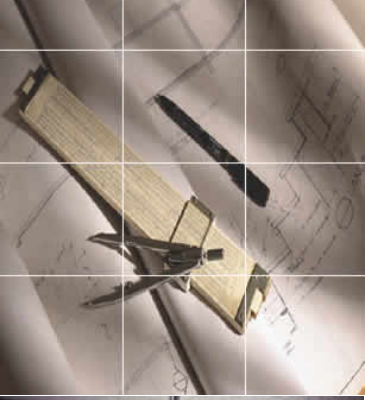
Chapter 2

Using Drawing Tools & Applied Geometry

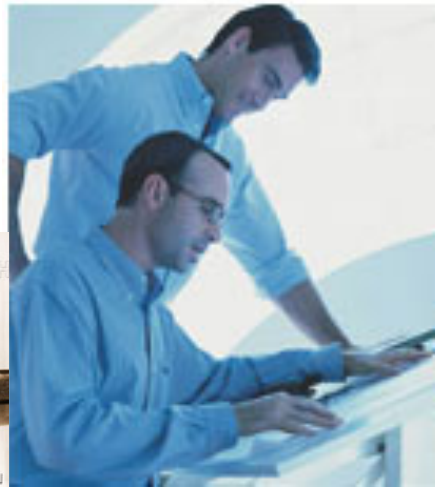


TOPICS

- Preparation of Tools.
- Using of Tools
- Applied Geometry

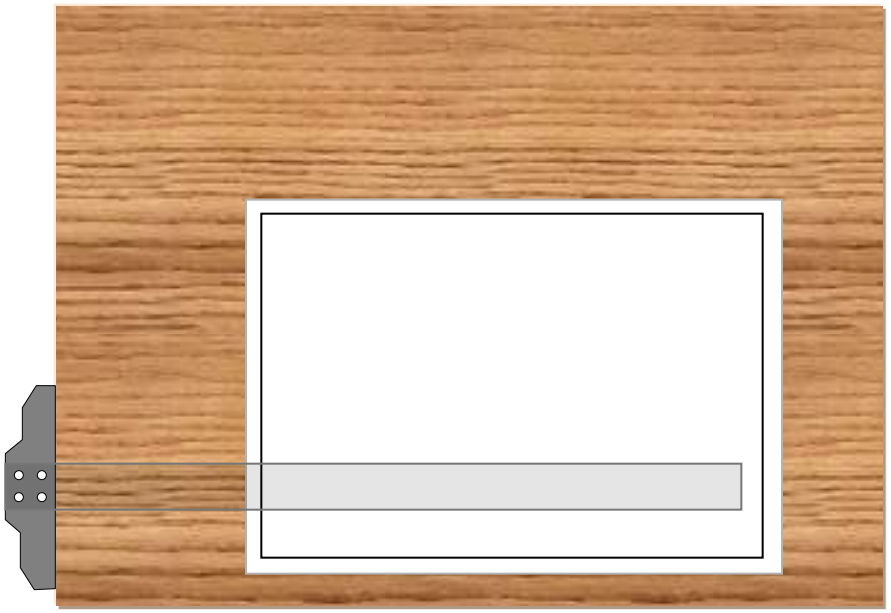


Preparation of Tools



Fastening Paper to Drafting Board

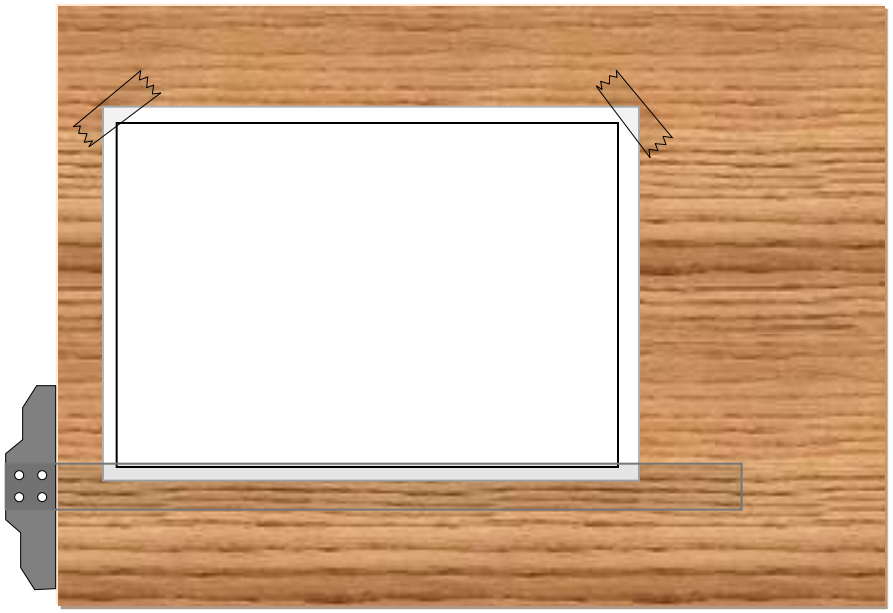
1. Place the paper close to the table's left edge.
2. Move the paper until its lower edge place about the top edge of T-square.



Fastening Paper to Drafting Board

3. Align the top edge of the paper with T-square blade.

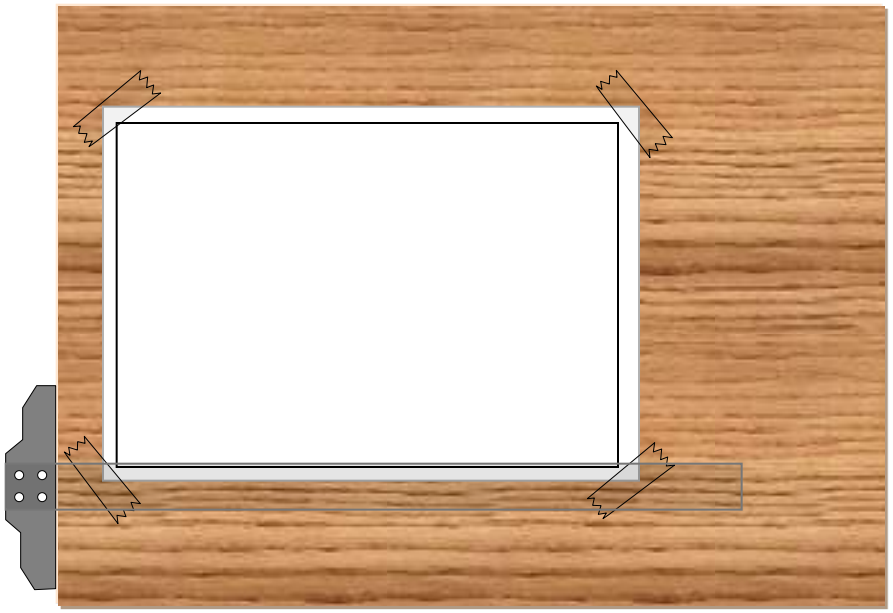
4. Attach the paper's corners with tape.



Fastening Paper to Drafting Board

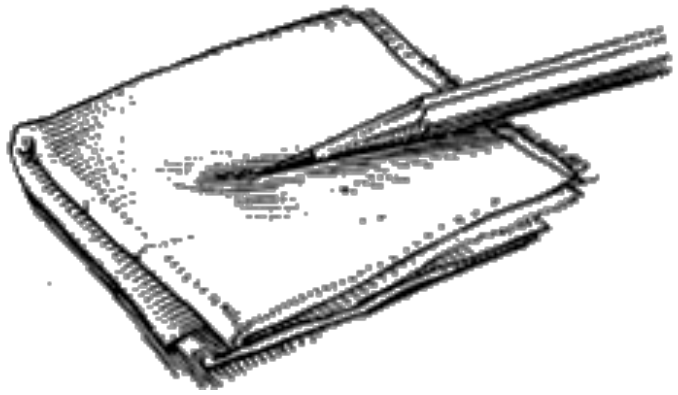
5. Move T-square down to smooth the paper.

6. Attach the remaining paper's corners with tape.



Sharpening the Pencil

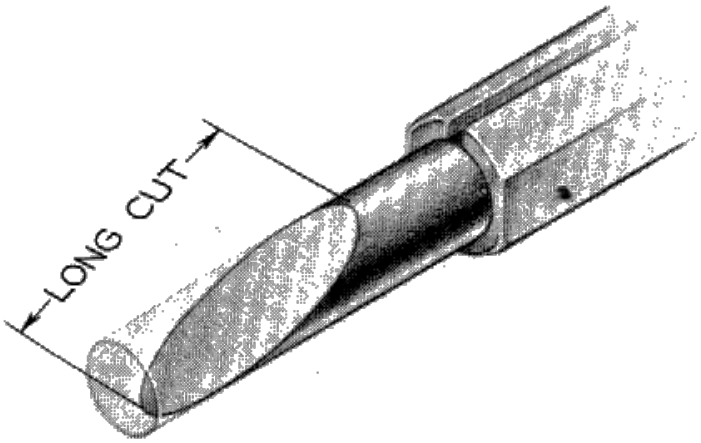
1. Remove the wood with penknife while expose a lead about 8-10 mm.
2. Polish the lead into a conical shape with a sandpaper.
3. Clean the lead with tissue paper.

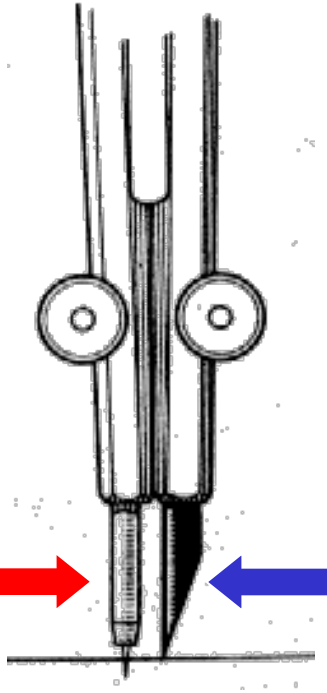


Preparing the Compass

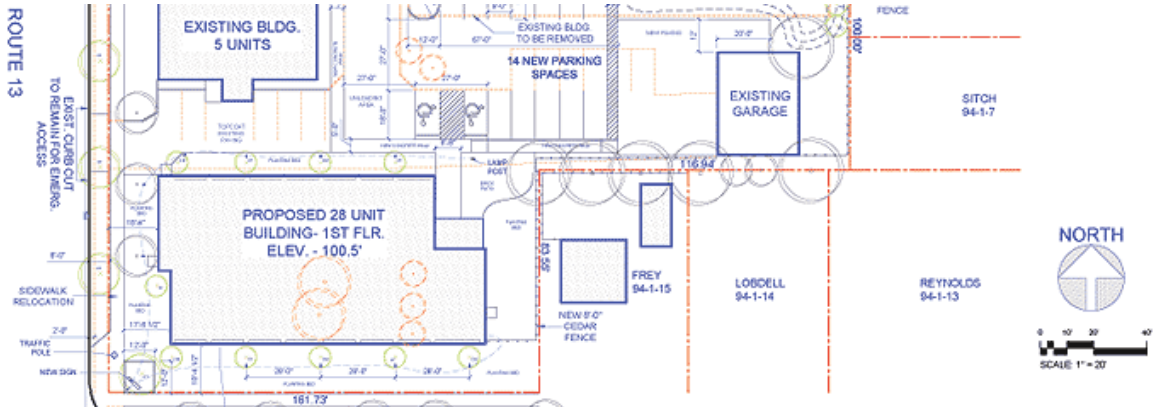
1. Sharpen the lead with a sandpaper.

2. Adjust the **needle** and the **lead** so that the tip of the needle extends slightly more than the lead.





Using the Tools



Function of the Tools

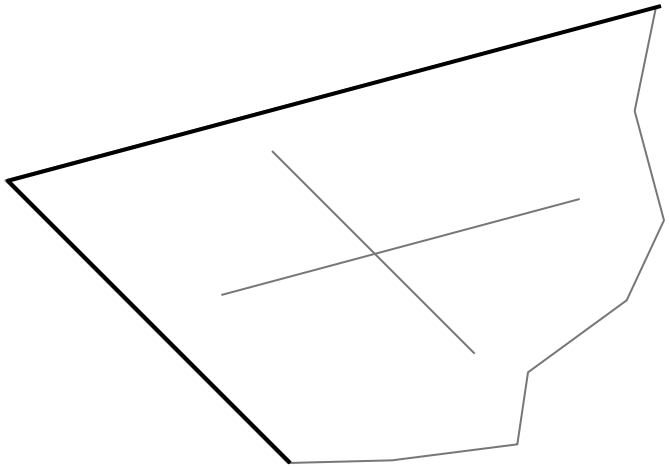
Tools	Shape to be drawn
1. T-square	Straight line
2. Triangles	
3. Compass	Arc, Circle
4. Circle template	

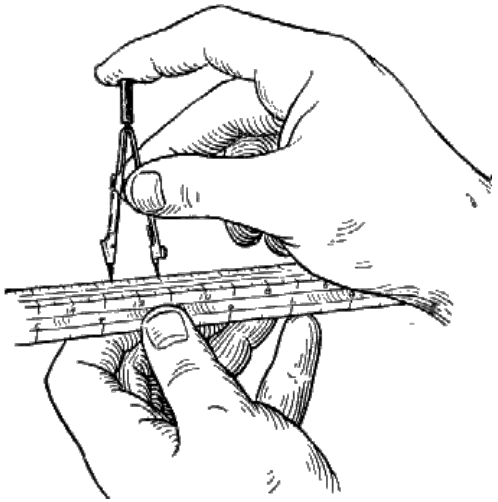
Using the Compass

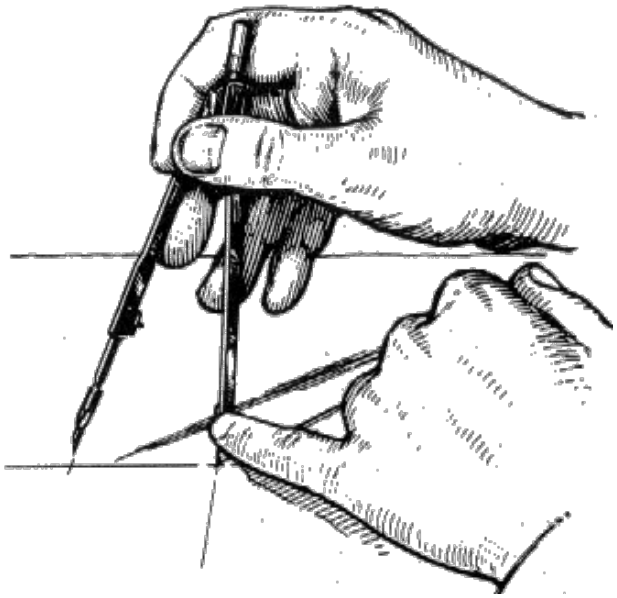
1. Locate the center of the circle by two intersecting lines.

2. Adjust the distance between needle and lead to a distance equal to radius of the circle.

3. Set the needle point at center.



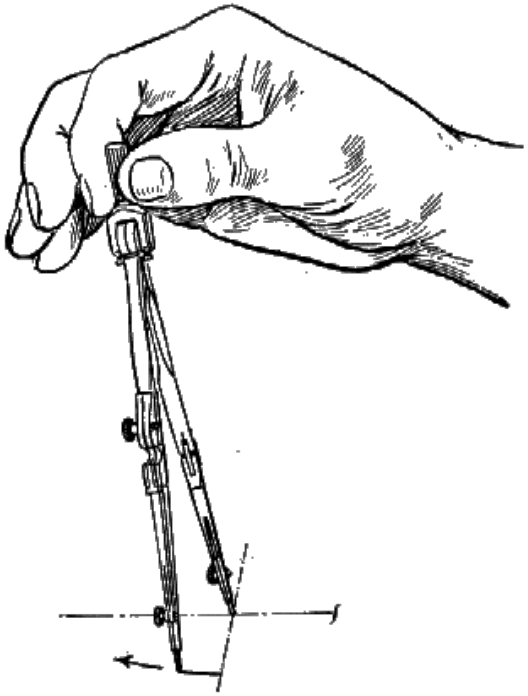


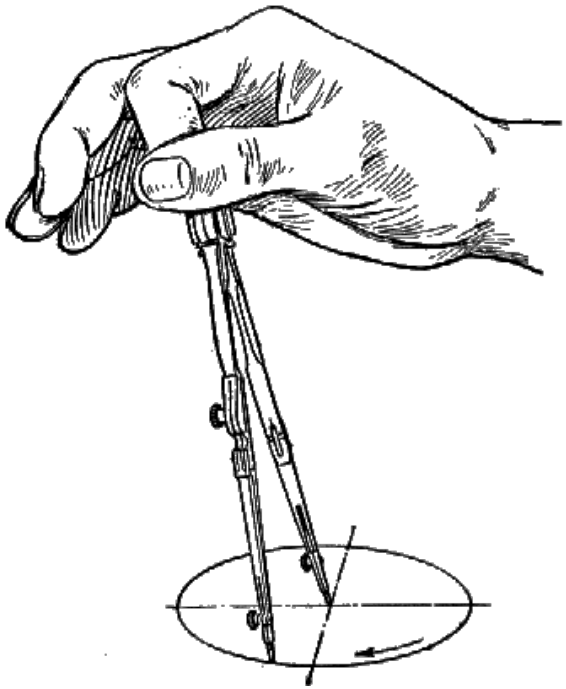


Using the Compass

4. ***Start circle.*** Apply enough pressure to the needle, holding compass handle between thumb and index fingers.

5. ***Complete circle***. Revolve handle clockwise.

