# CHAPTER - 13
# Properties of Triangles

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## 1 C. 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°. After some time, the angle of depression becomes 60°. 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 circumcircle)?
a) $a, \sin A, \sin B$
b) $a, b, c$
c) $a, \sin B, R$
d) $a, \sin A, R$

(2002S)

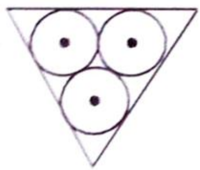
7) If the angles of a triangle are in the ratio 4: 1: 1, then the ratio of the longest side to the perimeter is
a) $\sqrt{3}: 2+\sqrt{3}$
b) $1: 6$
c) $1: 2+\sqrt{3}$
d) $2: 3$

(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 $ABC$, $\mathbf{a}, \mathbf{b}, \mathbf{c}$ are the lengths of its sides and $\mathbf{A}, \mathbf{B}, \mathbf{C}$ 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) $(b-c)\cos\left(\frac{A}{2}\right) = a\sin\left(\frac{B-C}{2}\right)$

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

(2005S)

11) One angle of an isosceles $\triangle$ is $120°$ 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 $\mathbf{A}, \mathbf{B}$ and $\mathbf{C}$ of a triangle are in an arithmetic progression and if $\mathbf{a}, \mathbf{b}$ and $\mathbf{c}$ denote the lengths of the sides opposite to $\mathbf{A}, \mathbf{B}$ and $\mathbf{C}$ 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 $\mathbf{a}, \mathbf{b}$ and $\mathbf{c}$ are the lengths of the sides of the triangle opposite to the angles at $\mathbf{P}, \mathbf{Q}$ and $\mathbf{R}$ 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 $\mathbf{x}$ and the product of the same sides is $\mathbf{y}$. If $x^2 - c^2 = y$, where $\mathbf{c}$ is the third side of the triangle, then the ratio of the inradius to the circum-radius of the triangle is
a) $\frac{3y}{2(x+c)}$
b) $\frac{3y}{2c(x+c)}$
c) $\frac{3y}{4x(x+c)}$
d) $\frac{3y}{4c(x+c)}$

(JEE Adv. 2014)