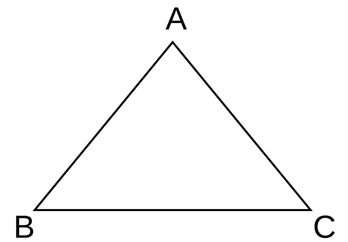
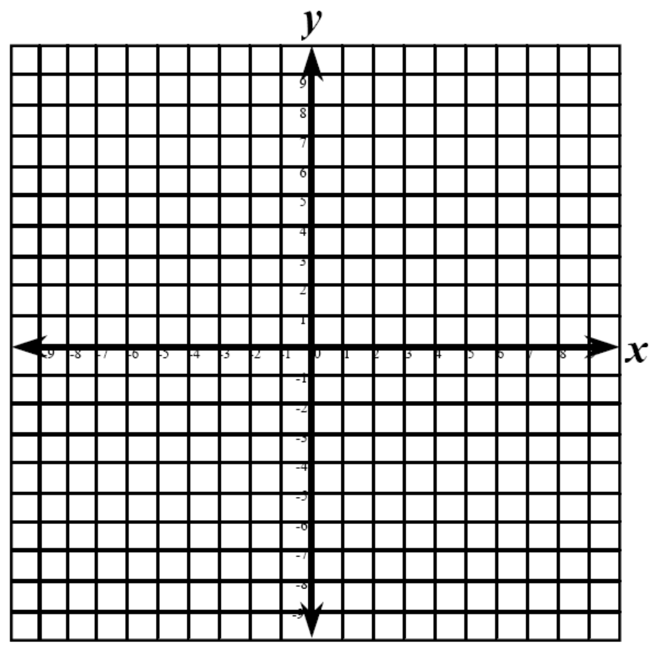
Notes: **MIDSEGMENTS**

Content Objective: ***I will be able to use properties of midsegments.***

TERM	DESCRIPTION	EXAMPLE
MIDSEGMENT	A midsegment of a triangle is a segment that connects the MIDPOINTS of two sides of a triangle.	Sketch the 3 midsegments for ΔABC 

1. **Draw a right triangle with vertices:**
   - **A(0,8)**
   - **B(6,0)**
   - **C(0,0)**
2. **Find the midpoints of** $\overline{AC}$ **and** $\overline{BC}$**.**
3. **Label the midpoints D and E.**
4. **Create midsegment** $\overline{DE}$

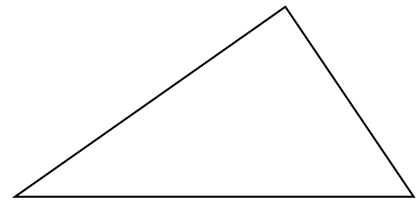
   (connect midpoints D and E).
5. **Compare the slopes and lengths of** $\overline{AB}$ **and** $\overline{DE}$**:**



	Slope	Length
$\overline{AB}$	**-4/3**	**10**
$\overline{DE}$	**-4/3**	**5**

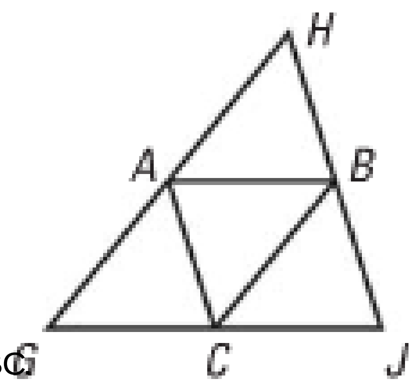
The slopes of $\overline{AB}$ **and** $\overline{DE}$ **are EQUAL, so** $\overline{AB}$ **and** $\overline{DE}$ **are PARALLEL.**

The length of $\overline{DE}$ **is HALF the length of** $\overline{AB}$**.**

TERM	DESCRIPTION	EXAMPLE
MIDSEGMENT THEOREM	A midsegment of a triangle is PARALLEL to the third side and is HALF as long as that side.	Sketch a midsegment and show that it is parallel to the third side. 