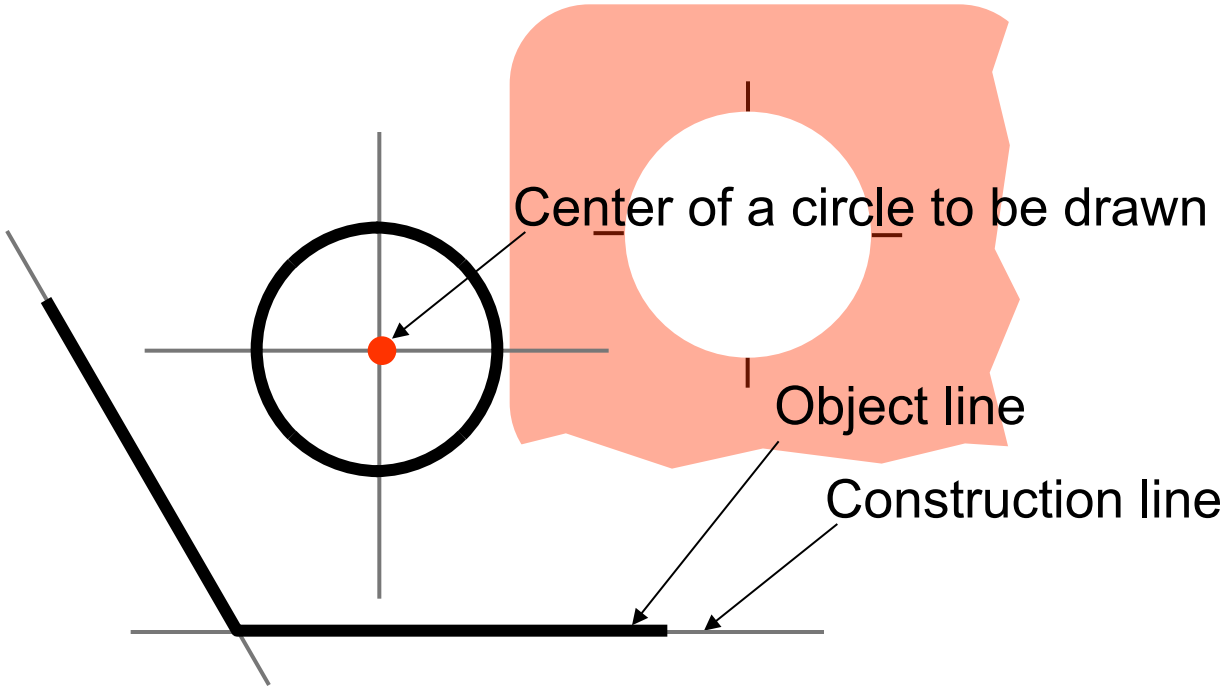




Using a Circle Template

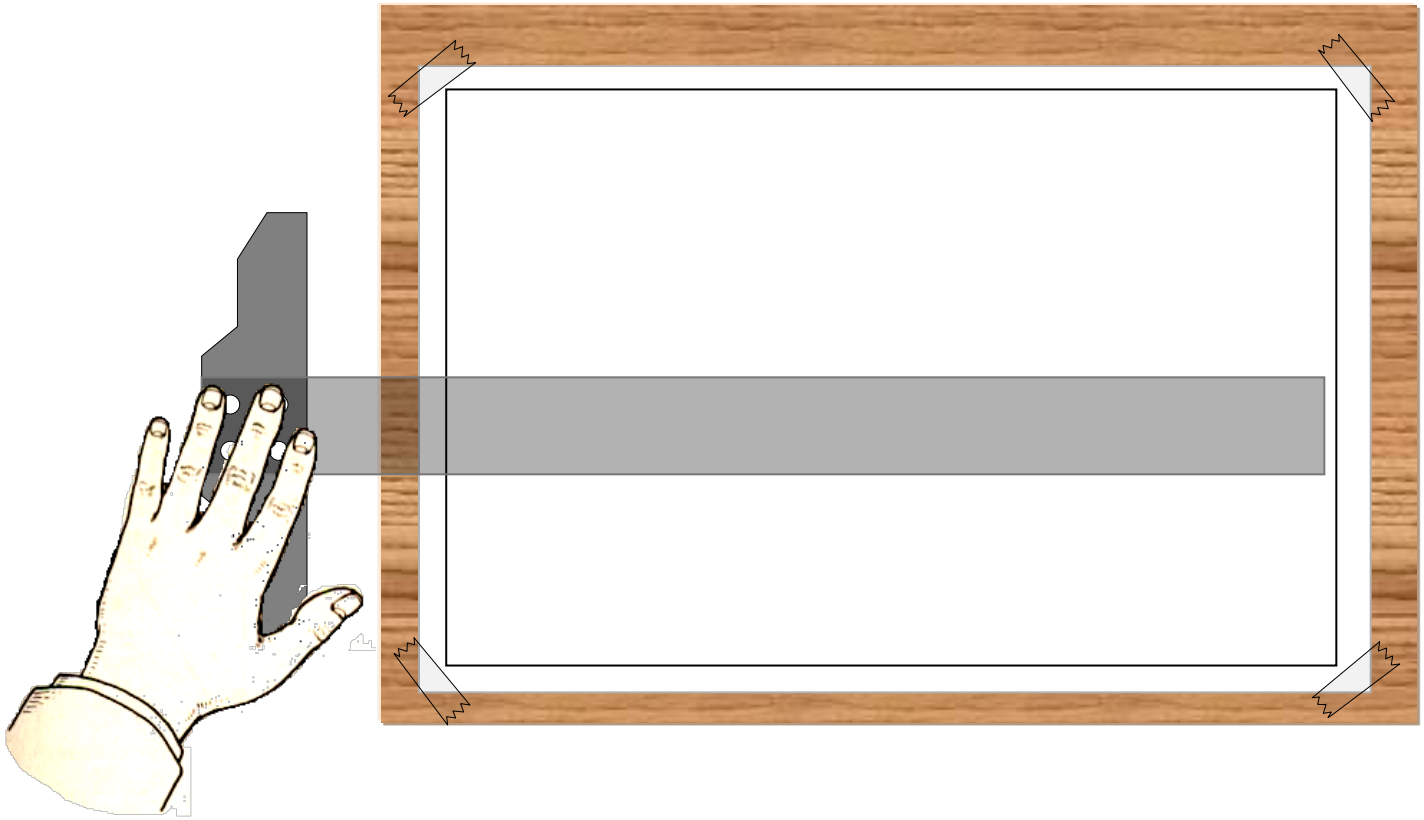
1. Draw two perpendicular lines that pass through center of a circle to be drawn.
2. Place the template till all marking coincide with center lines.
3. Tracing the circle. (Hold the pencil normal to the paper.)

Given



Draw a Horizontal Line

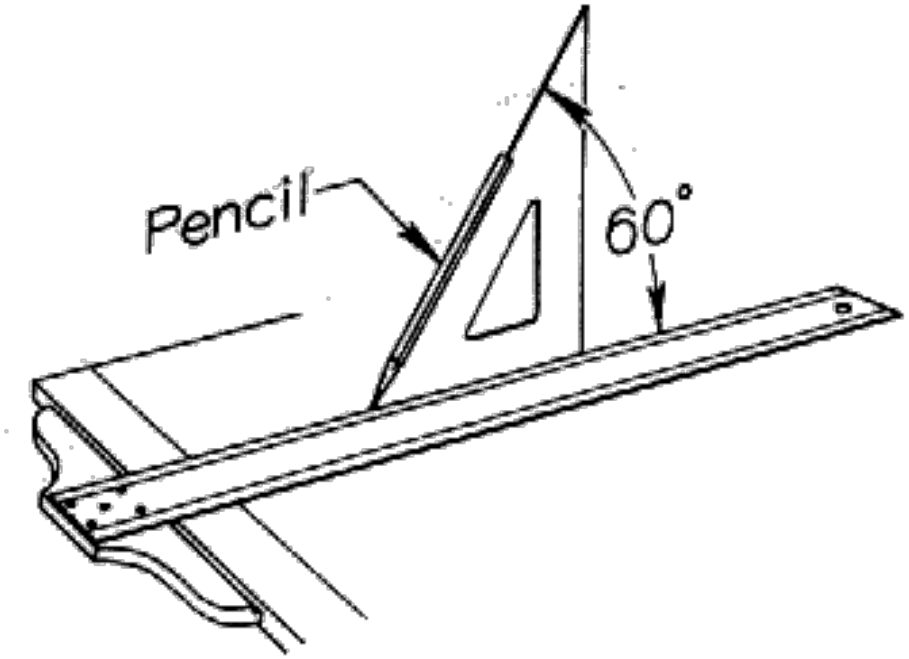
1. Press the T-square head against the left edge of the table.
2. Smooth the blade to the right.

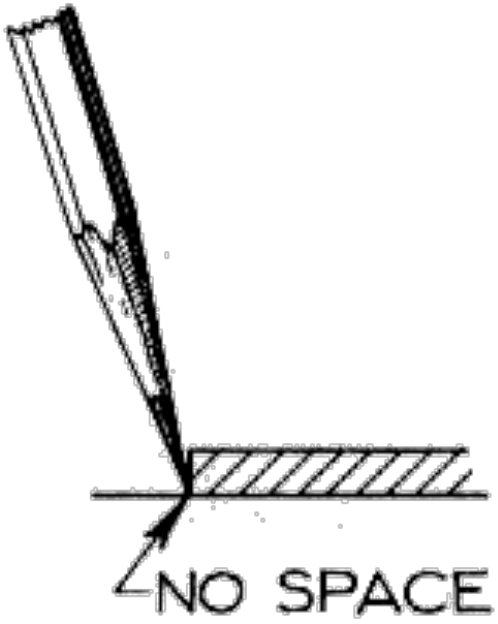


Draw a Horizontal Line

3. Lean the pencil at an angle about 60° with the paper in the direction of the line and slightly “toed in”.

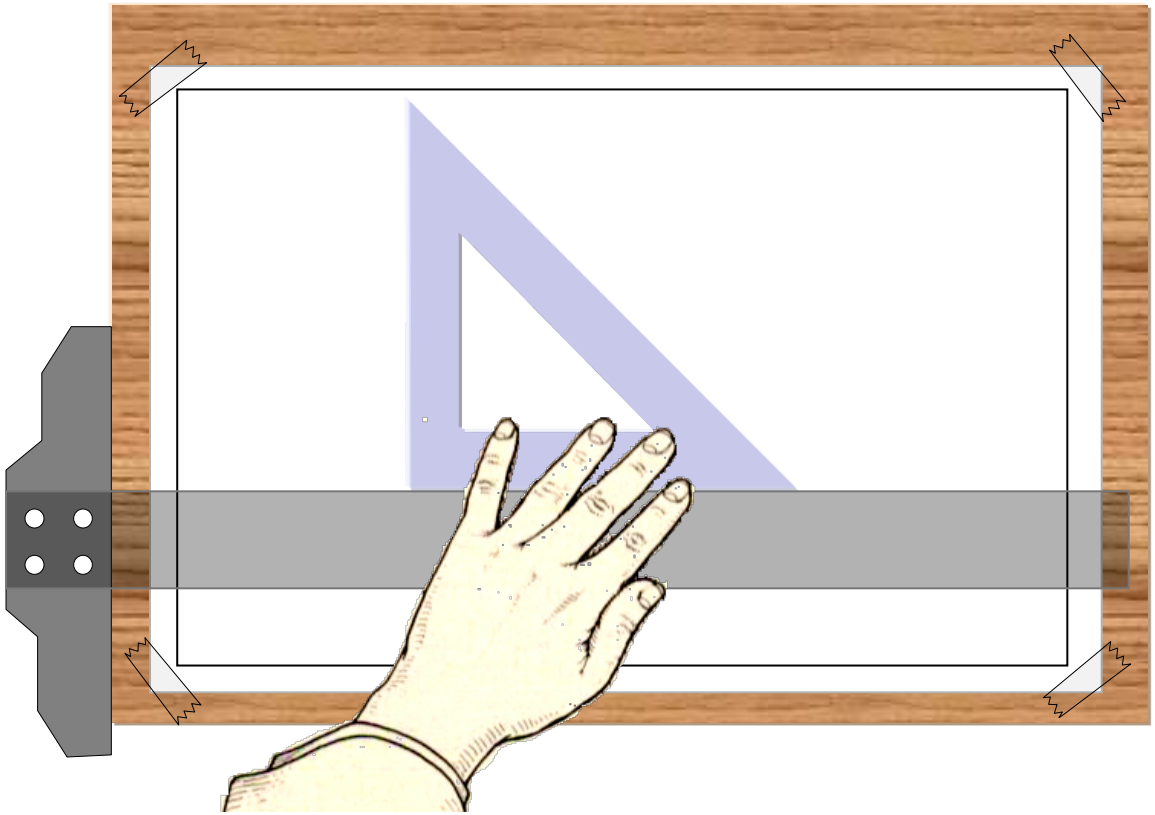
4. Draw the line from left to right while rotating the pencil slowly.





Draw a Vertical Line

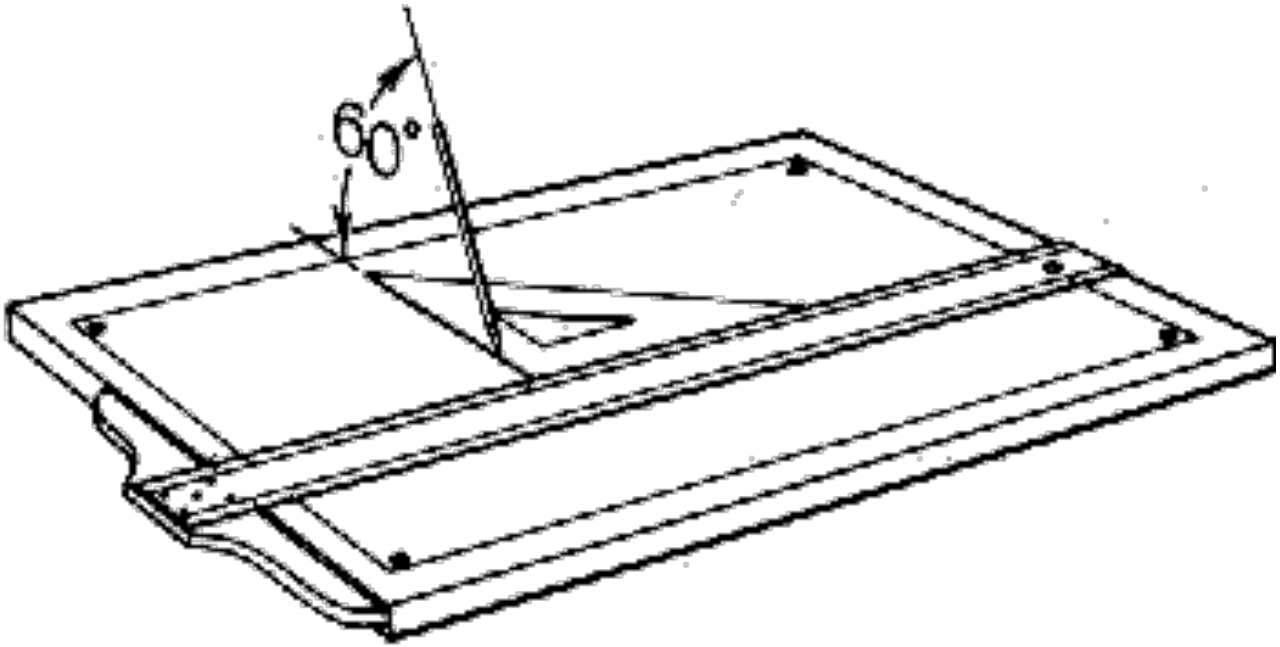
1. Set T-square as before. Place any triangle on T-square edge.
2. Slide your left hand to hold both T-square and triangle in position.



Draw a Vertical Line

3. Lean the pencil to the triangle.

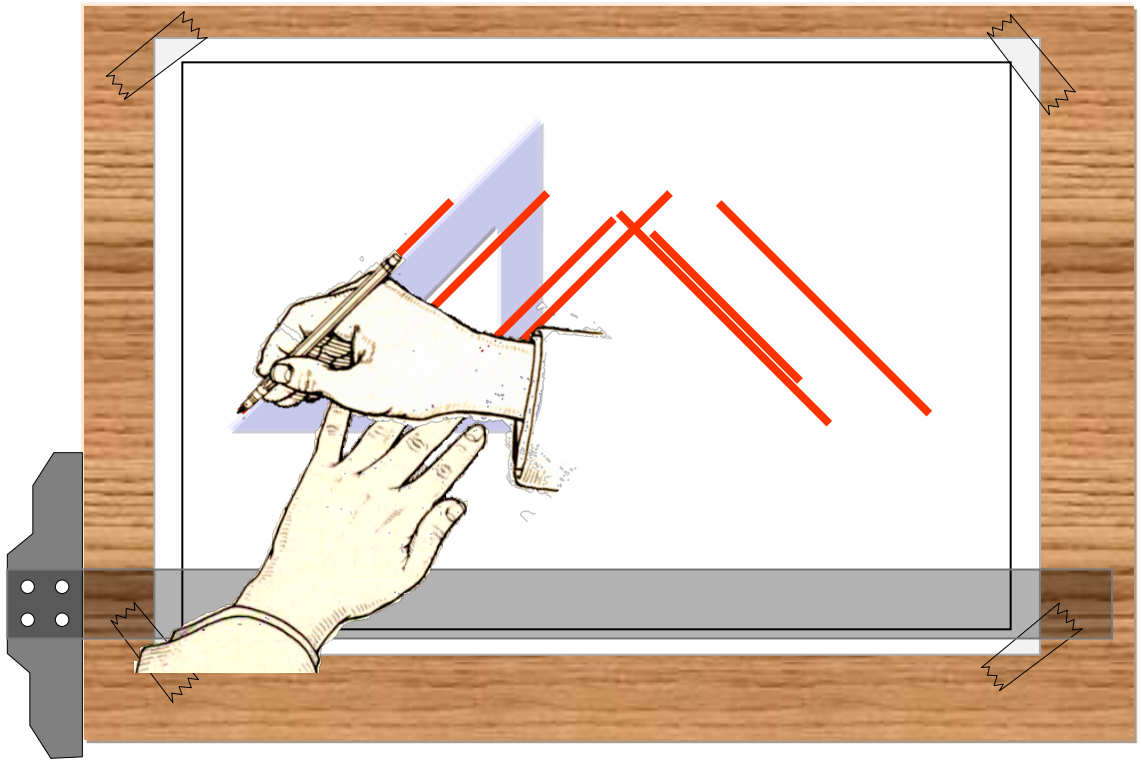
4. Draw the line upward while rotating the pencil slowly.



Draw a line at 45° with horizontal

1. Place 45° triangle on the T-square edge and press them firmly against the paper.

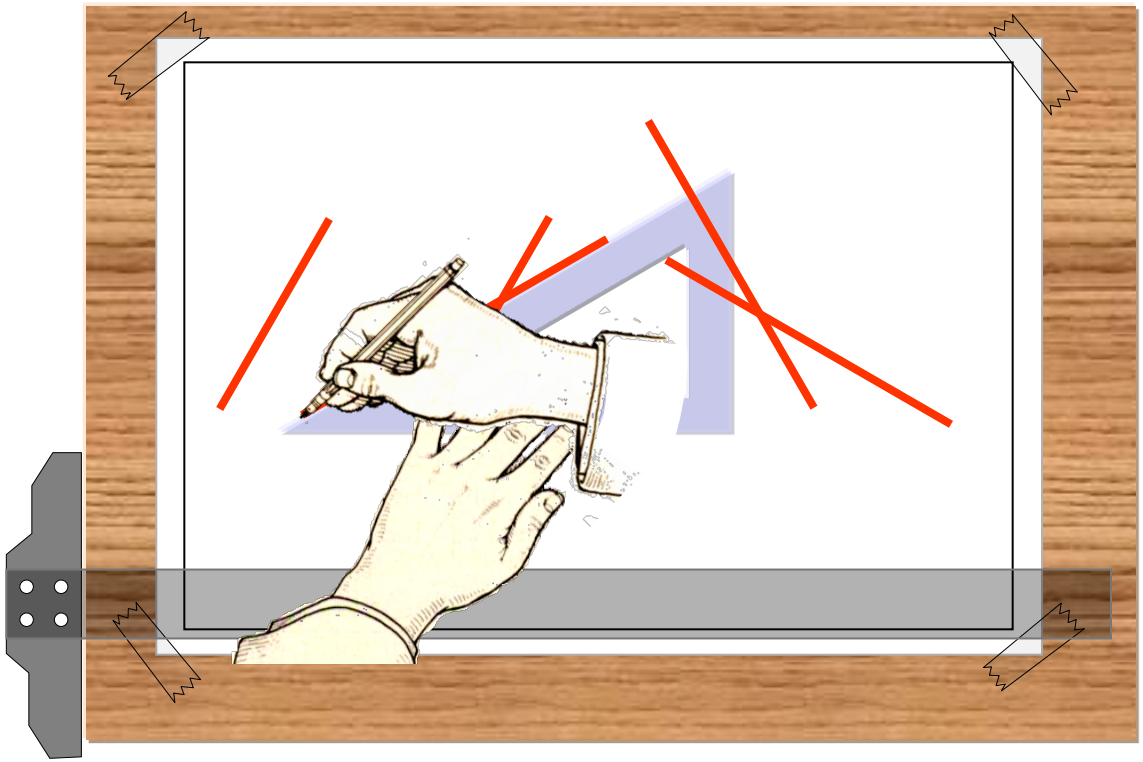
2. Draw the line in the direction as shown below.



