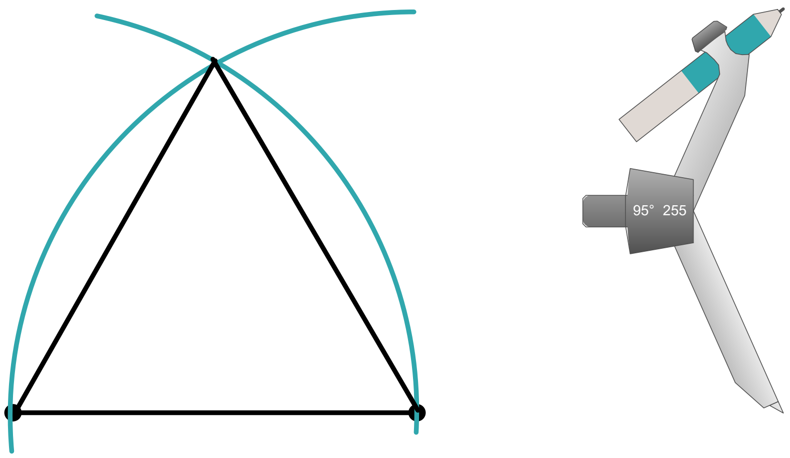
Constructing an equilateral triangle

1. Start with a line segment
2. Measure the line segment by placing the compass on one endpoint and extending it to the other endpoint
3. Keeping the compass on the first endpoint, make an arc above the line segment across the halfway point
4. Without adjusting the width of the compass, place it on the other endpoint
5. Make an arc above the line segment that intersects the first arc
6. Using a straightedge, connect each endpoint to the intersection of the arcs to make an equilateral triangle

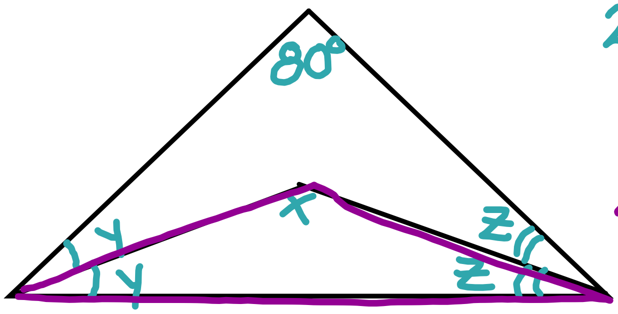


The measures of 3 angles of a triangle are in the ratio of 3:4:5.
Find the measure of the largest angle.

$$3x + 4x + 5x = 180$$
$$12x = 180$$
$$x = 15$$

75°

If one of the angles of a triangle is 80°, find the measure of the angle formed by the bisectors of the other two angles.



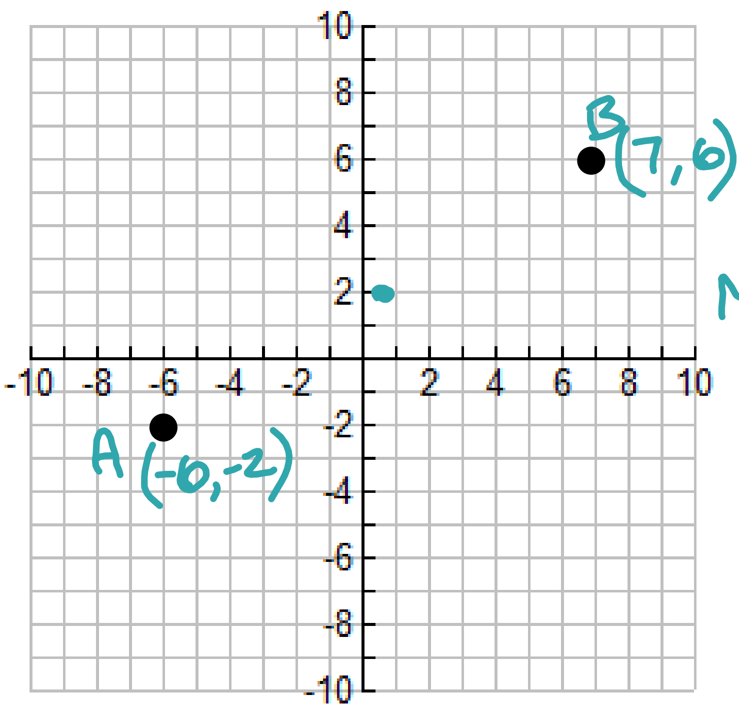
$$2y + 2z = 100$$
$$y + z = 50$$
$$x + \underline{y + z} = 180$$
$$x + 50 = 180$$
$$\boxed{x = 130°}$$

