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I.I GEOMETRIC CONSTRUCTIONS

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Geometric constructions serve as the basis for all technical drawings. The goal of geometric making is to construct precisely designed flat geometric shapes, from squares, triangles and three-dimensional cylinders to complex irregular curves and ellipses. These structures are usually produced without the aid of a scale, but rather with simple drafting tools.

Engineers, designers and draftsmen regularly use the principles of plane geometry in the production of geometric constructions in their work. The process involved in the production of geometric structures requires a basic understanding of plane geometry. Mastering geometric design skills requires precision and the correct use of drawing tools. When developing geometric structures, it is important that the drafting tools are in good condition. A small error or inaccuracy in solving a geometric problem can lead to a serious error in the final construction.

There are a number of basic geometrical constructions that the student should be familiar with. First, the student should learn how to develop different geometric shapes in each drawing, then follow the basic sequence.

Construction of point, line and angle.

Point: Constructing geometric figures begins with describing points on drawings. A point defines a specific location in space that has no width, height, or depth. Points are usually represented by two intersecting lines.

Figure 1.1. Definition of point.

A line can be defined as:

- Distance between two points.
- Point movement trajectory.
- A geometric shape with only one dimension: length.

The shortest distance between two points is called a straight line, and it is usually simply called a "line".

Accordingly, a straight line drawn from left to right relative to the inscriptions is called a horizontal line, and a line drawn from top to bottom perpendicular to the horizontal is called a vertical line. Two lines are called parallel if they are equidistant in length and never meet or intersect. || defining a parallel line. Two or more lines that cross each other are called intersecting lines. ∩ intersection sign. The exact place where two lines intersect is called the point of intersection. Lines that intersect or intersect to form a right angle are called perpendicular lines. ⊥ is the sign of perpendicularity.

Draw parallel lines.

Draw a line parallel to a given line through a given distance.

Method 1.

1. Draw line AB at an arbitrary angle.
2. Point E near A and point F near B are determined on line AB.
3. Two arcs with radius CD=R are drawn centering points E and f.
4. A straight line is drawn intersecting two arcs at the same time (GH).

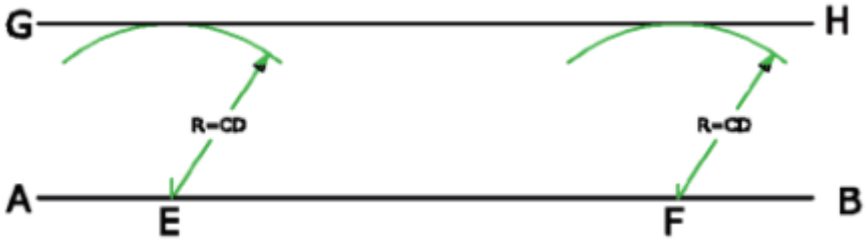

Figure 1.2. Drawing parallel lines method 1.

Method 2.

1. Draw the line AB at any angle.
2. Adjust the circle to R=CD.
3. R=CD is drawn centering arbitrary point E of the section AB.
4. Align the marked line with line AB using a t-line or other line as a support.
5. Move the marked line until it touches the arc.
6. Draw the GH line using the edge of the designated ruler.

