I will be able to use geometric properties in proofs.

Checking In

Minds on   Entry Question

Action!   Altitudes, Medians and
              perpendicular bisectors

Consolidation Making A Plan

Minds on

Grab one whiteboard per partner group.

How would you do it?

Be specific about the steps you would take.

Prove that ABCD is a rectangle.

Prove that PQR is a right isosceles triangle.

Prove that ABCD is a rectangle.

Find length of AB, BC, CD, DA
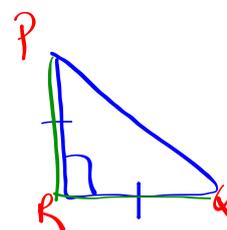
Find slope of AB, BC, CD, DA

If rectangle: $AB = CD$, $BC = DA$

$AB \perp BC$, $CD \perp DA$

Prove that PQR is a right isosceles triangle.

Find length of PQ, QR, RP

Two sides should be equal length
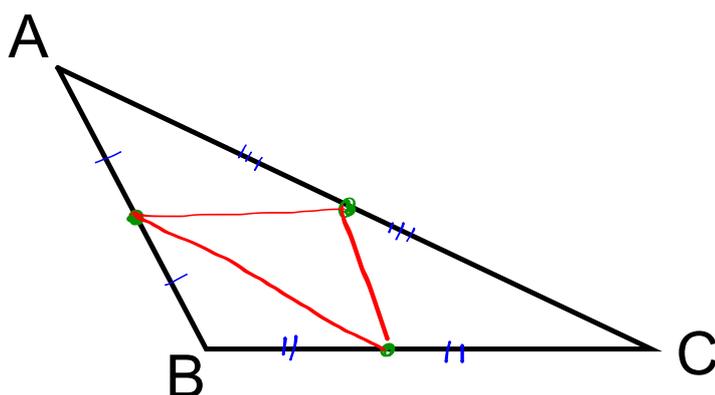
Slopes of two equal lines will be $\perp$

Minds on

What do you think a midsegment is?

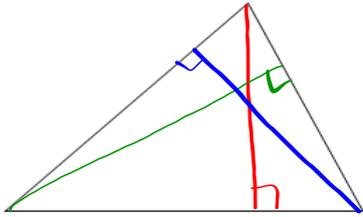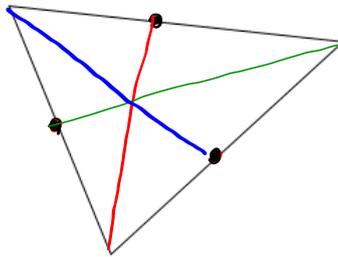Draw the midsegement of a triangle ABC.

Is there more than one?

How would you find the midsegment?
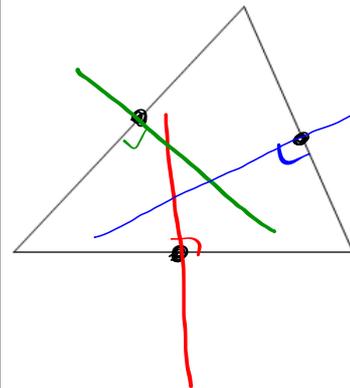
Lines and Line Segments within Triangles

An **altitude** (_height_) is the line segment drawn from a vertex of a triangle, perpendicular to the opposite side.

A **median**, in geometry, is a line that joins a vertex of a triangle to the midpoint of the opposite side.

The **perpendicular bisector** of a line segment is the line that passes through its midpoint at a right angle.

Example: △DEF has vertices at D(0, 1), E(6, -1), and F(3, 6):

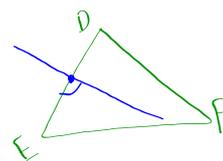a) Determine the equation of the
   perpendicular bisector of side DE.

Slope of DE

$$m = \frac{-1-1}{6-0}$$

$$= \frac{-2}{6} = \frac{-1}{3}$$

Slope of ⊥ bisector

$$= \frac{3}{1} \boxed{= 3}$$

Midpoint of DE

$$M = \left(\frac{0+6}{2}, \frac{1-1}{2}\right)$$

$$\boxed{M = (3, 0)}$$

Equation of Perpendicular Bisector
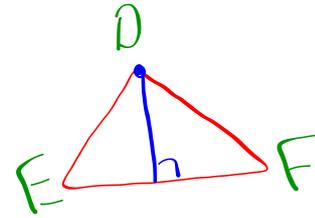
Find y-intercept

$$b = y - mx$$

$$b = 0 - (3)(3)$$

$$b = 0 - 9$$

$$\boxed{b = -9}$$

$$\therefore y = 3x - 9$$

Example: △DEF has vertices at D(0, 1), E(6, -1), and F(3, 6):

b) Determine the equation of the altitude through vertex D.

Slope of EF

$$m = \frac{6-(-1)}{3-6}$$

$$m = \frac{7}{-3}$$

⊥ Slope

$$\boxed{\frac{3}{7}}$$

y-intercept of altitude

$$b = y - mx$$

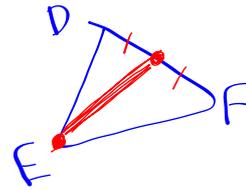$$b = (1) - \left(\frac{3}{7}\right)(0)$$

$$\boxed{b = 1}$$

$$\therefore \quad y = \frac{3}{7}x + 1$$

Example: $\triangle DEF$ has vertices at D(0, 1), E(6, -1), and F(3, 6):

c) Determine the equation of the median through vertex E.

<u>Midpoint of DF</u>

$$M = \left(\frac{0+3}{2}, \frac{1+6}{2}\right) = \left(\frac{3}{2}, \frac{7}{2}\right) = (1.5, 3.5)$$

<u>Slope of Median</u> (E to midpoint)

$$m = \frac{3.5 - (-1)}{1.5 - 6} = \frac{4.5}{-4.5} = -1$$

<u>y-intercept</u>

$$b = y - mx$$
$$b = -1 - (-1)(6)$$
$$b = -1 - (-6)$$
$$b = 5$$

$$\therefore y = -1x + 5$$

Practice: Page 109 #3 and Page 113 #2

pg 109-110: 3, 7, 10, 11, 13, 14