1. Construct a line segment congruent to a given line segment.

Draw a segment and label it $\overline{AB}$. This will be the given segment.

Step 1: Use a straightedge to draw $\overrightarrow{PS}$ so it is longer than $\overline{AB}$.

Step 2: Place the steel tip of the compass at A and the writing tip at B.

Step 3: Keep the same setting on the compass and place the steel tip at P. Draw an arc that intersects $\overrightarrow{PS}$. Name this point Q.

$\overline{PQ}$ is now congruent to $\overline{AB}$. $\overline{PQ} \cong \overline{AB}$
Construct the perpendicular bisector of a line segment.

Or, construct the midpoint of a line segment.

1. Begin with line segment $XY$.

2. Place the compass at point $X$. Adjust the compass radius so that it is more than $(1/2)XY$. Draw two arcs as shown here.

3. Without changing the compass radius, place the compass on point $Y$. Draw two arcs intersecting the previously drawn arcs. Label the intersection points $A$ and $B$.

4. Using the straightedge, draw line $AB$. Label the intersection point $M$. Point $M$ is the midpoint of line segment $XY$, and line $AB$ is perpendicular to line segment $XY$.

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**Given point P on line k, construct a line through P, perpendicular to k.**

1. Begin with line $k$, containing point $P$.

   ![Diagram](image1)

2. Place the compass on point $P$. Using an arbitrary radius, draw arcs intersecting line $k$ at two points. Label the intersection points $X$ and $Y$.

   ![Diagram](image2)

3. Place the compass at point $X$. Adjust the compass radius so that it is more than $(1/2)XY$. Draw an arc as shown here.

   ![Diagram](image3)

4. Without changing the compass radius, place the compass on point $Y$. Draw an arc intersecting the previously drawn arc. Label the intersection point $A$.

   ![Diagram](image4)

5. Use the straightedge to draw line $AP$. Line $AP$ is perpendicular to line $k$.

   ![Diagram](image5)

Back to Geometry Construction Reference
Given point $R$, not on line $k$, construct a line through $R$, perpendicular to $k$.

1. Begin with point line $k$ and point $R$, not on the line.

2. Place the compass on point $R$. Using an arbitrary radius, draw arcs intersecting line $k$ at two points. Label the intersection points $X$ and $Y$.

3. Place the compass at point $X$. Adjust the compass radius so that it is more than $(1/2)XY$. Draw an arc as shown here.

4. Without changing the compass radius, place the compass on point $Y$. Draw an arc intersecting the previously drawn arc. Label the intersection point $B$.

5. Use the straightedge to draw line $RB$. Line $RB$ is perpendicular to line $k$.

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Construct the bisector of an angle.

1. Let point $P$ be the vertex of the angle. Place the compass on point $P$ and draw an arc across both sides of the angle. Label the intersection points $Q$ and $R$.

2. Place the compass on point $Q$ and draw an arc across the interior of the angle.

3. Without changing the radius of the compass, place it on point $R$ and draw an arc intersecting the one drawn in the previous step. Label the intersection point $W$.

4. Using the straightedge, draw ray $PW$. This is the bisector of $\angle QPR$.

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Construct an angle congruent to a given angle.

1. To draw an angle congruent to \( \angle A \), begin by drawing a ray with endpoint \( D \).

2. Place the compass on point \( A \) and draw an arc across both sides of the angle. Without changing the compass radius, place the compass on point \( D \) and draw a long arc crossing the ray. Label the three intersection points as shown.

3. Set the compass so that its radius is \( BC \). Place the compass on point \( E \) and draw an arc intersecting the one drawn in the previous step. Label the intersection point \( F \).

4. Use the straightedge to draw ray \( DF \).

\[ \angle EDF \cong \angle BAC \]

Back to Geometry Construction Reference
**Given a line and a point, construct a line through the point, parallel to the given line.**

1. Begin with point $P$ and line $k$.

2. Draw an arbitrary line through point $P$, intersecting line $k$. Call the intersection point $Q$. Now the task is to construct an angle with vertex $P$, congruent to the angle of intersection.

3. Center the compass at point $Q$ and draw an arc intersecting both lines. Without changing the radius of the compass, center it at point $P$ and draw another arc.

4. Set the compass radius to the distance between the two intersection points of the first arc. Now center the compass at the point where the second arc intersects line $PQ$. Mark the arc intersection point $R$.

5. Line $PR$ is parallel to line $k$.

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http://whistleralley.com/construction/c6.htm

4/16/2010
Given a circle, its center point, and a point on the exterior of the circle, construct a line through the exterior point, tangent to the circle.

1. Begin with a circle centered on point $C$. Point $P$ is on the exterior of the circle.

2. Draw line segment $CP$, and construct point $M$, the midpoint of line segment $CP$. (Refer to the perpendicular bisector construction for the construction of the midpoint.)

3. Center the compass on point $M$. Draw a circle through points $C$ and $P$. It will intersect the other circle at two points, $R$ and $S$.

4. Points $R$ and $S$ are the tangent points. Lines $PR$ and $PS$ are tangent to the circle centered on point $C$.

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Given a triangle, inscribe a circle.

1. Begin with triangle $KLM$.

2. Construct the bisectors of $\angle K$ and $\angle L$. (Refer to the angle bisector construction.) Let point $Q$ be the intersection of the two angle bisectors.

3. Construct a line through point $Q$, perpendicular to line segment $KL$. Let point $R$ be the point of intersection. (Refer to the construction of a perpendicular line through a given point.)

4. Center the compass on point $Q$, and draw a circle through point $R$. The circle will be tangent to all three sides of a triangle.

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Given a triangle, circumscribe a circle.

1. Begin with triangle $STU$.

2. If a circle is circumscribed around the triangle, then all three vertices will be points on the circle, so follow the instructions for construction of a circle through three given points.

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Construct an equilateral triangle inside circle X.

1. Draw a diameter of the circle and label it AB.

2. Construct its perpendicular bisector and label it CD.

3. Construct the perpendicular bisector of CX and label it EF.

4. Use a straightedge to now draw a line ED and FD.

5. Done. The result is a triangle inscribed in a circle.
Construct an hexagon inscribed in a circle.

1. Mark a point anywhere on the circle to be the first vertex of the hexagon.

2. With the compass on that point, set its width to X.

3. Draw an arc across the circle creating the next vertex of the hexagon.

4. Move the compass to this new vertex and draw another arc for the next vertex.

5. Continue in this way until you have all 6 vertices.

6. Draw a line between each point and the next one on the circle.

7. Done. The result is a hexagon inscribed in a circle.
Construct a square inscribed in a circle.

1. Draw a diameter of the circle.

2. Construct a perpendicular bisector to the diameter.

3. Connect the 4 points where the diameter and the perpendicular bisector intersect the circle.

4. Done. The result is a square inscribed in a circle.