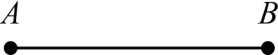


MAKE GEOMETRIC CONSTRUCTIONS



KEY IDEAS

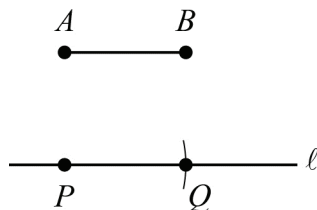
1. To *copy a segment*, follow the steps given:

Given: \overline{AB} 

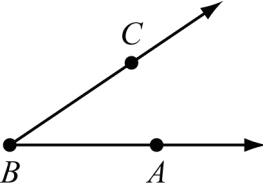
Construct: \overline{PQ} congruent to \overline{AB}

Procedure:

1. Use a straightedge to draw a line, l .
2. Choose a point on line l and label it point P .
3. Place the compass point on point A .
4. Adjust the compass width to the length of \overline{AB} .
5. Without changing the compass, place the compass point on point P and draw an arc intersecting line l . Label the point of intersection as point Q .
6. $\overline{PQ} \cong \overline{AB}$.



2. To *copy an angle*, follow the steps given:

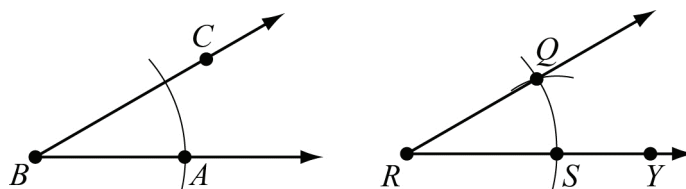
Given: $\angle ABC$ 

Construct: $\angle QRY$ congruent to $\angle ABC$

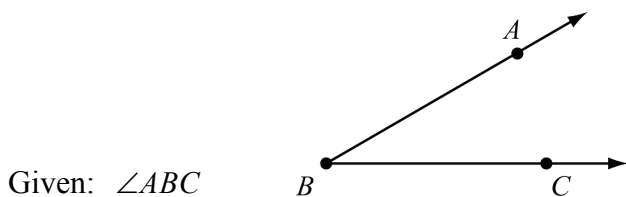
Procedure:

1. Draw a point R that will be the vertex of the new angle.
2. From point R , use a straightedge to draw \overline{RY} , which will become one side of the new angle.

3. Place the compass point on vertex B and draw an arc through point A .
4. Without changing the compass, place the compass point on point R , draw an arc intersecting \overline{RY} , and label the point of intersection point S .
5. Place the compass point on point A and adjust its width to where the arc intersects \overline{BC} .
6. Without changing the compass width, place the compass point on point S and draw another arc across the first arc. Label the point where both arcs intersect as point Q .
7. Use a straightedge to draw \overline{RQ} .
8. $\angle QRY \cong \angle ABC$



3. To **bisect an angle**, follow the steps given:

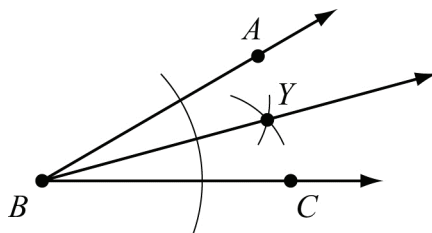


Construct: \overline{BY} , the bisector of $\angle ABC$

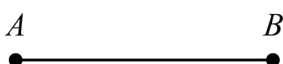
Procedure:

1. Place the compass point on vertex B .
2. Open the compass and draw an arc that crosses both sides of the angle.
3. Set the compass width to more than half the distance from point B to where the arc crosses \overline{BA} . Place the compass point where the arc crosses \overline{BA} and draw an arc in the angle's interior.
4. Without changing the compass width, place the compass point where the arc crosses \overline{BC} and draw an arc so that it crosses the previous arc. Label the intersection point Y .
5. Using a straightedge, draw a ray from vertex B through point Y .

6. $\angle ABY \cong \angle YBC$, so \overline{BY} is the bisector of $\angle ABC$.



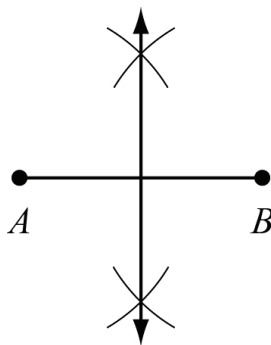
4. To **construct a perpendicular bisector of a line segment**, follow the steps given:

Given: \overline{AB} 

Construct: The perpendicular bisector of \overline{AB}

Procedure:

1. Adjust the compass to a width greater than half the length of \overline{AB} .
2. Place the compass on point A and draw an arc passing above \overline{AB} and an arc passing below \overline{AB} .
3. Without changing the compass width, place the compass on point B and draw an arc passing above and below \overline{AB} .
4. Use a straightedge to draw a line through the points of intersection of these arcs.
5. The segment is the perpendicular bisector of \overline{AB} .