Draw a line at angle 30° and 60°

1. Place 30°-60° triangle on the T-square edge and press them firmly against the paper.

2. Draw the line in the direction as shown below.



Draw the lines at 15° increment

0 deg.

15 deg. = –30 + 45 deg

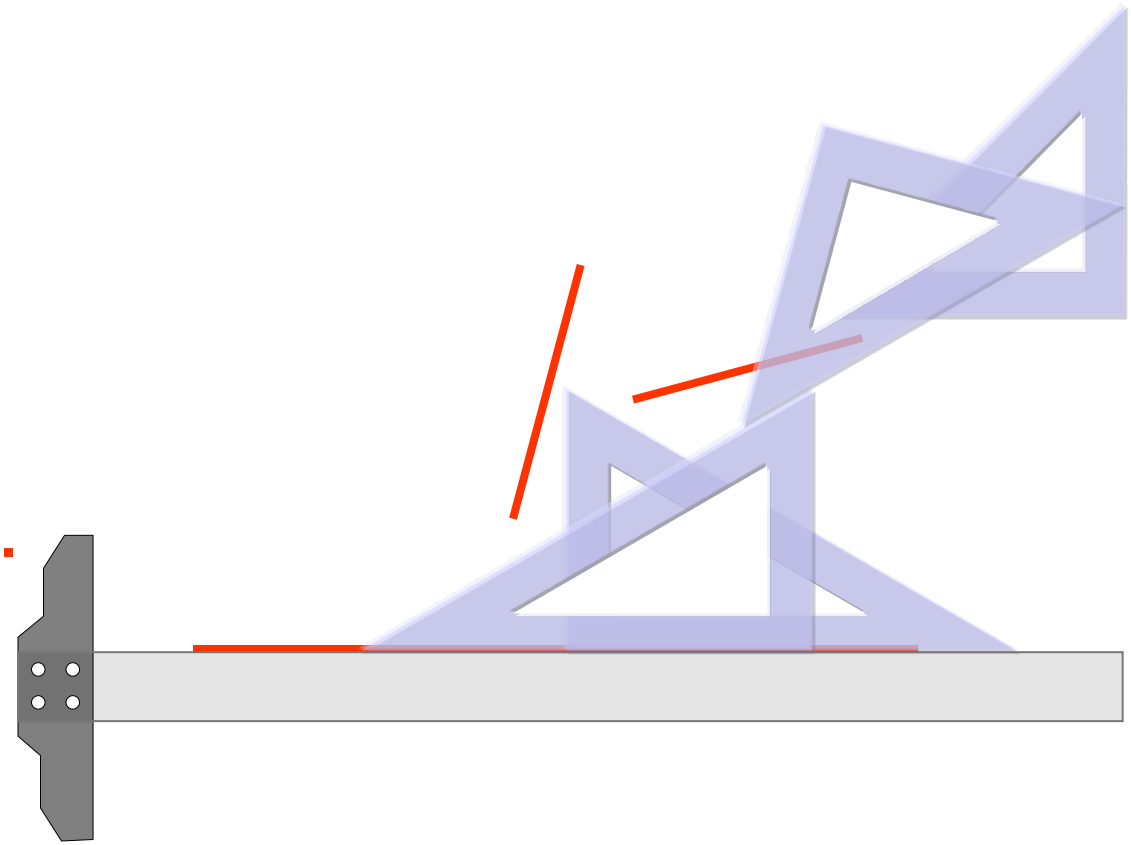
30 deg.

45 deg. Already demonstrated.

60 deg.

75 deg. = 30 + 45 deg

90 deg. Already demonstrated.



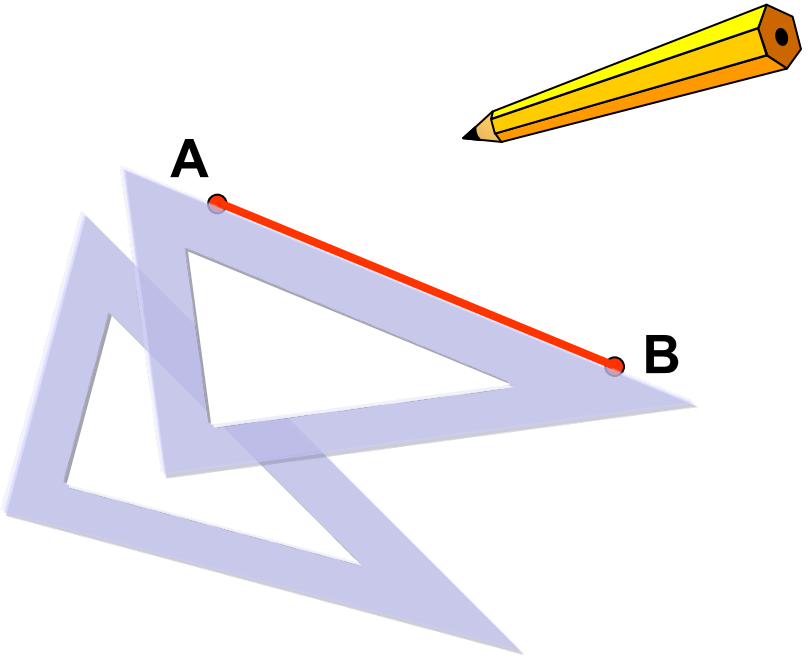
Draw the line passing through two given points

1. Place the pencil tip at one of the points.
2. Place the triangle against the pencil tip.
3. Swing the triangle around the pencil tip until its edge align with the second point.
4. Draw a line.

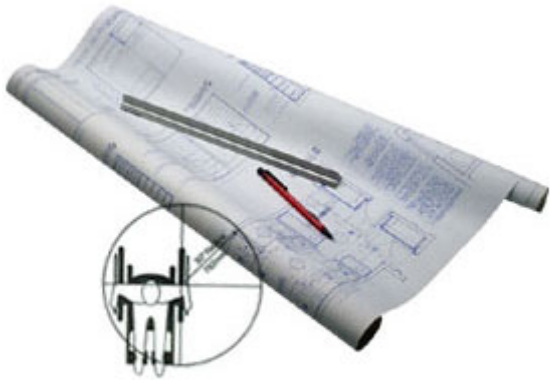
Given

A

B



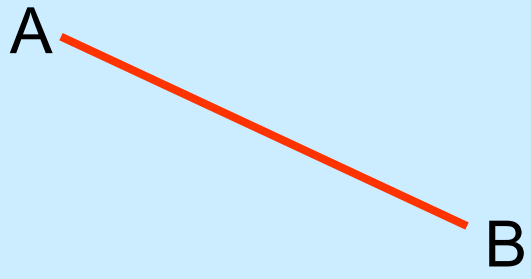
Applied Geometry

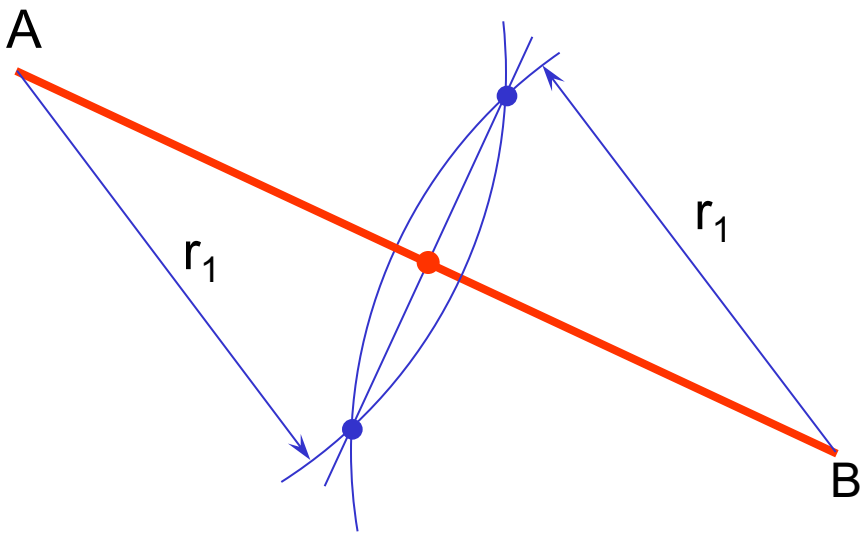


To Bisect a Line

1. Swing two arcs of any radius greater than half-length of the line with the centers at the ends of the line.
2. Join the intersection points of the arcs with a line.
3. Locate the midpoint.

Given



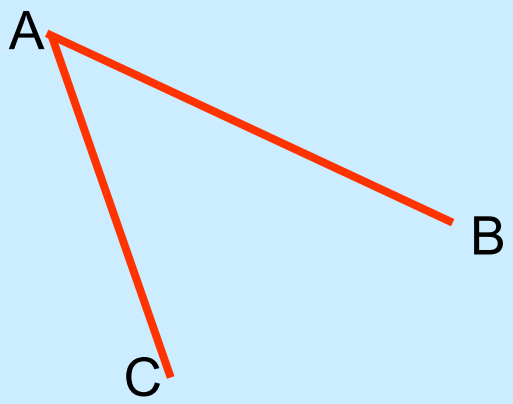


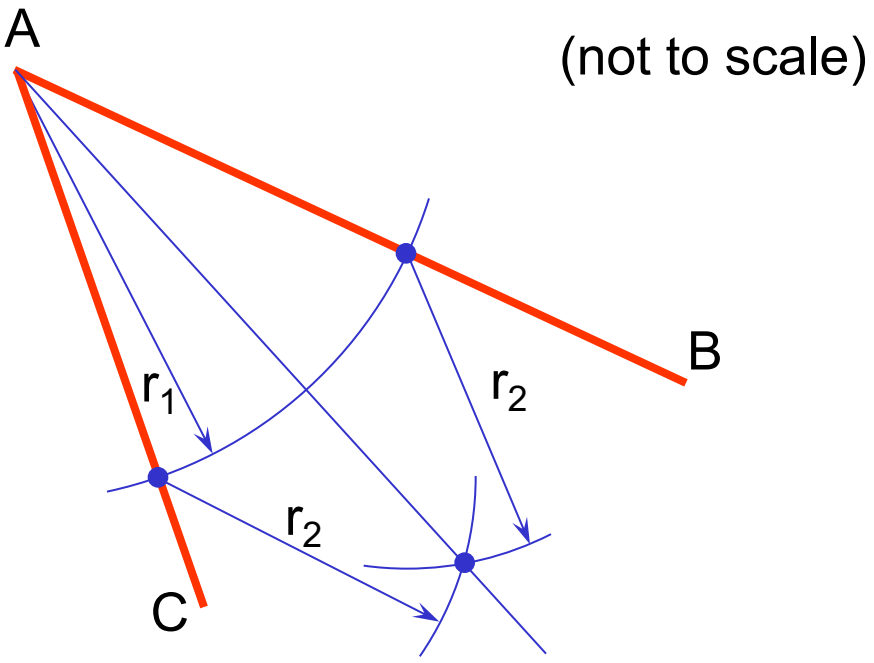
(not to scale)

To Bisect an Angle

1. Swing an arc of any radius whose centers at the vertex.
2. Swing the arcs of any radius from the intersection points between the previous arc and the lines.
3. Draw the line.

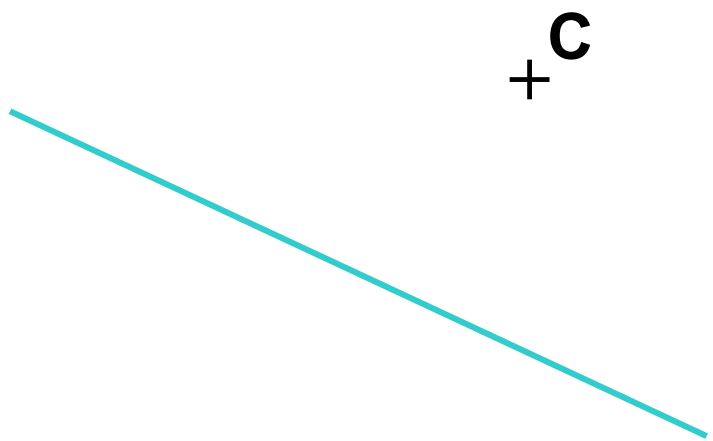
Given





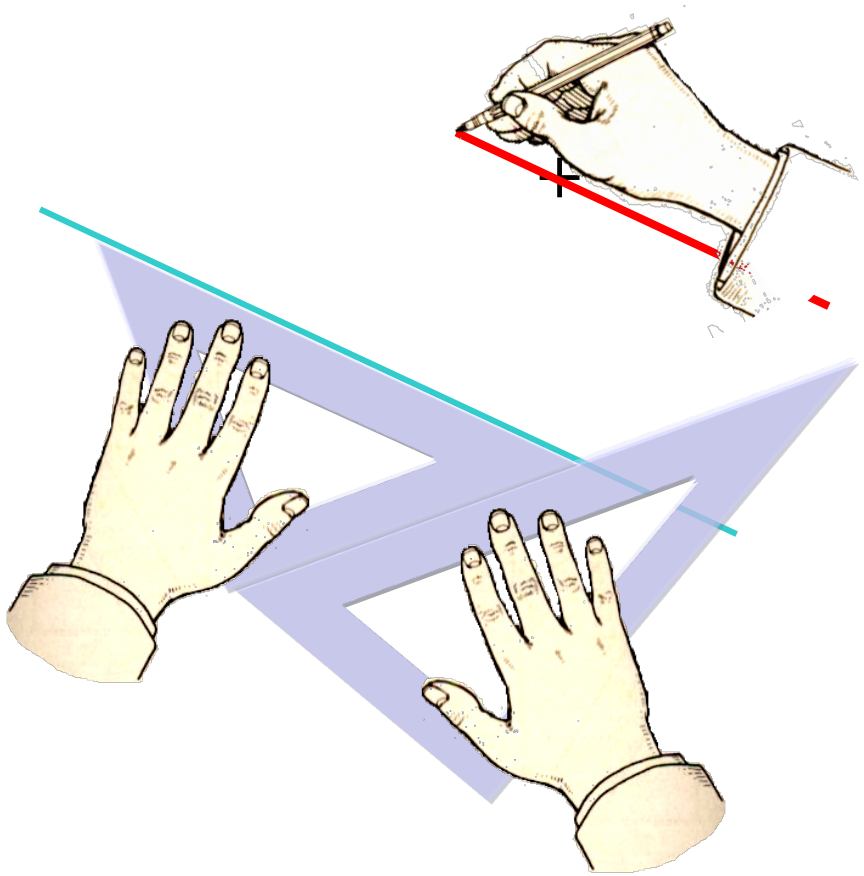
To draw the line parallel to a given line and passes through a given point

Given



To draw the line parallel to a given line and passes through a given point

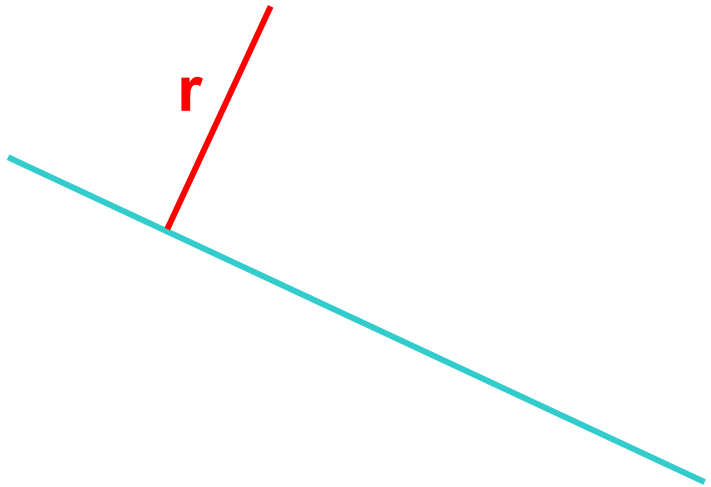
Given



Repeat

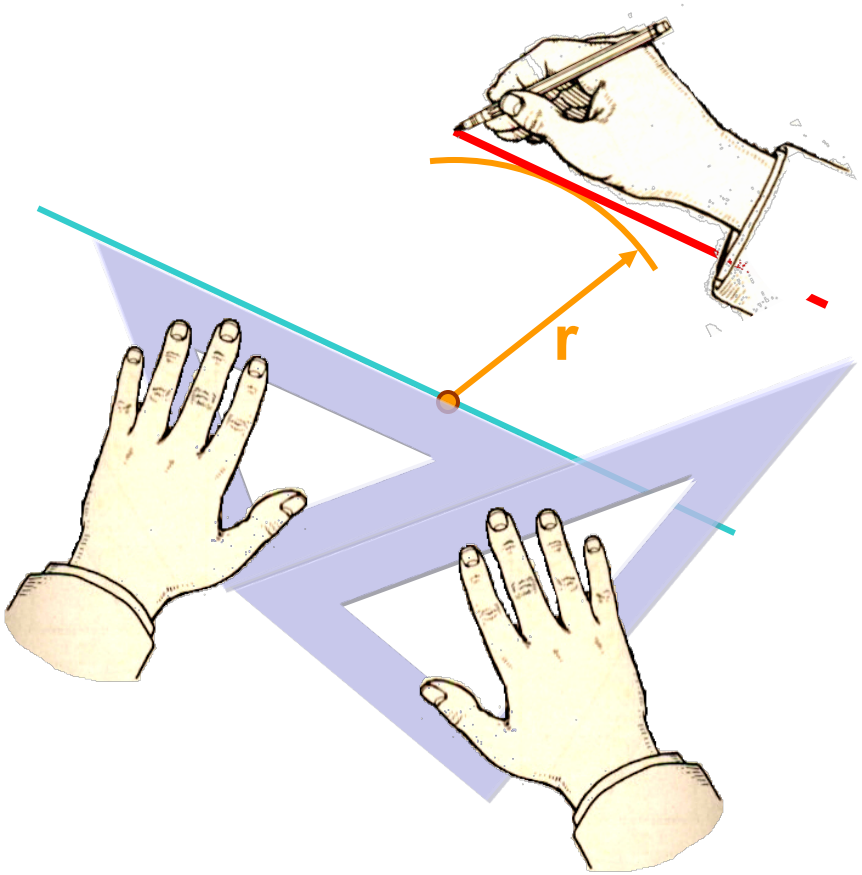
To draw the line parallel to a given line with a specified distance

