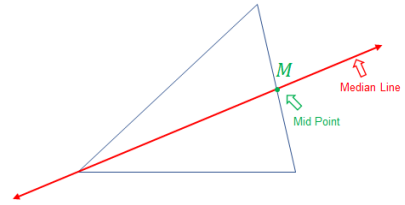


2.3 Apply Slope, Midpoint and Length Formulas

A Length of the Median Line

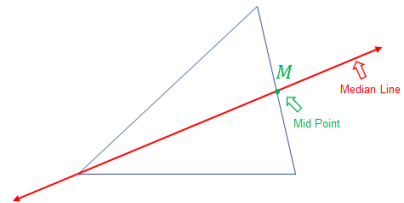
1. Find the midpoint $M\left(\frac{x_A+x_B}{2}, \frac{y_A+y_B}{2}\right)$
2. Use the length formula to find the length of the median line $AB = \sqrt{(x_B - x_A)^2 + (y_B - y_A)^2}$



Ex 1. Let consider the triangle $P(-2,4)$, $Q(6,8)$, and $R(0,6)$. Find the length of the median line from the vertex Q .

B Equation of the Median Line

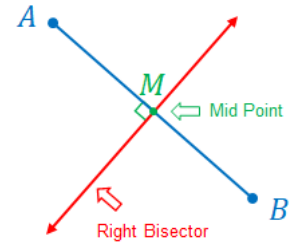
1. Find the midpoint $M\left(\frac{x_A+x_B}{2}, \frac{y_A+y_B}{2}\right)$
2. Find the slope of the median line $m = \frac{y_B-y_A}{x_B-x_A}$
3. Use $y = mx + b$, slope, vertex point or midpoint to find b
4. Find the equation of the median line $y = mx + b$



Ex 2. Let consider the triangle $P(-2,4)$, $Q(6,8)$, and $R(0,6)$. Find the equation of the median line from the vertex P .

C Equation of the Right (Perpendicular) Bisector

1. Find the midpoint $M\left(\frac{x_A+x_B}{2}, \frac{y_A+y_B}{2}\right)$
2. Find the slope of the side $m_1 = \frac{y_B-y_A}{x_B-x_A}$
3. Find the slope of the right bisector $m_2 = -\frac{1}{m_1}$
4. Use $y = m_2x + b$, slope and midpoint to find b
5. Find the equation of the right bisector $y = m_2x + b$



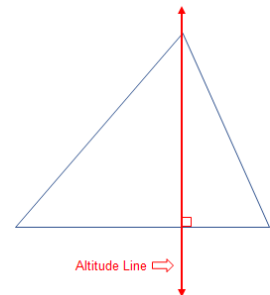
Ex 3. Let consider the triangle $P(-2,4)$, $Q(6,8)$, and $R(0,6)$. Find the length of the right bisector on PR .

D Altitude Line or Perpendicular Line from a Point

The altitude line is the line that passes through a vertex of a triangle and is perpendicular to the opposite side.

To find the equation of the altitude line from a vertex:

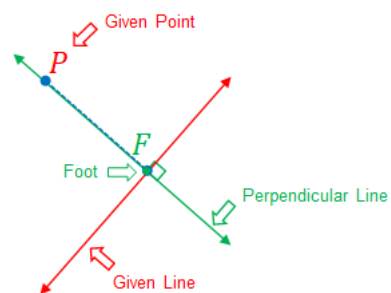
1. Find the slope of the opposite side to the vertex
$$m = \frac{y_2 - y_1}{x_2 - x_1}$$
2. Use $y = mx + b$, slope and vertex point to find b
3. Write the equation of the altitude line
$$y = mx + b$$



Ex 4. Find the equation of the altitude from the vertex A for the triangle defined by the vertices $A(1,0)$, $B(5,-3)$ and $C(2,-4)$.

E Shortest Distance from a Point to a Line

1. Find the slope of the line $y = m_1x + b$
2. Find the slope of the perpendicular line $m_2 = -\frac{1}{m_1}$
3. Use $y = m_2x + b$, slope and the given point to find b
4. Find the equation of the perpendicular line that passes through the given point $y = mx + b$
5. Use substitution or elimination to find the intersection of the given line and the perpendicular line
6. Use the length formula to find the length of the median line $AB = \sqrt{(x_B - x_A)^2 + (y_B - y_A)^2}$



Ex 5. Find the shortest distance from the origin to the line $y = -\frac{1}{2}x + 5$.

Reading: Textbook Pages 80-88

Homework: Textbook Pages 89-91 # 5, 6, 8, 10, 14, 17, 18, 21,