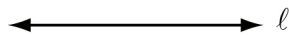


Note: To bisect \overline{AB} , follow the same steps listed above to construct the perpendicular bisector. The point where the perpendicular bisector intersects \overline{AB} is the midpoint of \overline{AB} .

5. To **construct a line perpendicular to a given line through a point not on the line**, follow the steps given:

• P

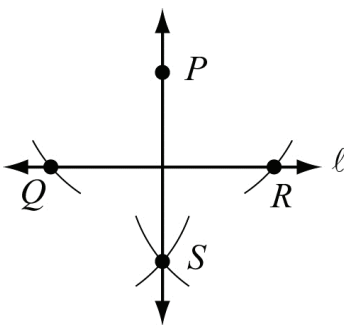
Given: Line l and point P that is not on line l



Construct: The line perpendicular to line l through point P

Procedure:

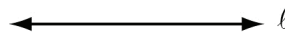
1. Place the compass point on point P .
2. Open the compass to a distance that is wide enough to draw two arcs across line l , one on each side of point P . Label these points Q and R .
3. From points Q and R , draw arcs on the opposite side of line l from point P so that the arcs intersect. Label the intersection point S .
4. Using a straightedge, draw \overline{PS} .
5. $\overline{PS} \perp \overline{QR}$.



6. To **construct a line parallel to a given line through a point not on the line**, follow the steps given:

• P

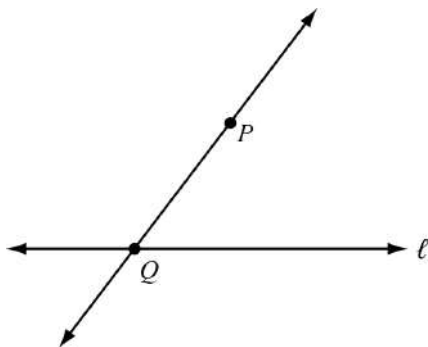
Given: Line l and point P that is not on line l



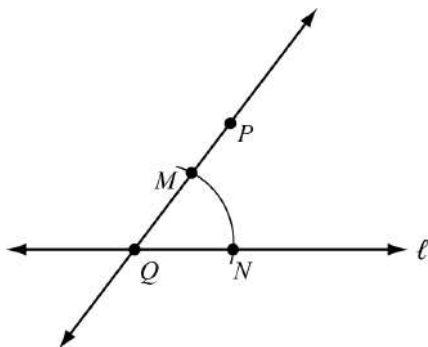
Construct: The line parallel to line l through point P

Procedure:

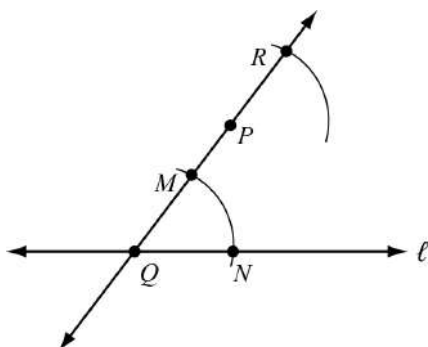
1. Draw a transversal line through point P crossing line l at a point. Label the point of intersection Q .



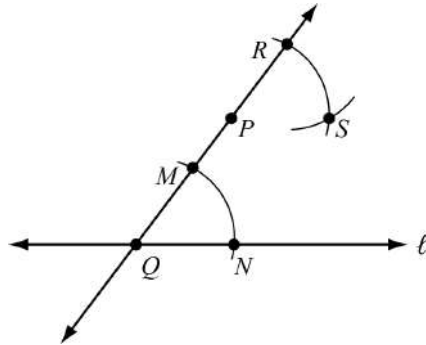
2. Open the compass to a width about half the distance from points P to Q . Place the compass point on point Q and draw an arc that intersects both lines. Label the intersection of the arc and \overline{PQ} as point M and the intersection of the arc and l as point N .



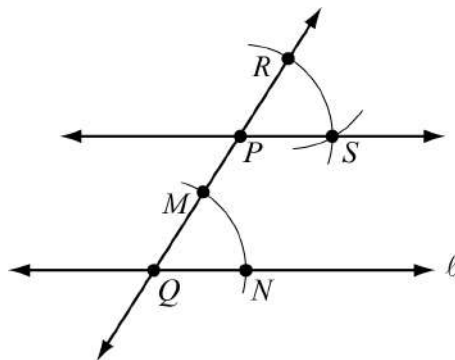
3. Without changing the compass width, place the compass point on point P and draw an arc that crosses \overline{PQ} above point P . Note that this arc must have the same orientation as the arc drawn from points M to N . Label the point R .