Given distance = r



To draw the line parallel to a given line with a specified distance

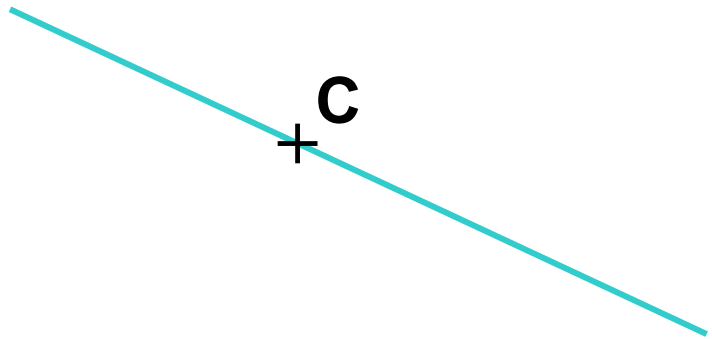
Given distance = r



Repeat

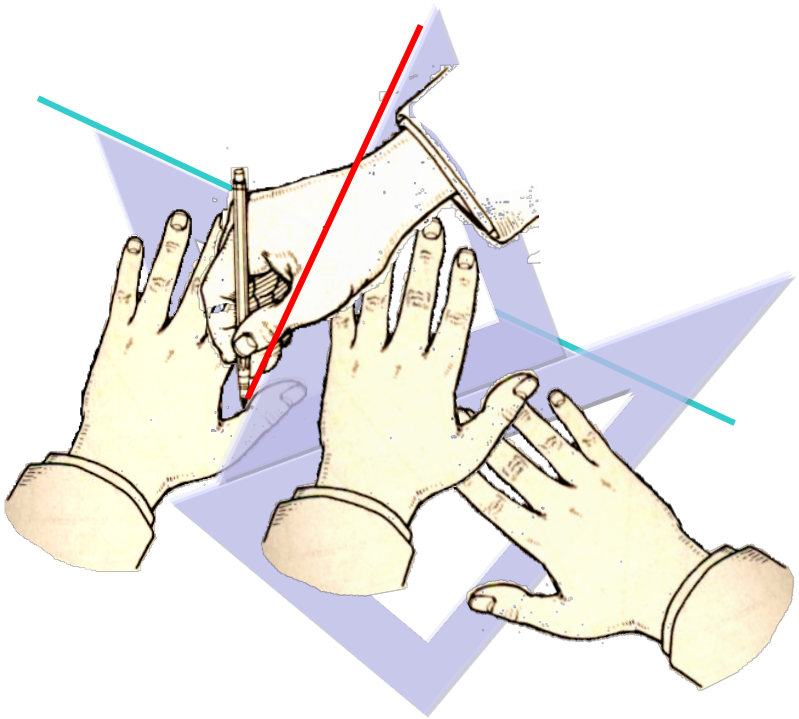
To draw the line perpendicular to a given line at a given point

Revolve method



To draw the line perpendicular to a given line at a given point

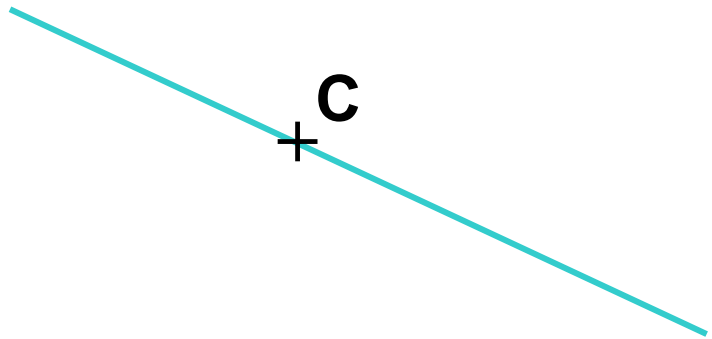
Revolve method



Repeat

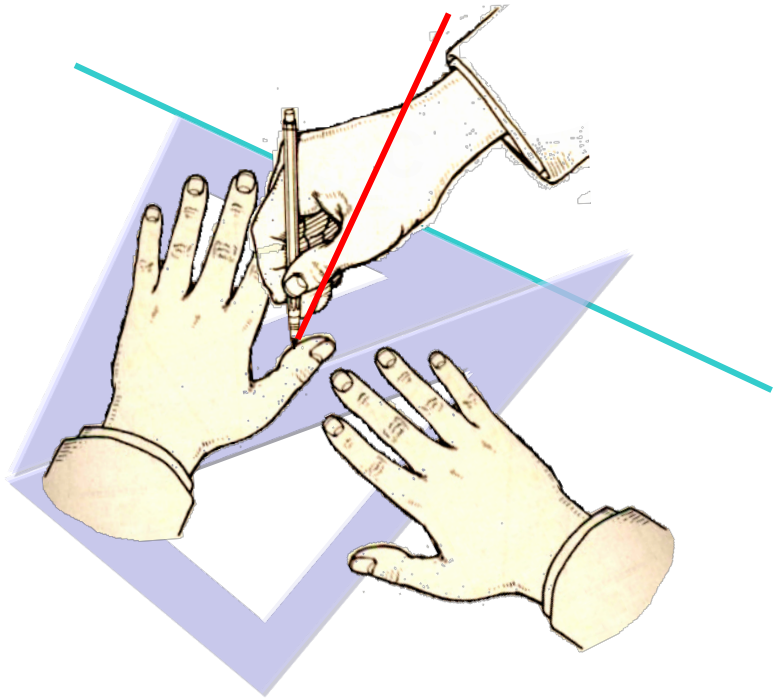
To draw the line perpendicular to a given line at a given point

Adjacent-sides method



To draw the line perpendicular to a given line at a given point

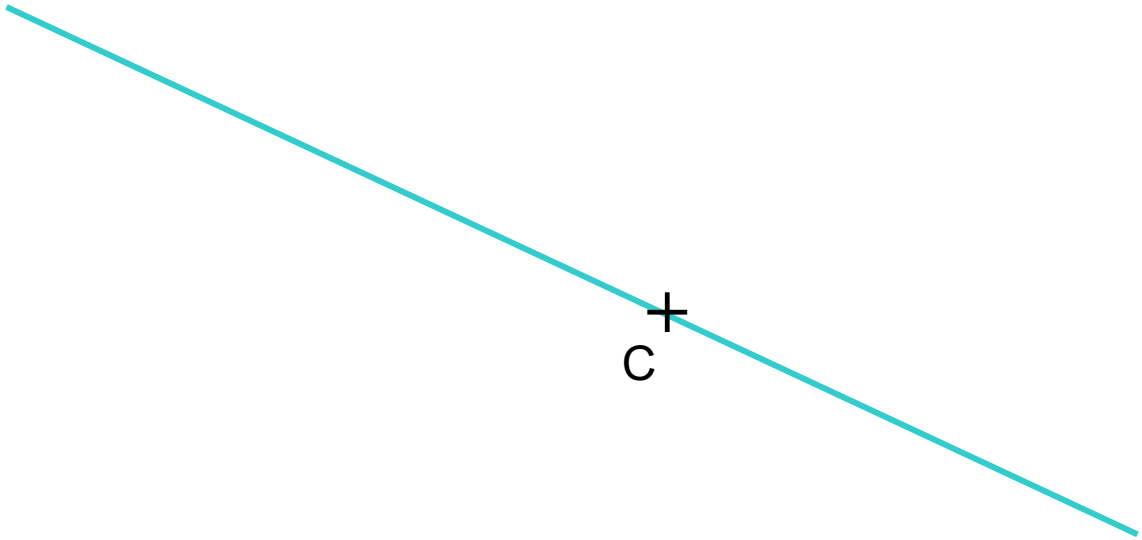
Adjacent-sides method



Repeat

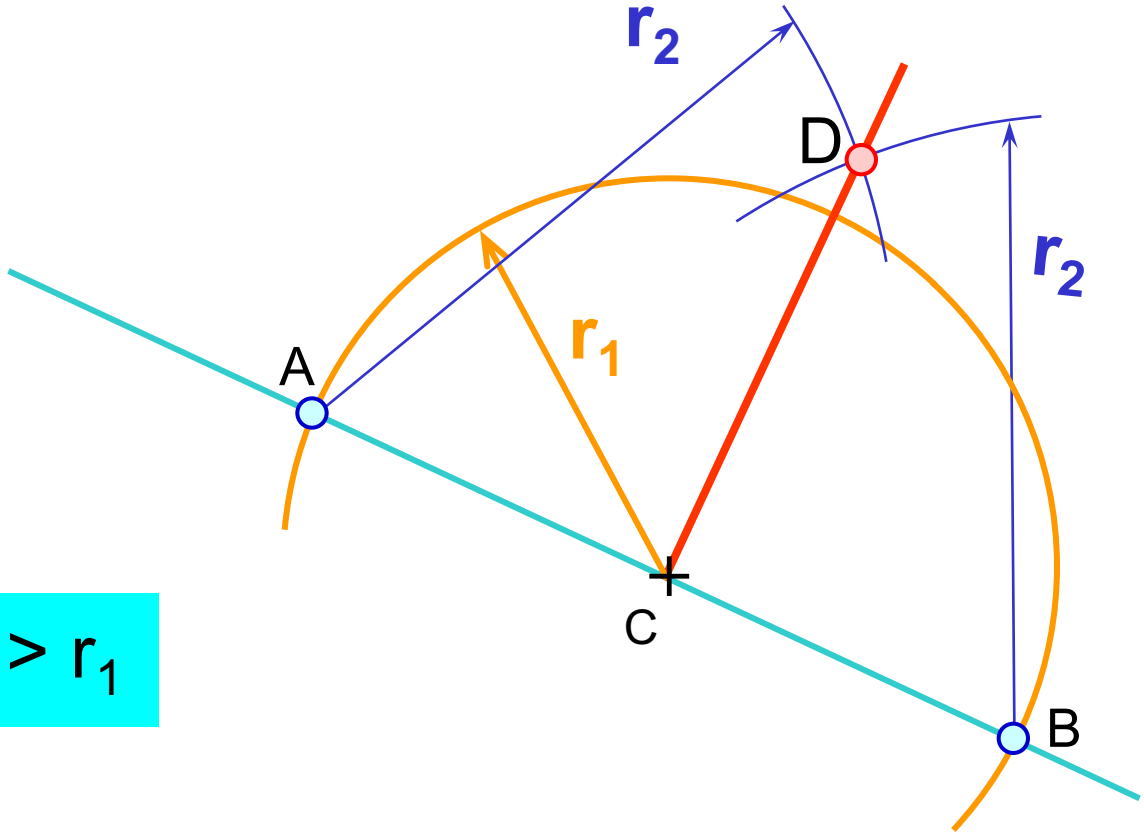
To draw the line perpendicular to a given line at a given point

Using Compass



To draw the line perpendicular to a given line at a given point

Using Compass

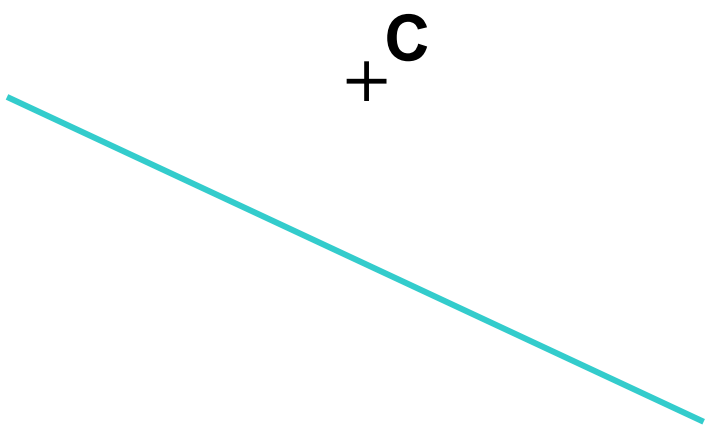


$r_2 > r_1$

Repeat

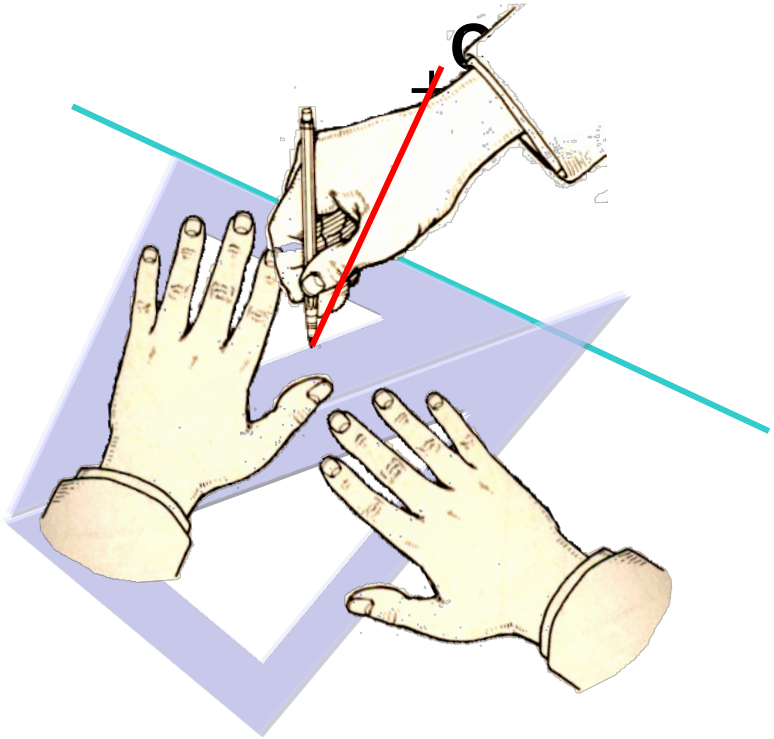
To draw the line perpendicular to a given line from a point not on the line

Adjacent-sides method



To draw the line perpendicular to a given line from a point not on the line

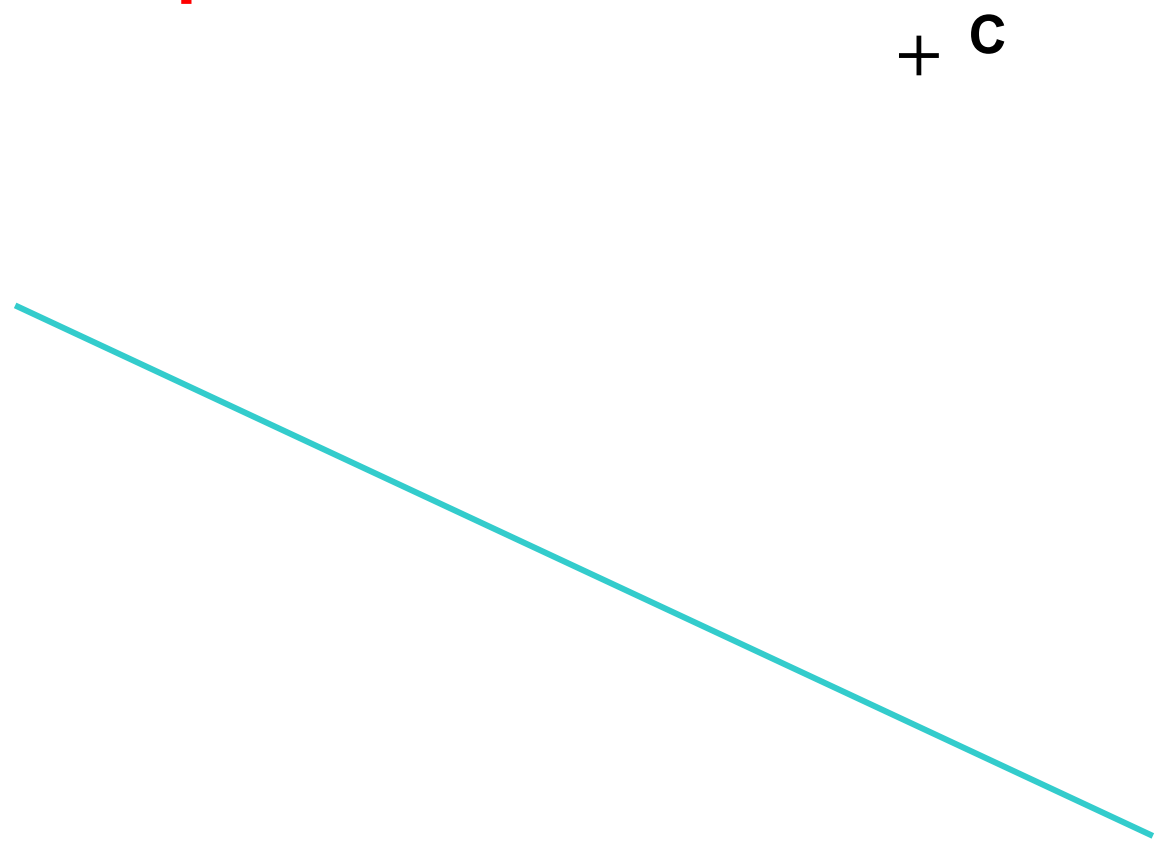
Adjacent-sides method



Repeat

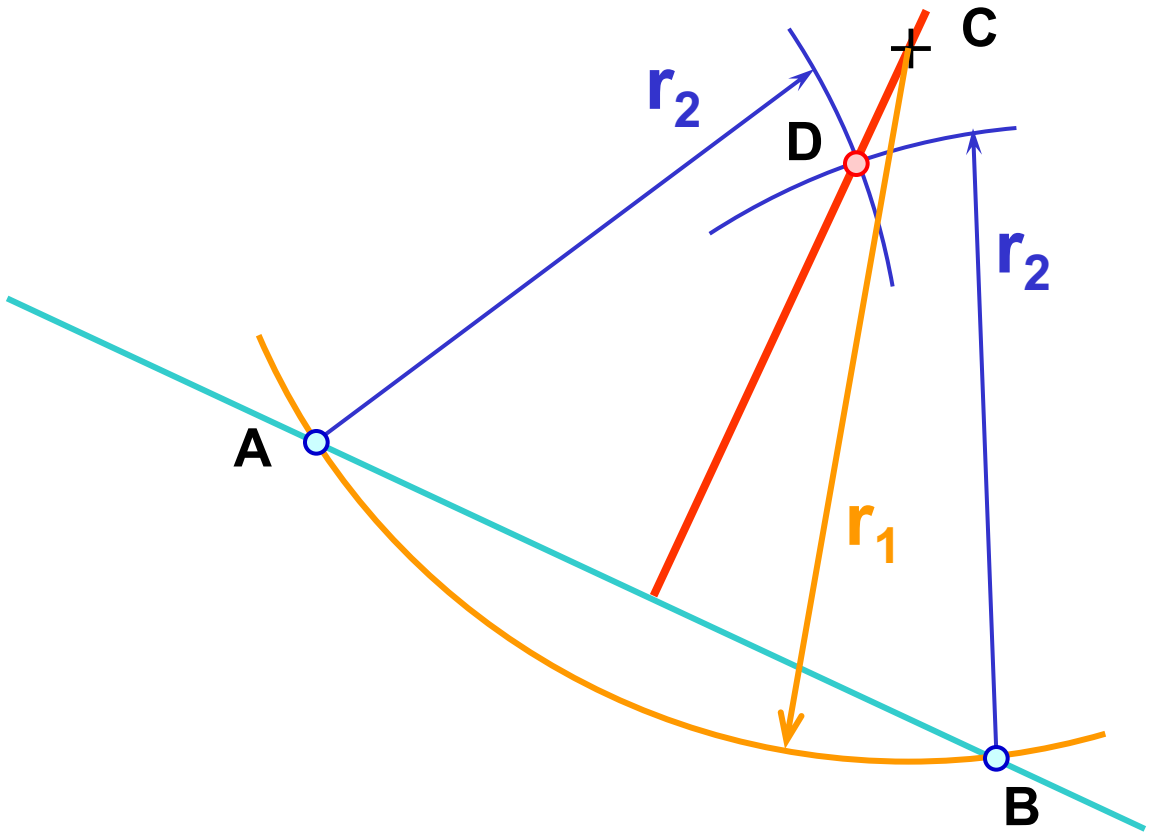
To draw the line perpendicular to a given line from a point not on the line

