# Circles

## Review Exercise Questions

### Level-2

Multiple Options may be Correct

**Q1.** Which of the following statements are correct?

(A) Every cyclic parallelogram is a rectangle.
(B) An isosceles trapezium is always cyclic.
(C) A cyclic trapezium is always isosceles.
(D) The quadrilateral formed by the angle bisectors of a cyclic quadrilateral is also cyclic.

Miscellaneous

**Q2.** A chord AB of a circle $S_1$ cuts a concentric circle $S_2$ at $A'$ and $B'$. Prove that $AA' = BB'$.

**Q3.** Two circles cut each other at A and B. PAQ and RBS are parallel straight lines which meet the circles against at P, Q, R and S. Show that PQ = RS.

**Q4.** Two straight lines OAB and OCD are drawn from an external point O to cut a circle at A, B, C and D. Can the intersection point of PAD and BC be the center of the circle?

**Q5.** Prove that a circle can be drawn through the vertices of any isosceles trapezium.

**Q6.** Each circle from a family of circles passes through a fixed point A and has its center on a fixed line L. Prove that every circle of this family will also pass through another fixed point.

**Q7.** H is the orthocenter of $\Delta ABC$. AH meets BC at D and the triangle's circumcircle at E. Prove that HD = DE.

**Q8.** I is the incenter of $\Delta ABC$. AI meets the triangle's circumcircle at D. Prove that DB = DC = DI.

**Q9.** In a triangle ABC, the internal bisectors of $\angle A$ meets the circumcircle in D. DE and DF are perpendiculars to AB and AC respectively from D. Prove that $AE = \frac{AB + AC}{2}$.

**Q10.** Two circles intersect at A and B. A variable line through A meets the circle at P and Q. What is the locus of the mid-point of PQ?

**Q11.** A, B and C are any three points on a circle. D and E are the mid-points of the minor arcs cut off by AB and AC respectively. Show that DE is equally in inclined to AB and AC.

**Q12.** Two chords of a circle are bisected by a fixed chord AB. Prove that the greater of the two chords will be the one which intersects AB at a point closer to its mid-point.

**Q13.** What is the locus of the mid-points of chords of a circle which pass through a fixed point?

**Q14.** I and S are the incenter and the circumcenter respectively of $\Delta ABC$. Evaluate $\angle IAS$ in terms of $\angle B$ and $\angle C$.

**Q15.** S is the circumcenter of $\Delta ABC$ and D is the mid-point of BC. Show that $\angle BSD = \angle BAC$

**Q16.** ABCD is parallelogram. Prove that the circumcenters of $\Delta ABC$ and $\Delta ADC$ are at the same distance from AC.

**Q17.** Consider an isosceles triangle ABC with base BC. X is any point on BC, while P and Q are the circumcenters of $\Delta ABX$ and $\Delta ACX$. Prove that APXQ is a parallelogram.

**Q18.** The diagonals of a quadrilateral ABCD meet at the point O. Show that the circumcentres of the four triangles OAB, OBC, OCD and ODA form a parallelogram.