Okay so, here I'll add geometry based stuff I'll learn over this year. And see how it goes.

Here in each part, I will write a topic name or a lemma, then I will describe that topic and some properties about it and in the last problems relating to it.

**1. Desargues Involution theorem**

This is a cute theorem I like. I think I’ll just give the link to the pdf.

[file:///C:/Raiyan/Mathx/Revolution/Geometry/Projective%20Geometry/desargues-involution-theorem.pdf](file:///C:\Raiyan\Mathx\Revolution\Geometry\Projective%20Geometry\desargues-involution-theorem.pdf)

**2.** **Steiner line of a triangle**

The Steiner line of a point P lying on the circumcircle of ABC is the line that goes through the reflections of P on the sides of ABC. This line also goes through the orthocenter H of ABC.

Now, if P' is the isogonal conjugate of P, then P' is a point at infinity and AP', BP', CP' are all parallel and each being perpendicular to the steiner line of P w.r.t ABC.

Problems relating to it are:

1) 2015 EGMO P6:

<https://artofproblemsolving.com/community/c6h1078898p4728597>

**3. Poncelet point of a Quadrilateral**

Taking 3 points at a time we can form 4 triangles. Their 4 nine point circles and the 4 pedal triangles circumcircles of each point w.r.t to the corresponding triangle. all these 8 circles go through a point which is called the poncelet point of ABCD.

Problems relating to it are:

1) IMO Shortlist 2018 G4:

<https://artofproblemsolving.com/community/c6h1876789p12752914>

**4. Lemma:**

**Let in a triangle ABC, K be a point such that, angle KBA= angle KCA = angle BAC.**

**Then K lies on the Euler line.**

Let M, Nbe the midpoints of AB, AC respectively. Let BK, CK meet AC, AB respectively at E, F. Then just apply Pappus theorem on FMB and ENC.

Problems relating to it are:

1. China TST 2019 Test 1 Day 1 P1:

<https://artofproblemsolving.com/community/c6h1804203p11992841>

**5. Lemma:**

**Let the perpendicular bisector of BC of triangle ABC meet AB and AC at X, Y. Then X, Y are inverses w.r.t. circle ABC.**

Just straightforward angle chase.

Problems relating to it are:

1. China TST Test 2 Day 1 P1

<https://artofproblemsolving.com/community/c6h1800001p119454765>

**6. Paralogic Triangles:**

<http://mathworld.wolfram.com/ParalogicTriangles.html>

**7. Sondats theorem:**

There are two Sondats theorem:

1. <http://mathworld.wolfram.com/SondatsTheorem.html>
2. <https://artofproblemsolving.com/community/c6h4337_sondat_theorem_about_orthologic_and_perspective_triangles>