Theorem 17: Equal corresponding angles mean that lines are parallel.
Corollary 1: Equal alternate interior angles mean that lines are parallel.
Corollary 2: Supplementary interior angles on the same side of a transversal mean that lines are parallel.
Corollary 3: In a plane, two lines perpendicular to a third line are parallel.

The Parallel Postulate – Through a point not on a line, there is exactly one line parallel to the given line.
Theorem 18: In a plane, two lines parallel to a third line are parallel to each other.

Theorem 19: Parallel lines form equal corresponding angles.
Corollary 1: Parallel lines form equal alternate interior angles.
Corollary 2: Parallel lines form supplementary interior angles on the same side of a transversal.
Corollary 3: In a plane, a line perpendicular to one of two parallel lines is also perpendicular to the other.

Theorem 20: The Triangle Sum Theorem – The sum of the angles of a triangle is 180°.
Corollary 1: If two angles of one triangle are equal to two angles of another triangle, the third angles are equal.
Corollary 2: The acute angles of a right triangle are complementary.
Corollary 3: Each angle of an equilateral triangle is 60°.

Theorem 21: An exterior angle of a triangle is equal to the sum of the remote interior angles.

Theorem 22: The AAS Theorem – If two angles and the side opposite one of them in one triangle are equal to the corresponding parts of another triangle, the triangles are congruent.

Theorem 23: The HL Theorem – If the hypotenuse and a leg of one right triangle are equal to the corresponding parts of another right triangle, the triangles are congruent.

ASA, SAS, SSS

~~SSA=ASS~~

Def: A diagonal of a polygon is a line segment that connects any two nonconsecutive vertices.

Theorem 24: The sum of the angles of a quadrilateral is 360°.

Def: A rectangle is a quadrilateral each of whose angles is a right angle.

Corollary to Theorem 24: A quadrilateral is equiangular iff it is a rectangle.

In general, if a polygon has n sides, in terms of n,

- n-3 diagonals can be drawn from one vertex
- these diagonals form n-2 triangles
- the sum of the angles of an n-gon is (n-2)*180°
- If the n-gon is equiangular, each angle measures (n-2)*180°/n

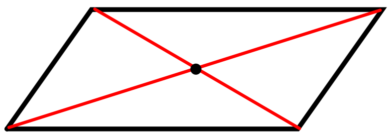
7.2 – Parallelograms and Point Symmetry

Def: A parallelogram is a quadrilateral whose opposite sides are parallel.

A figure has point symmetry if it looks exactly the same when it is rotated about a point.

Def: Two points are symmetric with respect to a point iff it is the midpoint of the line segment joining them.

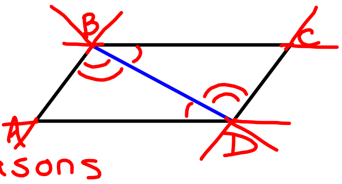
Parallelograms have point symmetry about the point in which their diagonals intersect.



Theorem 25: The opposite sides and angles of a parallelogram are equal.

Given: ABCD is a parallelogram.

Prove: AB=DC, AD=BC, ∠A=∠C, and ∠B=∠D.



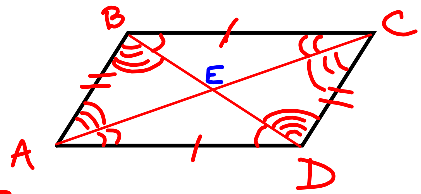
Proof :

Statements	Reasons
1. ABCD is a parallelogram	Given
2. Draw diagonal BD	2 points define a line
3. AB ∥ CD & BC ∥ AD	opposite sides of a parallelogram are parallel
4. ∠ADB = ∠CBD, ∠ABD = ∠CDB	parallel lines form equal opposite interior angles
5. ∠ABC = ∠ABD + ∠CBD, ∠ADC = ∠ADB + ∠CDB	Betweenness of Rays Theorem
6. ∠ABC = ∠CDB + ∠ADB	Substitution (#4 & 5)
7. ∠ABC = ∠ADC (∠B = ∠D)	Substitution (#5 & 6)
8. BD = BD	Reflexive
9. △BAD ≅ △DCB	SAS congruence
10. AB = DC, AD = BC, ∠A = ∠C	corresponding parts of congruent triangles are equal

Theorem 26: The diagonals of a parallelogram bisect each other.

