Math 61 Spring 2009 Name:

QUIZ #2 @ 70 points

Write in a neat and organized fashion. Use a pencil. Show all work to get credit.
Write all the solutions on separate paper.

1. Prove the following using an indirect proof. Write the hypothesis and conclusion using math notation pertinent to your drawing.

“ *If two lines are parallel to a third line, then they are parallel to each other*”.

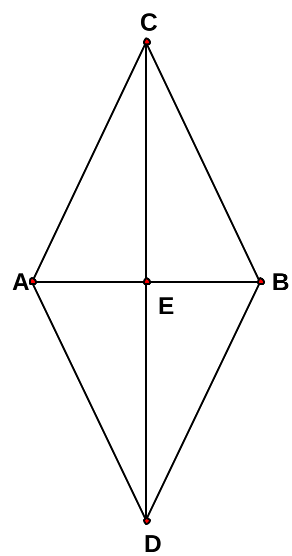
2. Prove the following theorem. Write the hypothesis and conclusion using math notation pertinent to your drawing.

“ *The sum of the measures of the angles of a triangle is* 180° ”.

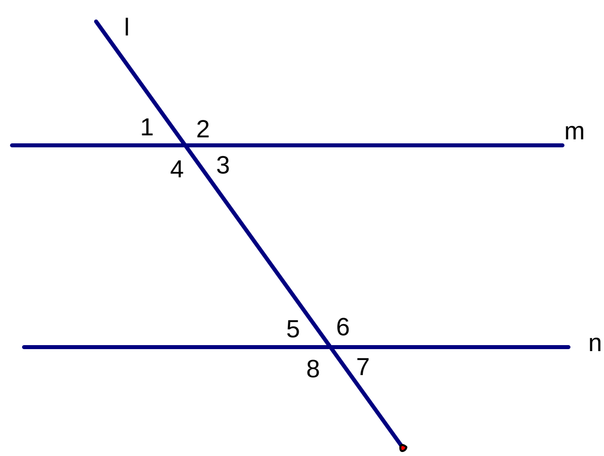
(Note: You will need to construct an auxiliary line - a line parallel to one of the sides of the triangle through the opposite vertex).

3. Given: $\overline{AB} \perp \overline{CD}$ at E
$\overline{AE} \cong \overline{BE}$
$\overline{AC} \cong \overline{BD}$

Prove: $\triangle AEC \cong \triangle BED$



4. Refer to the figure in which $m \parallel n$ and l is a transversal.



a) List two pairs of alternate interior angles.

b) List two pairs of alternate exterior angles.

c) List four pairs of corresponding angles.

d) List four angles that are supplementary to $\angle 1$.

e) List three angles that are congruent to $\angle 1$.

f) List three angles that are congruent to $\angle 4$.

g) If $m\angle 4 = 127^\circ$, find the measures of the other angles.

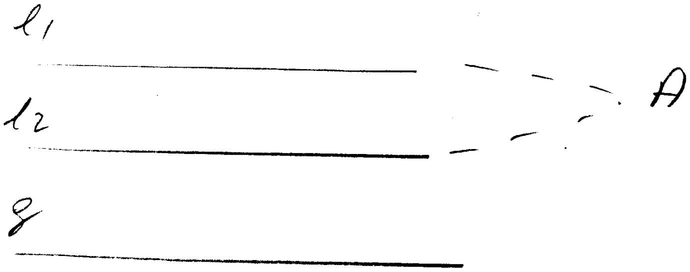
M61

QUIZ #2 - SOLUTIONS

① Given $l_1 \parallel g$

$l_2 \parallel g$

Prove $l_1 \parallel l_2$



Proof

Indirect proof:

We'll assume $l_1 \nparallel l_2 \Rightarrow l_1$ and l_2 intersect at A

$l_1 \cap l_2 = A$

We have a point A, a line g ($A \notin g$), and two lines through A that are parallel to g, l_1 and l_2

