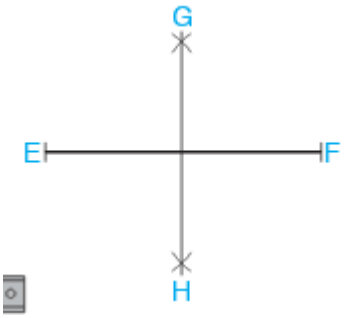
BISECT A LINE

A compass and straightedge can be used to draw a perpendicular bisector to any given line. This method is quick and very useful for lines that are not vertical or horizontal. The following procedure describes this method.

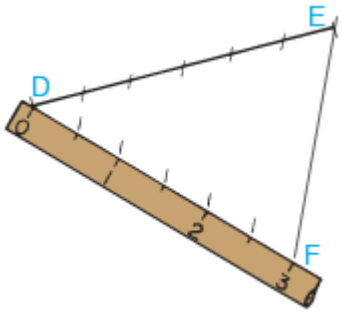
- Line EF is given,
- Using E and F as centers, use a compass to strike arcs with equal radii greater than one-half the length of Line EF, scribing Points G and H.
- Use a straightedge to draw Line GH.
- This line is the perpendicular bisector of Line EF



Divide a Line into a Given Number of Equal Parts

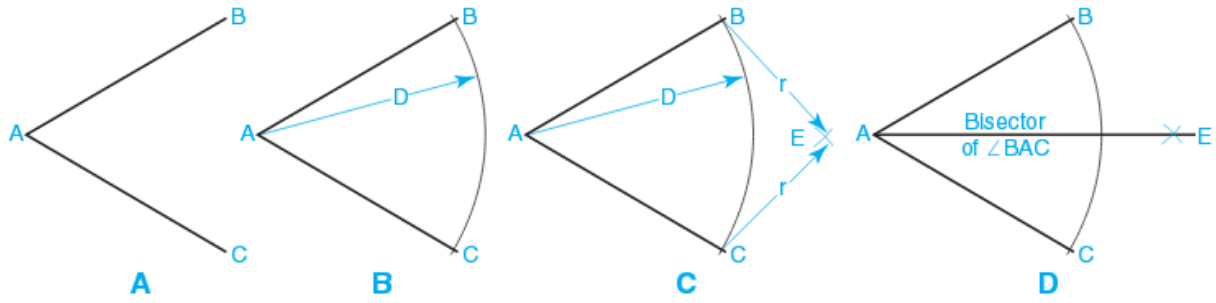
- Line DE is given and is to be divided into six equal parts,

- Draw a line from Point D at any convenient angle. With a scale or dividers, lay off six equal divisions. The length of these divisions is chosen arbitrarily, but all should be equal.
- Draw a line between the last division, Point F, and Point E.
- With lines parallel to Line FE, project the divisions to Line DE. This will divide line DE into six equal parts.


E
D
F

Bisect an Angle

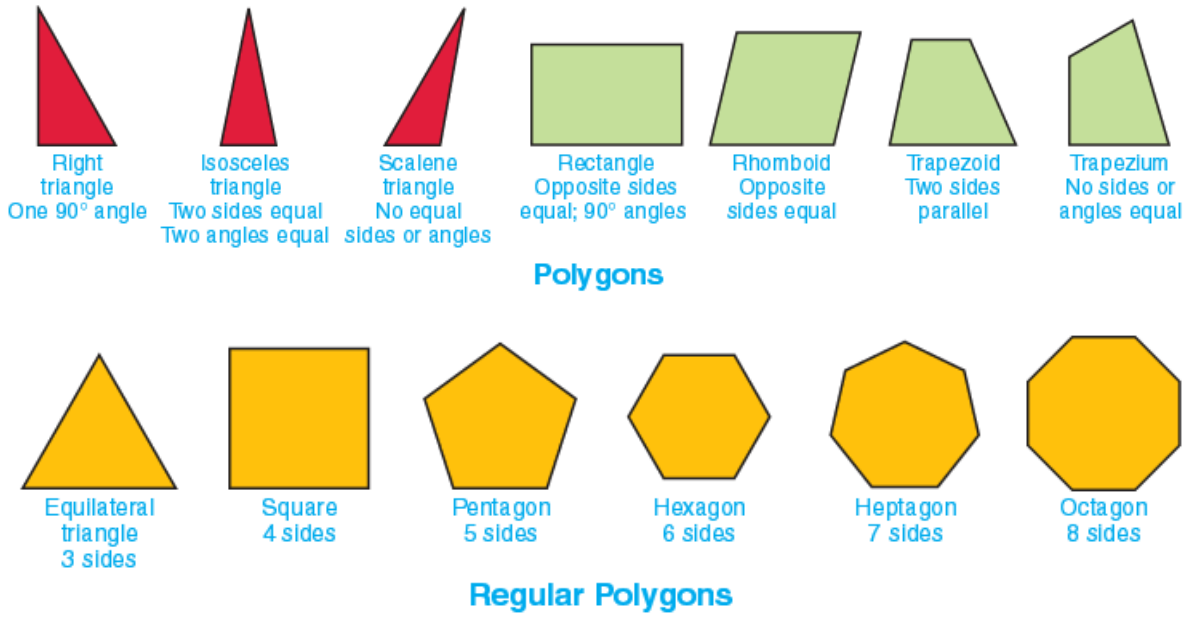
- Angle BAC is given and is to be bisected, Figure A
- Strike Arc D at any convenient radius, Figure B
- Strike arcs with equal radii. The radii should be slightly greater than one-half the distance from Point B to Point C. The intersection of these two arcs is Point E, Figure C
- Draw Line AE. This line bisects Angle BAC, Figure D



