

Appendix A

Basic Constructions

A.1 Finding the perpendicular bisector and midpoint of a segment

This construction finds the perpendicular bisector and the midpoint of a given segment.

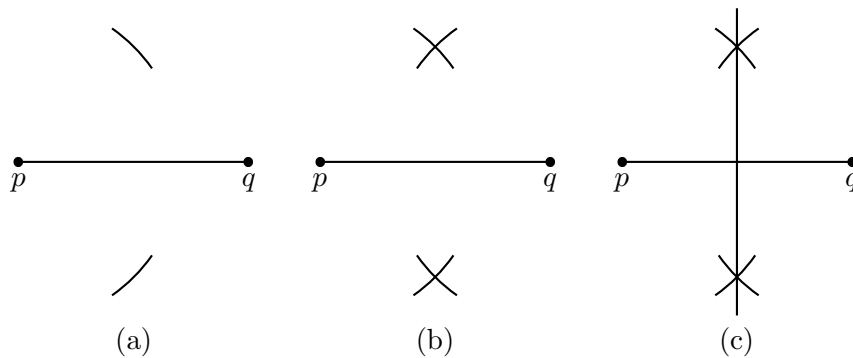


Figure A.1

Let the segment pq be given. Open the compass wider than half the length of the segment (otherwise the construction will not work). With compass point at p , draw arcs above and below the segment, as in (a). Repeat with the compass point at q , as in (b). Finally, join the intersections of the pairs of arcs, as in (c). This line is the perpendicular bisector of pq , so that it intersects the segment pq at its midpoint.

A.2 Constructing a perpendicular line

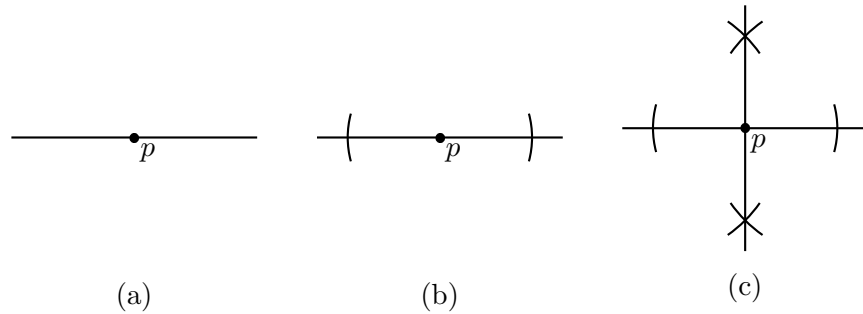


Figure A.2

Let p be given on a line, as in (a). With the compass point at p , draw arcs on either side of p intersecting the line, as in (b). The points where the arcs intersect the line are ends of a line segment. The perpendicular bisector (see above) of this segment will pass through p , as in (c).

A.3 Bisecting an angle

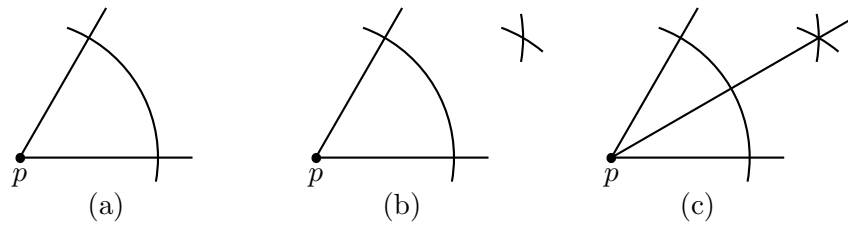


Figure A.3

Let the angle with vertex p be given. With compass point at p , draw an arc which passes through both sides of the angle, as in (a). With the compass point at the points of intersection of this arc and the angle, draw arcs which meet in the interior of the angle, as in (b). (The compass may need to be adjusted at this step.) Join the intersection of these arcs and p , as in (c). This line bisects the given angle.

