Math 1312
Section 4.2
The Parallelogram and Kite

Definition:
A kite is a quadrilateral with two distinct pairs of congruent adjacent sides.

Example 1:

Theorem: In a kite, **one** pair of opposite angles are congruent.

Properties of Kites

1. NOT a parallelogram!

2. Two pairs of consecutive sides are congruent.

3. The diagonals are perpendicular.

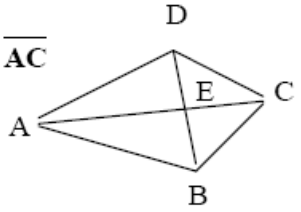
4. One diagonal is the perpendicular bisector of the other.

5. One pair of opposite angles are congruent.

6. One of the diagonals bisects a pair of opposite angles.

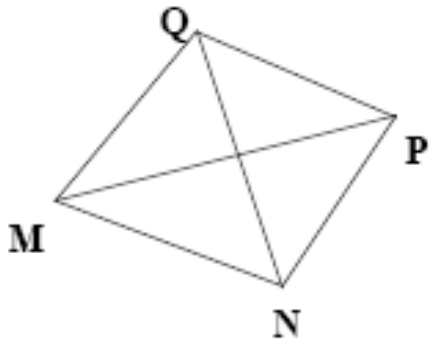
Example 2: Given a kite ABCD, $\overline{\mathbf{AC}}$ is the perpendicular bisector of $\overline{\mathbf{BD}}$:

a. If $\angle \mathbf{B} = \mathbf{90°}$ and AB =8 and BC 6. Find the length of $\overline{\mathbf{AC}}$

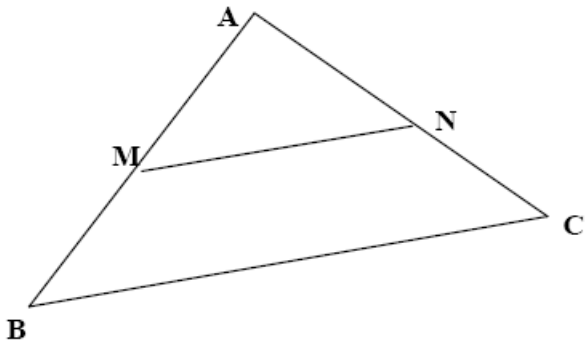


b. If AB = 16.3 and the perimeter of the kite is 54.7, find the lengths of DC, BC and AD.

Example: In kite MNPQ, $\overline{MP}$ is the perpendicular bisector of $\overline{NQ}$. If $m\angle QMN = 42°$ and $m\angle MNP = 98°$, find $m\angle NPQ$.

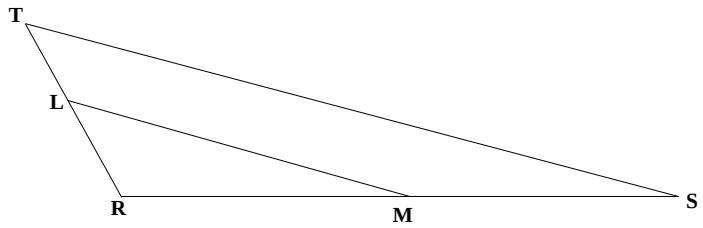


Theorem 4.2.5: The segment that joins the midpoints of the two sides of a triangle is parallel to the third side and has a length equal to on half the length of the third side.

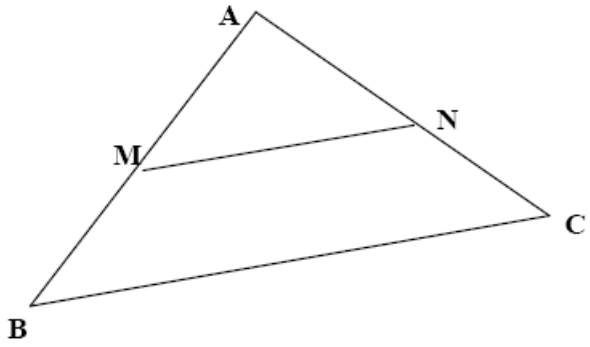


<u>Clarification</u>: in ΔTRS "M" is the midpoint of $\overline{RS}$ and "L" is the midpoint $\overline{RT}$.