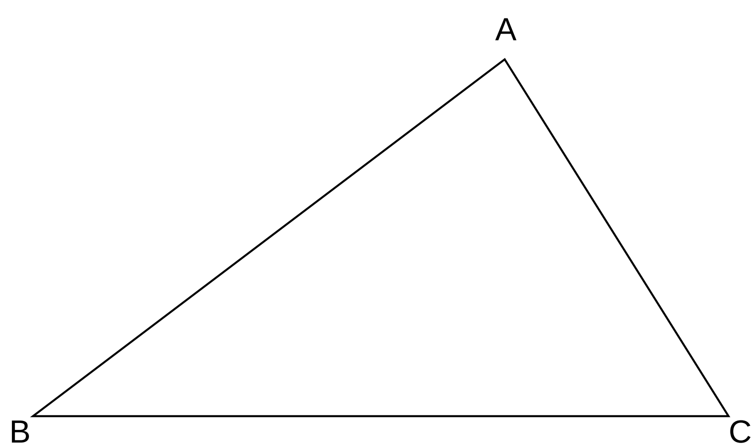
Parallel lines cut by a TRANSVERSAL produce corresponding ANGLES, which are CONGRUENT. And also SAME-SIDE INTERIOR angles that are SUPPLEMENTERY, their sum is 180°.

If A, B, and C are midpoints, then

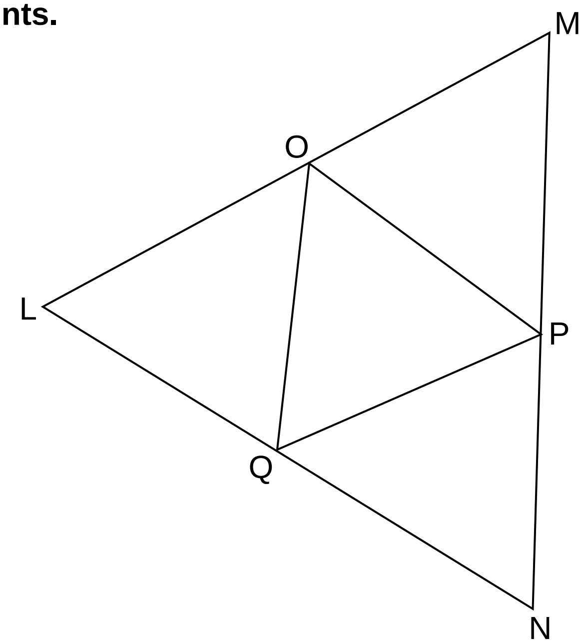


<HAB + <HGC	**<ABJ + <ABH = 180**
<HGC + <GAB =180	**<JGH = <JCB**
<GAC = <GHJ	**<JCA + <GCA = 180**

CONSTRUCTION: Construct a midsegment $\overline{DE}$ of $\triangle ABC$.



EXAMPLE 1: Use the figure below to complete the statements.
Points, Q, P, and O are midpoints.



a) $\overline{LM}$ ***// QP***

b) $\overline{OP} \cong$ **LQ** $\cong$ **QN**

c) <OLN + <LOP = 180

QUICK CHECK:

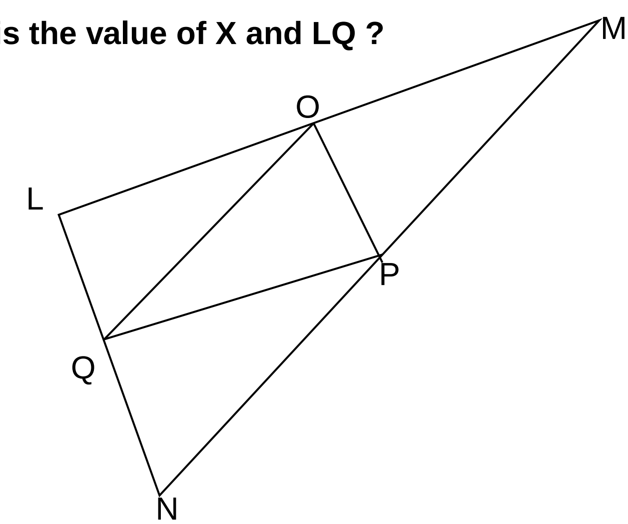
a) $\overline{OP}$ ***//*** **LN**

b) $\overline{NP} \cong$ **PM** $\cong$ **QO**

c) <LQO = < LNM

Use ΔLMN **, where O, P, and Q are midpoints of the sides.**

EXAMPLE 2: If $\overline{LN} = 18 - 4x$ **and** $\overline{OP} = 8x - 16$**, what is the value of X and LQ ?**



