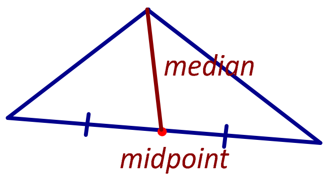
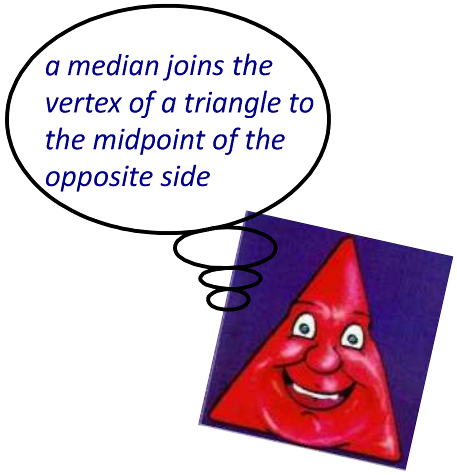
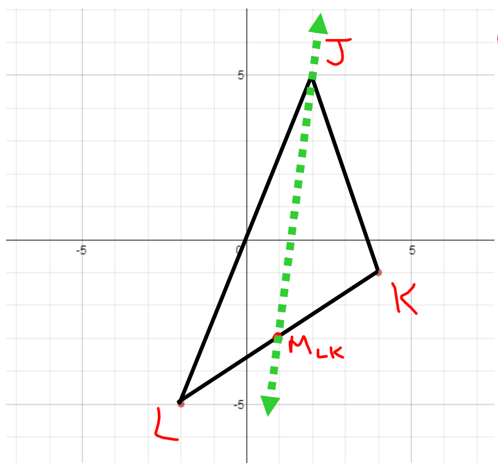
2.2 Equations of Medians, Altitudes and Right Bisectors

A. MEDIANS





Ex. 1: Determine the equation of the median from *J* for the triangle with vertices *J*(2,5), *K*(4,-1) and *L*(-2,-5).



① Find midpoint of LK
② Find slope of J M_{LK}
③ Substitute slope in $y=mx+b$ with (x,y) from J or M_{LK} to find y-int
④ Write equation

① $M_{LK} = \left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$

$= \left(\frac{-2+4}{2}, \frac{-5+(-1)}{2}\right)$

$= (1, -3)$

② $m_{JM} = \frac{\Delta y}{\Delta x}$

J(2,5)
$M_{LK}(1,-3)$

$= \frac{5-(-3)}{2-1}$

$= \frac{8}{1}$

$= 8$

③ $y = mx+b$

Sub $m=8$, J(2,5)

$5 = 8(2)+b$

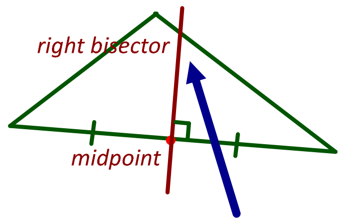
$5 = 16+b$

$5-16 = b$

$-11 = b$

④ $y = 8x-11$

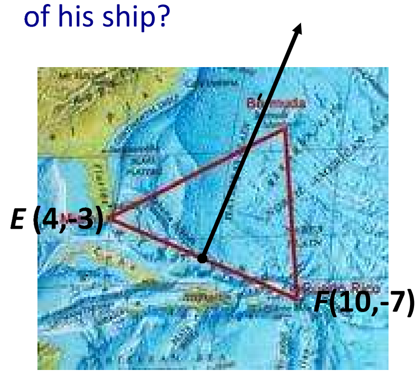
B. PERPENDICULAR (OR RIGHT) BISECTORS



look: does not have to go through vertex

a perpendicular bisector passes through a midpoint at 90⁰

<u>Ex. 2</u> Below is one of the most famous triangles... THE BERMUDA TRIANGLE! A ship plans to take the path of the perpendicular bisector from the segment *EF*. He wishes to be tracked the whole way. Can you determine the equation of his ship?



