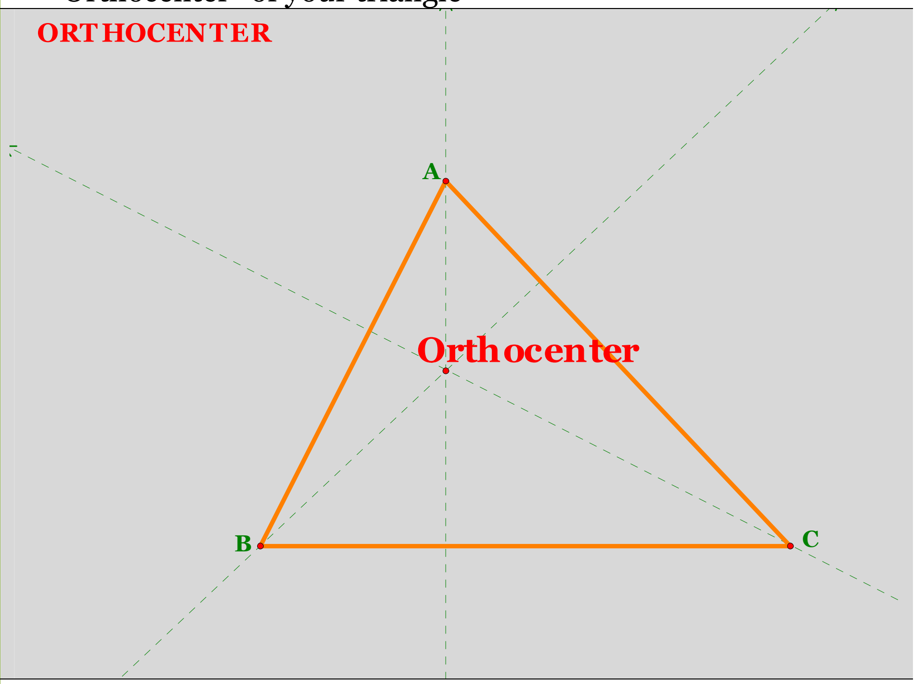
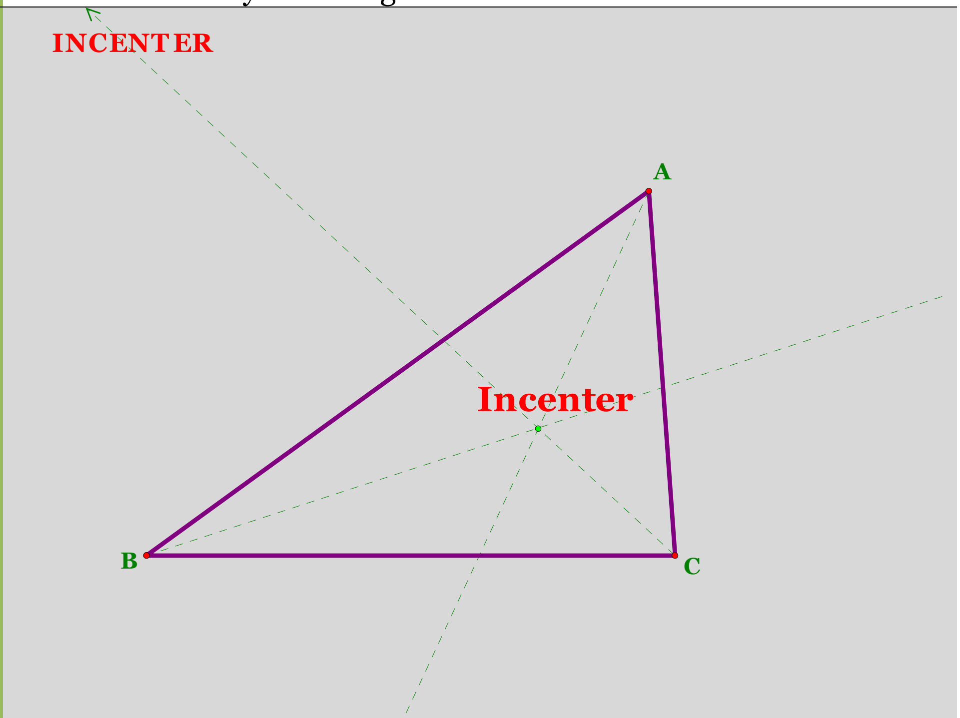
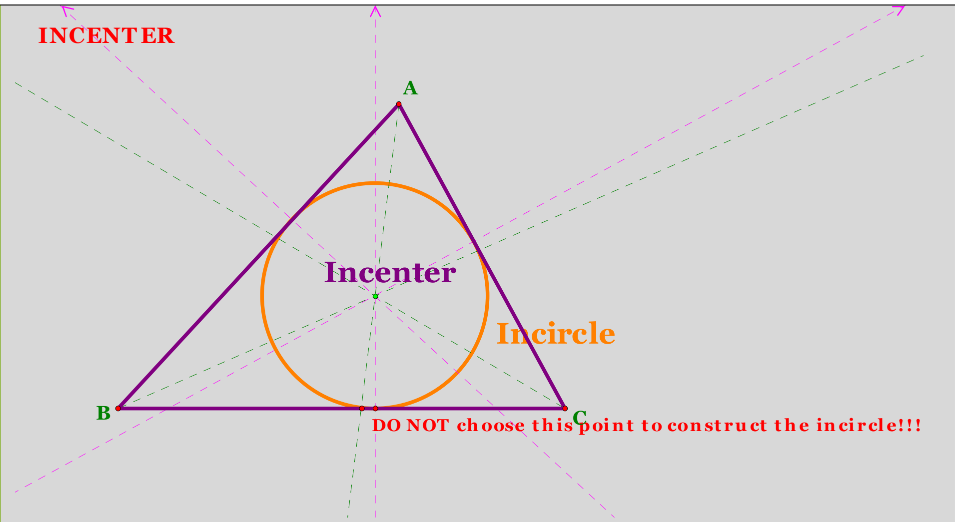
Centers of Triangle

