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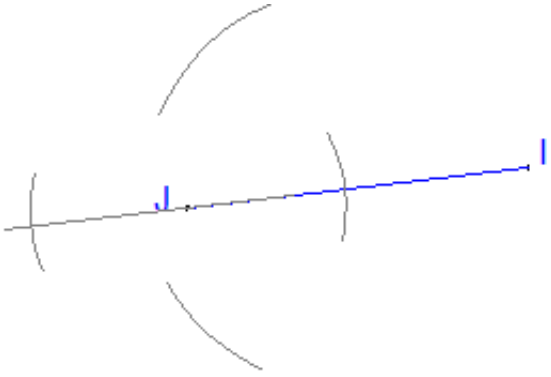
06.02.03 - Constructing a Right Isosceles Triangle (Geometry)

A **right isosceles triangle has one right angle and two sides that are the same**. We will later prove that the base must be the hypotenuse and the legs form the congruent sides. At this point, we will only be constructing a right isosceles triangle with a given length for the legs. Later we will construct a right isosceles triangle with a given hypotenuse.

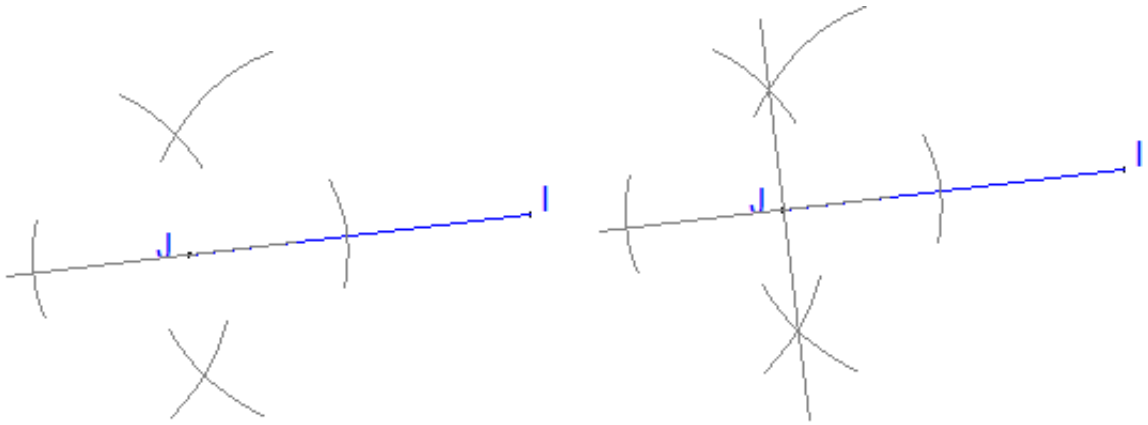
Consider $\overline{JI}$, shown here. Construct a right isosceles triangle where $\overline{JI}$ forms one leg. Start by extending segment $\overline{JI}$ through point J an arbitrary length.

Place the stationary end of your compass on point J and draw arcs on either side of J intersecting the line, as shown. The size of the span doesn't matter but it should be narrow enough to intersect your line.

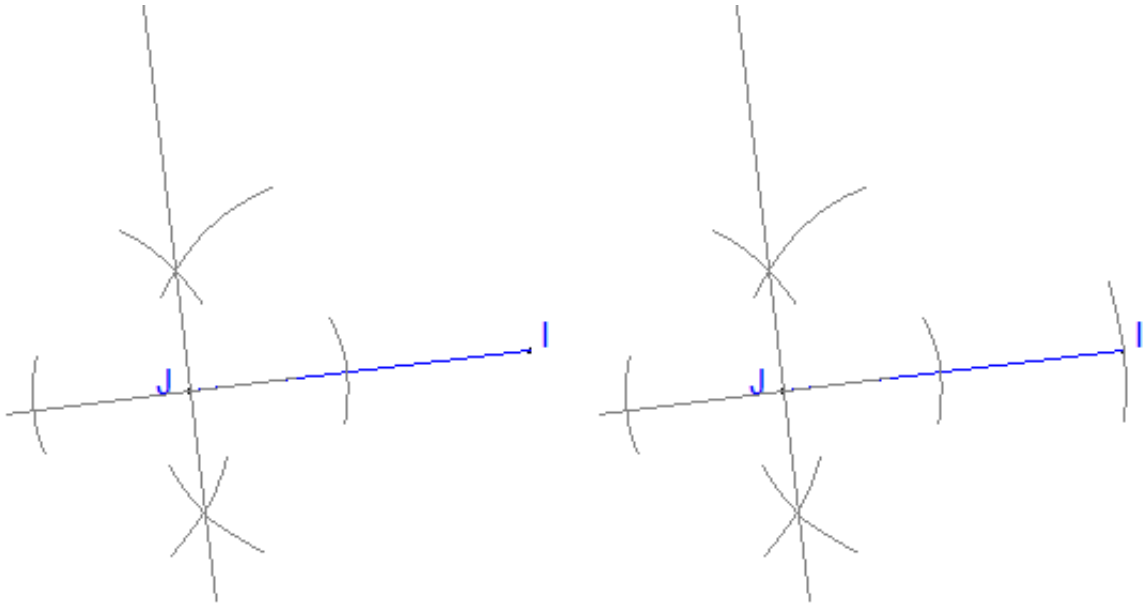
Open your compass a bit wider and move the stationary end to one of these intersections. Draw arcs on either side of $\overline{JI}$ above and below point J, as shown.



