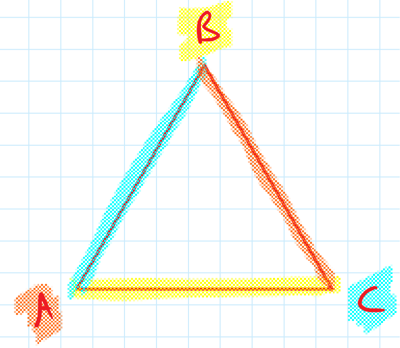
6.3.2 OrthoCenter

Tuesday, September 5, 2017 1:18 PM

What You Will Learn

▶ Use altitudes and find the orthocenters of triangles.



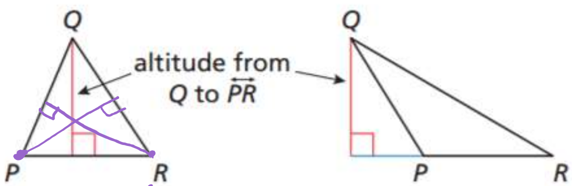
Circumcenter: - constructed using ⊥ bisectors (point of concurrence)
- equidistant to each vertex
- inside, outside, or on the △

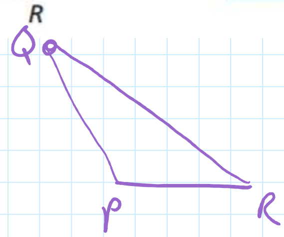
Incenter: - Always inside the △
- equidistant from each side
- constructed using angle bisectors (point of concurrence)

Centroid - constructed using medians (point of concurrence)
- centroid to side is $\frac{1}{3}$ the length of the median
centroid to vertex is $\frac{2}{3}$ the length of the median
- Always inside the △

Using the Altitude of a Triangle

An **altitude of a triangle** is the perpendicular segment from a vertex to the opposite side or to the line that contains the opposite side.

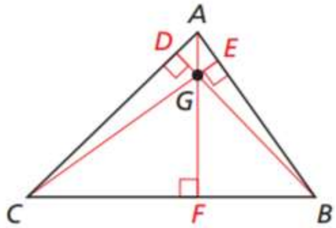




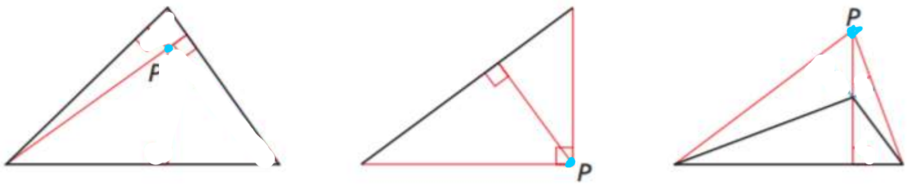
Orthocenter

The lines containing the altitudes of a triangle are concurrent. This point of concurrency is the **orthocenter** of the triangle.

The lines containing $\overline{AF}$, $\overline{BD}$, and $\overline{CE}$ meet at the orthocenter G of $\triangle ABC$.



As shown below, the location of the orthocenter P of a triangle depends on the type of triangle.

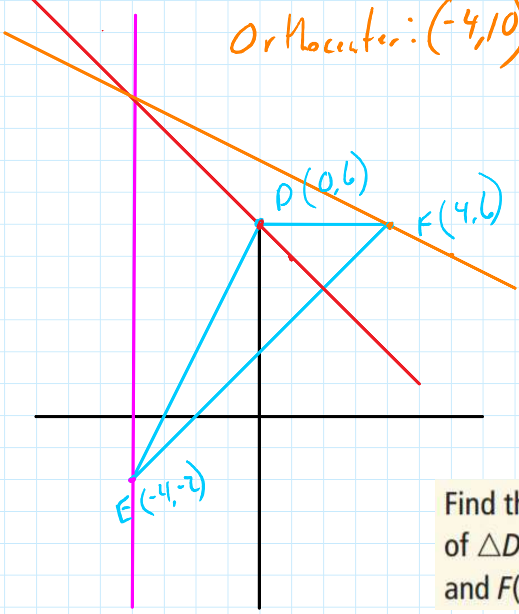


Acute triangle
P is inside triangle.

Right triangle
P is on triangle.

Obtuse triangle
P is outside triangle.

Orthocenter: (-4,10)



$m\,\overline{DF} = \frac{6-6}{0-4} = \frac{0}{-4} = 0$

$\perp m\,\overline{DF} = \frac{-4}{0}$

$m\,\overline{EF} = \frac{6+2}{4+4} = \frac{8}{8} = 1$

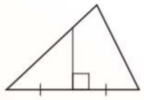
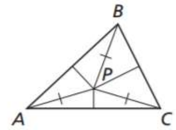
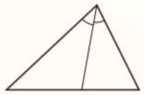
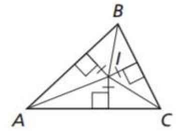
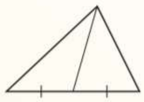
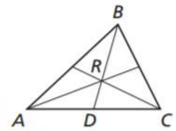
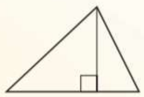
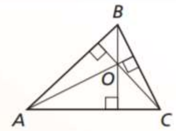
$\perp m\,\overline{EF} = -1 = \frac{-1}{1}$

$m\,\overline{DE} = \frac{6+2}{0+4} = \frac{8}{4} = 2$

$\perp m\,\overline{DE} = -\frac{1}{2}$

Find the coordinates of the orthocenter of $\triangle DEF$ with vertices $D(0, 6)$, $E(-4, -2)$, and $F(4, 6)$. $(-4, 10)$

Segments, Lines, Rays, and Points in Triangles

	Example	Point of Concurrency	Property	Example
perpendicular bisector		circumcenter	The circumcenter *P* of a triangle is equidistant from the vertices of the triangle.	
angle bisector		incenter	The incenter *I* of a triangle is equidistant from the sides of the triangle.	
median		centroid	The centroid *R* of a triangle is two thirds of the distance from each vertex to the midpoint of the opposite side.	
altitude		orthocenter	The lines containing the altitudes of a triangle are concurrent at the orthocenter *O*.	

Practice sec 6.3 **pg.**

324: 19-28A,

31-36A

Pg. 328: 11, 12