

# CHAPTER - 13

## Properties of Triangles

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### I. MCQs WITH ONE CORRECT ANSWER

- 1) In a triangle  $ABC$ ,  $\angle B = \frac{\pi}{3}$  and  $\angle C = \frac{\pi}{4}$ . Let  $D$  divide  $BC$  internally in the ratio  $1 : 3$  then  $\frac{\sin \angle BAD}{\sin \angle CAD}$  is equal to
  - (a)  $\frac{1}{\sqrt{6}}$
  - (b)  $\frac{1}{3}$
  - (c)  $\frac{1}{\sqrt{3}}$
  - (d)  $\sqrt{\frac{2}{3}}$

(1995S)
- 2) In a triangle  $ABC$ ,  $2ac \sin \frac{1}{2}(A - B + C) =$ 
  - (a)  $a^2 + b^2 - c^2$
  - (b)  $c^2 + a^2 - b^2$
  - (c)  $b^2 - c^2 - a^2$
  - (d)  $c^2 - a^2 - b^2$

(2000S)
- 3) In a triangle  $ABC$ , let  $\angle C = \frac{\pi}{2}$ . If  $r$  is the inradius and  $R$  is the circumradius of the triangle, then  $2(r + R)$  is equal to
  - (a)  $a + b$
  - (b)  $b + c$
  - (c)  $c + a$
  - (d)  $a + b + c$

(2000S)
- 4) A pole stands vertically inside a triangular park  $\triangle ABC$ . If the angle of elevation of the top of the pole from each corner of the park is same, then in  $\triangle ABC$  the foot of the pole is at the
  - (a) centroid
  - (b) circumcentre
  - (c) incentre
  - (d) orthocentre

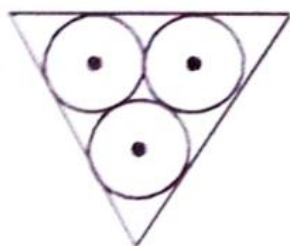
(2000S)
- 5) A man from the top of a 100 metres high tower sees a car moving towards the tower at an angle of depression of  $30^\circ$ . After some time, the angle of depression becomes  $60^\circ$ . The distance (in metres) travelled by the car during this time is
  - (a)  $100\sqrt{3}$
  - (b)  $\frac{200\sqrt{3}}{3}$
  - (c)  $\frac{100\sqrt{3}}{3}$
  - (d)  $200\sqrt{3}$

(2001S)
- 6) Which of the following pieces of data does NOT uniquely determine an acute-angled triangle  $\triangle ABC$  ( $R$  being the radius of the circum-circle)?
  - (a)  $a, \sin A, \sin B$
  - (b)  $a, b, c$
  - (c)  $a, \sin B, R$
  - (d)  $a, \sin A, R$

(2002S)
- 7) If the angles of a triangle are in the ratio  $4 : 1 : 1$ , then the ratio of the longest side to the perimeter is
  - (a)  $\sqrt{3} : 2 + \sqrt{3}$
  - (b)  $1 : 6$
  - (c)  $1 : 2 + \sqrt{3}$
  - (d)  $2 : 3$

(2003S)
- 8) The sides of a triangle are in the ratio  $1 : \sqrt{3} : 2$ , then the angles of the triangle are in the ratio
  - (a)  $1 : 3 : 5$
  - (b)  $2 : 3 : 4$
  - (c)  $3 : 2 : 1$
  - (d)  $1 : 2 : 3$

(2004S)
- 9) In an equilateral triangle, 3 coins of radii 1 unit each are kept so they touch each other and also



the sides of the triangle. Area of the triangle is

- (a)  $4 + 2\sqrt{3}$
- (b)  $6 + 4\sqrt{3}$
- (c)  $12 + \frac{7\sqrt{3}}{4}$
- (d)  $3 + \frac{7\sqrt{3}}{4}$

(2005S)

- 10) In a triangle  $ABC$ ,  $a, b, c$  are the lengths of its sides and  $A, B, C$  are the angles of triangle  $ABC$ . The correct relation is given by

- (a)  $(b - c) \sin\left(\frac{B-C}{2}\right) = a \cos\left(\frac{A}{2}\right)$
- (b)  $(b - c) \cos\frac{A}{2} = a \sin\left(\frac{B-C}{2}\right)$
- (c)  $(b + c) \sin\left(\frac{B+C}{2}\right) = a \cos\left(\frac{A}{2}\right)$
- (d)  $(b - c) \cos\frac{A}{2} = a \sin\left(\frac{B+C}{2}\right)$

(2005S)

- 11) One angle of an isosceles  $\triangle$  is  $120^\circ$  and radius of its incircle  $= \sqrt{3}$ . Then the area of the triangle in sq. units is

- (a)  $7 + 12\sqrt{3}$
- (b)  $12 - 7\sqrt{3}$
- (c)  $12 + 7\sqrt{3}$
- (d)  $4\pi$

(2006 - 3M, -1)

- 12) Let  $ABCD$  be a quadrilateral with area 18, with side  $AB$  parallel to the side  $CD$  and  $2AB = CD$ . Let  $AD$  be perpendicular to  $AB$  and  $CD$ . If a circle is drawn inside the quadrilateral  $ABCD$  touching all the sides, then the radius is

- (a) 3
- (b) 2
- (c)  $\frac{3}{2}$
- (d) 1

(2007 - 3 Marks)

- 13) If the angles  $A, B$  and  $C$  of a triangle are in an

arithmetic progression and if  $a, b$  and  $c$  denote the lengths of the sides opposite to  $A, B$  and  $C$  respectively, then the value of the expression  $\frac{a}{c} \sin 2C + \frac{c}{a} \sin 2A$  is

- (a)  $\frac{1}{2}$
- (b)  $\frac{\sqrt{3}}{2}$
- (c) 1
- (d)  $\sqrt{3}$

(2010)

- 14) Let  $PQR$  be a triangle of area  $\Delta$  with  $a = 2, b = \frac{7}{2}$  and  $c = \frac{5}{2}$ , where  $a, b$  and  $c$  are the lengths of the sides of the triangle opposite to the angles at  $P, Q$  and  $R$  respectively. Then  $\frac{2 \sin P - \sin 2P}{2 \sin P + \sin 2P}$  equals

- (a)  $\frac{3}{4\Delta}$
- (b)  $\frac{45}{4\Delta}$
- (c)  $\left(\frac{3}{4\Delta}\right)^2$
- (d)  $\left(\frac{45}{4\Delta}\right)^2$

(2012)

- 15) In a triangle the sum of two sides is  $x$  and the product of the same sides is  $y$ . If  $x^2 - c^2 = y$ , where  $c$  is the third side of the triangle, then the ratio of the inradius to the circum-radius of the triangle is

- (a)  $\frac{3y}{2x(x+c)}$
- (b)  $\frac{3y}{2c(x+c)}$
- (c)  $\frac{3y}{4x(x+c)}$
- (d)  $\frac{3y}{4c(x+c)}$

(JEE Adv. 2014)