**Cevas Theorem** :  Given a triangle *ABC*, let the lines *AO*, *BO* and *CO* be drawn from the vertices to a common point *O* to meet opposite sides at *D*, *E* and *F* respectively. Then

\frac{AF}{FB}  \cdot \frac{BD}{DC} \cdot \frac{CE}{EA} = 1.

**Menelaus Theorem :**  Given a triangle *ABC*, and a [transversal](http://en.wikipedia.org/wiki/Transversal_(geometry)) line that crosses *BC*, *AC* and *AB* at points *D*, *E* and *F* respectively, with *D*, *E*, and *F* distinct from *A*, *B* and *C*, then

\frac{AF}{FB} \times \frac{BD}{DC} \times \frac{CE}{EA} =  1.

1 . **I**f a line through centroid  **G**  of triangle **ABC** meets **AB**  in M and **AC** at N. prove that

**AN.MB + AM.NC = AM.AN.**

**2. G** is centroid of triangle **ABC . AG** is produced to X such that GX = AG. If we draw parallels through X to CA, AB, BC meeting BC, CA, AB at L, M, N respectively . Prove that L, M, N are collinear.

3. . AD is the altitude of triangle ABC. Points E, F are on AC and AB respectively such that AD, BE, CF are concurrent. Prove that AD bisects angle EDF.

4 Equilateral Triangles DBC, ECA, FAB are constructed externally on sides BC, CA, AB respectively of triangle ABC. AD and BE intersect at point X. Prove that (a) AD = BE

(b) quadrilaterals BXCD and AXCE are Cyclic. (c) AD, BE, CF are concurrent.

5. Three circles are such that any pair of circles have two points in common .prove that their common chords are either parallel or concurrent.

6. **SIMPSONS LINE:**  P is any Point on circumcircle of triangle ABC. Prove that foot of perpendiculars from P to the sides of triangle ABC are collinear.

7. O1, O2 are centres of Squares which are constructed externally on sides AC and AB of triangle ABC respectively. If M is mid-point of side BC then prove that Point M is equidistant from O1 and O2 .

8. Equilateral triangles DAC and EAB are constructed externally on sides of triangle ABC.

M is mid point of side BC of triangle ABC. Prove that M is Equidistant from mid points of line-segments AD and AE .

9. Squares ACDE and ABFG are constructed externally on sides AB and AC of triangle ABC.

(a) Prove that CG = BE. (b) Given if lines EG and BC are parallel then prove that Triangle ABC is Isosceles.

10 . Incircle with centre I of triangle ABC touches BC, CA , AB at D, E, F respectively . Lines

DI and EF intersects at X .Line through X perpendicular to DX intersects AB and AC at P and Q . If line AX extended meets BC at M . Prove that PX = XQ using this result Prove BM = MC.

11. A circle is inscribed in a Quadrilateral ABCD ,which touches its sides AB, BC, CD, AD at

E, F, G, H . Prove that diagonals of Quadrilateral ABCD and EFGH are concurrent.

12. A circle is inscribed in triangle ABC and touches side BC at point M, MK being its diameter AK extended intersects the circle at a point P and side BC at N.

(a) Prove that BM = NC. [HINT: draw a line through K parallel to BC intersecting AB at A1, BC at B1 observe that triangles AA1C1 and ABC are similar and prove EXCIRCLE of triangle ABC touches BC at N. ]

(b) Using above result prove that tangent to incircle at P bisects side BC.

13. AD is altitude from A of triangle ABC . A circle is drawn with AD as diameter intersecting AB and AC at K and L respectively. Tangents at K and L intersect at N. AN intersects BC at M.

Prove that AN bisects BC.[HINT: Draw a line through N Parallel to BC intersecting AB and AC at B1 and C1 and prove BN = NK = NC = NL]

14. In triangle ABC angle B is 90 degrees. BD is feet of perpendicular from B to AC . Circumcircle of triangle ABC is drawn M is the midpoint of semicircle arc (B and M lie on opposite sides of AC). Point K is taken on AC such that DM = DK . find value of ratio AC : BK .

15. In triangle ABC angle B is 90 degrees. BD is feet of perpendicular from B to AC . A circle

is drawn with BD as diameter .Tangents from A and C to circle touching it at K and L, meets at Point P. Find numerical value of ratio PK : BD.

16. Two circles touch each other internally at a point A . A radius OB touching the smaller circle at point C is drawn from the centre O of larger circle. Find angle BAC .

17. In triangle ABC angle B = 60 degrees and bisector of angle A intersects BC at M . A point K is taken on side AC such that angle AMK = 30 .find value of angle OKC where O is centre of circumcircle of triangle AMC .[Hint : Extend MK to intersect circumcircle drawn at P. prove P is circumcentre of triangle AKO. ]

18. Prove that if one angle of triangle is equal to 120 degrees, then the triangle formed by the feet of its angle bisectors is right angled .

19. IN a triangle , AB = AC, angle A = 80 degrees and S is circumcentre .Bisectors of angle ACS and ABS meet BS and CS respectively at X and Y. Find angles of triangle AXY .

20. **G** is centroid of triangle **ABC . AG** is produced to X such that GX = AG. Prove that triangle GXC is similar to triangle formed by medians as sides . Find the ratio of areas of triangle formed by medians and triangle ABC .

21. In a non isosceles triangle ABC median AD is drawn .Sum of angles BAD and ACB is 90 degrees .Find numerical value of angle BAC .

22.IN a triangle ABC, the midperpendicular to side AB intersects the line AC at M, and midperpendicular to the side AC intersects line AB at N.It is known that MN = BC and line MN is perpendicular to line BC. Determine angles of triangle ABC .