By the above "rule", ML ll ST and ML = ½ ST. This can also be expressed as 2ML = ST.



Example 3. M and N are the midpoints of the sides $\overline{AB}$ and $\overline{BC}$ of ΔABC

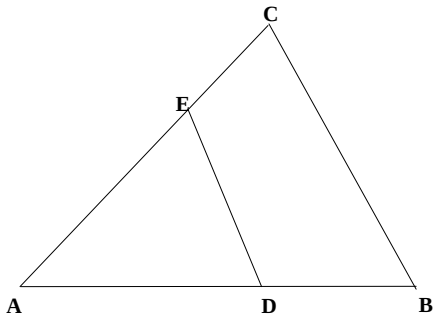


a. If MN = 7.3, find the length of $\overline{BC}$.

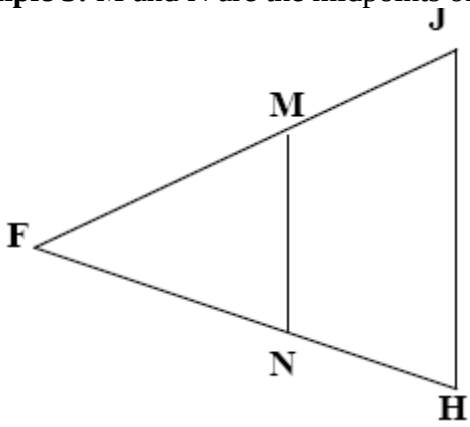
b. If BC = 4x + 6 and MN = x + 9, find the length of $\overline{BC}$.

Example 4:

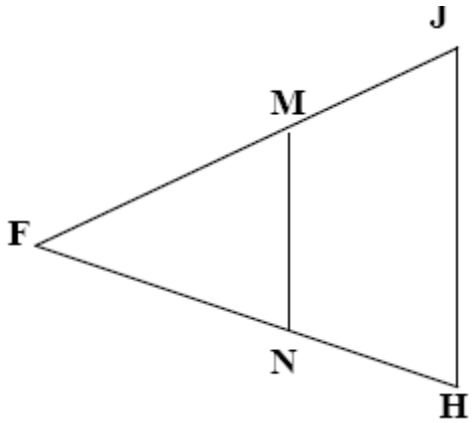
In the figure below, AE=8, CE=x, DA=6, and BA=12. Is ED ll CB?



Example 5: M and N are the midpoints of $\overline{FJ}$ **and** $\overline{FH}$

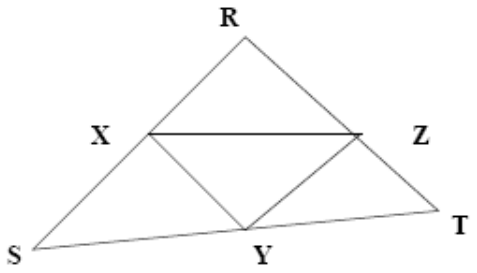


a. Given that ΔFHJ is isosceles, with $\overline{FJ} \cong \overline{FH}$, FM = 2y +3, NH = 5y−9 and JH = 2y. Find the perimeter of ΔFHJ .



b. Given JH = 12, $m\angle J = 80°$ and $m\angle F = 60°$. Find MN, $m\angle FMN$ and $m\angle FNM$.

Example 6: Use the following figure for both parts a and b. In ΔRST, X, Y and Z are the midpoints of the sides as shown.



a. If RS = 18 , RT =24, and ST = 26. Find XY, YZ, XZ and the perimeter of ΔXYZ.

b. If XY = 7.2 , XZ = 6.9, YZ = 5.1. Find RS, RT, ST and perimeter ΔRST.

Example 7:

In ΔABC, D is the midpoint of AB, E is the midpoint of BC, and F is the midpoint of AC. Find the perimeter of ΔDEF if AB = 24, BC = 32, and AC = 26.

Perimeter of ΔDEF = _____