Constructing Polygons

A polygon is a geometric figure enclosed with straight lines. A polygon is called a regular polygon when all sides are equal and all interior angles are equal. Common polygons are shown in Figure

The procedures in the following sections show how to construct triangles, squares, and other common polygons

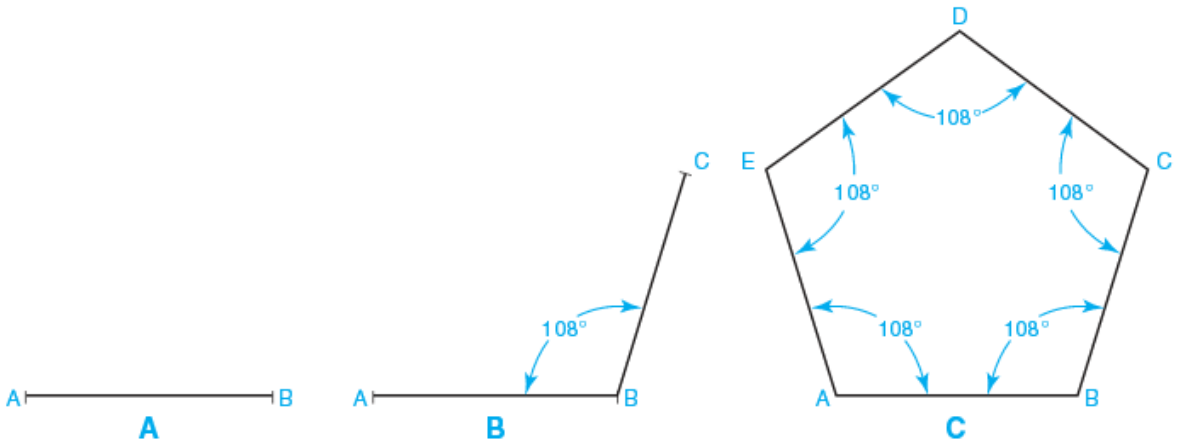


Construct a Triangle with Three Side Lengths Given

- Side lengths A, B, and C are given, Figure A
- Draw a base line and lay off one side (Side C in this case), Figure B
- With a radius equal to one of the remaining side lengths (Side A in this case), lay off an arc using a compass (Arc A in this case).
- With a radius equal to the remaining side length (Side B in this case), lay off an arc that intersects the first arc (Arc B in this case), Figure C
- Draw the sides to form the required triangle, Figure D

Construct a Regular Pentagon with the Side Length Given

- A pentagon is a polygon with five sides. A regular pentagon has five equal sides and Five equal interior angles. Each of the interior angles measures 108 °
- The length of Side AB is given, Figure A
- With a protractor, lay off Side BC equal in length to Side AB and at an angle of 108°. The center of the angle should be at Point B, Figure B
- Lay off Side AE in a similar manner. Continue until the required regular pentagon is formed, Figure C