Using compass



To draw the line perpendicular to a given line from a point not on the line

Using compass

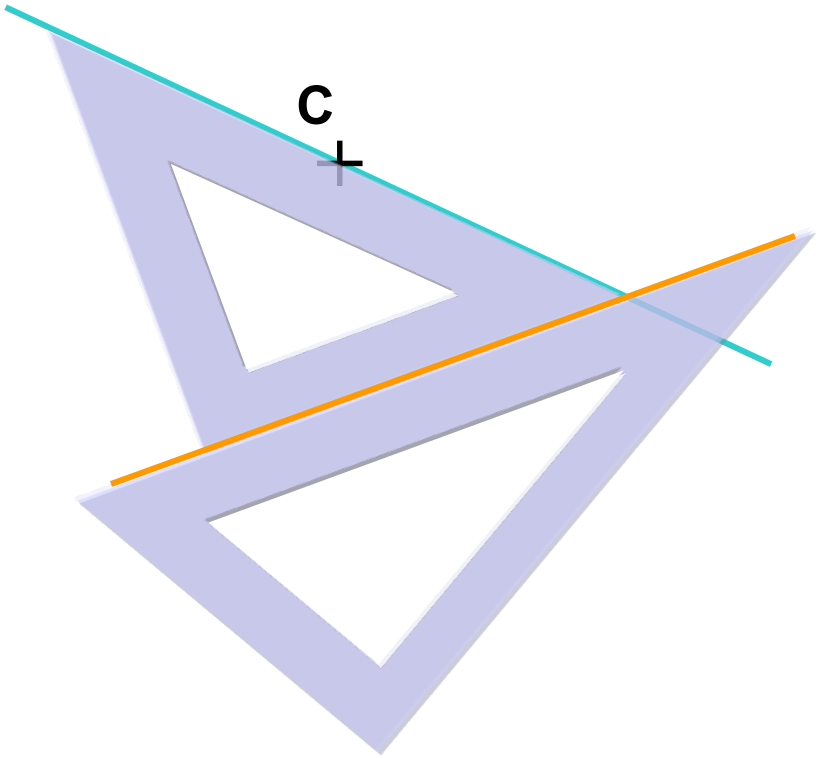


Note:
You can also use revolve method. How ? Try by yourself !!!

Repeat

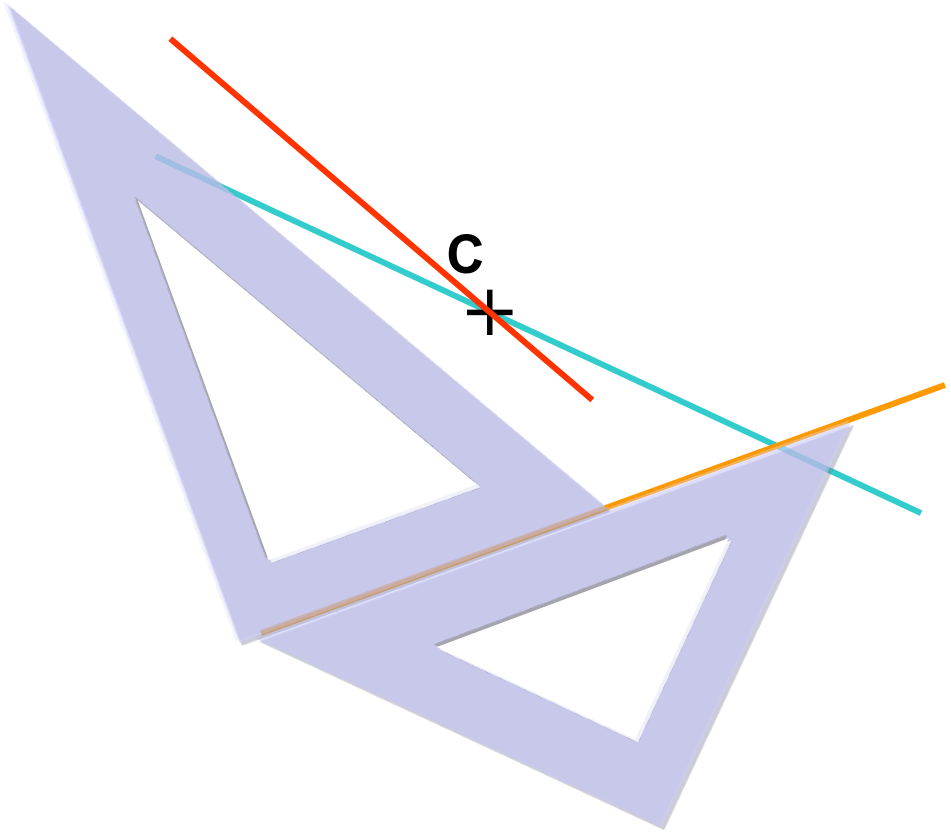
To draw a line making 15º with a given line and pass through a given point.

Given



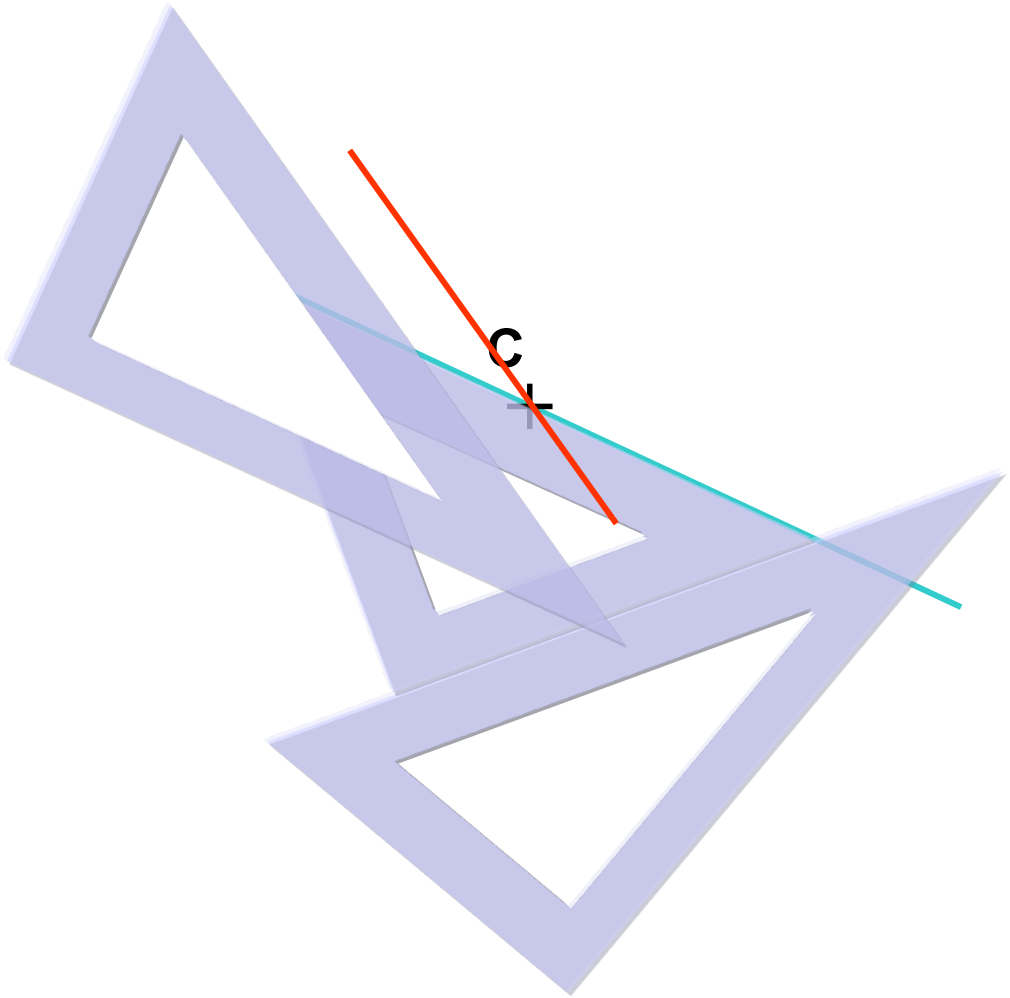
To draw a line making 15º with a given line and pass through a given point.

Given



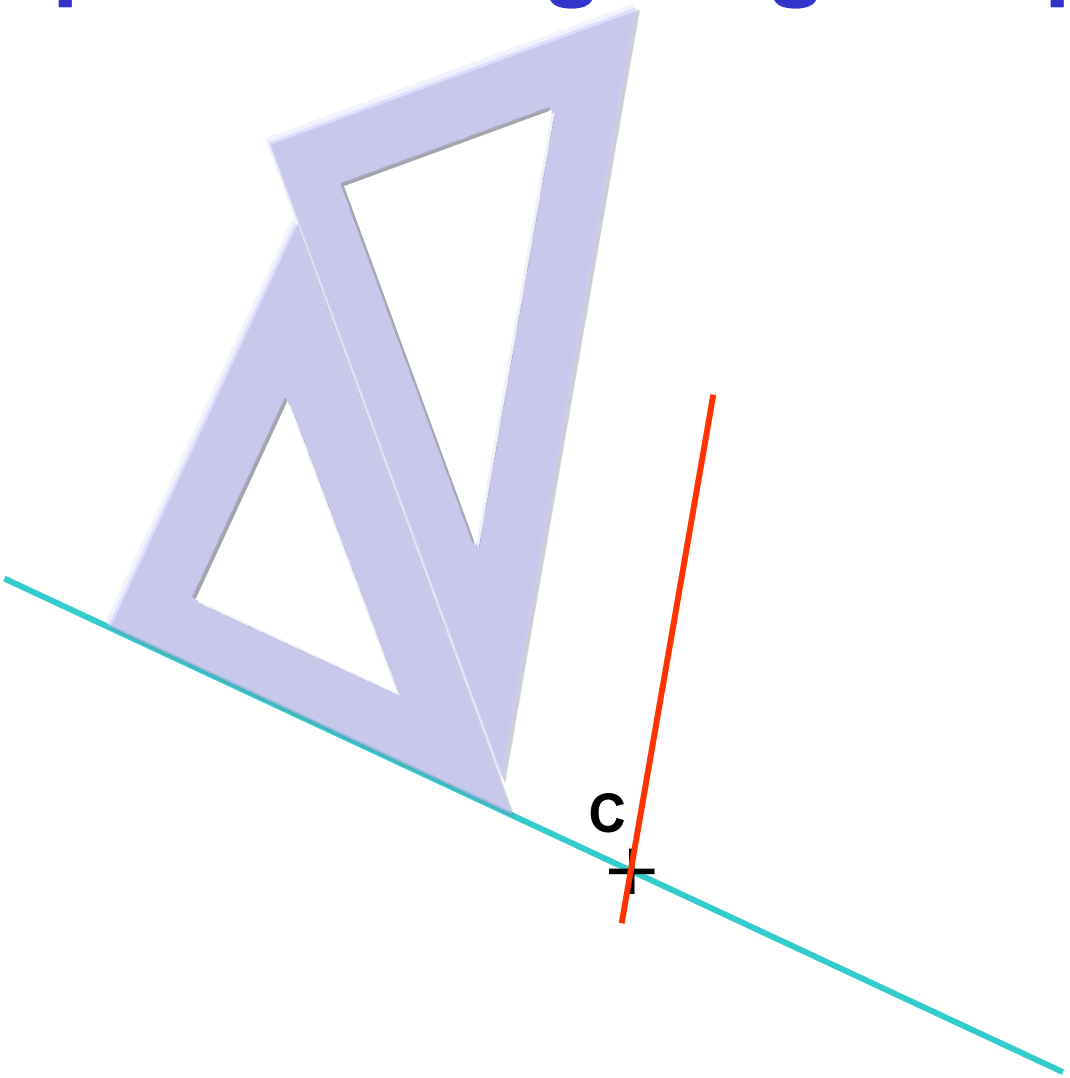
To draw a line making 30° with a given line and pass through a given point.

Given

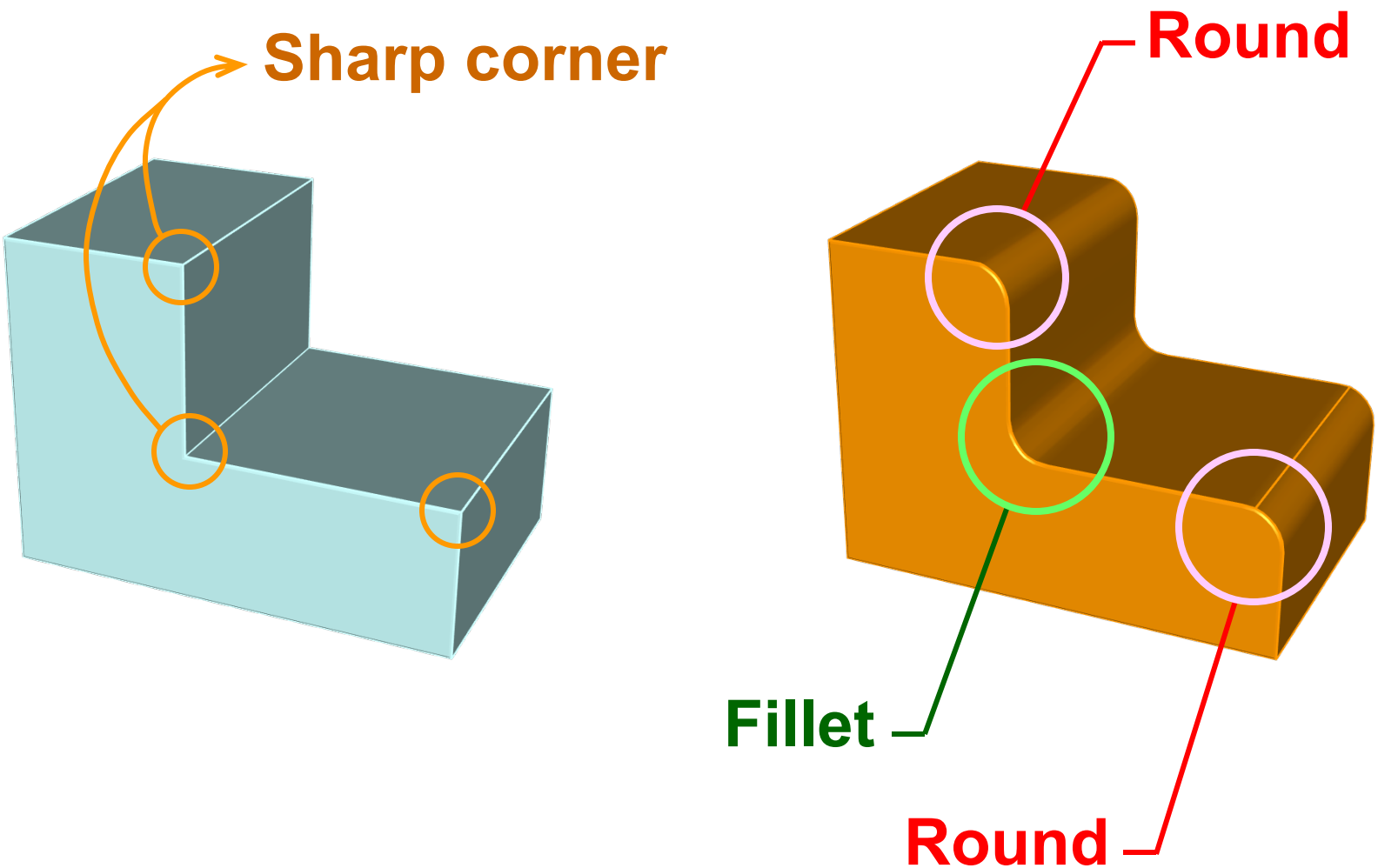


To draw a line making 75º with a given line and pass through a given point.

