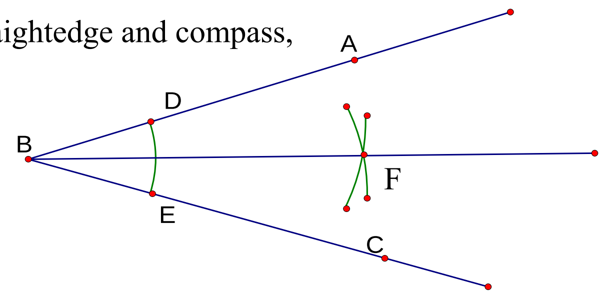
CONSTRUCTIONS

G.G.17 - **Bisect a given angle** ∠ABC using a straightedge and compass, and justify the construction.

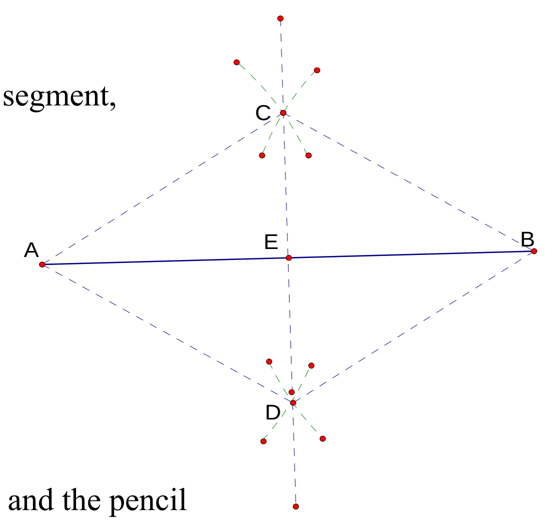


Given: ∠ABC

How to Proceed:
1. With B as the center and any convenient radius, draw an arc that intersects BA at D and BC at E.
2. With D and E as centers and with equal radii of sufficient length, draw arcs that intersect at F.
3. Draw BF

Plan for Proof: If FD and FE are drawn, then the construction makes BD ≅ BE and DF ≅ EF. Also, BF ≅ BF. Thus Δ BDF ≅ Δ BEF by SSS ≅ SSS and ∠ ABF ≅ ∠ CBF

G.G. 18 – **Construct the perpendicular bisector** of a given segment, using a straightedge and compass, and justify the construction.

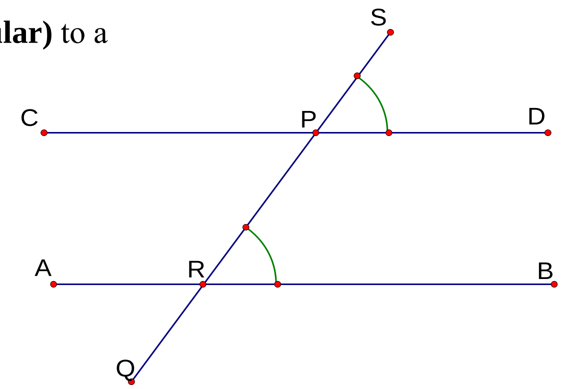


Given: Line AB

How to Proceed:
1. Open the compasses so that the distance between the point and the pencil point (this distance will be called the radius) is more than half the length of AB.
2. Using point A as a center, draw one arc above AB and one arc below AB.
3. Using the same radius and point B as a center, draw another pair of arcs, one above AB and the other below AB, that intersect the first pair of arcs at points C and D.
4. Use a straightedge to draw CD intersecting AB at E.

Plan for Proof: If CD, CB, DA and DB are drawn, the construction makes CA ≅ CB and DA ≅ DB (radii of congruent circles are congruent). Therefore, CD is the perpendicular bisector of AB because two points, each equidistant from the endpoints of a line segment, determine the perpendicular bisector of the line segment.

G.G.19 – **Construct a line parallel (or perpendicular)** to a given line through a given point, using a straightedge and compass, and justify the construction.

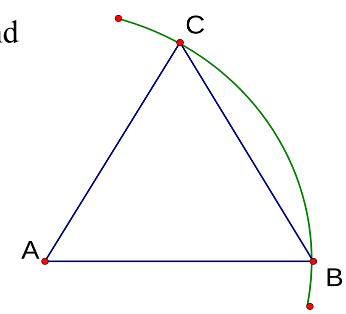


Given: line AB and an external point P.

How to Proceed:
1. Through P, draw any line, intersecting AB at R. Let S be any point on the ray opposite PR.
2. At P, construct ∠SPD ≅ ∠ PRB, to make a pair of congruent corresponding angles.

Plan for Proof: The construction makes ∠SPD ≅ ∠ PRB. Therefore AB || CD because, if two lines are cut by a transversal making a pair of corresponding angles congruent, the lines are parallel.

G.G.20 – **Construct an equilateral triangle**, using a straightedge and compass, and justify the construction.



Given: Point A

How to Proceed:
1. Draw a ray with endpoint A, and any point B.
2. Using A as the center and a radius whose length is equal to AB, draw an arc.
3. Using B as the center and a radius whose length is equal to AB, draw another arc that intersects the first arc at C.
4. Draw CA and CB, forming equilateral triangle ABC.

Plan for Proof: The construction makes Δ ABC an equilateral triangle by SSS.