

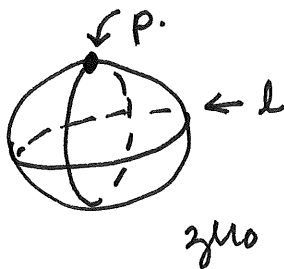
Math 3305 Chapter 2, Section 2 script

Parallel Lines

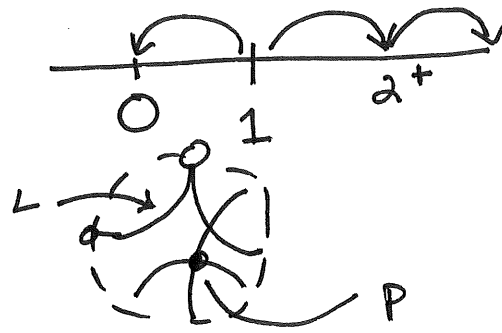
Let's start with SMSG A16 The Parallel Postulate:

Through a given external point there is at most one line parallel to a given line.

Now let's negate "one line parallel" on a number line. If we're looking a NOT Euclidean geometry where can we go?



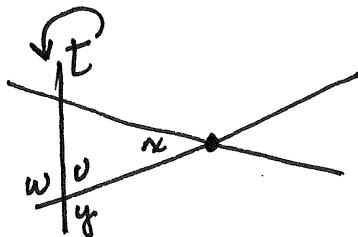
Spherical



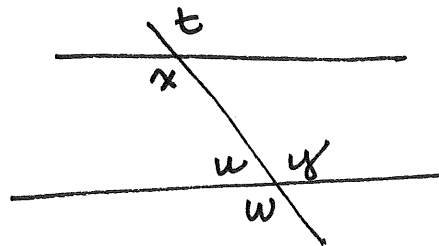
Hyperbolic

Now let's stick with Euclidean for a while. Let's look at a transversal:

Given two distinct lines L_1 and L_2 then a third line L_3 is said to be a transversal if L_3 has a nonempty intersection with each of L_1 and L_2 and if the intersection of the first two lines doesn't include L_3 . L_1 and L_2 need not be parallel with this definition!



and



Let's look at alternate interior angles (x, y) and corresponding angles (x, w) and interior angles on the same side of L_3 (x, u).

Theorem 2.2.1 Alternate Interior Angle Criteria

We need this thm

A transversal L_3 to L_1 and L_2 has a pair of congruent alternate interior angles IFF L_1 and L_2 are parallel.

Popper 2.2, Question One

How many proofs will we have to do for this theorem?

- A. 1
- B. 2

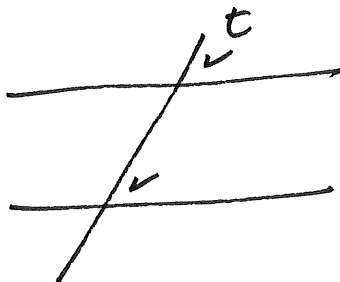
Now let's talk lemma and corollary.

Lemma *prequel* precedes, usually smaller, usually gets used in the theorem ... "by lemma, we know!"

Corollary *sequel* follows a theorem. shorter usually. an additional point

Corollary 2.2.2 Corresponding Angle Criteria

A transversal L_3 to L_1 and L_2 has a pair of congruent corresponding angles IFF L_1 and L_2 are parallel.

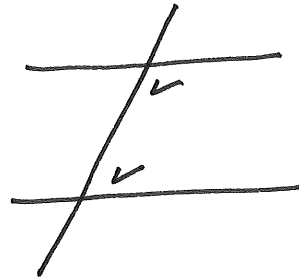


4 pr of corresponding angles

Corollary 2.2.3 Same-side Interior Angle Criteria

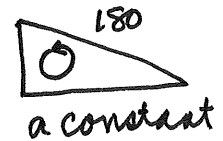
A transversal L_3 to L_1 and L_2 has a congruent pair of interior angles on the same side of L_3 that are supplements IFF L_1 and L_2 are parallel