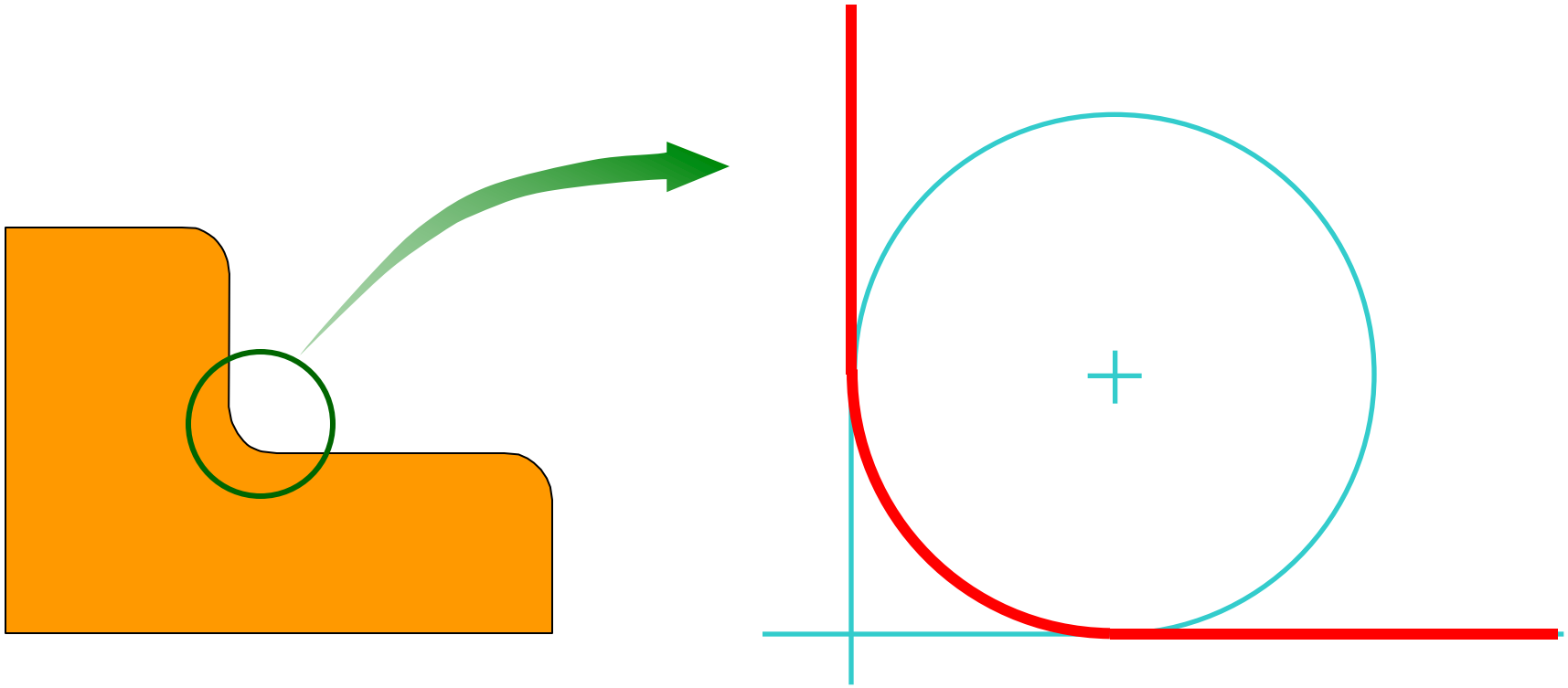
Given



FILLET AND ROUND



FILLET AND ROUND

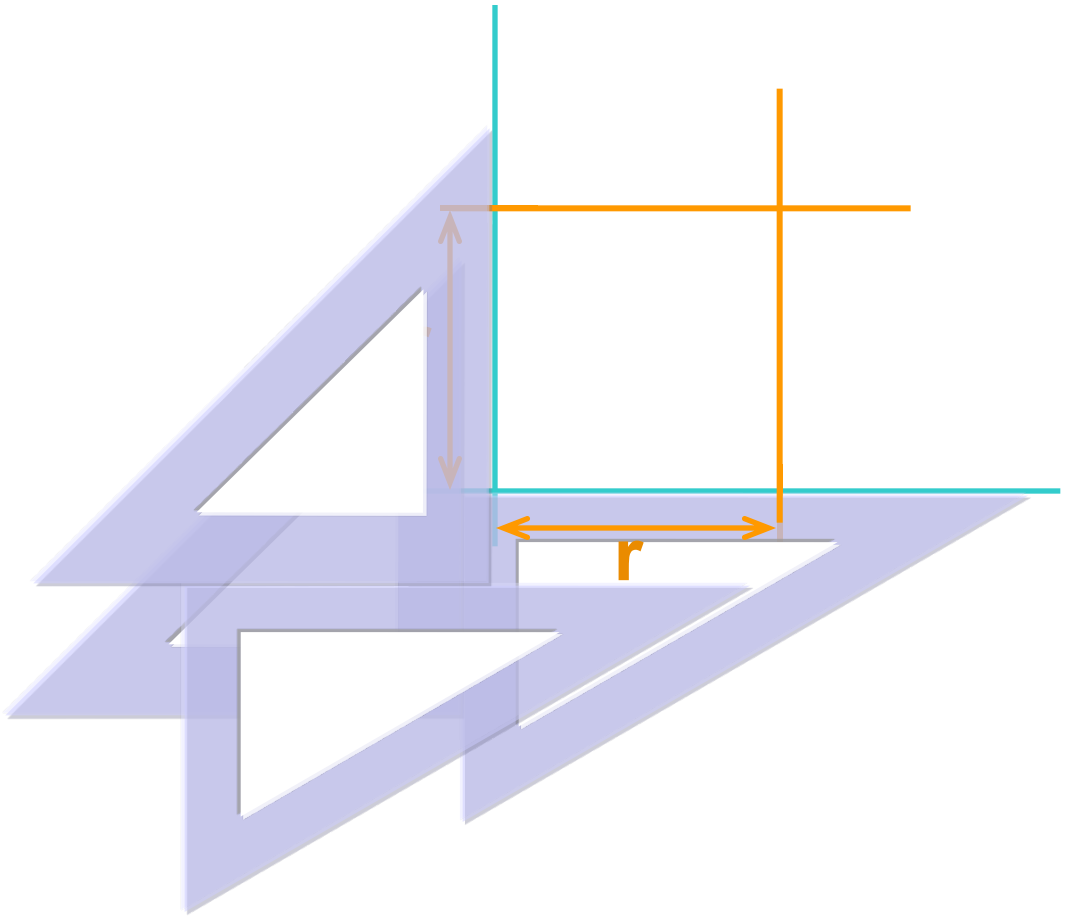


To draw the arc, we must find the location of the center of that arc.

How do we find the center of the arc?

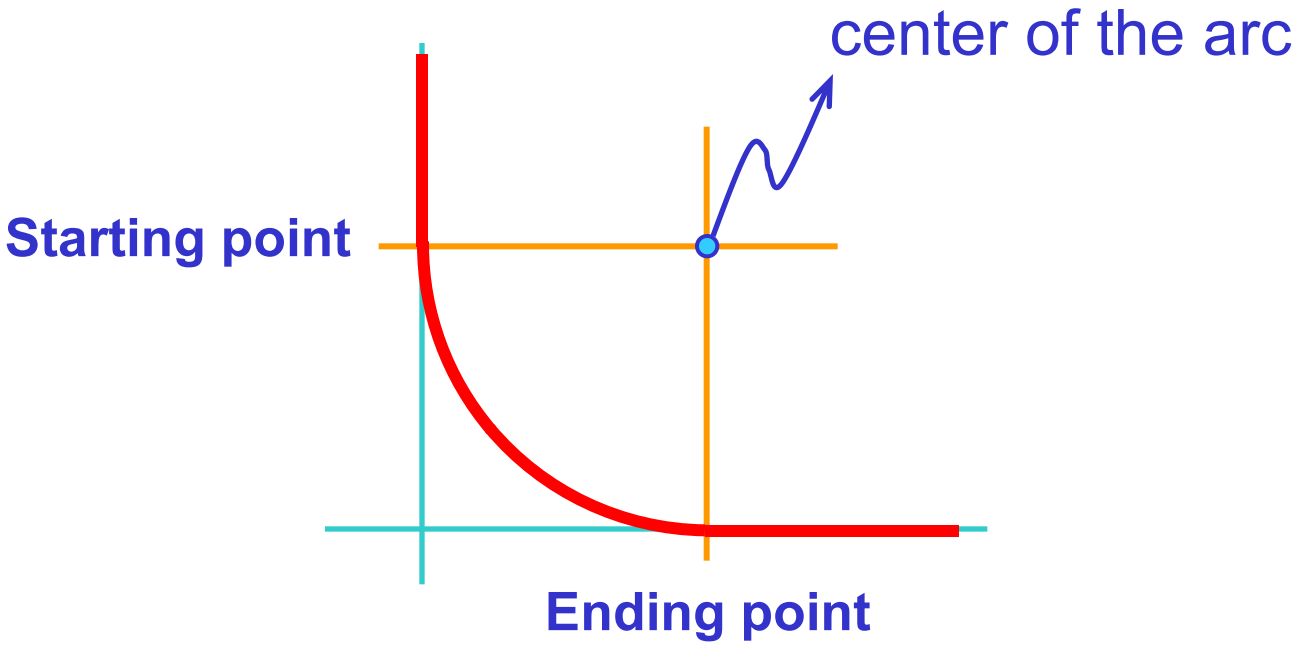
To draw an arc of given radius tangent to two perpendicular lines

Given arc radius r



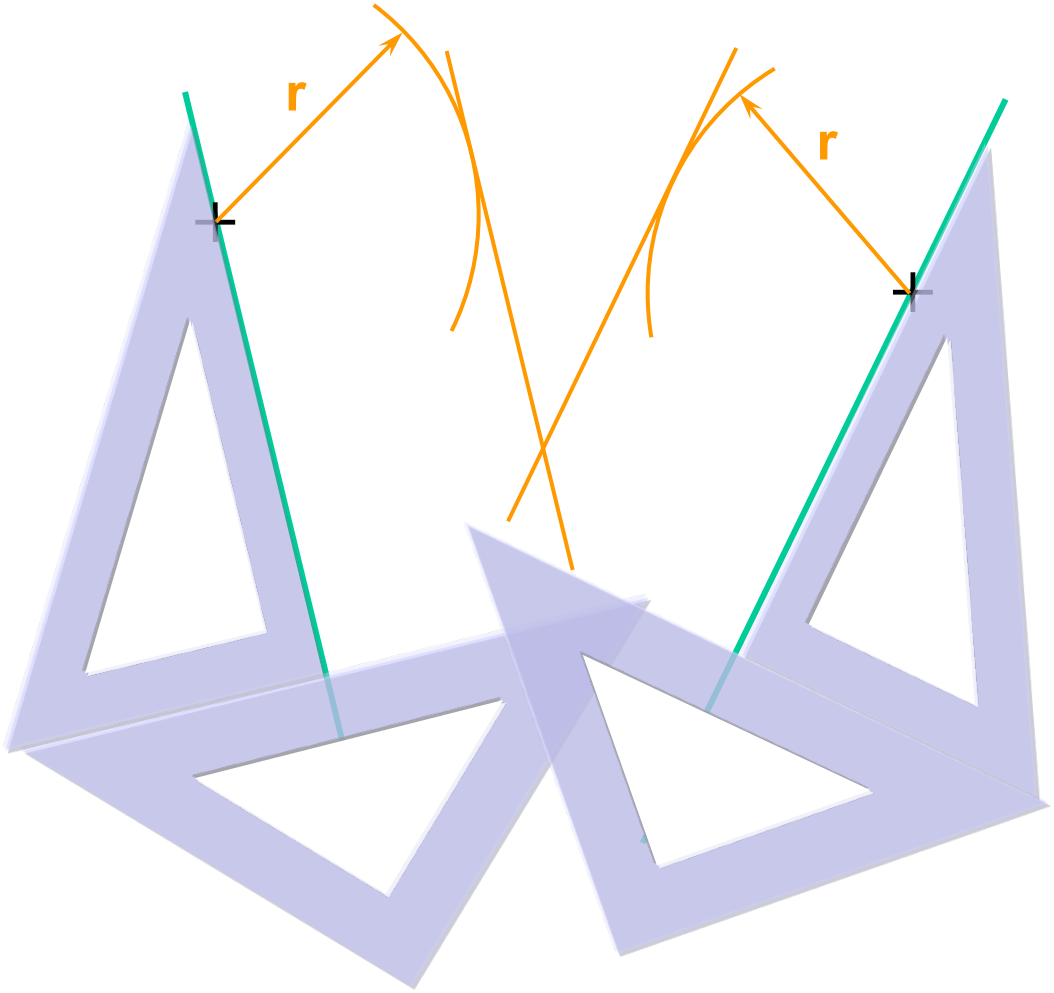
To draw an arc of given radius tangent to two perpendicular lines

Given arc radius r



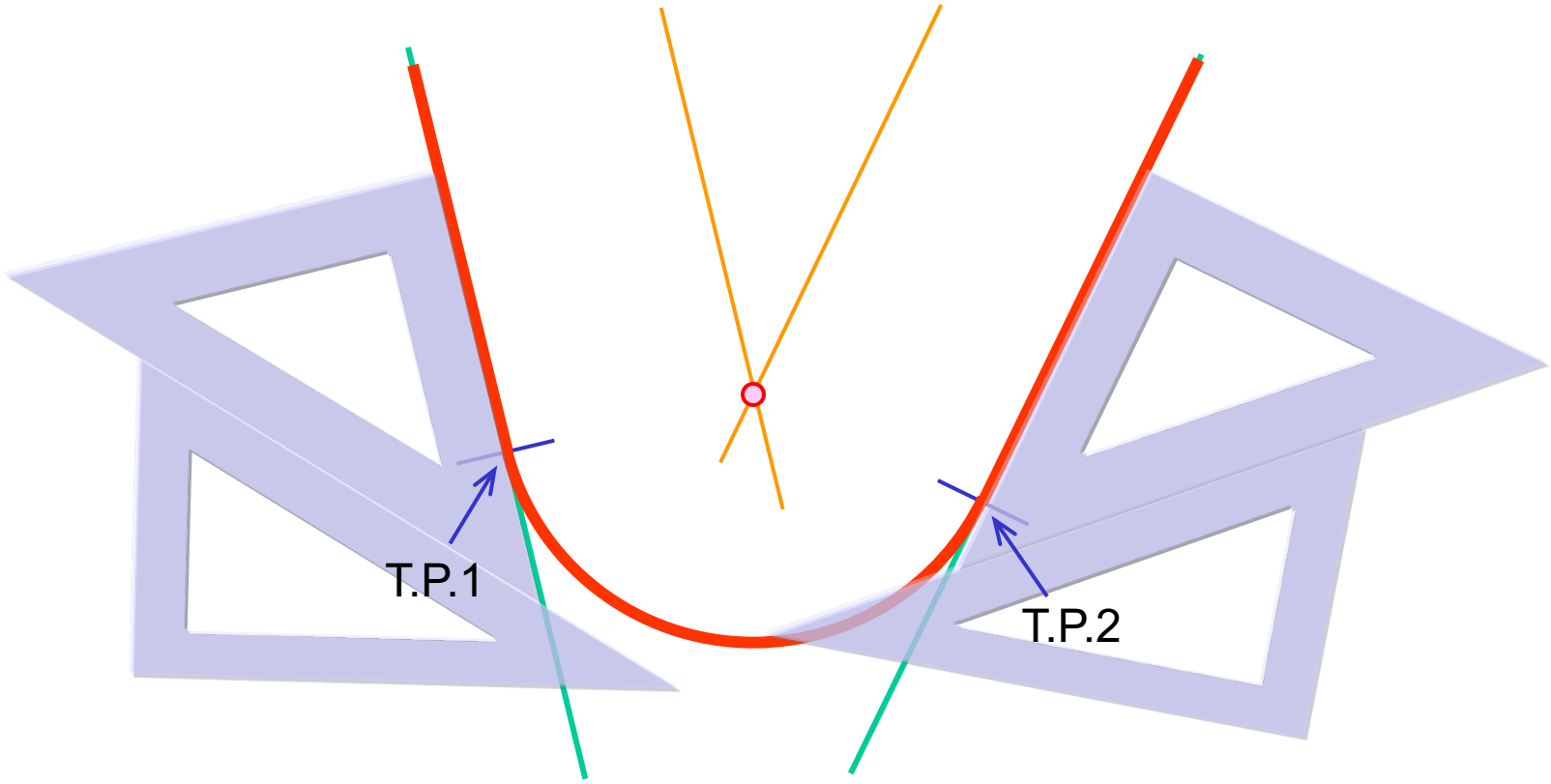
To draw an arc of given radius tangent to two lines

Given arc radius r



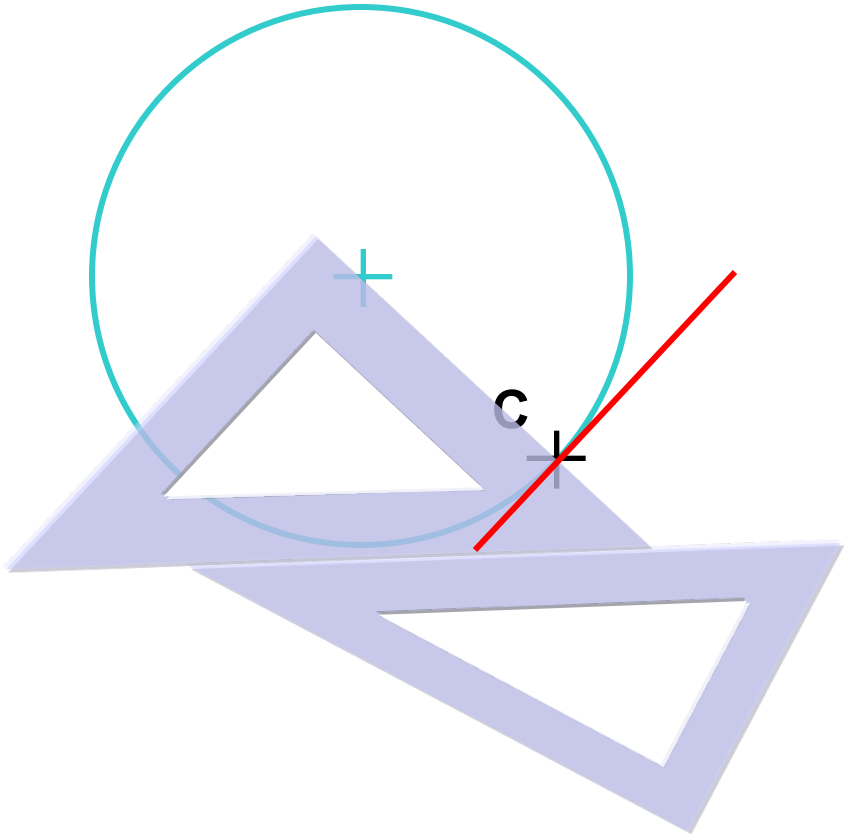
To draw an arc of given radius tangent to two lines

Given arc radius r



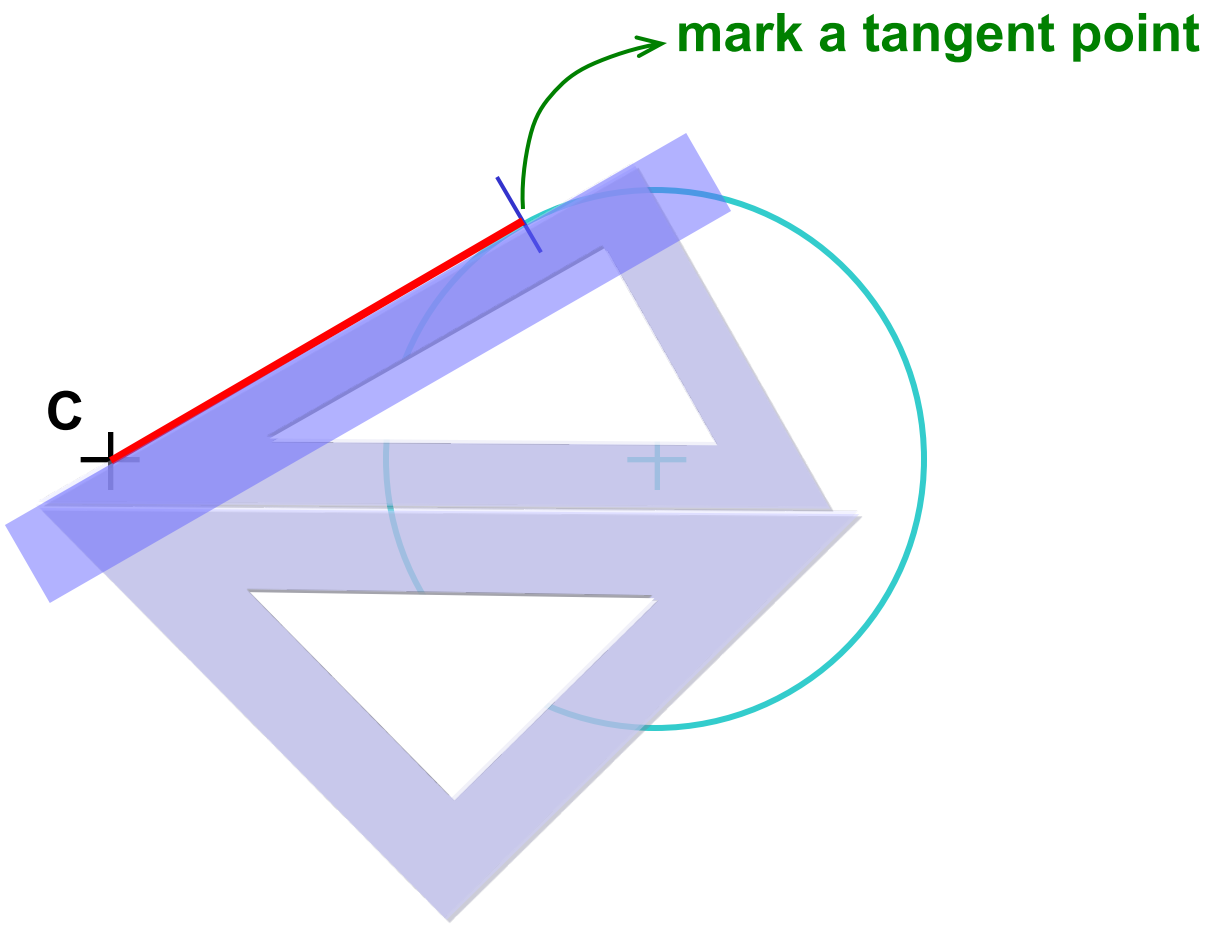
To draw a line tangent to a circle at a point on the circle

