SHAPE WITH GEOCAD

GEOCAD

Design Geometry with Computer Aid

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1) Bisection-Proposition 9

**(Bisecting a given linear angle in AutoCAD)**

Bisection is dividing line segments or angles into two equal parts by a line, which is called a *bisector.* Bisecting an angle means drawing a ray in the interior of the angle, with its initial point at the vertex of the angle such that it divides the angle into two equal parts.

How to Bisect an Angle?

To bisect an angle without protractor you will need:

- a computer;
- AutoCAD drawing program

Let's do this!
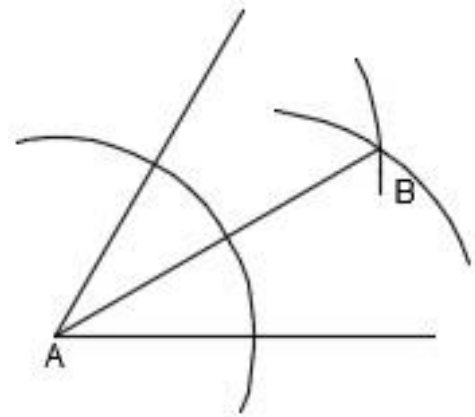
1. With the line command, a 5 cm long line is drawn parallel to the ground.
2. An acute angle 5 cm long is drawn starting from the same starting point.
3. İn the arc command; Using "start, center, end" draw an arc starting from a random point below the parallel line, with the center chosen as the junction of the two lines and slightly past the angled line.
4. In the arc command, "center, start, end" is selected. From the points where the drawn arc cuts the lines, 2 arcs are drawn, starting from the points where the drawn arc is 3 cm in diameter and intersecting each other, and point B is created.
5. A line starting from point A and intersecting point B is drawn with the Line command.

2) Descending a perpendicular line from a point on a given line

The steps required to draw a line from a point 90° above a straight line are listed. You can fulfill the given task by following the step-by-step instructions to draw a perpendicular line.

How to draw a perpendicular line?

materials you need to descend perpendicularly from a point:

- A computer
- AutoCAD drawing program
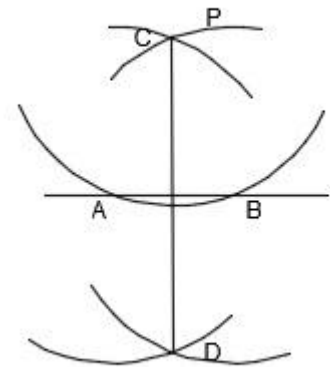
Let's do this!

1. Draw a 5 cm long line parallel to the ground.

2. A random point P is added to the top of the line.

3. By selecting "center, start, end" with the arc command, an arc is drawn from the P point, intersecting the line in 2 places.

4. From two points on the line, by selecting "center, start, end" with the arc command, arcs are drawn to cross each other above and below the line.

5. The intersection points of the intersecting arcs are named C and D, respectively.

6. Points C and D are joined by a line using the line command.

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3) Getting 90⁰ perpendicular from a given edge point on the line
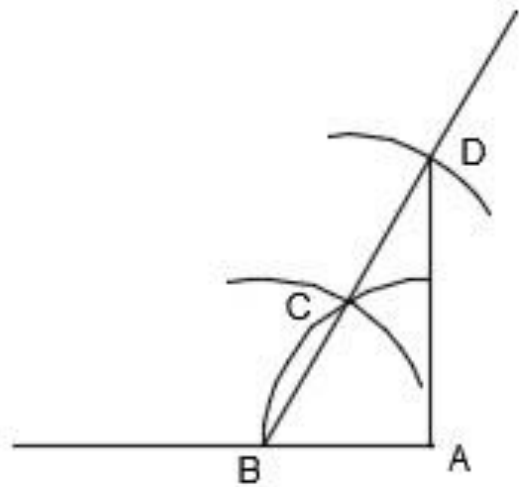
The necessary materials and instructions are given step by step to draw a perpendicular line from a point on the side of a line with the help of the line command.

How to draw a perpendicular line from the corner of the line?

materials you need to descend perpendicularly from a point:

- A computer,
- AutoCAD drawing program
-

Let's do this!

1. Draw a 5 cm long line parallel to the ground.

2. Mark a point A on the right side of the line.

3. By selecting "center, start, end" in the arc command, draw a quarter circle that starts from point A, 2 cm long, above the line and intersects the line.