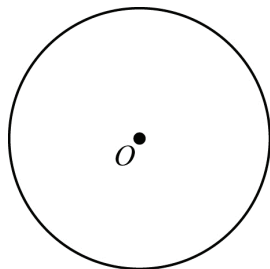
4. Set the compass width to the distance from points M to N .
5. Place the compass point on point R and draw an arc that crosses the upper arc. Label the point of intersection S .



6. Using a straightedge, draw a line through points P and S .
7. $\overline{PS} \parallel l$



7. To **construct an equilateral triangle inscribed in a circle**, follow the steps given:

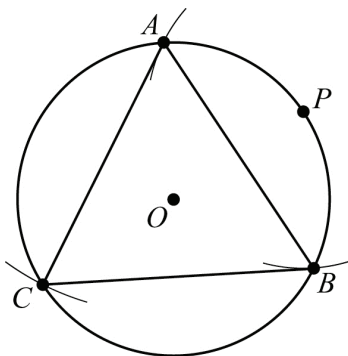


Given: Circle O

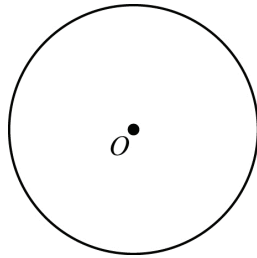
Construct: Equilateral $\triangle ABC$ inscribed in circle O

Procedure:

1. Mark a point anywhere on the circle and label it point P .
2. Open the compass to the radius of circle O .
3. Place the compass point on point P and draw an arc that intersects the circle at two points. Label the points A and B .
4. Using a straightedge, draw \overline{AB} .
5. Open the compass to the length of \overline{AB} .
6. Place the compass point on A . Draw an arc from point A that intersects the circle. Label this point C .
7. Using a straightedge, draw \overline{AC} and \overline{BC} .
8. Equilateral $\triangle ABC$ is inscribed in circle O .



8. To *construct a square inscribed in a circle*, follow the steps given:

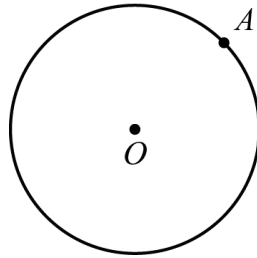


Given: Circle O

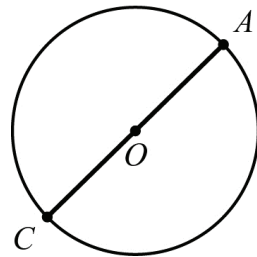
Construct: Square $ABCD$ inscribed in circle O

Procedure:

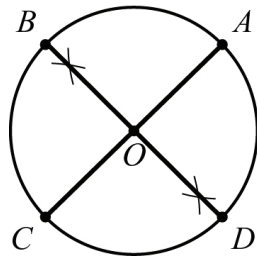
1. Mark a point anywhere on the circle and label it point A .



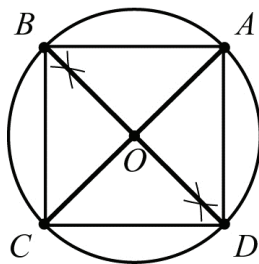
2. Using a straightedge, draw a diameter from point A . Label the other endpoint of the diameter as point C . This is diameter \overline{AC} .



3. Construct a perpendicular bisector to \overline{AC} through the center of circle O . Label the points where it intersects the circle as point B and point D .

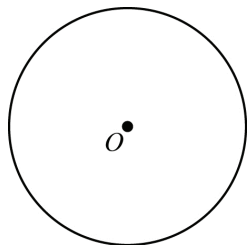


4. Using a straightedge, draw \overline{AB} , \overline{BC} , \overline{CD} , and \overline{AD} .



5. Square $ABCD$ is inscribed in circle O .

9. To **construct a regular hexagon inscribed in a circle**, follow the steps given:



Given: Circle O

Construct: Regular hexagon $ABCDEF$ inscribed in circle O

Procedure:

1. Mark a point anywhere on the circle and label it point A .
2. Open the compass to the radius of circle O .
3. Place the compass point on point A and draw an arc across the circle. Label this point B .
4. Without changing the width of the compass, place the compass point on B and draw another arc across the circle. Label this point C .
5. Repeat this process from point C to a point D , from point D to a point E , and from point E to a point F .
6. Use a straightedge to draw \overline{AB} , \overline{BC} , \overline{CD} , \overline{DE} , \overline{EF} , and \overline{AF} .
7. Regular hexagon $ABCDEF$ is inscribed in circle O .