Given

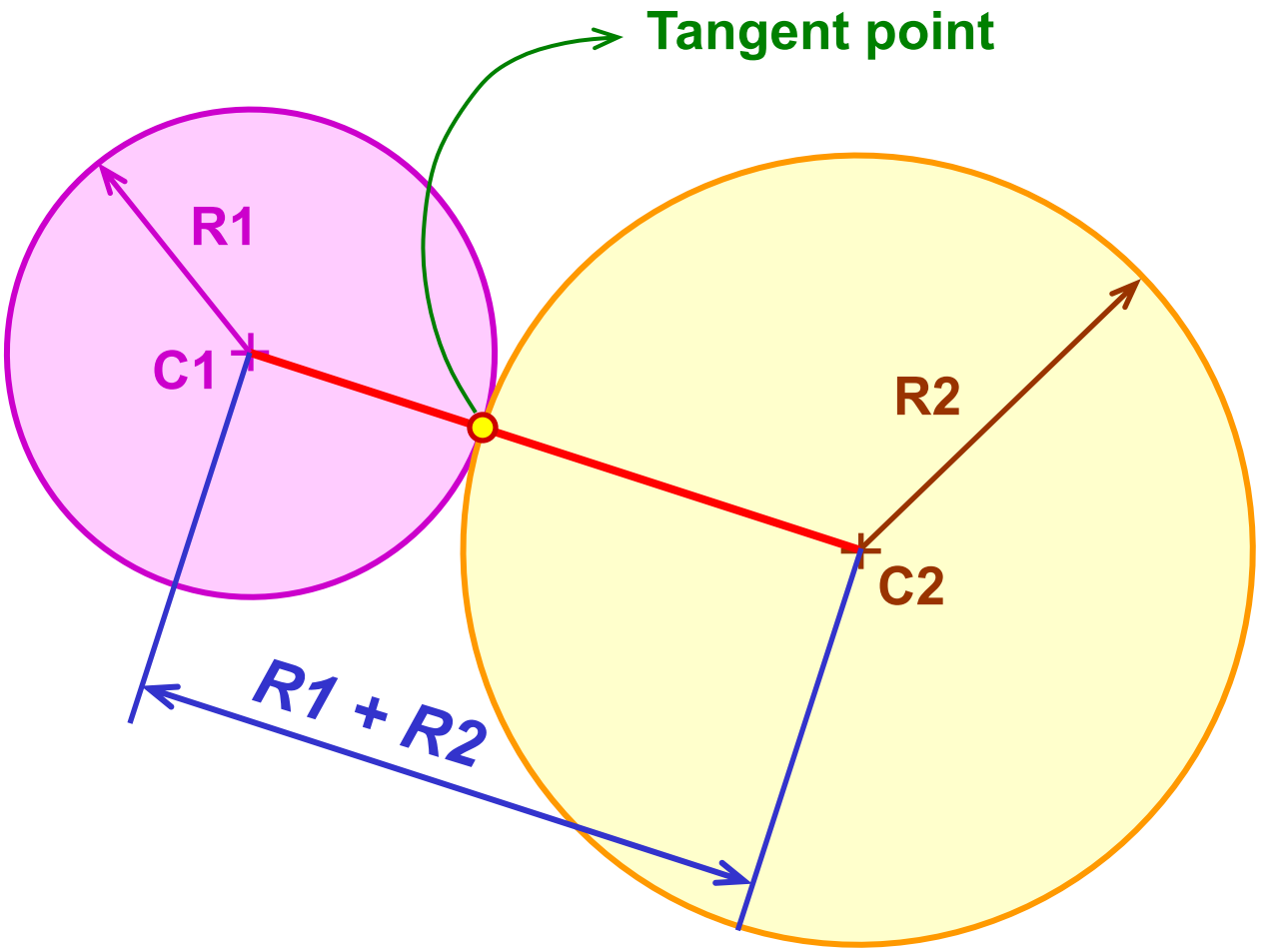


To draw a line tangent to a circle from a point outside the circle

Given



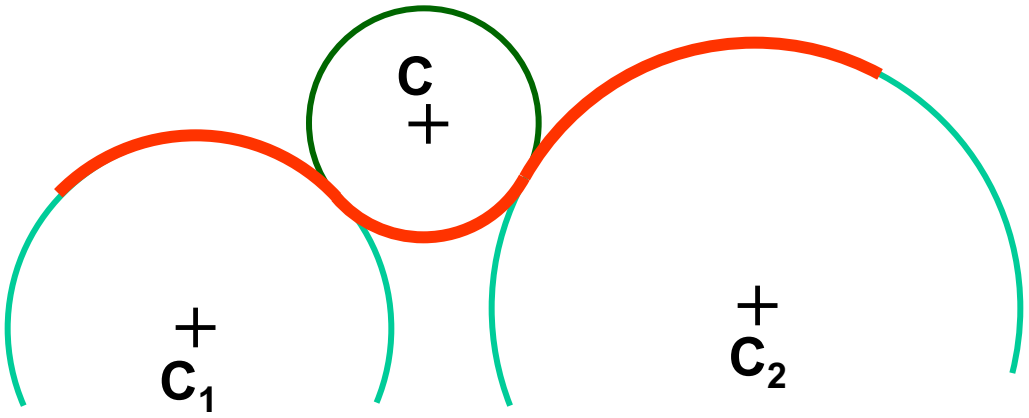
When circle tangent to other circle



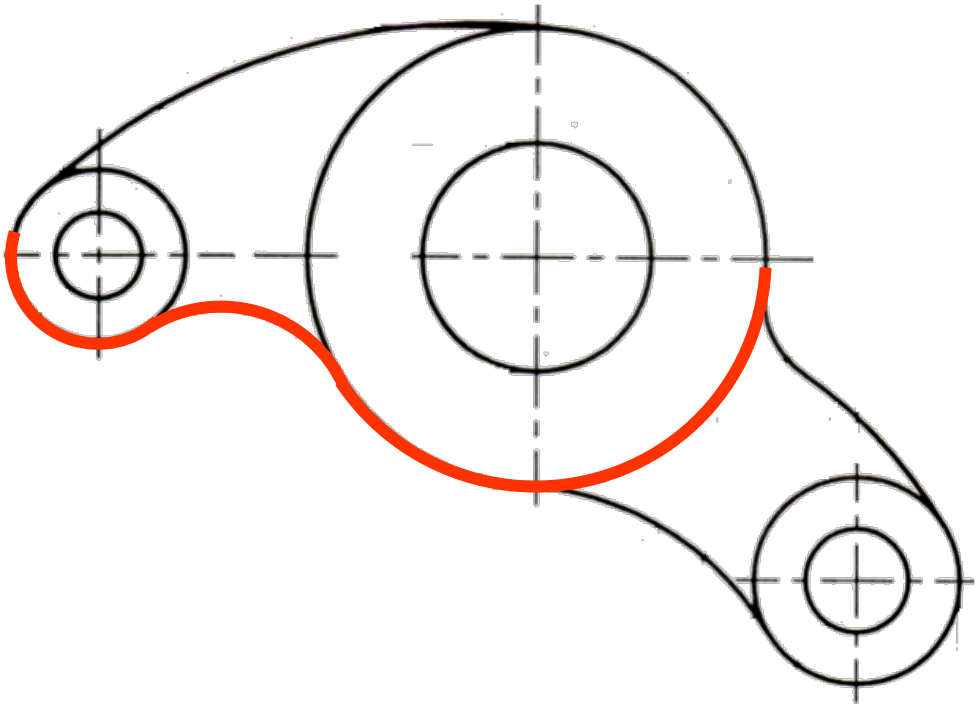
The center of two circles and tangent point lie on the same straight line !!!

To draw a circle tangent to two circles I

Given

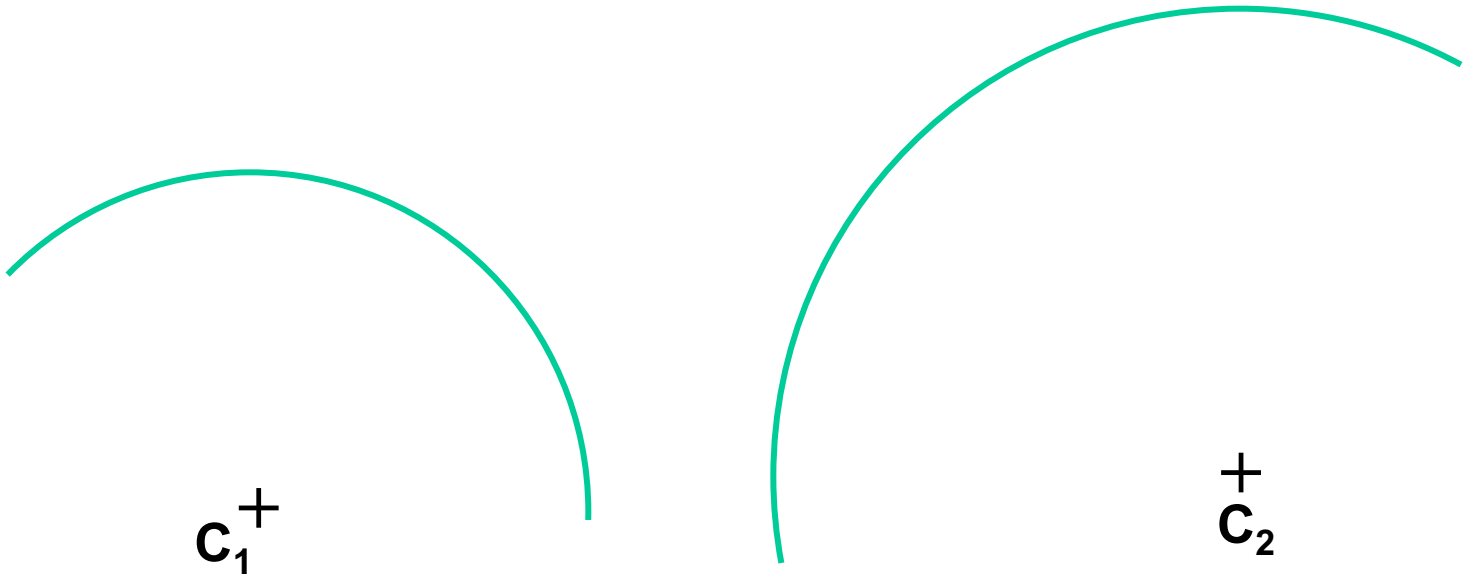


Example



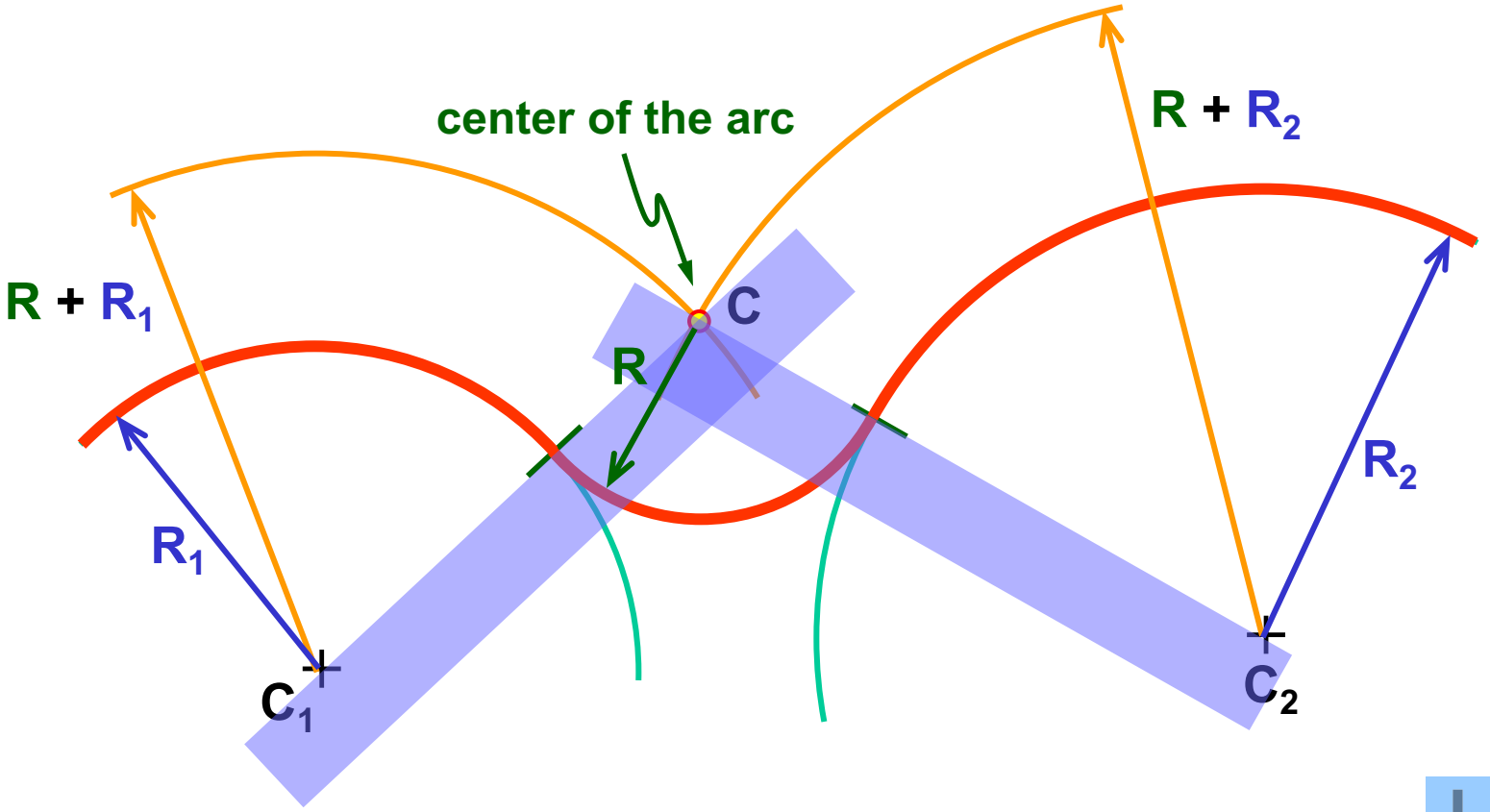
To draw a circle tangent to two circles I

Given Two circles and the radius of the third circle = R



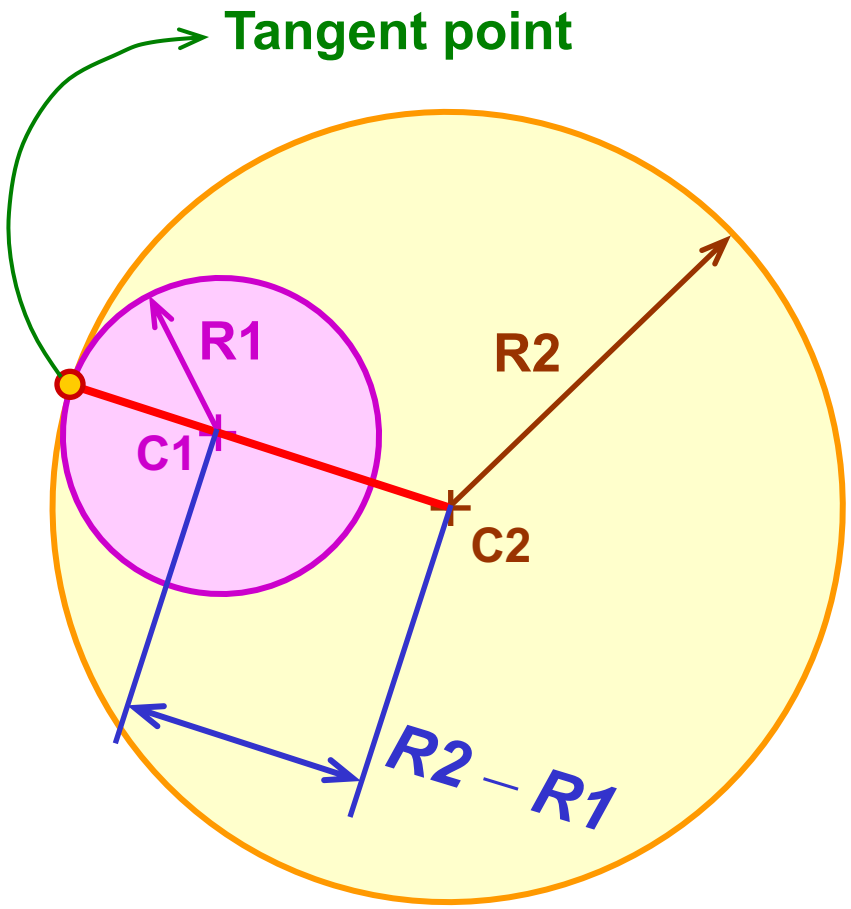
To draw a circle tangent to two circles I

