Homework #7 - Due Friday, 15 January

Ch 7 Review, pp. 292-295 **#1-53**

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.

SSS, SAS, AAS, ASA, HL

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.

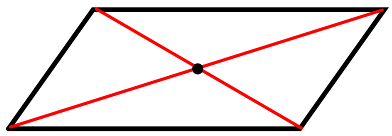
In general, if a polygon has n sides, in terms of n,
- n-3 diagonals can be drawn from one vertex
- these diagonals form n-2 triangles
- the sum of the angles of an n-gon is (n-2)*180°
- If the n-gon is equiangular, each angle measures (n-2)*180°/n

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.

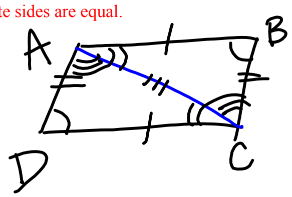


Theorem 25: The opposite sides and angles of a parallelogram are equal.
Theorem 26: The diagonals of a parallelogram bisect each other.

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

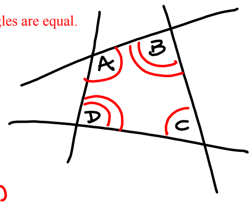
Theorem 27: A quadrilateral is a parallelogram, if its opposite sides are equal.
Given: In quadrilateral ABCD, AB=DC and AD=BC
Prove: ABCD is a parallelogram



Proof :

1. ABCD w/ $AB \cong DC$ & $AD = BC$	Given
2. Draw AC	2 pts define a line
3. $\triangle ABC \cong \triangle CDA$	SSS congruence
4. $\angle ACD = \angle CAB$	corresponding parts of congruent $\triangle$'s are =
5. $AB \parallel DC$	equal alternate interior $\angle$'s mean lines are parallel
6. $\angle DAC = \angle BCA$	corresponding parts of congruent $\triangle$'s are =
7. $AD \parallel BC$	equal alternate interior angles mean line are parallel
8. ABCD is a parallelogram	def. of parallelogram (quadrilateral w/ parallel opposite side is a parallelogram)

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



Given: quadrilateral ABCD w/ $\angle A = \angle C$ & $\angle B = \angle D$

Prove: ABCD is a parallelogram

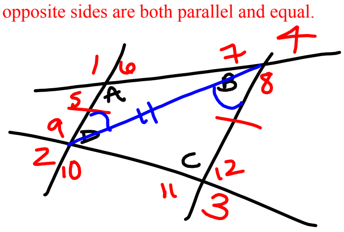
Proof:

1. ABCD w/ $\angle A = \angle C$ & $\angle B = \angle D$ — Given
~~2. Draw AC — 2 points define a line~~
~~3. AC = CA — Reflexivity~~
4. $\angle A + \angle B + \angle C + \angle D = 360°$ — Quadrilateral Sum Theorem
5. $\angle A + \angle B + \angle A + \angle B = 360°$ — Substitution
6. $2\angle A + 2\angle B = 360°$ — Simplification; $2(\angle A + \angle B) = 360°$ — distributive; $\angle A + \angle B = 180°$ — division
7. $\angle A$ & $\angle B$ are supplementary — def.
8. AD ∥ BC — supplementary interior $\angle$'s on same side of transversal mean lines are parallel
9. $\angle C + \angle D = 180°$ — Subst.
10. $\angle C$ & $\angle D$ are supp. — def. of supp $\angle$'s
11. AB ∥ CD
12. ABCD is a parallelogram — def of parallelogram

Theorem 29: A quadrilateral is a parallelogram if two opposite sides are both parallel and equal.

Given: ABCD w/ AD ∥ BC & AD = BC

Prove ABCD is a parallelogram



Proof:

1. AD ∥ BC & AD = BC — Given
2. $\angle 1 = \angle A$, $\angle 2 = \angle D$, $\angle 3 = \angle C$, $\angle 4 = \angle B$ — vertical $\angle$'s are equal
3. Draw BD — 2 pts define a line
4. BD = BD — reflexivity
5. $\angle DBC = \angle BDA$ — parallel lines form equal alternate interior $\angle$s
6. $\triangle DBC \cong \triangle BDA$ — SAS congruence
7. AB = CD — corresponding parts of congruent $\triangle$'s are =
8. ABCD is a parallelogram — quadrilateral w/ 2 pairs of equal opposite sides is a parallelogram