alpha	numerical
↓ C	90 ↓
↓ S	180 ↓

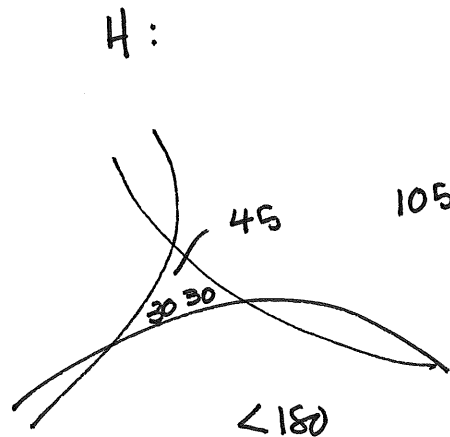
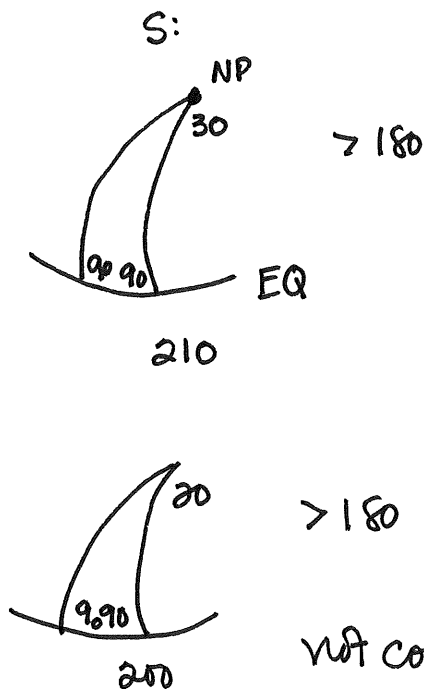


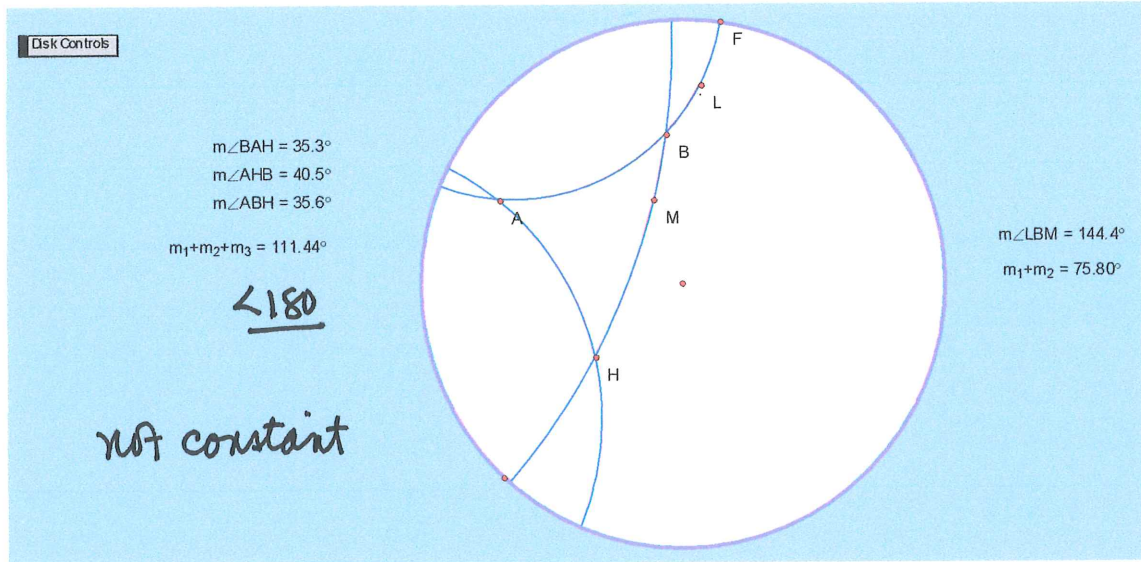
Theorem 2.2.4 Angle Sum Theorem

The sum of the measures of a Euclidean triangle is 180 degrees.



Let's review S and H (next page)