Given: ABCD is a parallelogram with diagonals AC and BD.

Prove: AC and BD bisect each other.
(AE = EC & BE = ED)



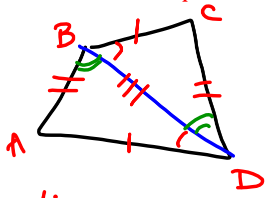
Proof :

Statements	Reasons
1. ABCD is a parallelogram	Given
2. AB = CD & BC = DA	opposite sides of a parallelogram are equal
3. AB ∥ CD & BC ∥ DA	opposite sides of a parallelogram are equal
4. ∠CBE = ∠ADE, ∠BCE = ∠DAE, ∠BAE = ∠DCE, ∠ABE = ∠CDE	parallel lines form equal opposite interior angles
5. △BCE ≅ △DAE, △ABE ≅ △CDE	ASA congruence
6. AE = EC & BE = ED	corresponding parts of congruent triangles are equal

7.3 – More on Parallelograms

A quadrilateral is a parallelogram if:
1. its opposite sides are parallel ✓
2. its opposite sides are equal ✓
3. its opposite angles are equal ✓
4. two opposite sides are parallel and equal ✓
5. its diagonals bisect each other ✓

Theorem 27: A quadrilateral is a parallelogram, if its opposite sides are equal.
Given: In quadrilateral ABCD, AB=DC and AD=BC
Prove: ABCD is a parallelogram

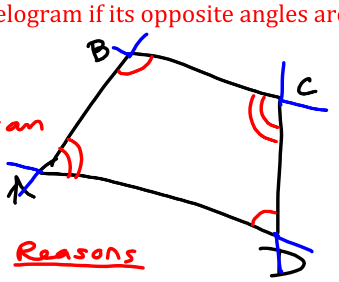


Proof :

Statements	Reasons
1. AB=DC & AD=BC	Given
2. Draw diagonal BD	2 points define a line
3. BD = BD	Reflexive
4. △BAD≅△DCB	SSS congruence
5. ∠CBD=∠ADB, ∠ABD=∠CDB	corresponding parts of congruent △'s are equal
6. BC ∥ AD, AB ∥ CD	equal opposite interior ∠'s mean parallel lines
7. ABCD is a parallelogram	a parallelogram is a quadrilateral whose opposite sides are parallel

Theorem 28: A quadrilateral is a parallelogram if its opposite angles are equal.

Given: ∠A=∠C
∠B=∠D
Prove: ABCD is a parallelogram



Proof

Statements	Reasons
1. ∠A=∠C, ∠B=∠D	Given
2. ∠A+∠B+∠C+∠D = 360°	Quadrilateral Sum Theorem
3. ∠A+∠B+∠A+∠B = 360°, 2∠A+2∠B=360°	Subsitution (& simplification)
4. ∠A + ∠B = 180°	Division
5. ∠A & ∠B are supplementary	Supplementary ∠'s sum to 180°
6.	Supplementary ∠'s on the same side of a transversal means lines are parallel
7.	Parallelogram is a quadrilateral whose opposite sides are parallel

HW #1 (submitted Friday, 11/7)
- Ch 1 Review Problems pp. 36-38
- Start working on Geometry badge on Khan Academy

HW #2 (submitted Friday, 11/14)
- Ch 2 Review Problems pp. 71-74
- Ch 3 Review Problems pp. 124-128
- Khan Academy exercises: "Introduction to Euclidean geometry," "Angles and intersecting lines"

HW #3 (submitted Friday, 11/21)
- Ch 4 Review Problems pp.176-180
- Khan Academy exercises: "Congruence"

HW #4 (submitted Friday, 12/5)
- Ch 5 Review Problems pp. 206-209
- Work toward mastery of practiced Khan Academy exercises in "Introduction to Euclidean Geometry," "Angles and Intersecting Lines," and "Congruence"

HW #5 (due Friday, 12/12)
- **Ch 6 Review Problems pp. 250-254**
- Start working on Ch 7 Review Problems pp. 292-295

QUIZ #3 - FRIDAY, 12/12