Given Two circles and the radius of the third circle = R



Repeat

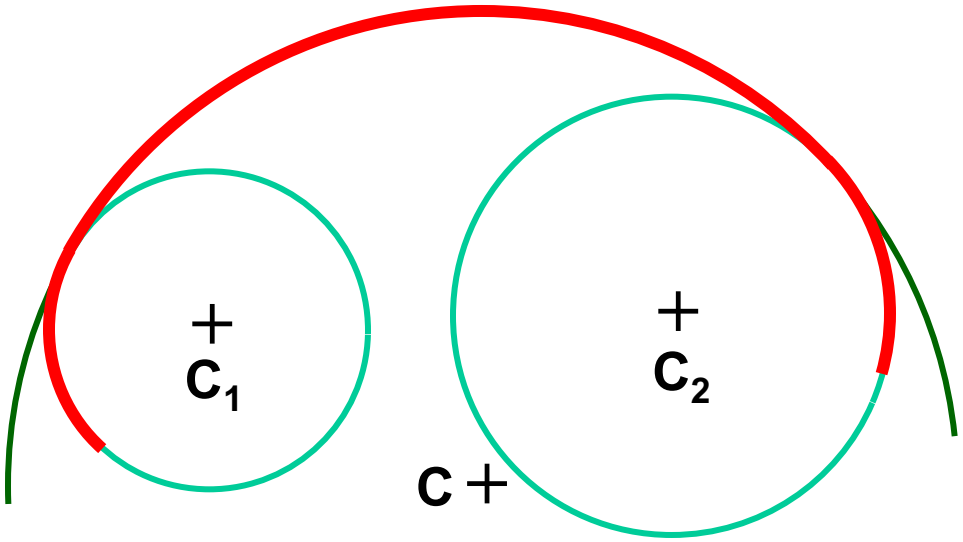
When circle tangent to other circle



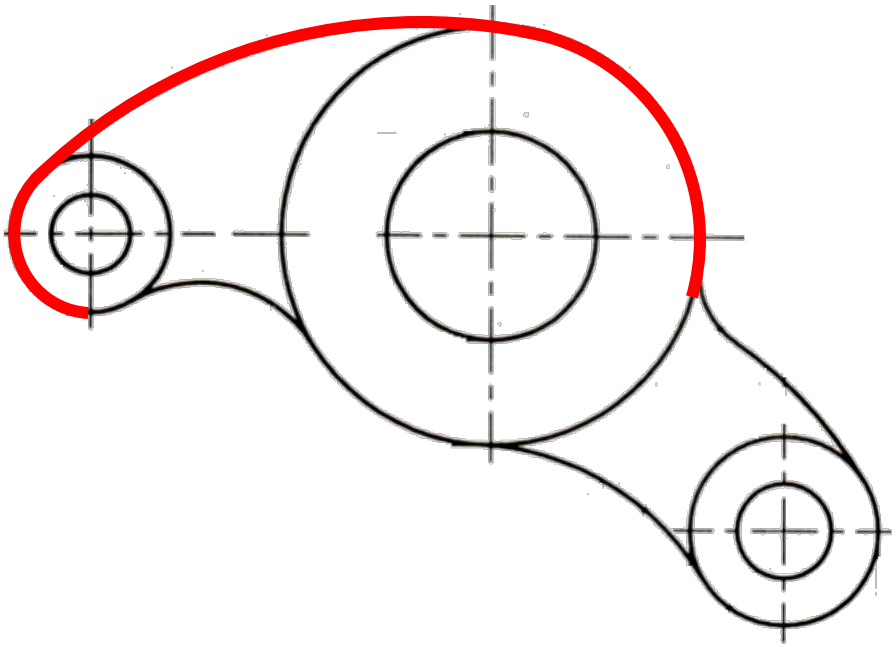
The center of two circles and tangent point must lie on the same straight line !!!

To draw a circle tangent to two circles II

Given

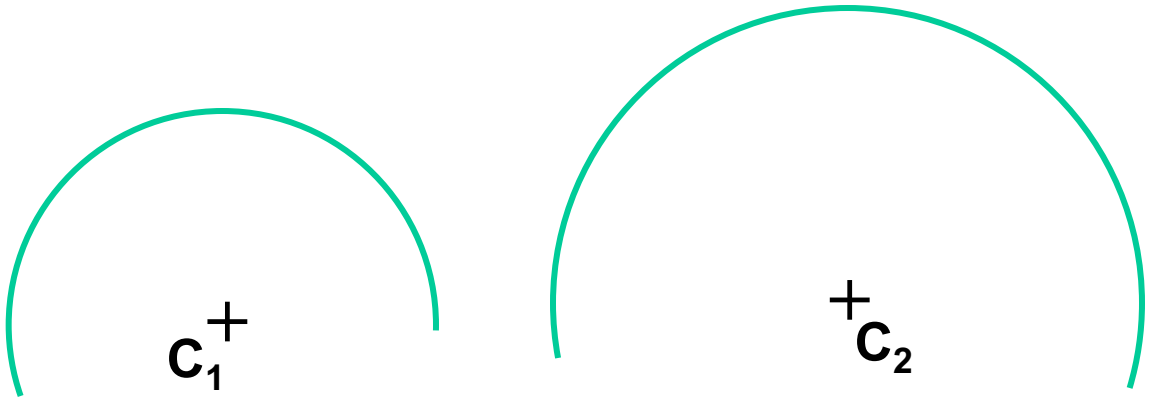


Example



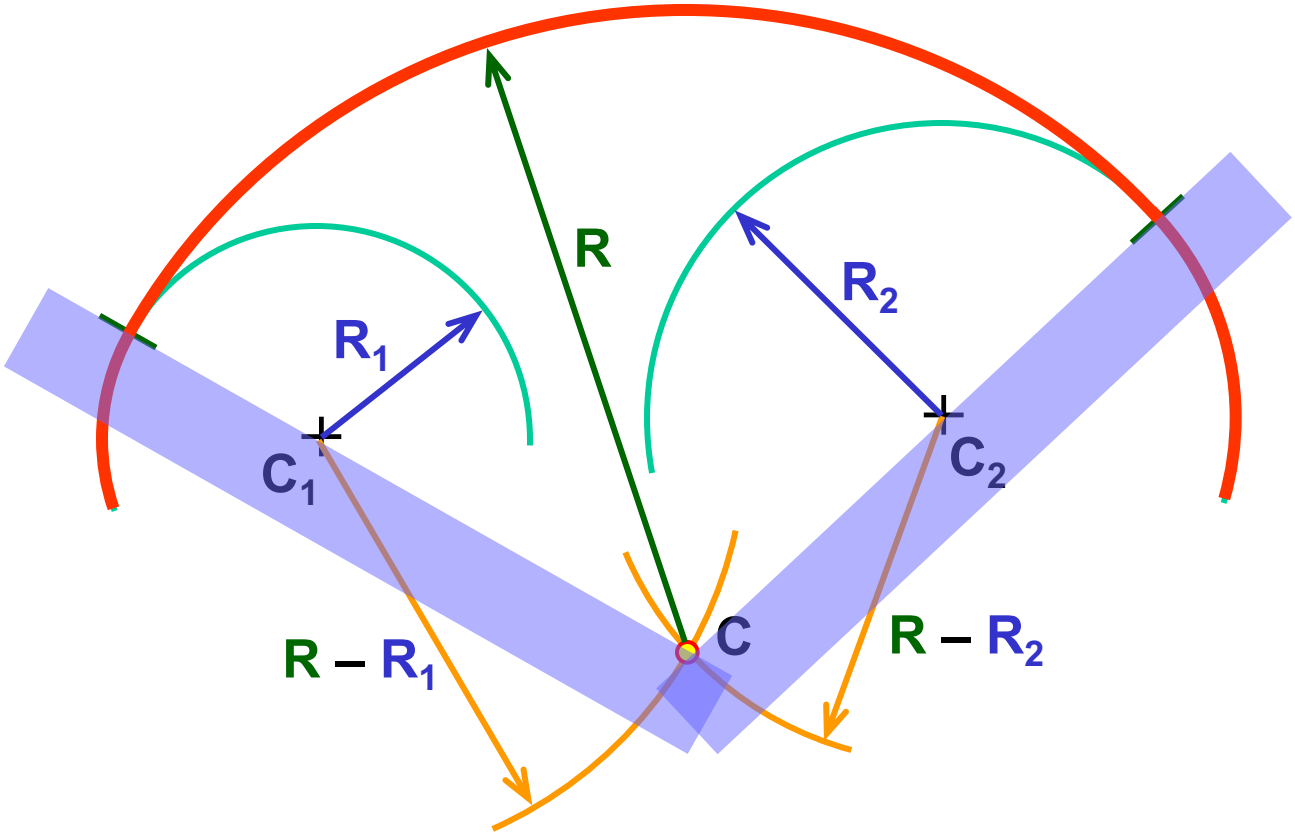
To draw a circle tangent to two circles II

Given Two circles and the radius of the third circle = R



To draw a circle tangent to two circles II

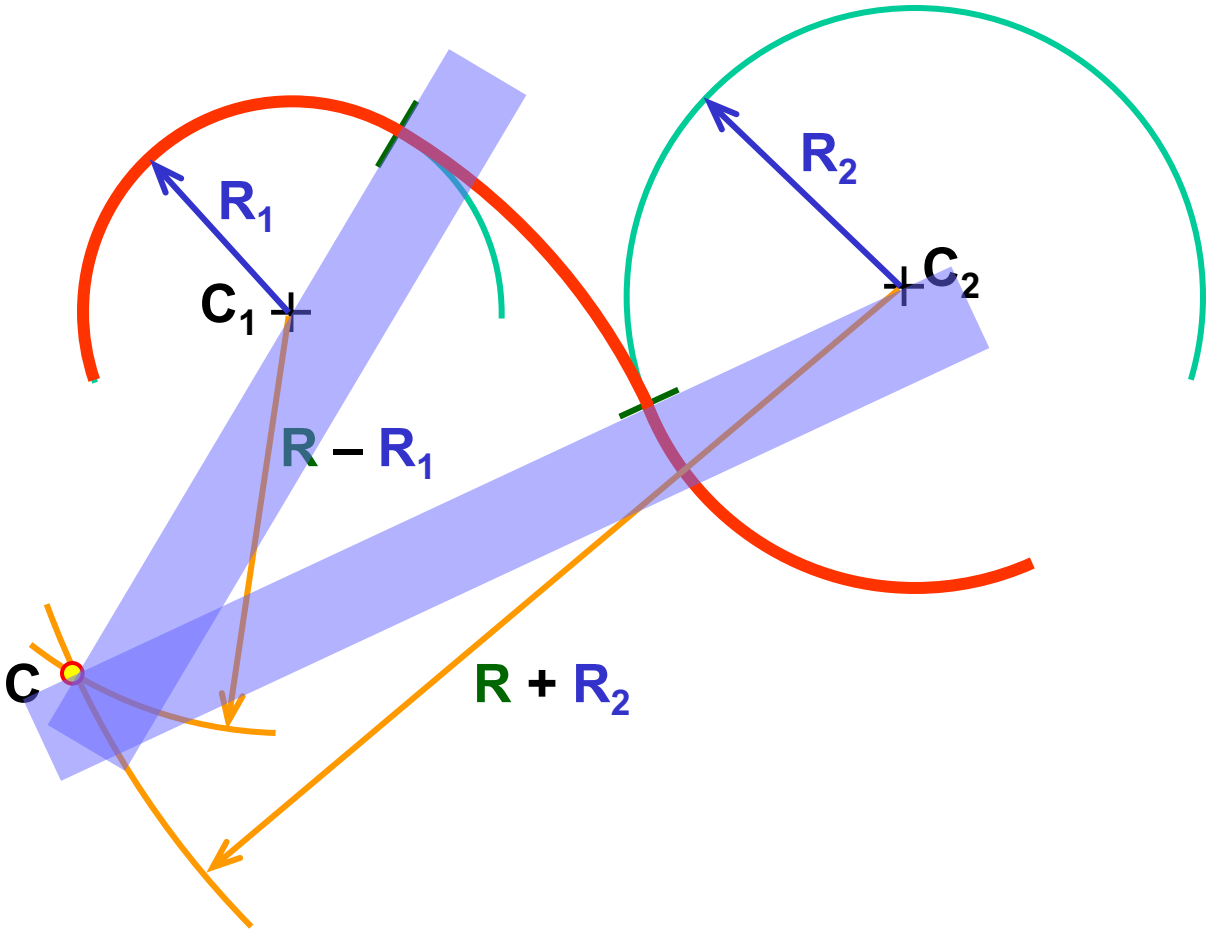
Given Two circles and the radius of the third circle = R



Repeat

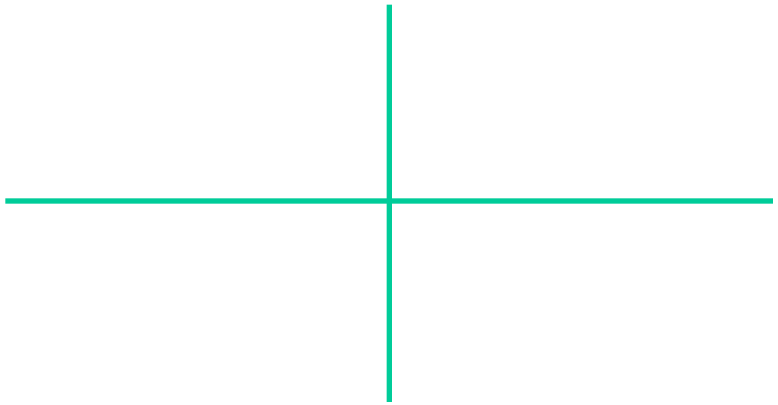
To draw a circle tangent to two circles III

Given Two circles and the radius of the third circle = R



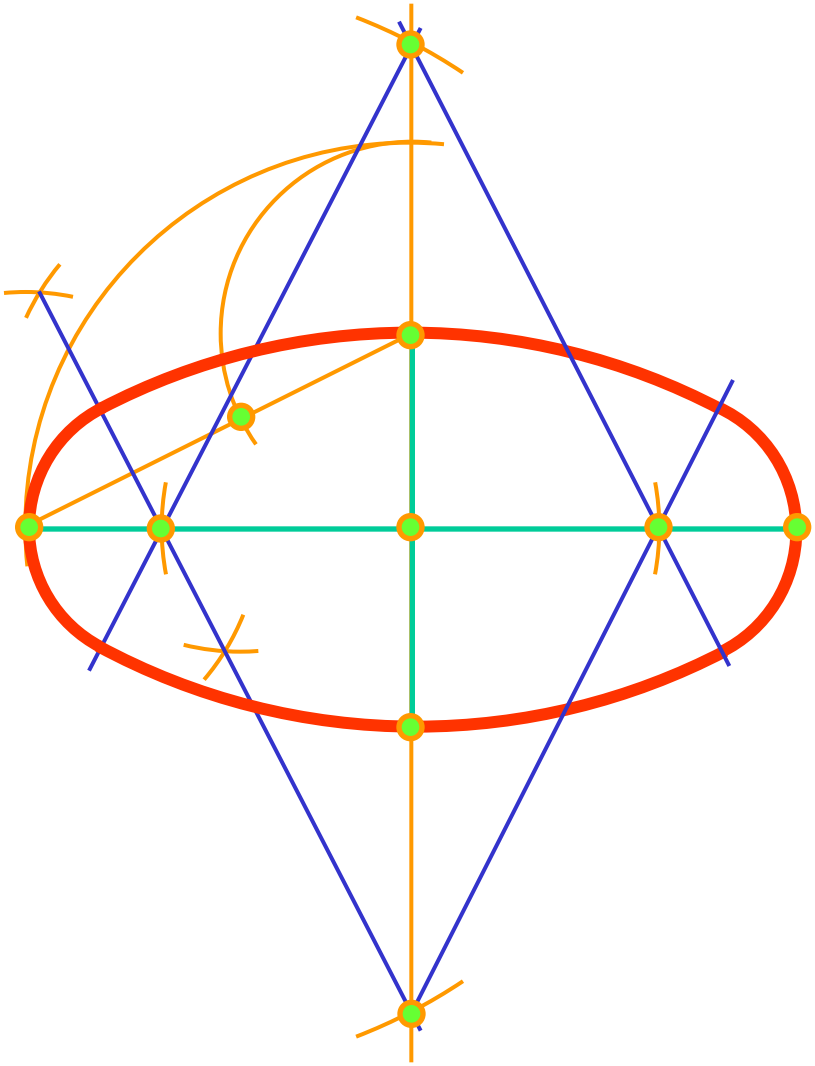
To draw an approximate ellipse

Given Major and minor axes



To draw an approximate ellipse

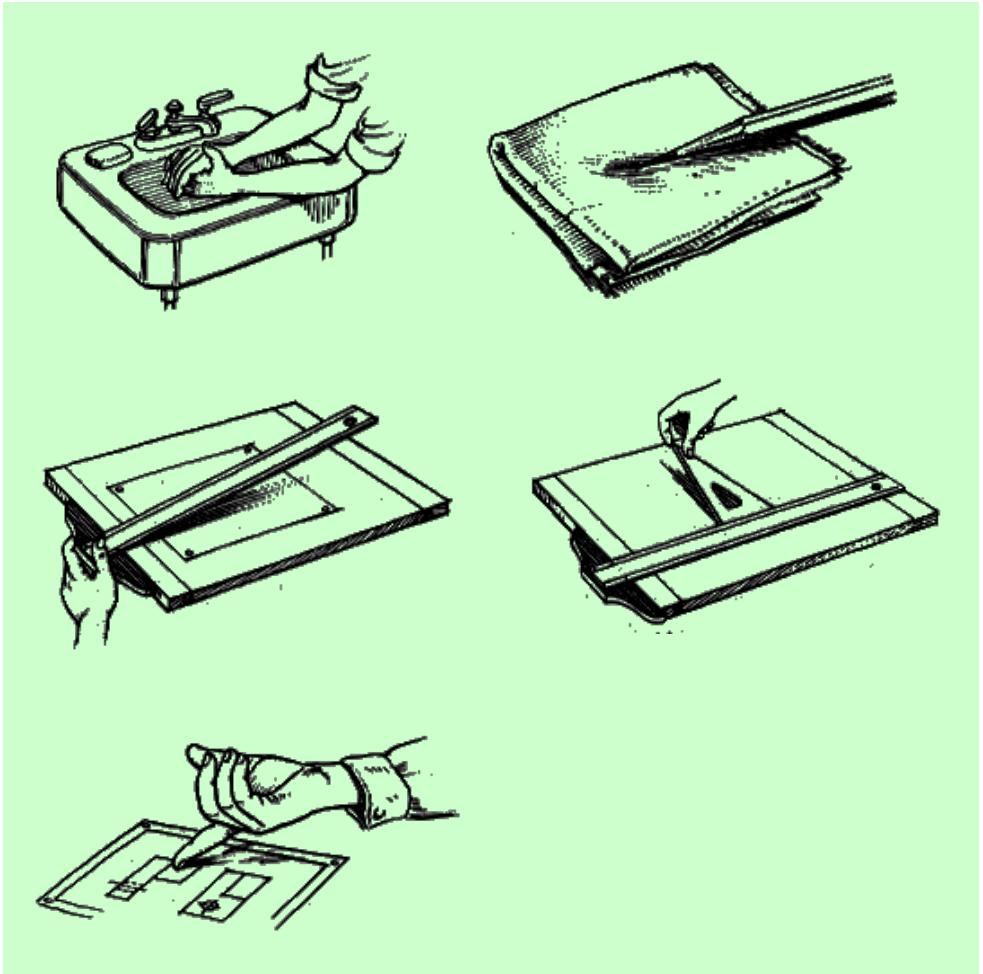
Given Major and minor axes



Repeat

How to Keep Your Drawing Clean

Do



Don't