4. We write point B at the point where the quarter circle cuts the line, and starting from point B, "center, startrt, end" is selected from the Arc command and an arc is drawn to cut the quarter circle at a distance of 2 cm and point C is written.

5. By selecting "center, start, end" in the arc command, a distance of 2 cm is given and an arc is drawn centered at point C and on the upper right side.

6. Using the line command, a line long enough to cross the last drawn arc is drawn by aligning points B and C.

7. Point D and point A, where the line cuts the arc, are aligned and drawn perpendicular to the corner of the line.

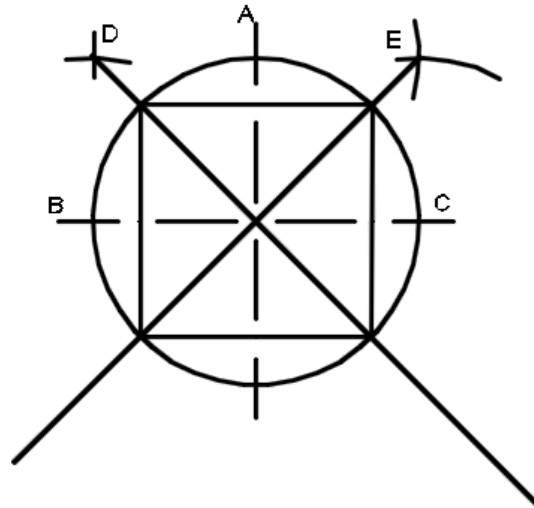## 4) Drawing a rectangle in a circle with technical drawing rules

Using appropriate material, draw a circle with a diameter of 5 cm on the axis lines on the given worksheet and draw a quadrilateral inside the circle using the points on the circle..

How to draw a rectangle

materials needed to draw a rectangle:

- A computer,
- AutoCAD drawing program

Let's do this!

1. Draw a 10 cm long line parallel to the ground and draw a vertical line 5 cm above it and 5 cm below it, passing through its center.

2. With the circle command, a circle with a radius of 2.5 cm is drawn starting from the intersection points of the lines.

3. Points A, B, C are marked and using the arc command "center, start, end", arcs are drawn 3 cm from points A and B, and points D and E are found.

4. From D and E points, a line is drawn up to the outer perimeter of the circle with the line command to cut the center of the circle.

5. A square is created by combining the points where two lines intersect the circle with the line command.
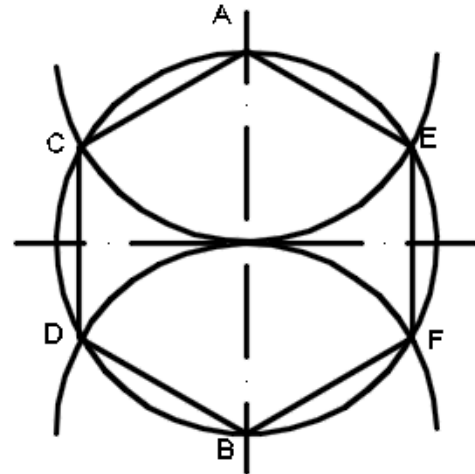
5) Drawing hexagons with technical drawing rules

Draw a hexagon using a circle with a diameter of 5 cm drawn on the axis lines on the given worksheet.

How to draw hexagon

materials needed to draw a hexagon:

- A computer,

- AutoCAD drawing program

Let's do this!

     1. Draw a 10 cm long line parallel to the ground and draw a vertical line 5 cm above it and 5 cm below it, passing through its center.

     2. With the circle command, a circle with a radius of 2.5 cm is drawn starting from the intersection points of the lines.

     3. Points A and B are written.

     4. An arc is drawn starting from point A, by selecting "center, start, end" in the arc command, with a radius of 2.5 cm and cutting the circle from 2 sides.

     5. An arc is drawn starting from point B, by selecting "center, start, end" in the arc command, with a radius of 2.5 cm and cutting the circle from 2 sides..

     7. The points where the semicircles intersect the circle are named with the letters C, D, E, F.

     8. The hexagon is completed by combining all the points in sequence with the line command.

6) Drawing hexagon with technical drawing rules

This worksheet shows how to construct a regular hexagon using AutoCAD software.