OP=1/2LN
8X-16 = ½(18-4X)
X=2.5
LQ=4

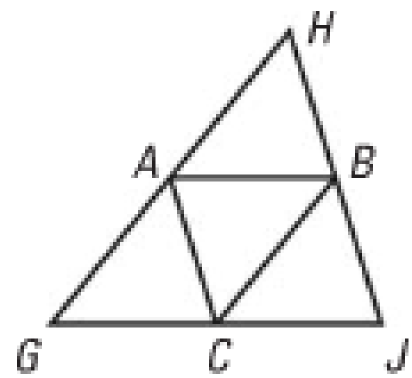
QUICK CHECK: If $\overline{NP} = x^2 + 5x - 16$ **and** $\overline{OQ} = 5x,$ **what is the value of x and NM?**

NP=OQ
X^2 + 5x – 16 = 5x
X^2 + 5x – 5x - 16 = 0
X^2 – 16 = 0
X^2 = 16
X= +4, x=-4
X=4 ; NM=40

Use $\triangle GHJ$ **, where A, B, and C are midpoints of the sides.**

EXAMPLE 3: If $\overline{AB} = 5y - 9$ **and** $\overline{GJ} = -y + 4$ **what is the value of y and CJ?**

AB= ½ GJ
5Y-9 = ½(-y + 4)
Y=2
CJ=1



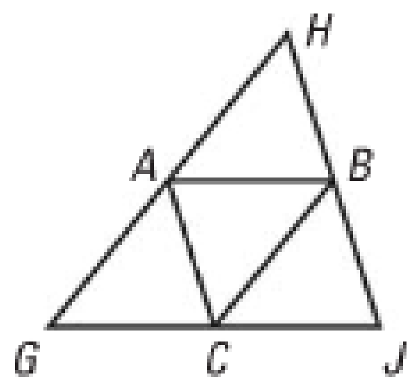
QUICK CHECK: If $\overline{AC} = \frac{1}{2}x + 4$ **and** $\overline{HJ} = 7x - 16$ **what is the value of x and HJ?**

AC = ½ HJ
1/2X +4= ½(7X-16)
X=4
HJ=12

Use $\triangle GHJ$ **, where A, B, and C are midpoints of the sides.**

EXAMPLE 4: Find the value of x and the $m\angle GAB$ **given** $\angle HGJ = 3x + 5$ **and** $\angle GAB = 6x - 14$.

<HGJ + < GAB = 180
3X+5 + 6X-14 = 180
X=21



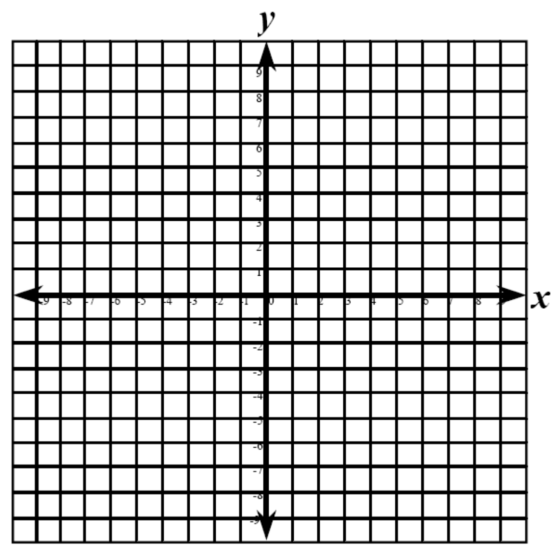
QUICK CHECK: Find the value of x and the $m\angle GHJ$ **given** $\angle JBC = 2x - 22$ **and** $\angle GHJ = x + 16$

<JBC = <GHJ
2X -22 = X + 16
X=38

EXAMPLE 5: The midpoints of the three sides of a triangle are P(2, 0), Q(-4, 4), and R(-1, -2). Find the length of each midsegment rounded to the nearest tenth and the perimeter of $\triangle QPR$**. Then find the perimeter of the original triangle.**