THE MIDPOINT FORMULA

Given two points, $A(x_1, y_1)$ and $B(x_2, y_2)$, the MIDPOINT of $\overline{AB}$ can be found using the formula:

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

Find the coordinates of the midpoint of $\overline{AB}$



$$M=\left(\frac{-6+7}{2},\frac{-2+6}{2}\right)$$

$$=\left(\frac{1}{2},\ 2\right)$$

If the midpoint of $\overline{AB}$ falls at (7, 9), and point *A* is located at (-2, 4), then find the coordinates of *B*

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

$$(7, 9) = \left(\frac{-2+x}{2}, \frac{4+y}{2}\right)$$

$$7 = \frac{-2+x}{2} \qquad 9 = \frac{4+y}{2}$$

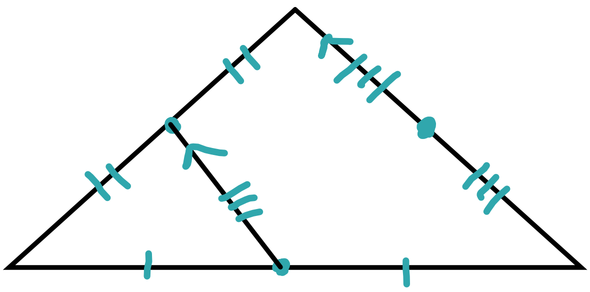
$$14 = -2+x \qquad 18 = 4+y$$

$$\boxed{16 = x} \qquad \boxed{y = 14}$$

B(16, 14)

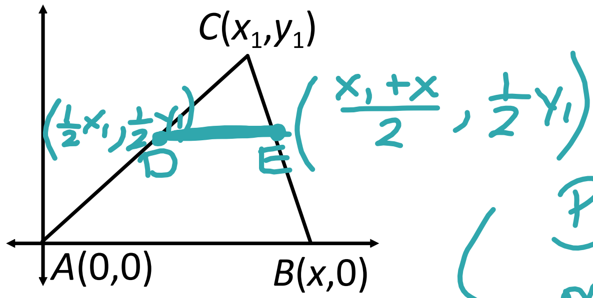
<u>Midsegment of a Triangle</u>

A segment that connects the midpoints of two sides of a triangle



Triangle Midsegment Theorem

A midsegment of a triangle will always be parallel to the the 3rd side, and half of its length



Prove $\frac{1}{2}$ length

$AB = x - 0 = x$

$DE = \frac{x_1+x}{2} - \frac{1}{2}x_1$

$\frac{1}{2}x_1 + \frac{1}{2}x - \frac{1}{2}x_1 = \frac{1}{2}x$

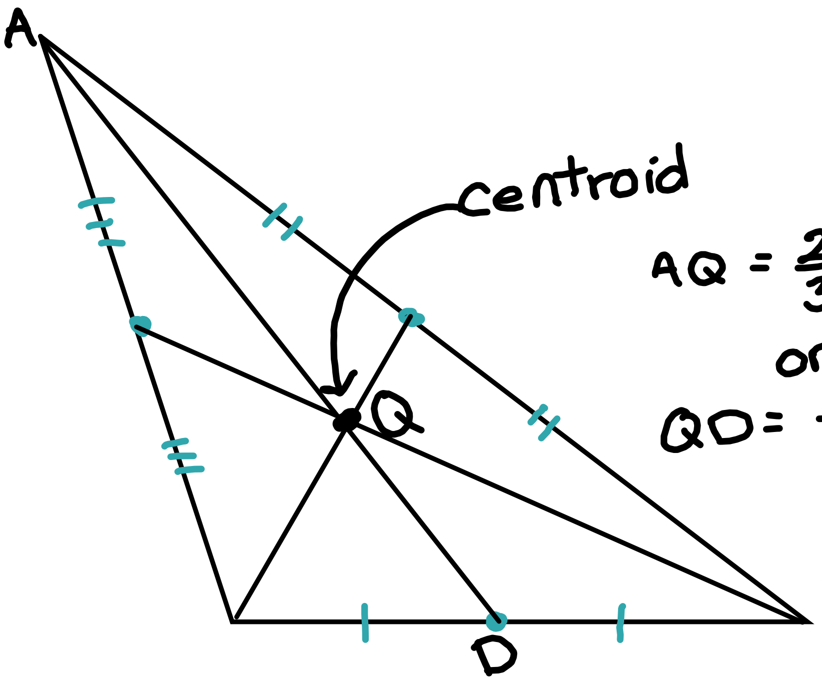
Prove //

$m\overline{AB} = \frac{0-0}{x-0} = 0$

$m\overline{DE} = \dfrac{\frac{1}{2}y_1 - \frac{1}{2}y_1}{\frac{x_1+x}{2} - \frac{1}{2}x_1} = 0$