Construction steps:

1. Draw a CIRCLE of custom size with center point O. Keep in mind that the side of your hexagon will be equal to the radius of your circle.
2. Using the LINE tool draw a diameter of the circle. Mark the connection points of the diameter with the circle as A and B. To name the point use the tool MTEXT.
3. Draw a second circle with the same radius with the center A.
4. And another one with the center B.
5. Clicking two circles O and A use a BREAKATPOINT tool to create an intersection point. Name the point C.
6. Draw a CIRCLE with the same size as previous centered at point C.
7. Repeat the steps 5-6 to complete the drawing symmetrically. Name the point of intersection and the center of fourth circle as D.
8. Click to the points of intersection of the pairs of circles A - O and B - O. Name them F and E.
9. Using the LINE tool connect the dots ADEBFC to get an hexagon.
10. We can measure all the sides to proof, that the resulting geometric shape is a regular hexagon.
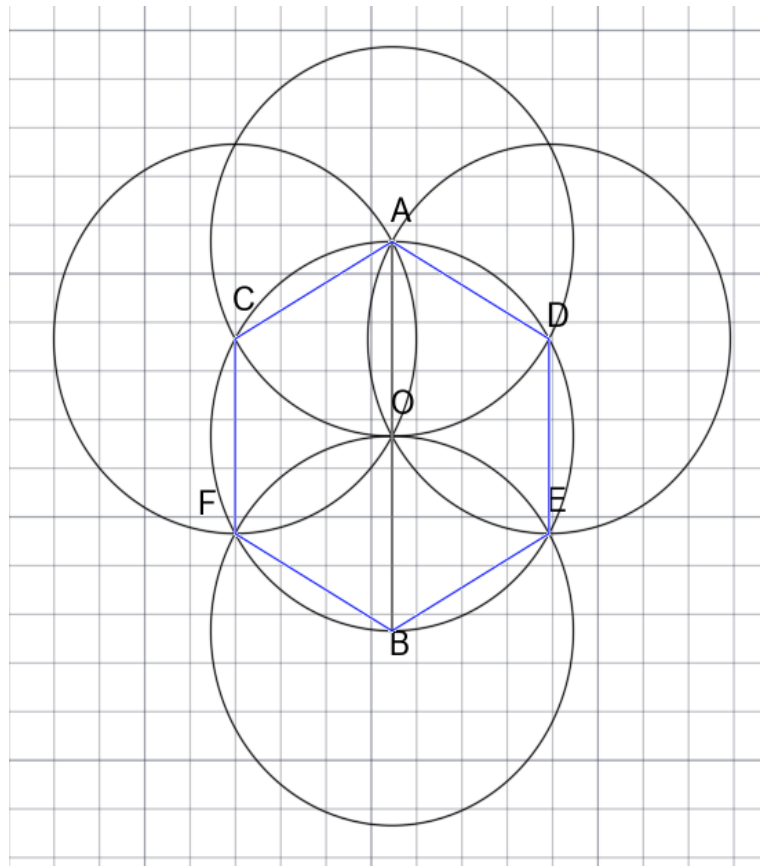
You can also see the same drawing in AutoCAD Web application clicking the link,

7) Draw Euler's line in a triangle using AUTOCAD commands.
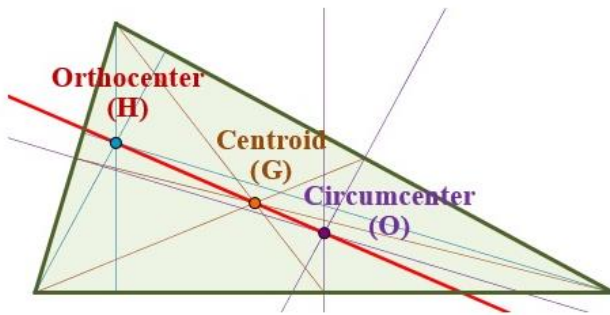
Step1: draw the circumcenter of the triangle

The **circumcenter** of a triangle (*O*) is the point where the three perpendicular bisectors (Ma, Mb y Mc) of the sides of the triangle intersect. It can be also defined as one of a triangle's points of concurrency.

The perpendicular bisector of a triangle is a line perpendicular to the side that passes through its midpoint.
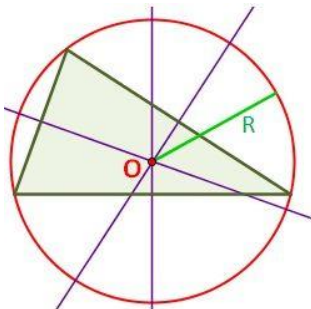

The **circumcenter** (*O*) is the central point that forms the origin
of **circumcircle** (circumscribed circle) in which all three vertices of the triangle lie on the circle.

