who truly have the condition, how many are expected to test positive?

- | | |
|--------------|--------------|
| A. 90 | B. 99 |
| C. 9 | D. 10 |
-

Answers and explanations

Check why the answer works, then retry any question you missed.

1. D - 5

The determinant is $2 \times 4 - 1 \times 3 = 5$.

2. B - $3x^2 - 4$

By the power rule, $dy/dx = 3x^2 - 4$.

3. C - 7

Magnitude = $\sqrt{2^2 + (-3)^2 + 6^2} = \sqrt{49} = 7$.

4. D - $5/32$

There are 5 choices for the head position among 32 outcomes, so $5/32$.

5. B - 4

Solve $2x+1=9$ to get $x=4$.

6. B - $x=3$

$dy/dx=2x-6=0$ gives $x=3$.

7. C - 8

The dot product is $4 - 2 + 6 = 8$.

8. A - $1/12$

For independent events, multiply: $1/3 \times 1/4 = 1/12$.

9. D - $[(11), (4)]$

The product is $(1 \times 3 + 2 \times 4, 0 \times 3 + 1 \times 4) = (11, 4)$.

Answers and explanations (continued)

10. B - 9

Integral x^2 from 0 to 3 equals 9.

11. C - 3

$\sqrt{2^2 + (-1)^2 + 2^2} = \sqrt{9} = 3$.

12. D - 50

For a symmetric normal distribution, mean and median are both 50.

13. C - 0

$1x4 - 2x2 = 0$, so the rows are linearly dependent.

14. A - 12

$dy/dx = 3x^2$; at $x=2$ the slope is 12.

15. A - 5

Distance = $\sqrt{3^2 + 4^2 + 0^2} = 5$.

16. A - 90

Sensitivity is the true-positive rate: $0.9 \times 100 = 90$.

Topic scope checked against SOF syllabus: [SOF IMO Class 12 syllabus](#)