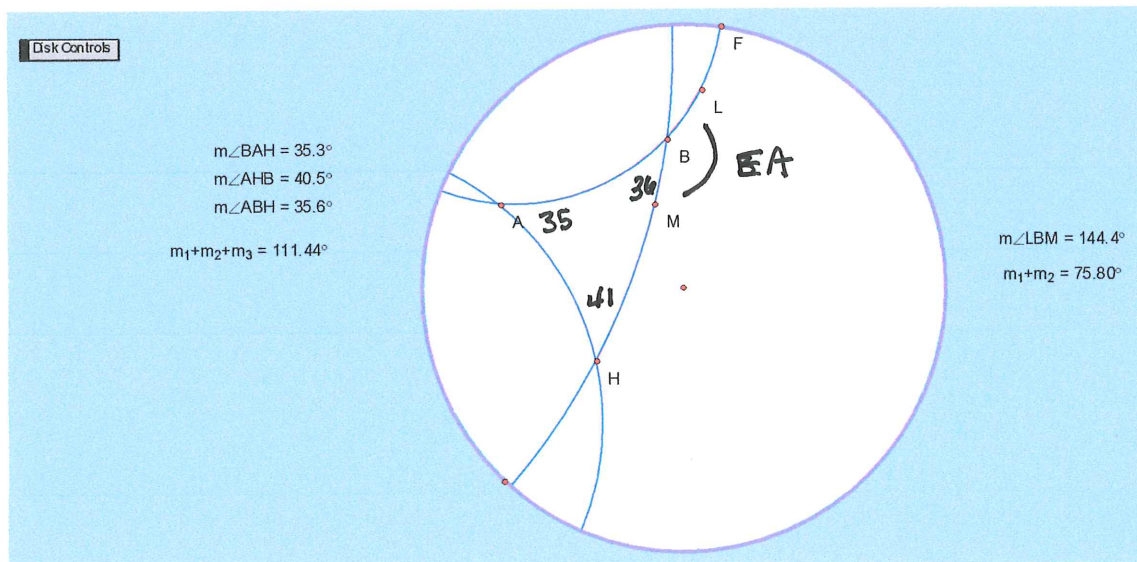
Corollary 2.2.5 Exterior Angle Equality

The measure of a triangle's exterior angle is equal to the sum of the measures of the two remote interiors.

Checking on SG:



Checking on HG:



Well it's true in EG!

Let's look at Homework and some essays

Homework

#4 see Dear Dr. Math on page 55 for the formula

#6

#8

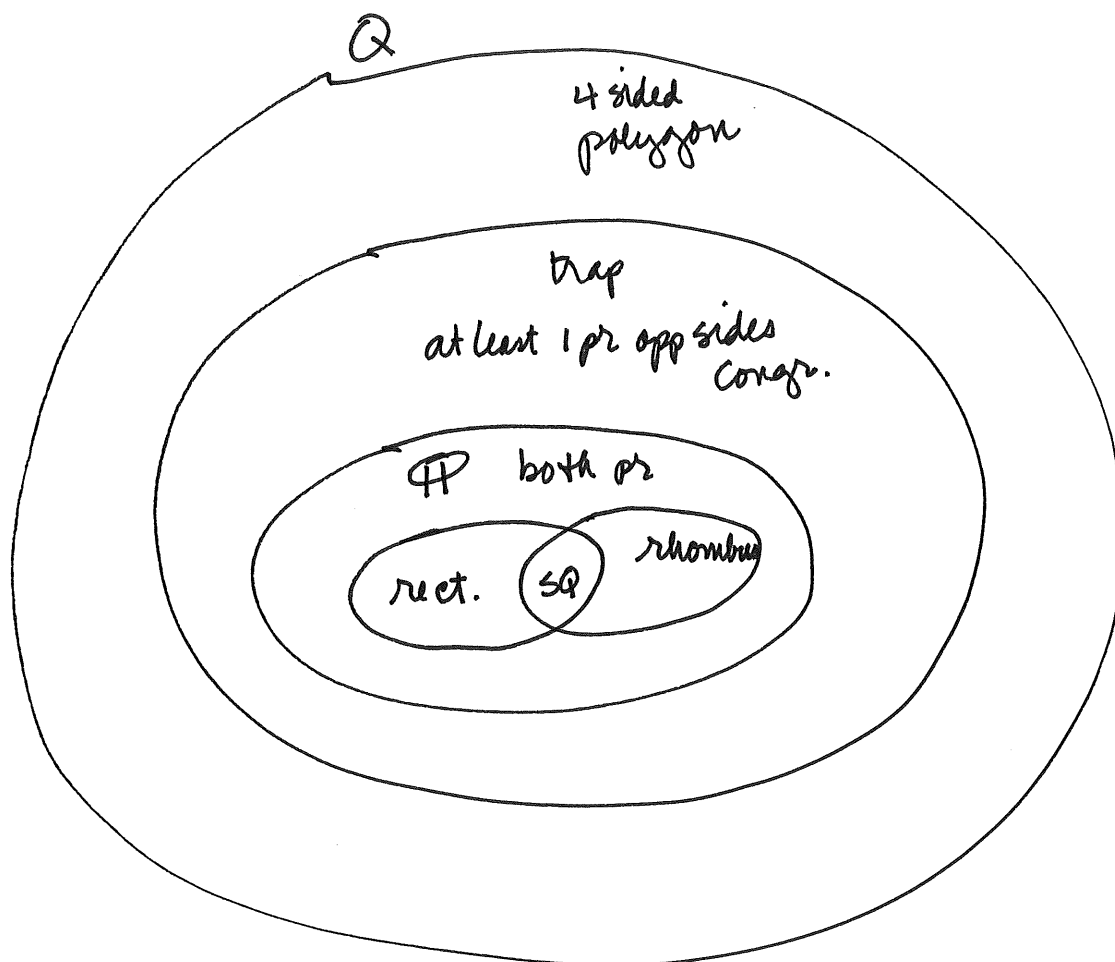
2.2 Essay One:

