

Chapter 13 Properties of Triangle ¹

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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 $\triangle ABC$, 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 $\triangle ABC$ is (2003)
- a) $\frac{64}{3}$ b) $\frac{8}{3}$ c) $\frac{16}{3}$ d) $\frac{32}{3\sqrt{3}}$
- 5) If in $\triangle ABC$ $a \cos^2\left(\frac{C}{2}\right) + c \cos^2\left(\frac{A}{2}\right) = \frac{3b}{2}$, 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 $\sin \alpha, \cos \alpha$ and $\sqrt{1 + \sin \alpha \cos \alpha}$ 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 $\triangle ABC$, let $\angle C = \frac{\pi}{2}$. If r is the inradius and R is the circumradius of the triangle $\triangle ABC$, then $2(R + r)$ equals (2005)
- a) $b + c$ b) $a + b$ c) $a + b + c$ d) $c + a$
- 9) If in a $\triangle ABC$, let the altitudes from the vertices **A**, **B**, **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) $\frac{7\sqrt{3}}{2} (\sqrt{3} + 1)m$ c) $\frac{7\sqrt{3}}{2} (\sqrt{3} - 1)m$ 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) $20(\sqrt{3} - 1)$ c) $40(\sqrt{2} - 1)$ d) $40(\sqrt{3} - \sqrt{2})$

- 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) $\triangle PQR$ 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