1. Orthocenter

Definition	Intersection of three altitudes
How To	a. Construct a triangle using "Line" command on the left menu b. Choose one vertex and opposite side by click c. Go to "Construct" and click "Perpendicular Line" d. Repeat b & c for other vertices e. Find the intersection of three altitudes, and this is the "Orthocenter" of your triangle
GSP	
Properties	▪ Can exist outside of the triangle
References	
Animation	Orthocenter_Ani.gsp

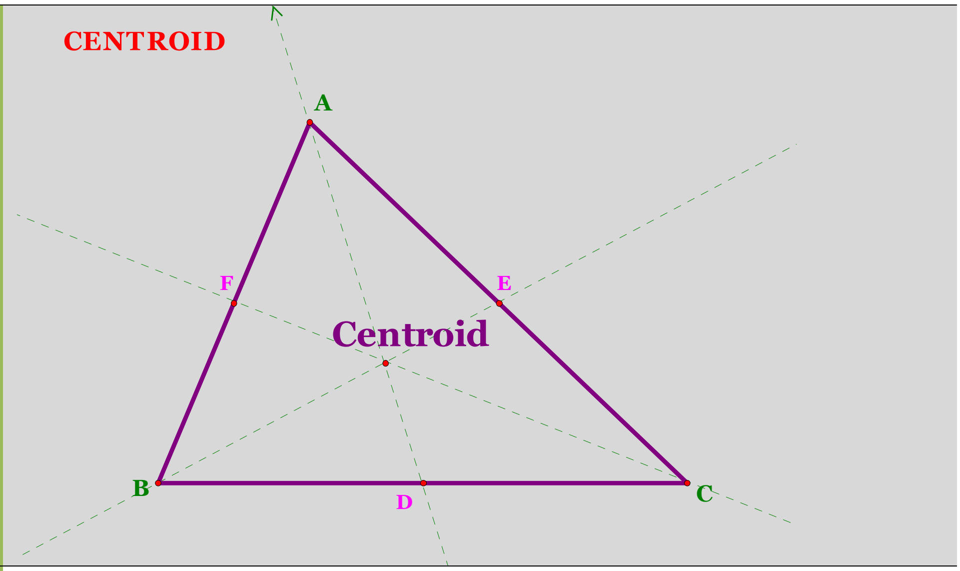
2. Incenter

Definition	Intersection of three angle bisectors
How To	a. Construct a triangle using “Line” command on the left menu b. Choose three vertices in order (e.g. if you want to choose angle A, then click B-A-C or C-A-B in order) c. Go to “Construct” and click “Angle Bisector” d. Repeat b & c for other vertices e. Find the intersection of three angle bisectors, and this is the “Incenter” of your triangle
GSP	
Properties	▪ Equidistance to each side ▪ Always exsit inside of the triangle

References	 ➢ When you construct the incenter, you should find an intersecting point that is perpendicular to each side and passes through "Incenter."
Animation	Incenter_Ani.gsp

