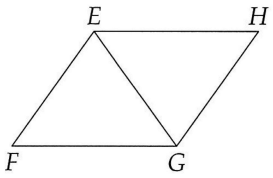
Congruent Triangles RHS
Geometry Research Honors

3.2.1 $EF = GH$ and $FG = EH$ in the diagram at right.



(a) Prove that $\triangle EFG \cong \triangle GHE$.

(b) Show that $\angle EGF = \angle GEH$.

(c) Show that $\overline{HE} \parallel \overline{FG}$.

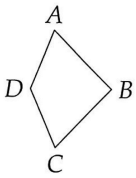
(d) Show that $\overline{HG} \parallel \overline{EF}$.

3.2.2 In triangle ABC, $AB = AC$. Let M be the midpoint of side $\overline{BC}$.

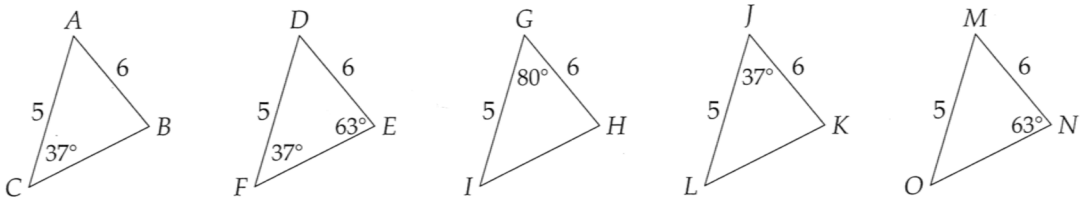
(a) A segment, line, or ray **bisects** an angle if it divides it into two angles with equal measure. Show that $\overline{AM}$ bisects $\angle BAC$ by proving that $\angle BAM = \angle CAM$.

(b) Show that $\overline{AM} \perp \overline{BC}$.

3.2.3 In the diagram at right, $AB = 7$, $AD = 4$, $CD = 4$, and $BC = 7$. Prove that $\angle ABD = \angle CBD$. **Hints:** 165



3.3.1 Which two of the triangles below must be congruent and why must they be congruent?

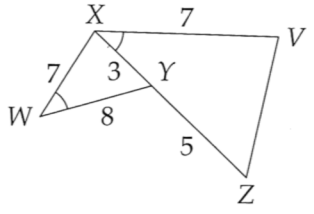


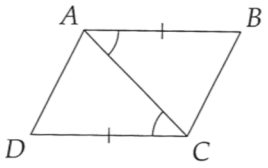
3.3.2 In triangle ABC, $AB = AC$. Let M be the point on $\overline{BC}$ such that $\overline{AM}$ bisects $\angle BAC$ (so that $\angle CAM = \angle BAM$).

(a) Show that M is the midpoint of $\overline{BC}$.

(b) Show that $\overline{AM} \perp \overline{BC}$.

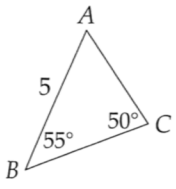
3.3.3 Find VZ in the diagram at the left below. (Note: The diagram is not to scale.) **Hints:** 467

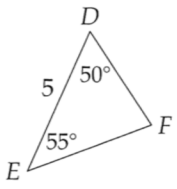


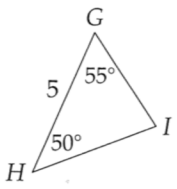


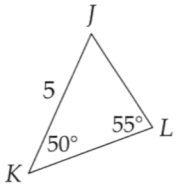
3.3.4 In the figure to the right above, $AB = CD$ and $\angle BAC = \angle DCA$. Prove that $\overline{AD} \parallel \overline{BC}$.

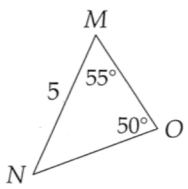
3.4.1 Find all pairs of triangles below that must be congruent. Write out the appropriate congruence (make sure you have the vertices in the right order!), and explain why the triangles must be congruent.



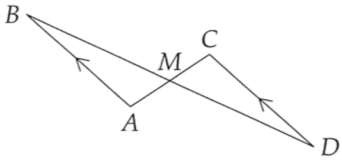








3.4.2 In the diagram at right, $\overline{AB} \parallel \overline{DC}$. If M is the midpoint of $\overline{AC}$, must it also be the midpoint of $\overline{BD}$? Why or why not? **Hints:** 183



3.4.3 Use ASA Congruence to prove that AAS Congruence is a valid Congruence Theorem. (Do not assume AAS Congruence is a valid theorem for this part – you are asked here to show that any two triangles that satisfy the AAS criteria are indeed congruent *without using AAS*.) **Hints:** 463

3.4.4 In the figure, $PQ = PR$ and $\angle PQY = \angle PRX$.

(a) Prove that $QY = RX$.

(b)★ Prove that $XN = YN$. **Hints:** 158, 343