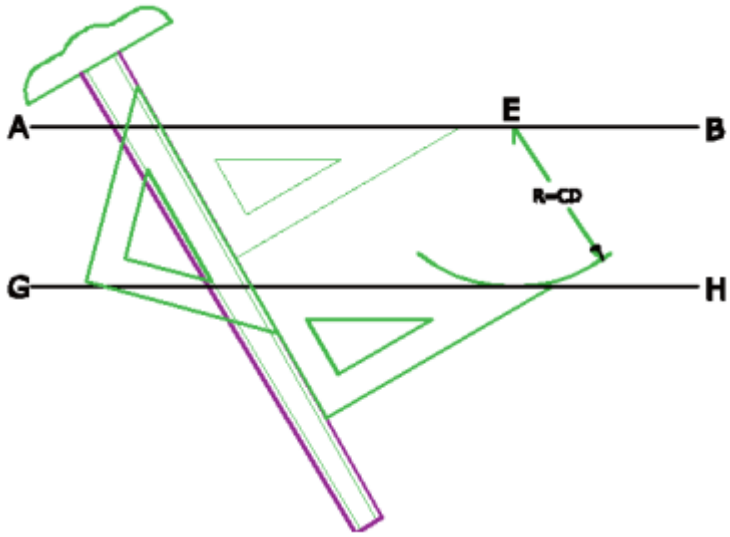

Figure 1.3. Method 2 of drawing parallel lines.

Draw perpendicular lines

Construct a perpendicular to a line through a point corresponding to a line segment.

1. The line AB is drawn and the point P is determined on it.
2. An arc is constructed with an arbitrary radius centered on point p. This arc intersects the section AB and determines the points C and D.
3. Arcs are drawn centering on points C and D with a larger radius. We mark the intersection point of these arcs with E. Connect line E to P. The result is EP⊥AB.

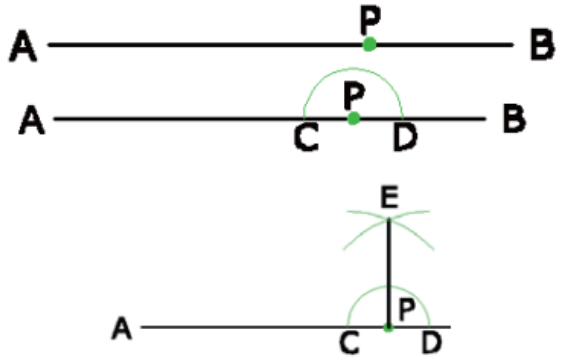

Figure 1.4. Draw a perpendicular line through the point corresponding to the section.

Construct a perpendicular bisector of a given line or arc

1. Draw a line or arc AB.

2. Adjust the circlip to a radius greater than 1/2 the length of the cut.

3. Arcs are drawn centering on points A and B, and points where the arc intersects are marked D and E.

4. The straight line DE is as follows. DE⊥AB and AC=CB .

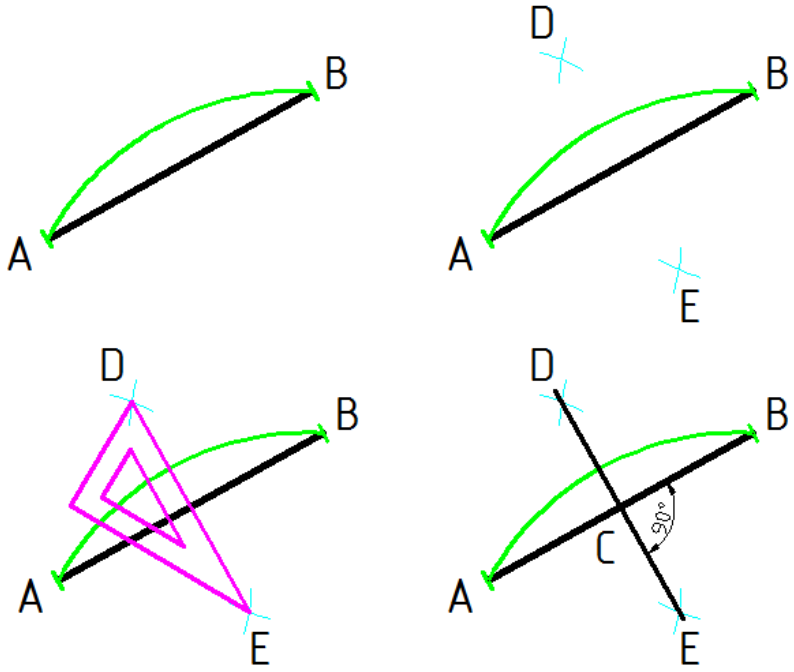

Figure 1.5. Constructing a perpendicular to a line from a point to which the line does not belong

Method 1.

