Chapter 13 Properties of Triangle

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1) The sides of a triangle are $3x+4y, 4x+3y$ and $5x+5y$ where $x, y > 0$ then the triangle is (2002)

a) right angled b) obtuse angled c) equilateral d) none of these

2) In a triangle with sides $a, b, c, r_1 > r_2 > r_3$ (which are ex-radius) then (2002)

a) $a > b > c$ b) $a < b < c$ c) $a > b$ and $b < c$ d) $a < b$ and $b > c$

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 **ABC**, 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 Δ**ABC** is (2003)

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

5) If in Δ**ABC** $a\cos^2\left(\frac{C}{2}\right) + c\cos^2\left(\frac{A}{2}\right) = \frac{3b}{2}$, 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 ABC, let $\angle C = \frac{\pi}{2}$. If r is the inradius and R is the circumradius of the triangle ABC, 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 $\mathbf{AB}\,(=a)$ 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 $\mathbf{CD} = 7m$. 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 (*JEEM*2014)

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 $\mathbf{A}, \mathbf{B}$ and $\mathbf{C}$ on a line leading to foot of the tower, are $30°, 45°$and$60°$ respectively, then the ratio, $\mathbf{AB} : \mathbf{BC}$, is: (*JEEM*2015)

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 $\mathbf{AP} = 2\mathbf{AB}$. If $\angle BPC = \beta$, then $\tan\beta$ is equal to: (*JEEM*2017)

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

16) **PQR** 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