A.4 Constructing an equilateral triangle

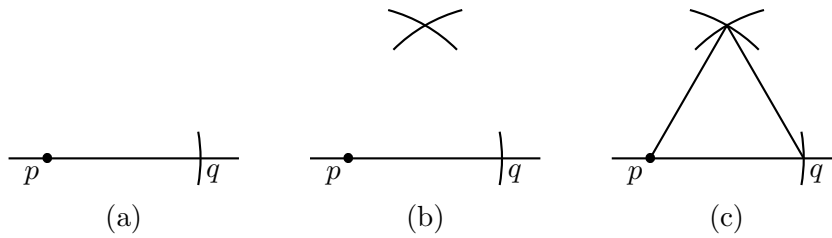


Figure A.4

Open the compass to the desired length of the sides of the triangle, and draw a line. With the compass point at some point on the line, say p , mark off a point q on the same line, as in (a). With the compass set to the same length, create intersecting arcs by placing the compass point at p , then at q , as in (b). Complete the equilateral triangle as in (c).

A.5 Copying an angle

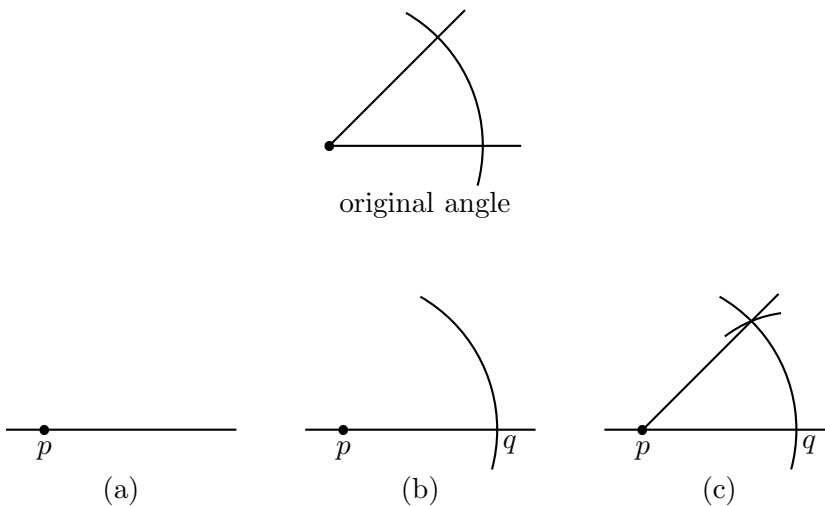


Figure A.5

Draw a line and a point p on the line as in (a). With the compass point at the vertex of the original angle, draw an arc passing through both sides of the angle. With this same compass setting, draw an arc with compass

point at p , intersecting the line at q as in (b). Measure the width of the arc on the original angle. With this compass setting, draw an arc with compass point at q intersecting the arc drawn in (b). Draw a line through p and this intersection as in (c). This produces a copy of the original angle.

A.6 Trisecting a segment

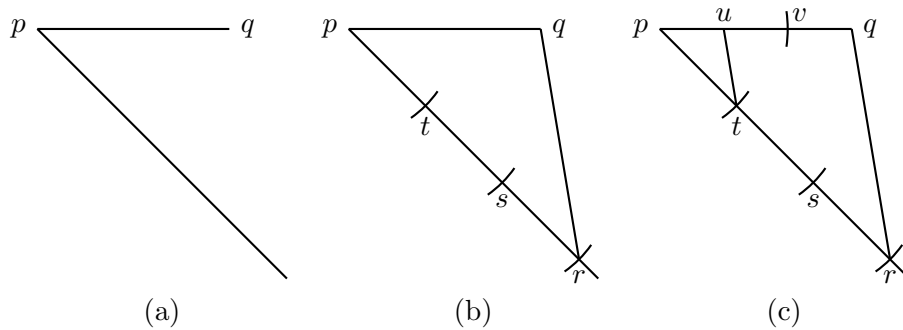


Figure A.6

To trisect segment pq , draw a ray from p as in (a). With the compass set not too wide and the compass point at p , mark off t on the ray drawn in (a), as in (b). With compass point at t , mark off s , and with compass point at s , mark off r . Note that pr is divided into equal thirds.

Draw rq . Copy $\angle prq$ at t (see above), thereby creating similar triangles. This will create pu , which is therefore one-third of the segment pq , as in (c). With compass set to the length $[pu]$, create uv , finishing the construction.

To divide a segment into, say, five congruent parts, simply mark off five points at step (b) rather than three. This method may be extended to divide a segment into any number of congruent parts.