# Geometric Constructions

You know constructions of a lot of geometric elements like parallel lines, perpendicular lines, angles, angles bisectors and many others. In this session we will try to see why these constructions work. That is, we will investigate why do these processes or steps work and try to justify these processes. And also find out more constructions.

For the constructions, we will be using only two tools – an unmarked ruler, also called as a straight edge and a compass.

These two tools are also called as Euclidean tools after the famous mathematician, Euclid. Most probably they are called Euclidean tools because of the fact that joining points, extending segments and drawing circles with a given center and a given radius are the basic geometric constructions described in the first three Euclidean postulates.

**Investigation 1:**
Construct a perpendicular bisector for a given line segment. How will you check that this process will always give you a  perpendicular bisector of the given line segment? Justify your construction

**Investigation 2:**
Draw a parallel line to a given line from a point outside the line. Do you think this method will always give us a line parallel to a given line through a given point? Justify your construction

**Investigation 3:**
Given an angle, construct an angle bisector for that angle. Do you think this method will always give us a bisector of a given angle?  Why? Justify your construction

**Investigation 4:**
Construct an angle whose measures are the following.
(a)  45
(b) 60
(c) 120
(d) 67.5
(e) 37.5

> Write down the steps you took for the construction. Compare your steps with your partners. Justify how the measure of the angle you have constructed.

**Investigation 5:**
Find the centre of  the circle given at the end of these sheets.  Write down the steps you took for the construction.  Justify why this point is the centre of the circle.

**Investigation 6:**
Given a circle, inscribe a square in the circle. (All the four points of the square should be on the boundary of the circle) Justify why your construction is correct.

**Investigation 7:**
Given a circle, circumscribe a square outside the circle. (The circle touches all the four sides of the square but does not cut the square) Justify why your construction is correct.

**Investigation 8:**
Draw a quadrilateral on your sheet. Now you have to construct a triangle whose area is equal to the area of the given quadrilateral. Justify your construction.

**Investigation 9:**
Draw a triangle and an angle on your sheet. Now you have to construct a parallelogram whose area is equal to the area of the given triangle and one of the angles is equal to the given angle. Justify your construction.

**Investigation 10:**
Draw three line segments on your sheet. Now you have to construct a parallelogram such that one of the line segments you have drawn is a side of the parallelogram and other two are the diagonals. Justify your construction.

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