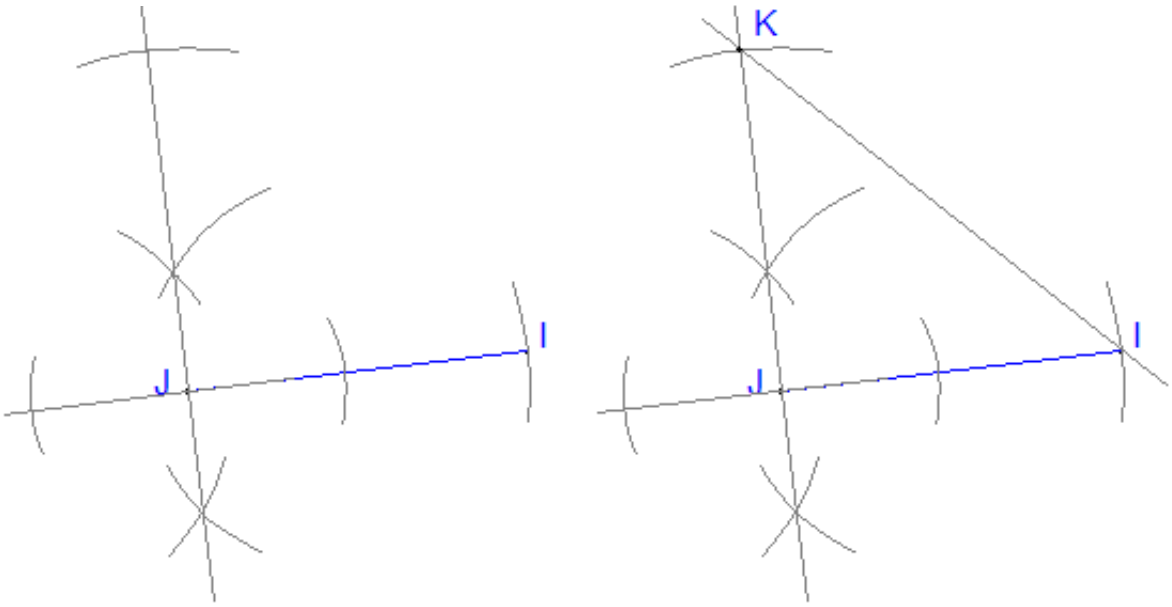
Without changing the span of your compass, move the stationary end to the other intersection and repeat the previous step, as shown here. Draw the line connecting the intersections on either side of point J. This line is perpendicular to $\overleftrightarrow{IJ}$ through point J.



Next, extend this line upwards until it is longer than IJ, as shown. Move the stationary end of the compass to point J and measure the distance IJ.



Mark off this distance on the perpendicular line. Label this intersection point K. Finally, draw the line connecting points K and I.



You have now constructed the right isosceles triangle with legs $\overline{IJ}$ and $\overline{JK}$ and base/hypotenuse $\overline{IK}$.

Can you figure out why this construction would not work for a given hypotenuse?

Later we will construct some arbitrary triangles. **What information do you need to define a triangle?** Think about these constructions. What did you need to know? What could you construct? How much information did you need to fully define the triangle? Why?

Links: https://share.ehs.uen.org/node/12180