Chapter 13 Properties of Triangle

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3) The sum of the radii of inscribed and circumscribed circles for an n sided regular polygon of side a, is (2003)

a) $\frac{a}{4}\cot\left(\frac{\pi}{2n}\right)$ b) $a\cot\left(\frac{\pi}{n}\right)$ c) $\frac{a}{2}\cot\left(\frac{\pi}{2n}\right)$ d) $a\cot\left(\frac{\pi}{2n}\right)$

4) In a triangle ΔABC, medians AD and BE are drawn. If AD= $4, \angle DAB = \frac{\pi}{6}$ and $\angle ABE = \frac{\pi}{3}$, then the area of the ΔABC is (2003)

a) $\frac{64}{3}$ b) $\frac{8}{3}$ c) $\frac{16}{3}$ d) $\frac{32}{3\sqrt{3}}$

5) If in ΔABC $a\cos^2\left(\frac{\mathbf{C}}{2}\right) + c\cos^2\left(\frac{\mathbf{A}}{2}\right) = \frac{3b}{2}$, then the sides a, b and c (2003)

a) satisfy $a + b = c$ b) are in A.P. c) are in G.P. d) are in H.P.

6) The sides of a triangle are $\sin\alpha, \cos\alpha$ ad $\sqrt{1 + \sin\alpha\cos\alpha}$ for some $0 < \alpha < \frac{\pi}{2}$. Then the greatest angle of the triangle is (2004)

a) 150° b) 90° c) 120° d) 60°

7) A person standing on the bank of a river observes that the angle of elevation of the top of a tree on the opposite bank of the river is 60° and when he retires 40 meters away from the tree, the angle of elevation becomes 30°. The breadth of the river is (2004)

a) $60m$ b) $30m$ c) $40m$ d) $20m$

8) In a triangle ΔABC, let $\angle C = \frac{\pi}{2}$. If r is the inradius and R is the circumradius of the triangle ΔABC, then $2(R + r)$ equals (2005)

a) $b + c$ b) $a + b$ c) $a + b + c$ d) $c + a$

9) If in a ΔABC, let the altitudes from the vertices $\mathbf{A}, \mathbf{B}, \mathbf{C}$ on opposite sides are in H.P., then $\sin\mathbf{A}, \sin\mathbf{B}, \sin\mathbf{C}$ are in (2005)

a) *G.P.* b) *A.P.* c) *A.P.* − *G.P.* d) *H.P.*

10) A tower stand at the centre of a circular park. **A** and **B** are two points on the boundary of the park such that AB $(= a)$ subtends an angle of 60° at the foot of the tower, and the angle of elevation of the top of the tower from **A** or **B** is 30°. The height of the tower is (2007)

a) $\frac{a}{\sqrt{3}}$ b) $a\sqrt{3}$ c) $\frac{2a}{\sqrt{3}}$ d) $2a\sqrt{3}$

11) AB is a vertical pole with **B** at the ground level and **A** at the top. A man finds that the angle of elevation the the point **A** from a certain point **C** on the ground is 60°. He moves away from the pole along the line BC to a point **D** such that CD = $7m$. From **D** the angle of elevation of point **A** is 45°. Then the height of the pole is (2008)

a) $\frac{7\sqrt{3}}{2}\frac{1}{\sqrt{3}-1}m$ b) $\frac{7\sqrt{3}}{2}\left(\sqrt{3}+1\right)m$ c) $\frac{7\sqrt{3}}{2}\left(\sqrt{3}-1\right)m$ d) $\frac{7\sqrt{3}}{2}\frac{1}{\sqrt{3}+1}m$

12) For a regular polygon, let r and R be the radii of the inscribed and the circumscribed circles. A false statement among the following is (2010)

a) There is a regular polygon with $\frac{r}{R}=\frac{1}{\sqrt{2}}$
b) There is a regular polygon with $\frac{r}{R}=\frac{2}{3}$
c) There is a regular polygon with $\frac{r}{R}=\frac{\sqrt{3}}{2}$
d) There is a regular polygon with $\frac{r}{R}=\frac{1}{2}$

13) A bird is sitting on the top of a vertical pole $20m$ high and its elevation from a point **O** on the ground is 45°. It flies off horizontally straight away from the point **O**. After one second, the elevation of the bird from **O** is reduced to 30°. Then the speed in $(in\ m/s)$ of the bird is $(JEEM2014)$

a) $20\sqrt{2}$ b) $20\left(\sqrt{3}-1\right)$ c) $40\left(\sqrt{2}-1\right)$ d) $40\left(\sqrt{3}-\sqrt{2}\right)$

14) If the angle of elevation of the top of a tower from three colinear points **A**, **B** and **C** on a line leading to foot of the tower, are $30°, 45°$and$60°$ respectively, then the ratio, AB : BC, is: $(JEEM2015)$

a) $1:\sqrt{3}$ b) $2:3$ c) $\sqrt{3}:1$ d) $\sqrt{3}:\sqrt{2}$

15) Let a vertical tower AB have its end **A** on the level ground. Let **C** be the mid-point of AB and **P** be a point on the ground such that AP = 2AB. If $\angle BPC=\beta$, then $\tan\beta$ is equal to: $(JEEM2017)$

a) $\frac{4}{9}$ b) $\frac{6}{7}$ c) $\frac{1}{4}$ d) $\frac{2}{9}$

16) ΔPQR is a triangular park with PQ = PR = $200m$. A T.V. tower stands at the mid-point of QR. If the angles of the elevation of the top of the tower at **P**, **Q** and **R** are respectively $45°, 30°$ and 30°, then the height of the tower $(in\ m)$ is: $(JEEM2018)$

a) 50 b) $100\sqrt{3}$ c) $50\sqrt{2}$ d) 100