# Chapter 5: Geometrical Construction 

## Proportion of Width and Height for Single Stroke Gothic Letters (Uppercase) \& Numbers

## How to Draw A Pentagon (5 Sides)

Given: The locations of the pentagon center and the diameter of circle that will circumscribe the pentagon.
Step 1: Draw the circle with given diameter taking given location as center (C). Letter a diameter as HB.
$\square$ Step 2: Draw a perpendicular CD that meets the circumference at D .
$\square$ Step 3: Bisect radius CB at A.
$\square$ Step 4: With A as center, and CD as radius, strike arc DE that meets the radius CH at E .
$\square$ Step 5: With D as center, and DE as radius, strike arc EF that meets the nearest circumference at F.
$\square$ Step 6: Draw line DF, this is the length of one side. Now set off distances DE around the circumference of the circle, and draw the sides through these points.


HEXAGON

## How to Draw a Hexagon (6 Sides)

Given: The locations of the hexagon center and the diameter of circle that will circumscribe the hexagon.
Step 1: Draw the circle with given diameter taking given location as center.
$\square$ Step 2: Extend the compass upto a length equal to the radius of the ciecle.
Step 3: Starting from any point, say A1, on the circumference, cut 6 equal segments and mark the points as A1, A2, A3, A4, A5 and A6.
$\square$ Step 4: Join each 2 consecutive points to obtain the hexagon A1 A2 A3 A4 A5A6.

## How to Draw an Octagon (8 Sides)

Given: The locations of the octagon center and the diameter of circle that will be inscribed by the octagon.
$\square$ Step 1: Draw the circle with given diameter taking given location as center.
$\square$ Step 2: Draw any two mutually perpendicular diameters.
$\square$ Step 3: Draw tangents to the circle at the ends of diameters to obtain a square.
$\square$ Step 4: Draw diagonals of the square. Diagonals will intersect the circle at 4 points.
$\square$ Step 5: Draw tangent to the circle at the 4 intersection points obtained in step 4 . These tangents will meet the sides of square drawn in step 3 . Now darken the obtained octagon.


## How to Draw an Ellipse (Four-centered Approximate Method)

Given: Major and Minor axis length (say, a and b respectively).
Step 1: Draw a line $\mathrm{PQ}=\mathrm{a}$ and find out its mid-point O . At O draw a perpendiculars $\mathrm{OR}=\mathrm{OS}=\mathrm{b} / 2$.
Step 2: Taking center O and radius OP , draw an arc PA that intersects the extended minor axis (RS) at A.
Step 3: Join PR. Taking R as center and RA as radius draw an arc that intersects PR at B.
Step 4: Bisect PB at C and draw a perpendicular at C that intersects the extended minor axis (RS) at D .
The line CD also intersects PO at E .
Step 5: Draw OE' equal to OE and OD' equal to OD. Join DE', D'E and D'E' and extend them.
Step 6: Taking D and D' as centers and DR or D'S as radius draw 2 arcs MRN and KSL respectively.
Step 7: Taking E and E' as centers and PE or QE' as radius draw another 2 arcs KPM and NQL respectively.
Thus the ellipse will be completed.