Write a small essay about at least 2 similarities and at least 3 differences between triangles in Euclidean, Spherical and Hyperbolic Geometry.

Math 3305 Chapter 2, Section 3 script is in this same video starting on the next page

We need a big set diagram for all the vocabulary. We'll start with quadrilateral – a polygon with exactly 4 sides. One with all 4 sides different lengths goes here:

A trapezoid is a proper subset of quadrilateral and has at least one pair of opposite sides being parallel. A parallelogram has both pairs of opposite sides being parallel and is a proper subset of trapezoids. Now we'll put in rectangles (one right angle, subset of parallelogram), rhombus (subset of parallelogram with all four sides congruent). Squares – in the intersection of rectangles and rhombi! Let's discuss the "inheritance property" of subsets!



SQ ... check what it inherits!

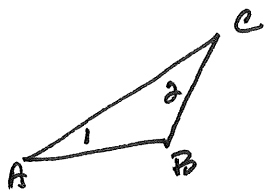
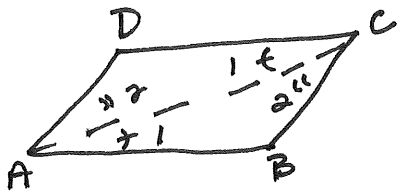
Theorem 2.3.1

A quadrilateral is a parallelogram IFF opposite sides are of equal length.

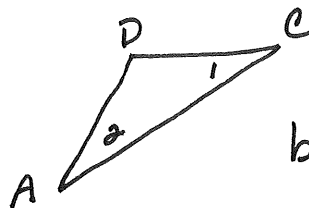
Proof part 1 P implies E

given ABCD is \square

$\overline{AB} \parallel \overline{DC}$ & $\overline{AD} \parallel \overline{BC}$ put in diag. AC which functions as a transversal. Alt int angles are congruent ($\angle 1$'s & $\angle 2$'s)
now



\cong

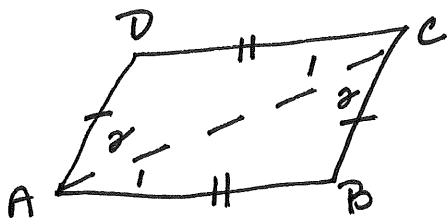


by ASA

so $\overline{AB} \cong \overline{DC}$
 $\overline{AD} \cong \overline{BC}$

by CPCF \square

Proof part 2 E implies P



use SSS to get the 2 triangles are congruent.

by CPCF angles 1 and 2 are a pr of congruent angles

therefore by Thm 2.2.1 the opp sides are parallel!
 \square

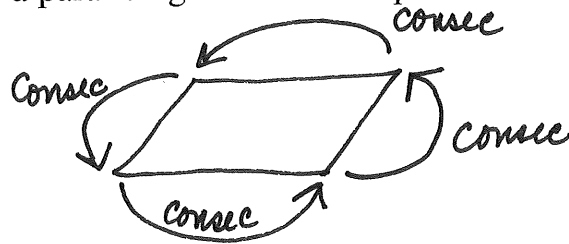
And let's look at 3 more results:

Theorem 2.3.2 The diagonals of a parallelogram bisect each other.

Theorem 2.3.3 A quadrilateral is a parallelogram IFF each pair of consecutive angles are supplementary

C
↓
S

90
↓
180



Corollary 2.3.4 All 4 angles of a rectangle are right angles.

Check the book you are teaching from! Sometimes this is the definition!

Homework 2.3

#4

#6