Median of a Triangle

A segment that connects the vertex of a triangle to the midpoint of the opposite side



$AQ = \frac{2}{3}AD$

or

$QD = \frac{1}{3}AD$

or

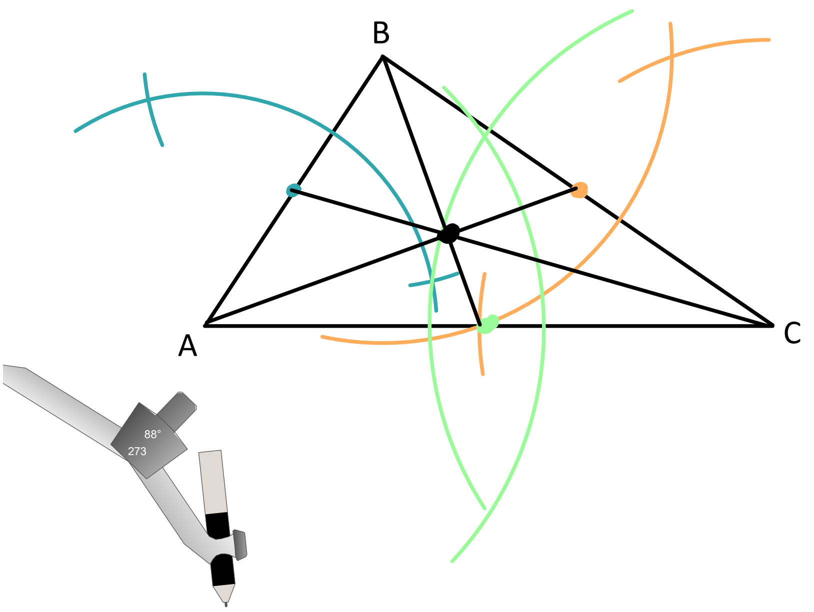
$QD = \frac{1}{2}AQ$

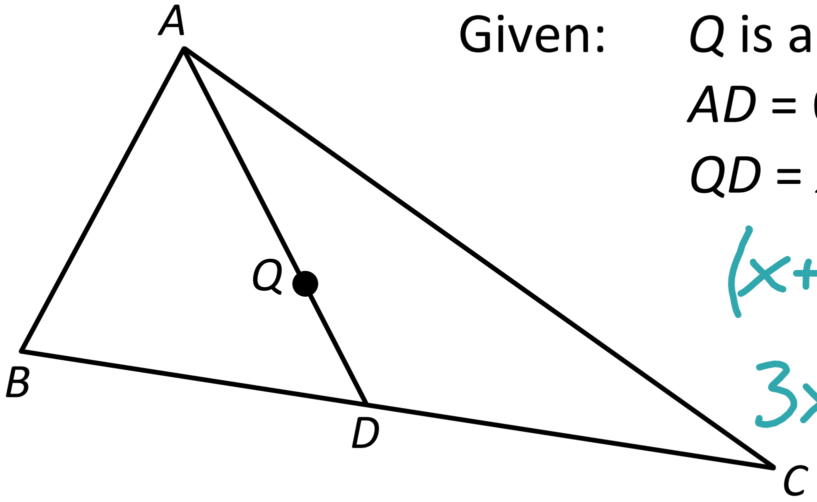
Centroid of a Triangle

- point of concurrency for the medians of a triangle
- always in the interior of the triangle
- center of gravity
- length from vertex to centroid is 2/3 the length of the entire median

To construct a centroid, construct the perpendicular bisector of each side of the triangle

** when drawing the bisector, just draw enough of it to intersect the side of the triangle - this indicates its midpoint





Given: Q is a centroid

$AD = 6x - 24$

$QD = x + 5$

$(x+5) = \frac{1}{3}(6x-24)$

$3x + 15 = 6x - 24$

$39 = 3x$

$\boxed{x = 13}$