

# Congruence Worksheet 1 - Answers

1. How would you construct a line segment congruent to a given segment?  
Use a compass to transfer the length of the given segment.
2. How would you find the midpoint of a given segment?  
Using a compass, make arcs above and below the approximate location of the midpoint from both ends of the segment. Connect the arc intersections both above and below the segment with a straightedge. The point at which these two segments intersect is the midpoint of the given segment.
3. How would you construct the perpendicular bisector of a given segment?  
Using a compass, make arcs above and below the approximate location of the midpoint from both ends of the segment. Connect the arc intersections both above and below the segment with a straightedge. The newly drawn segment is the perpendicular bisector of the given segment.
4. How would you construct a line segment perpendicular to a given line segment that goes through a given point?  
Using a compass, choose an arbitrary length from the point to the line segment. Create an arc that is this length from the line segment on the side opposite the point. Do this once again from the other side of the segment. With a straightedge, connect the given point to the intersection of the arcs.
5. How would you construct a segment perpendicular to a given segment that goes through a point on the given segment?  
Select a point clearly not on the given segment and not perpendicular. Using this point as the center, use a compass to draw a circle with the radius as the distance from the chosen point to the given point. It should intersect with the given segment at another location. Draw the diameter of the circle with a straightedge from the circle and segment intersection to the other side of the circle. Connect this final point (on the circle but not on the given segment) with the original point to construct a segment perpendicular to the given segment at that point.
6. How would you construct a line segment parallel to a given segment that goes through a given point?  
Construct a segment from the given point to the given segment at an arbitrary angle. Using a compass, mark the angle made at the intersection of the segments with an arc and do the same at the given point, where the desired segment will be. Adjusting the compass, mark the distance from the intersections of the arc with the segments. On the intersection between the drawn segment and the arc at the given point, draw an arc that intersects with the arc made above the given segment. These two arcs intersect at a point that, when connected to the given point with

a straightedge, is on a line segment parallel to the original.

7. How would you construct an angle congruent to a given angle?

Draw a ray. Using a compass, draw an arc that intersects the sides of the given angle. Keeping the compass at the same measure, draw an arc at the endpoint of the drawn ray. Adjusting the compass, measure the distance between the intersections of the arc with the sides of the given angle. Using the intersection of the arc and the drawn ray as the center, draw an arc that intersects with the previous arc. With a straightedge, draw a segment from the endpoint of the ray to the intersection of the two arcs to form a congruent angle.

8. How would you construct the angle bisector of a given angle?

Using a compass, draw an arc that intersects the sides of the given angle. Keeping the same measurement, draw arcs on the interior of the angle using the intersections of the arcs with the angle's sides as vertices. The two arcs in-

tersect a point. The segment that connects the vertex of the angle and this point is the angle bisector.

9. How would you construct the angle bisectors of each of the three angles in the triangle?

Choose an angle. Using a compass, draw an arc that intersects the sides of the given angle. Keeping the same measurement, draw arcs on the interior of the angle using the intersections of the arcs with the angle's sides as vertices. The two arcs intersect a point. The segment that connects the vertex of the angle and this point is the angle bisector. Repeat this for the two remaining angles.

10. How would you construct the orthocenter of a triangle?

This is identical to constructing three perpendicular segments to each of the three sides of the triangle using the opposite vertex as the given point. The three perpendicular segments should intersect at a single point called the orthocenter.