Step 2: draw the orthocenter of the triangle

In a triangle *ABC* the **orthocenter** *H* is the intersection point of the three altitudes of the triangle.

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Every triangle has three altitudes (or heights) and three sides (or bases).

An altitude of a triangle (ha, hb y hc) is a perpendicular line segment from a vertex to the opposite side. This line containing the opposite side is called the extended base of the altitude.
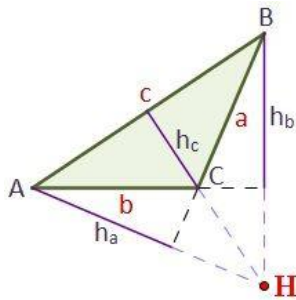
Altitude can also be understood as the distance between the base and the vertex.

Where is the Orthocenter of a Triangle Located?

If it's an obtuse triangle the orthocenter is located outside the triangle (as we see in the picture above).

If it's an acute triangle the orthocenter is located inside the triangle.

If it's a right triangle the orthocenter lies on the vertex of the right angle.

Step3: draw the triangle centroid

The **centroid of a triangle** (or **barycenter of a triangle**) *G* is the point where the three medians of the triangle meet.

The medians of a triangle are the line segments created by joining one vertex to the midpoint of the opposite side. Since every triangle has three sides and three angles, it has three medians (ma, mb and mc).
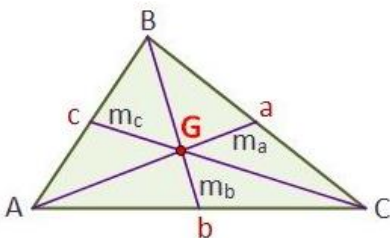
Step3: draw the Euler line.

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8)Draw the geometrical shape below with AutoCad commands

First we draw a square with a side of 200mm. We draw diagonals for a given square. When we draw diagonals we get the center. Then we draw the bisectors of the sides. From the center, draw two circles with diameter r20 and r50. Connect each vertex with the intersection of the large circle and the line bisector. Round off the vertex with r30.

Then we dimension the drawing.
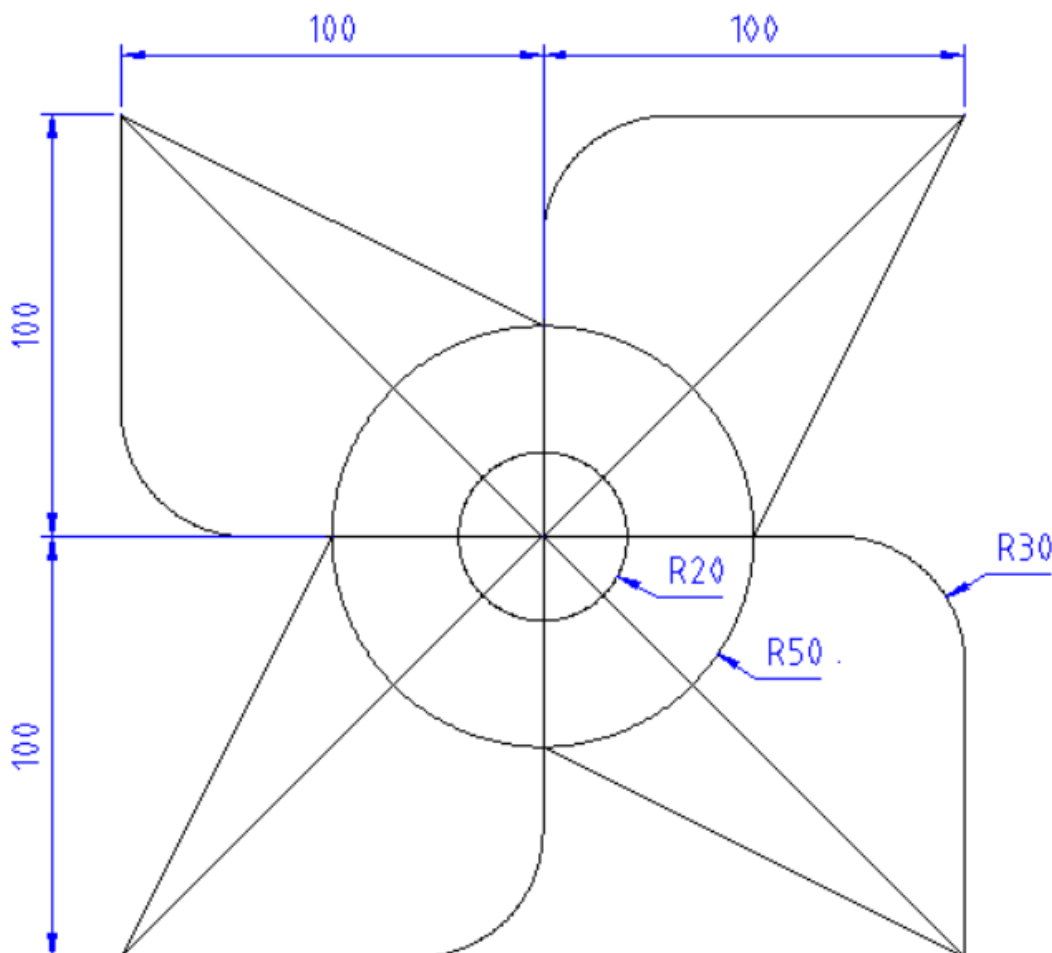
9)How to draw a tangent of a circle from a point outside the circle