$E(4,-3)$ $F(10,-7)$

① Find slope of EF
② Find ⊥ slope
③ Find midpoint of EF (M_{EF})
④ Use $m_\perp$ & M_{EF} in $y=mx+b$ to find y-int
⑤ Write equation

① $m_{EF} = \frac{-7-(-3)}{10-4}$

$= \frac{-4}{6}$

$= -\frac{2}{3}$

② $m_\perp = \frac{3}{2}$

③ $M_{EF} = \left(\frac{4+10}{2}, \frac{-3+(-7)}{2}\right)$

$= (7, -5)$

④ Sub $m = \frac{3}{2}$ & $(7,-5)$ into $y=mx+b$

$-5 = \frac{3}{2}(7) + b$

$-5 = \frac{21}{2} + b$

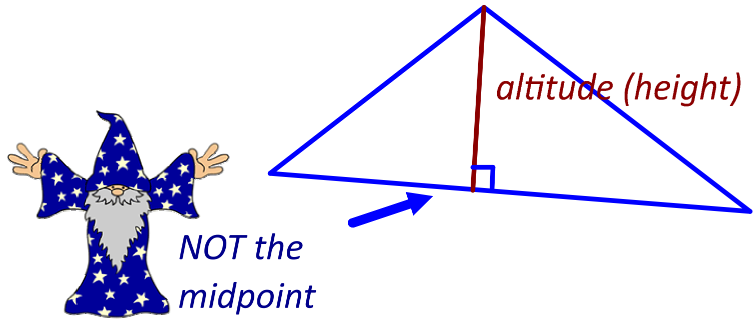
$-\frac{10}{2} - \frac{21}{2} = b$

$-\frac{31}{2} = b$

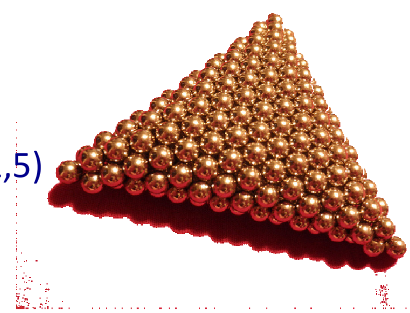
⑤ $y = \frac{3}{2}x - \frac{31}{2}$

C. ALTITUDES

An altitude joins the vertex of a triangle to its opposite side at 90º



Ex. 3 Determine the equation of the altitude from *A*.



1. Find slope of CB
2. Find $\perp$ slope
3. Substitute $m_\perp$ & point A into $y=mx+b$ to find y-int.
4. Write the equation

① $m_{CB} = \dfrac{3-5}{-7-(-1)} = \dfrac{-2}{-6} = \dfrac{1}{3}$

② $m_\perp = -3$

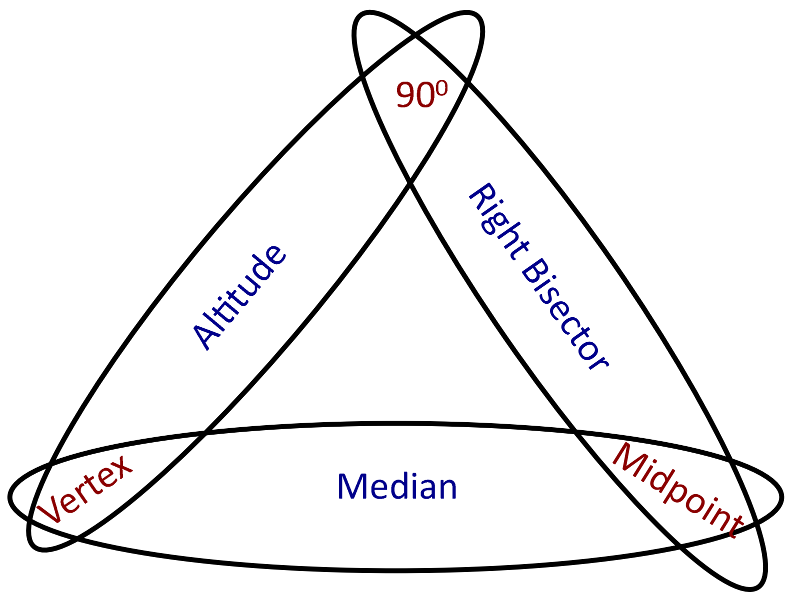
③ Sub $m=-3$ & $(4,-1)$ into $y=mx+b$

$-1 = -3(4)+b$

$-1 = -12 + b$

$11 = b$

④ $y = -3x + 11$


90^0
Altitude
Right Bisector
Vertex
Median
Midpoint

FBUHL:
Basic: pg. 66 #4, pg. 100 #4
Regular: pg. 65 #C3, 8,17 & Pg. 90 #18
Challenge: pg. 68 #23,29