<u>USE THE DISTANCE FORMULA:</u>

PQ = 7.2



PR = 3.6

RQ = 6.7

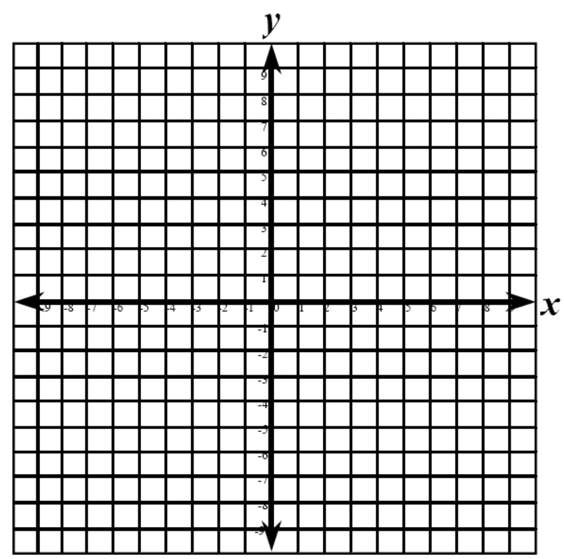
Perimeter of $\triangle QPR$ **17.5**

Perimeter of the original 35

QUICK CHECK: The midpoints of the three sides of a triangle are P(0, 0), Q(6, -3), and R(4, 1). Find the length of each midsegment rounded to the nearest tenth and the perimeter of $\triangle QPR$**. Then find the perimeter of the original triangle.**

<u>USE THE DISTANCE FORMULA:</u>

PQ = 6.7



PR = 4.1

RQ = 4.8

Perimeter of ΔPQR **15.6**

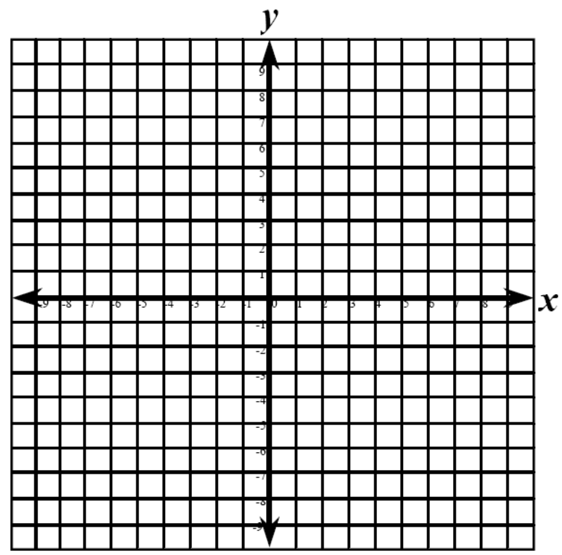
Perimeter of the original 31.2

1. **Draw a right triangle with vertices:**
   - **A(10,0)**
   - **B(0,8)**
   - **C(0,0)**
2. **Write the equation of $\overleftrightarrow{AB}$ in slope-intercept form: y = -4/5X + 8**
3. **Find the midpoints of $\overline{AC}$ and $\overline{BC}$.**

   (5,0), (0,4)
4. **Label the midpoints D and E.**
5. **Create midsegment $\overline{DE}$**

   (connect midpoints D and E).
6. **Write the equation of $\overleftrightarrow{DE}$ in slope-intercept form: y = -4/5X + 4**

EXAMPLE 6:



QUICK CHECK:

1. **Draw a right triangle with vertices:**
    a. **A(0,8)**
    b. **B(0,0)**
    c. **C(-6,0)**
2. **Write the equation of** $\overleftrightarrow{AB}$ **in slope-intercept form: y = ________________**
3. **Find the midpoints of** $\overline{AB}$ **and** $\overline{BC}$**.**
4. **Label the midpoints D and E.**
5. **Create midsegment** $\overline{DE}$
    a. **(connect midpoints D and E).**
6. **Write the equation of** $\overleftrightarrow{DE}$ **in slope-intercept form: y = ________________**