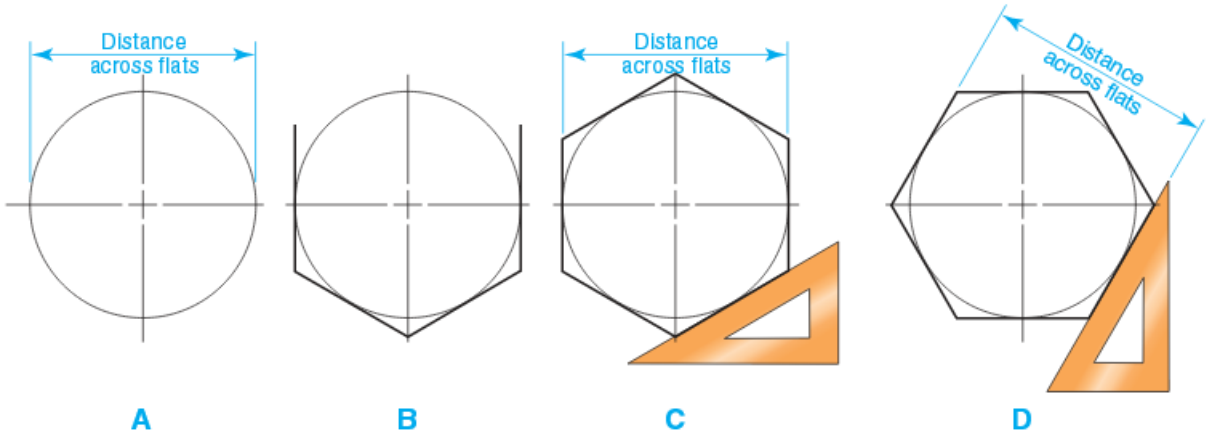
Construct a Hexagon with the Distance across the Flats Given

A hexagon is a polygon with six sides. A regular hexagon has six equal sides and six equal interior angles. A hexagon can be constructed based on the distance across the flats (opposite sides). In this construction, the hexagon is circumscribed about a circle with a diameter equal to the distance across the flats.

With a compass, draw a circle equal in diameter to the given distance across the flats, Figure A

With a T-square and a 30°-60°triangle, draw lines tangent to the circle, Figure B

Draw the remaining sides to form the required hexagon, Figure Can alternate construction for a hexagon using the distance across the flats is shown in Figure D



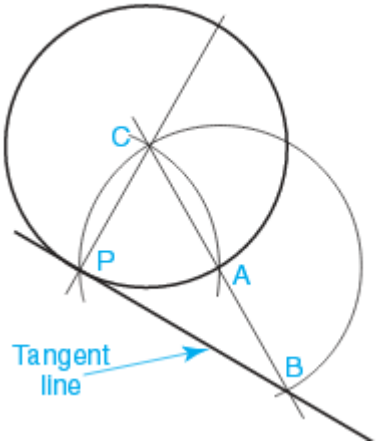
Construct a Line Tangent to a Circle or Arc

- With the point of tangency (Point P) as the center point and the circle radius PC, use a compass to construct an arc through the center point of the circle (Point C). This arc should pass through Point C and a point on the circle, Point A, Figure 6-45B

- With Point A as the center point and the same radius PC, construct a semicircular arc to pass through Point P.
- This semi-circle should also extend to the opposite side of Point A.

- Extend Line CA until it intersects with the semicircle at Point B.

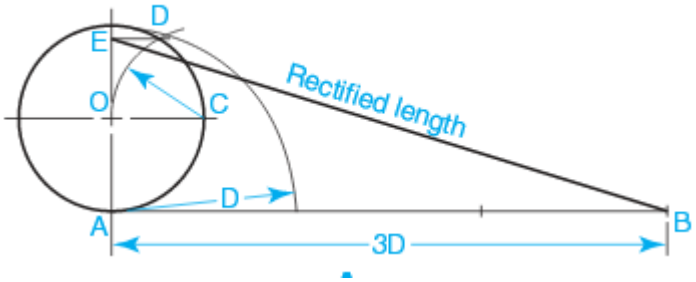
- Line BP is perpendicular to Line PC. This line is also the required tangent line



Lay Off the Length of the Circumference of a Circle

Laying off the circumference of a circle is also referred to as locating the true length or rectified length. The rectified length of a curved surface (such as a circle) is the length of the surface laid out on a straight line.

- Circle O is given, Figure 6-58A
- Draw Line AB tangent to the point where the vertical centerline crosses the circle. The length of the line should be equal to three times the diameter of the circle.
- Locate Point C where the horizontal centerline crosses the circle. With the center at Point C, strike an arc of a radius equal to that of the circle. This arc will intersect the circle at Point D. (Note that Point D is on the opposite side of the circle center as Point A.)
- From Point D, draw Line ED perpendicular to the vertical centerline.Line EB is the approximate length of the circumference of Circle O. The error of this line is equal to less than 1″in 20,000″or .005%. This error is well within the accuracy range of mechanical drafting instruments.


D
E
O
C
Rectified length
D
A
3D
B