

# COMPASS AND STRAIGHT-EDGE CONSTRUCTION

This is compass:



This is straight-edge:

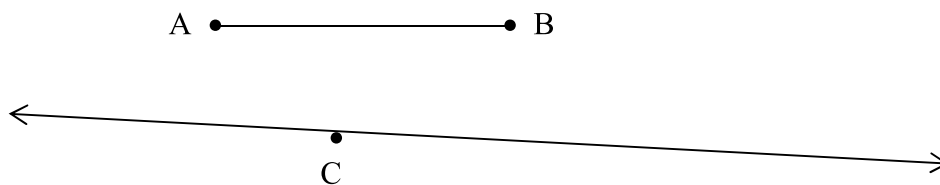


Not this:



- Using a compass, one can measure a distance between two points and then draw a circle with the fixed radius.
- Using a straight-edge, one can draw a straight line through two fixed points.

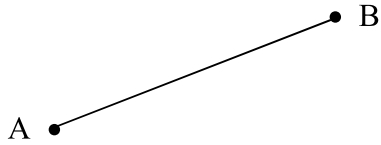
Exercise 1. Using a compass, measure the length of the interval  $\overline{AB}$  and draw an interval  $\overline{CD}$  of the same length located on the given line.



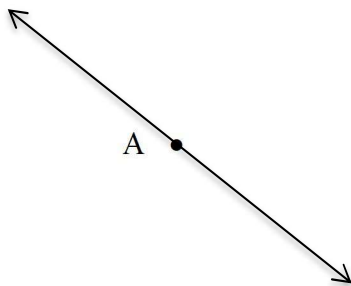
Exercise 2. Using a straight-edge, draw a straight-line passing through the points A and B.



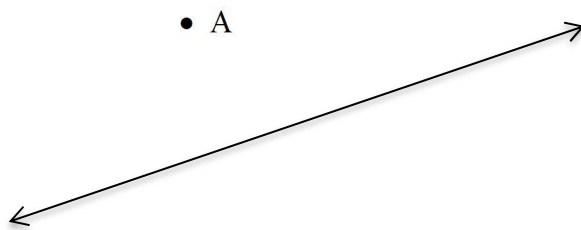
Exercise 3. Using a compass and straight-edge, divide the interval  $\overline{AB}$  in half.



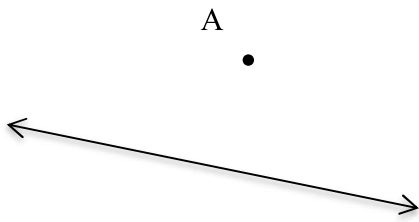
Exercise 4. Using a compass and straight-edge, draw a line that is perpendicular to the given line and passes through the point  $A$  located on that line.



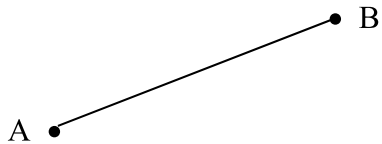
Exercise 5. Using a compass and straight-edge, draw a line that is perpendicular to the given line and passes through the point  $A$  not located on that line.



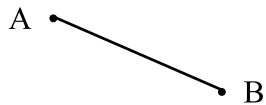
Exercise 6. Using a compass and straight-edge, draw a line that is parallel to the given line and passes through the point A not located on that line.



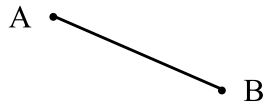
Exercise 7. Using a compass and straight-edge, divide the interval  $\overline{AB}$  into 5 equal parts.



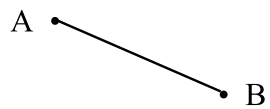
Exercise 8. Construct an equilateral triangle with sides equal to  $|\overline{AB}|$ .



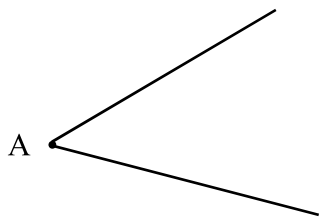
Exercise 9. Construct a square with sides equal to  $|\overline{AB}|$ .



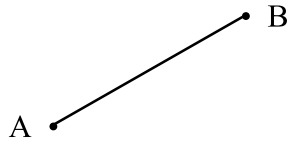
Exercise 10. Construct a hexagon with sides equal to  $|\overline{AB}|$ .



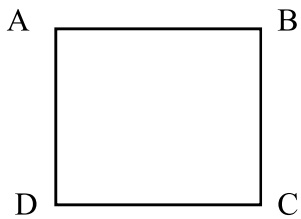
Exercise 11. Bisect the angle  $\angle A$ .



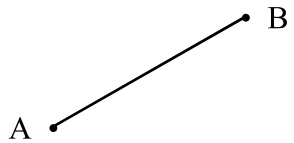
Exercise 12. Construct a line segment which length is equal to  $\sqrt{2} |\overline{AB}|$ .



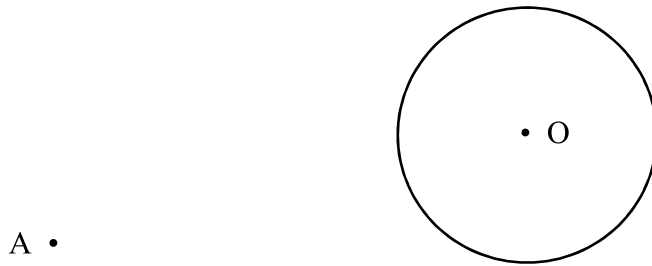
Exercise 13. Construct a square which area is twice the area of the square ABCD.



Exercise 14. Construct a line segment which length is equal to  $\sqrt{3} |\overline{AB}|$ .



Exercise 15. Draw two lines that pass through the point  $A$  and are tangent to the circle with the center  $O$ .



Impossible constructions:

- **Squaring a circle** (or **quadrature of a circle**): It is impossible to construct a square with the same area as a given circle using only compass and straight-edge (it is not possible to construct  $\sqrt{\pi}$ ).
- **Doubling the cube**: It is impossible to construct a cube that has twice the volume of a cube with a given edge using only compass and straight-edge (it is not possible to construct  $\sqrt[3]{2}$ ).
- **Angle trisection**: In general, it is impossible to construct an angle that is one-third of a given angle using only compass and straight-edge.