1. Draw an arbitrary line AB and determine the point P (P AB).

2. Point C and D are determined to the left and right of point P with an arbitrary radius R as the center.

3. Circular arcs are drawn with radius r>AB/2 with C and D as centers. Let's mark the point where these arcs intersect as E.

4. The straight line formed by connecting the points P and E cuts the section AB at a right angle (Fig. 1.5).

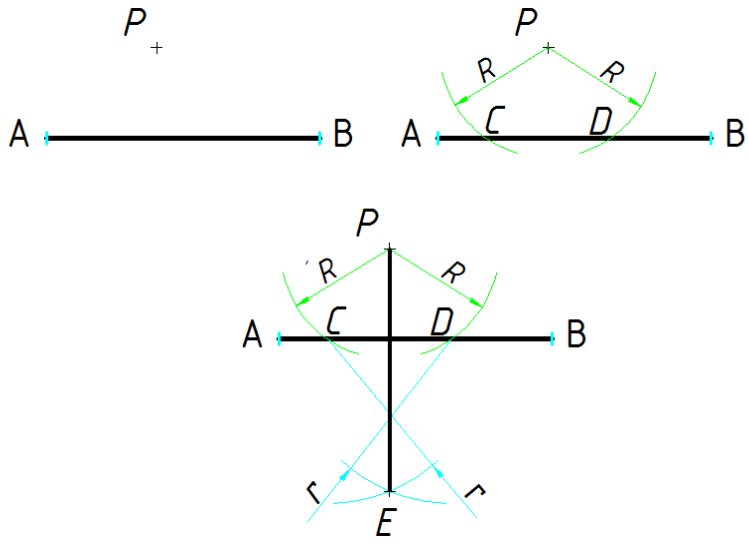

Figure 1.6.

Method 2.

1. An arbitrary section AB is drawn and point P AB is determined.
2. Let's make an arbitrary ray from the point P and cross it with the section AB and mark this point with C.
3. As mentioned in the previous discussion, the midpoint O of the cross section PC is found.
4. Let's draw an arc with radius OP, centering point O. Let's mark the point where the arc intersects the section AB as E.
5. The section PE formed by connecting the points P and E is perpendicular to the section AB.

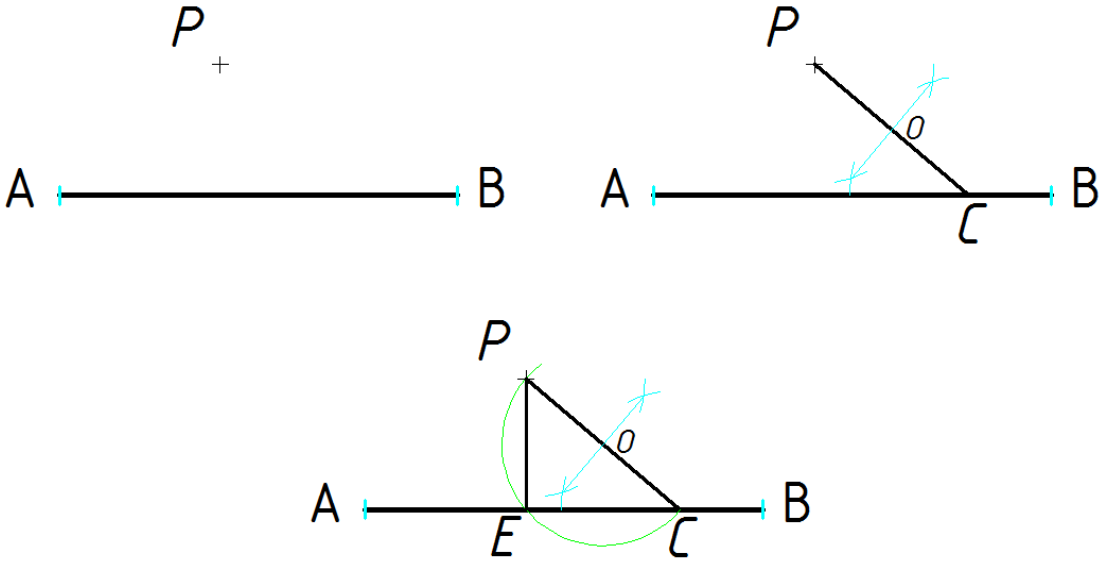

Figure 1.7. Drop perpendicular to a straight line from a point.