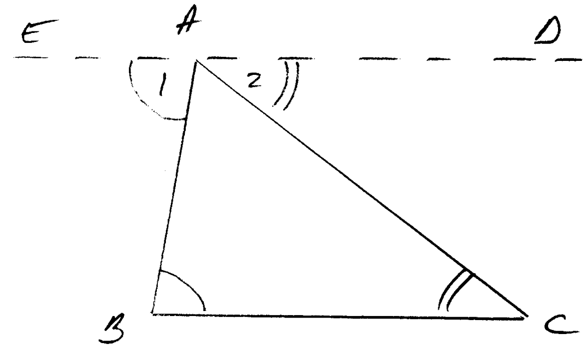
This contradicts the uniqueness of a line parallel to a given line through a given point not on the line.

Therefore, $l_1 \parallel l_2$.

Q.E.D.

② Given $\triangle ABC$

Prove $m\angle A + m\angle B + m\angle C = 180^\circ$



Proof

Statements	Reasons
1. Construct line $\overleftrightarrow{ED} \parallel \overline{BC}$	1. Through a point not on a line there is only one parallel to the given line
2. $\angle EAD$ - straight $\angle$	2. Definition straight angle
3. $m\angle EAD = 180^\circ$	3. Definition straight angle
4. $m\angle 1 + m\angle A + m\angle 2 = m\angle EAD$	4. Angle Addition Postulate
5. $\angle 1 \cong \angle B$	5. $\parallel$ iff alt. int. $\angle$'s $\cong$ ($\overline{ED} \parallel \overline{BC}$ with $\overline{AB}$ transversal)
6. $\angle 2 \cong \angle C$	6. $\parallel$ iff alt. int. $\angle$'s $\cong$ ($\overline{ED} \parallel \overline{BC}$, $\overline{AC}$ transversal)

7. (5,6)	$m\angle 1 = m\angle B$ $m\angle 2 = m\angle C$	7. Definition congruent angles
8. (3,4,7)	$m\angle B + m\angle A + m\angle C = 180°$	8. Substitution

Q.E.D.

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(3) Proof

Statements	Reasons
1. $\overline{AB} \perp \overline{CD}$ at E	1. given
2. $\angle AEC$, $\angle DEB$ = right ∠'s	2. definition ⊥ lines
3. $\triangle AEC$, $\triangle DEB$ = right △'s	3. definition right △
4. $\overline{AE} \cong \overline{BE}$	4. given
5. $\overline{AC} \cong \overline{DB}$	5. given
6. (3,4,5) $\triangle AEC \cong \triangle BED$	6. HL

Q.E.D.

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(4)

(a) $\angle 3$ and $\angle 5$
$\angle 4$ and $\angle 6$

(b) $\angle 2$ and $\angle 8$
$\angle 1$ and $\angle 7$

(c) $\angle 4$ and $\angle 8$
$\angle 1$ and $\angle 5$
$\angle 3$ and $\angle 7$
$\angle 2$ and $\angle 6$

(d) $\angle 2$, $\angle 4$
$\angle 6$, $\angle 8$

(e) $\angle 3$, $\angle 5$, $\angle 7$

(f) $\angle 2$, $\angle 8$, $\angle 6$

(g) $m\angle 4 = 127°$
$m\angle 2 = 127°$ ($\angle 4 \cong \angle 2$ vertical)
$m\angle 8 = 127°$ ($\angle 4 \cong \angle 8$ corresp.
$m\angle 6 = 127°$ ($\angle 8 \cong \angle 8$ vertical)
$m\angle 1 = 180° - 127° = 53°$
($\angle 1$ and $\angle 4$ = supplement
$m\angle 3 = 53°$ ($\angle 1 \cong \angle 3$ vertical)
$m\angle 5 = 53°$ ($\angle 3 \cong \angle 5$ alt. int)
$m\angle 7 = 53°$ ($\angle 7 \cong \angle 5$ vertical)