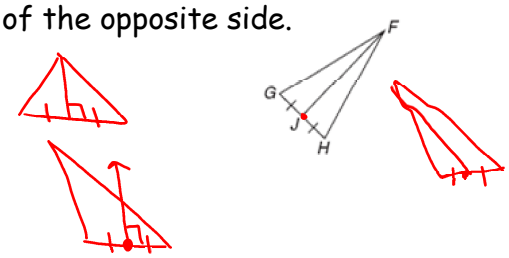
Objectives: *You will learn to identify altitudes and medians and use their properties to solve problems.*

Median of a Triangle: A segment whose endpoints are the vertex and the midpoint of the opposite side.

middle



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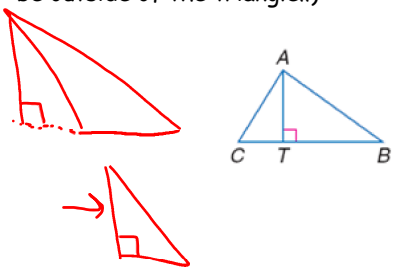
Altitude of a Triangle: perpendicular segment from a vertex to the line containing the opposite side (may be outside of the triangle!!)

height



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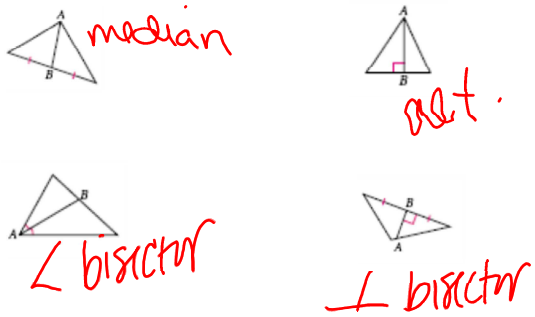
Example 1: Determine what $\overline{AB}$ is in each triangle.



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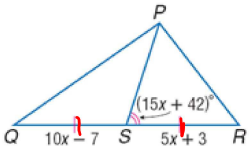
Example 2: **ALGEBRA** Find x if $\overline{PS}$ is a median of $\triangle PQR$.



$10x-7=5x+3$

$5x-7=3$

$5x=10$

$x=2$

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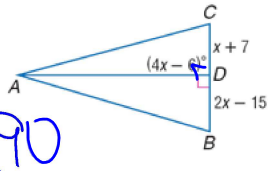
Example 3: **ALGEBRA** Find x if $\overline{AD}$ is an altitude of $\triangle ABC$.



$4x-6=90$

$4x=96$

$x=24$

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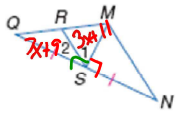
Example 4:

ALGEBRA Find x and $m\angle 2$ if $\overline{MS}$ is an altitude of $\triangle MNQ$, $m\angle 1 = 3x + 11$, and $m\angle 2 = 7x + 9$.



$(7x+9)+(3x+11)=90$

$10x+20=90$

$10x=70$

$x=7$

$m\angle 2 = 7(7)+9$

$= 58°$

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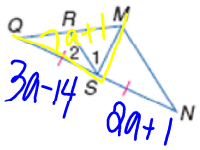
ALGEBRA If $\overline{MS}$ is a median of $\triangle MNQ$, $QS = 3a - 14$, $SN = 2a + 1$, and $m\angle MSQ = 7a + 1$, find the value of a. Is $\overline{MS}$ also an altitude of $\triangle MNQ$? Explain.



$3a - 14 = 2a + 1$

$a - 14 = 1$

$a = 15$

$7(15) + 1 = 106°$

$106 \neq 90$

$\overline{MS}$ is not alt.

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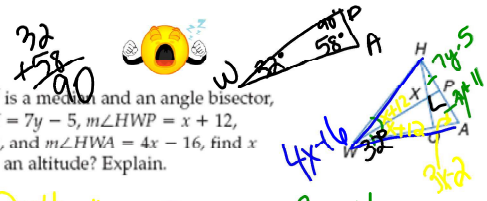
Example 5:

ALGEBRA If $\overline{WP}$ is a median and an angle bisector, $AP = 3y + 11$, $PH = 7y - 5$, $m\angle HWP = x + 12$, $m\angle PAW = 3x - 2$, and $m\angle HWA = 4x - 16$, find x and y. Is $\overline{WP}$ also an altitude? Explain.



$x + 12 + x + 12 = 4x - 16$

$2x + 24 = 4x - 16$

$24 = 2x - 16$

$40 = 2x$

$20 = x$

$7y - 5 = 3y + 11$

$4y - 5 = 11$

$4y = 16$

$y = 4$

Yes, $\overline{WP}$ is alt. because $m\angle WPA$ is 90°

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