Mathematics Test - Grade 10 CBSE

Duration: 1.5 Hours

Maximum Marks: 50

Section A (1 mark each) - Total 5 Marks

1. Find the 15th term of an arithmetic sequence where the 7th term is 17, and the 10th term is 26.
2. If $\tan\theta = \frac{3}{4}$, find $\sin\theta$ and $\cos\theta$.
3. The top of a lighthouse, 100 meters above sea level, is observed from a boat at an angle of elevation of 30°. How far is the boat from the base of the lighthouse?
4. A cone has a slant height of 13 cm and a radius of 5 cm. Find its total surface area.
5. Determine the nature of roots for the equation $2x^2 - 4x + 3 = 0$.

Section B (2 marks each) - Total 10 Marks

6. If the first term of an arithmetic sequence is 4 and the sum of its first 10 terms is 145, find the common difference.
7. Prove that $\cot A \cdot \csc A = \frac{1}{\sin A}$.
8. The angle of elevation of the top of a tower from a point on the ground is 45°. Moving 20 meters closer to the tower, the angle of elevation becomes 60°. Find the height of the tower.
9. A solid cylinder has a height of 14 cm and a radius of 3.5 cm. Find its total surface area.
10. Solve for x: $2x^2 - 5x + 3 = 0$ using the quadratic formula.

Section C (3 marks each) - Total 15 Marks

11. In an arithmetic progression, the sum of the first n terms is given by $S_n = 3n^2 + 5n$. Find the n-th term and the first term.
12. Prove that $\sec^4 A - \tan^4 A = 1 + 2\tan^2 A$.
13. From a point 50 m away from the base of a building, the angle of elevation of the top of the building is observed to be 60°. Find the height of the building.
14. A hollow cylindrical pipe has an outer radius of 10 cm, an inner radius of 8 cm, and a height of 15 cm. Calculate its volume.
15. A man saves a certain amount every month such that he is able to save Rs. 2700 in the first 12 months and Rs. 5800 in the next 8 months. Assuming that he saves in an increasing arithmetic pattern, find his savings in the 20th month.

Section D (5 marks each) - Total 20 Marks

16. The sum of the first 25 terms of an arithmetic progression is 525, and the 10th term is 25. Find the first term and common difference, and hence, determine the sum of the first 50 terms of this sequence.
17. A man standing on top of a building 50 meters high observes the top of a tower at an angle of elevation of 30° and the foot of the tower at an angle of depression of 45°. Find the height of the tower and the distance between the building and the tower.
18. A hemispherical bowl of radius 10 cm is full of water. A solid metal sphere of radius 5 cm is completely immersed in the water. Calculate the volume of water that will spill out.
19. A school wants to build a conical tent with a radius of 7 m and a height of 24 m. Calculate the area of the canvas required to build this tent, and also find the cost if the canvas costs Rs. 150 per square meter.