Straightedge and Compass Constructions

A collapsible compass can construct a circle with a given center, passing through a given point. A rigid compass can also construct a circle with a given center and a given radius. A straightedge can construct a line through two points.

Using a rigid compass and a straightedge, construct the following objects and prove that your construction is valid:

1. Given a segment $\overline{AB}$ and point *D*, construct an equilateral triangle ΔDEF with sides congruent to $\overline{AB}$.

2. Given ΔABC and point *D* on line *l*, construct ΔDEF so that *E* lies on *l* and $\Delta ABC \cong \Delta DEF$.

3. Given $\angle ABC$ and ray $\overrightarrow{PQ}$, construct point *R* so that $\angle RPQ \cong \angle ABC$.

4. Given segment $\overline{AB}$, construct the midpoint *M* of the segment.

5. Given $\angle ABC$, construct the angle bisector of $\angle ABC$.

6. Given a line *l* and a point *P* on *l*, construct a line through *P*, perpendicular to *l*.

7. Given a line *l* and a point *P* not on *l*, construct a line through *P*, perpendicular to *l*.

8. Given segment $\overline{AB}$, construct a rhombus with side length AB.

Challenge: Using a collapsible compass and straightedge, given $\overline{AB}$ and point *D*, construct segment $\overline{DE}$ so that $\overline{DE} \cong \overline{AB}$.