1. Draw a random circle with center O.

2. Draw a point A outside from the circle.

3. Draw the segment AO from the point to the center of the circle.

4. Find the middle

point M of the

segment AO:

a. Draw a circle

with center

the point A

and with

radius greater

than the half

of the

segment AO

b. Draw a circle with center the point O and with radius greater than the
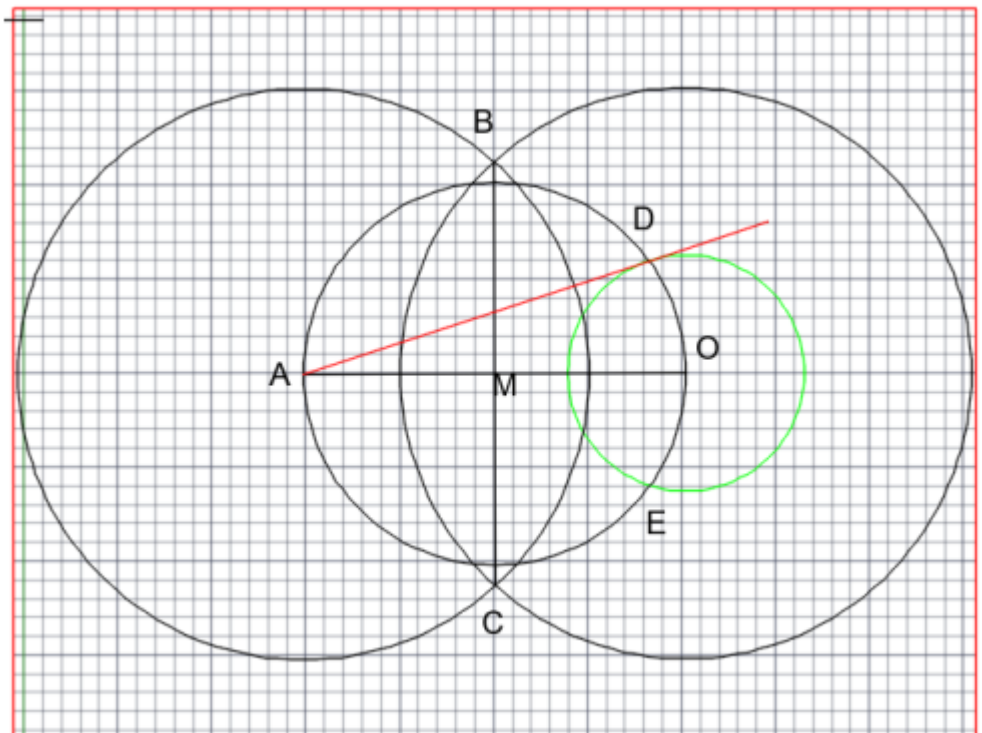
half of the segment AO

c. The two previous circles must intersect to the points B and C.

d. Draw the segment BC which intersects with the segment AO to the

point M that we looking for.

5. Draw a circle with center the point M and radius the length MA (or MO).

6. The first circle and the last circle intersects to two points D and E.

7. Draw the line AD (or AE) which is the tangent of the first circle (Why?)

https://web.autocad.com/acad/me/sid/shares/drawings/14c642f1-01a7-41e6-803b-7daf0116fc0f/editor