3. Centroid

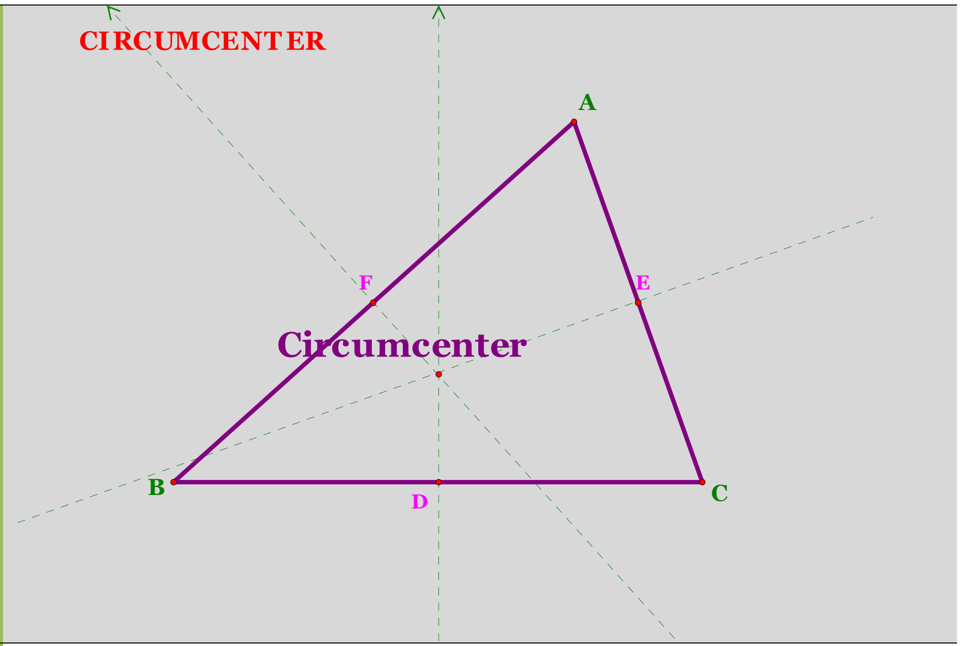
Definition	Intersection of three medians
How To	a. Construct a triangle using "Line" command on the left menu b. Choose a side c. Go to "Construct" and click "Midpoint" d. Choose the midpoint and opposite vertex e. Go to "Construct" again and click "Line" f. Repeat b ~ e for other sides g. Find the intersection of three medians, and this is the "Centroid" of your triangle

GSP	
Properties	▪ Always exsit inside of the triangle (→ moves "left & right", parallel to the base)
References	
Animation	[Centroid_Ani.gsp]()

4. Circumcenter

Definition	Intersection of three perpendicular bisectors
How To	a. Construct a triangle using "Line" command on the left menu b. Choose a side c. Go to "Construct" and click "Midpoint" d. Choose the midpoint and the side that includes the midpoint e. Go to "Construct" again and click "Perpendicular Line" f. Repeat b ~ e for other sides g. Find the intersection of three perpendicular bisectors, and this is the "Circumcenter" of your triangle

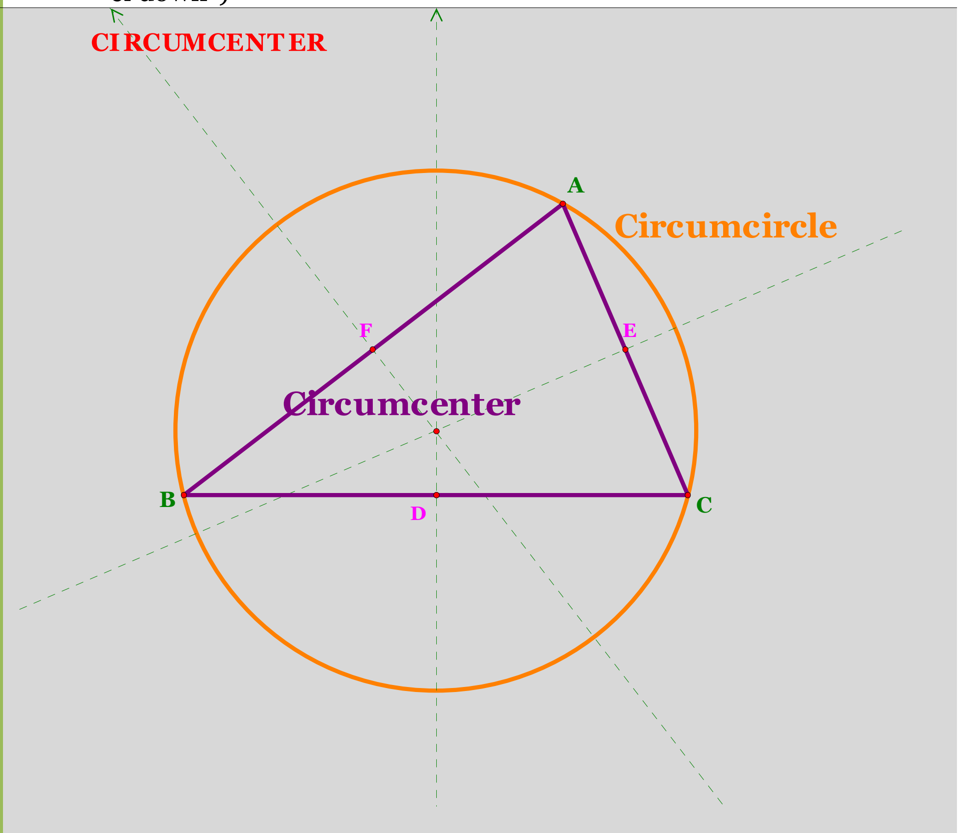
GSP



Properties

- Equidistance from each vertex (→ "Perpendicular Bisector Theorem")
- Can exsit outside of the triangle
- Always be on the perpendicular bisector of the base (→ moves "up & down")

References



Animation	Circumcenter_Ani.gsp

- Questions
  - "Why do these three line segments intersect?"
  - "When are all the centers same?"
    - Equilateral triangles since it is symmetric
    - Isosceles triangles also have special property → INCENTER and CENTROID are collinear
  - "Why does CENTROID move along the parallel line to the base?"
  - "Why does CIRCUMCENTER move along the perpendicular bisector to the base?"