Dividing a straight line in the ratio 3/1.

Angles of 30°-60° are performed as follows.

1. A straight line AB is drawn.
2. 300 lines are drawn from points A and B.
3. Extend them until they intersect at point C.
4. In both directions, draw a horizontal line of 600 from point C and extend them to intersect AB at D and E. The resulting sections are divided into equal parts (AD=DE=EB).

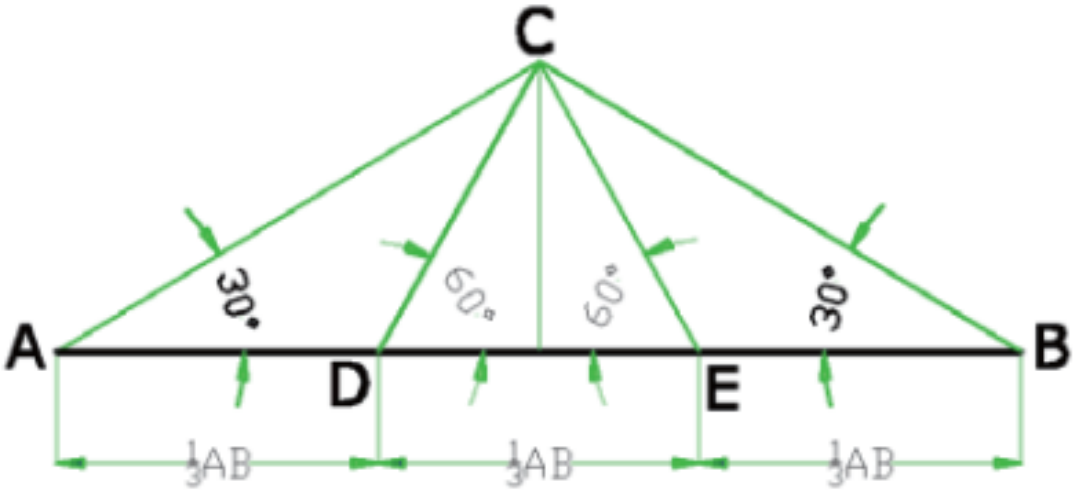

Figure 1.8.

Dividing lines into n equal line segments.

In this example n=5.

1. A line AB is drawn.

2. A line is drawn from point A or B to AB at any convenient acute angle. Here it is taken out from B and one end of it is marked as C.

3. From the point of intersection of the lines (B) is divided into the required 5 equal parts.

4. A line is drawn from the last (fifth) interval to A.

5. Lines parallel to AC are drawn through each of the other points on BC. Now the line AB is divided into five equal parts. Use a triangle and a T-square to draw parallel lines.

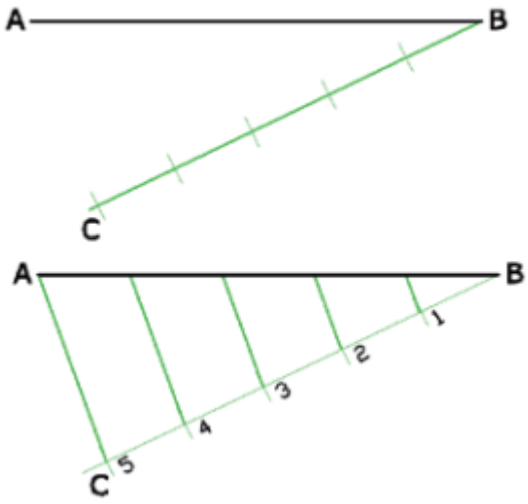

Figure 1.9.

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