2.8 Similar Triangles

Part 2

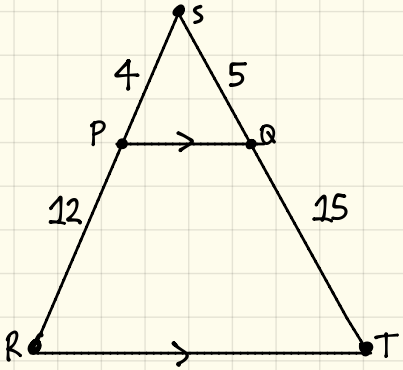
Midsegment of Triangle, Proportions in Triangle, Base Angle Theorem

Old Similar Triangles

Let's recall characteristics of Similar Triangles:

- same shape, but possibly different size
- corresponding sides are proportional
- proving similar triangles by AA, SSS, SAS.

Let's consider the diagram below. Prove $\Delta RST \sim \Delta PSQ$.



- Are sides proportional?

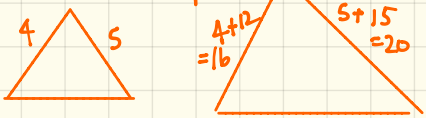
$\frac{SP}{SR} = \frac{SQ}{ST}$ $\quad \frac{4}{16} = \frac{5}{20}$ $\quad \frac{1}{4} = \frac{1}{4}$

yes!

- Included angle congruent? yes
  $\angle S \cong \angle S$ (Reflexive Property)

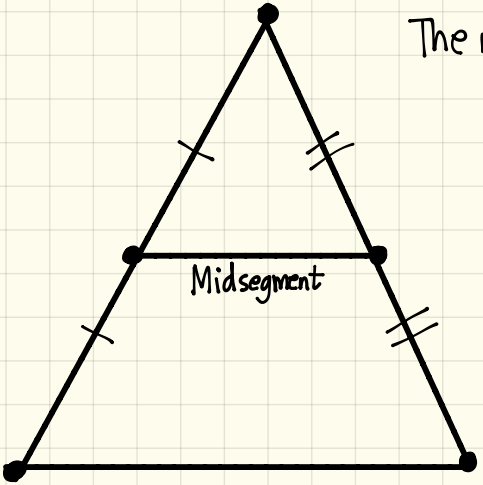
So, SAS. Therefore, $\Delta RST \sim \Delta PSQ$.

We could split triangles apart:



note: ">" means parallel.

new-A Triangle Midsegment Theorem



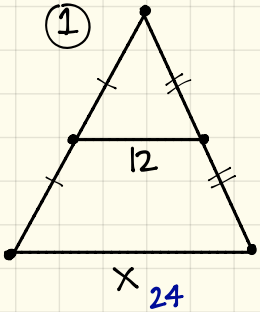
The midsegment is:

1. Parallel to one side of the triangle
2. Is half of the length of the parallel side
3. 2 midpoints connecting.

EQUATION

$\text{Midsegment} = \frac{1}{2}\text{Parallel Side}$

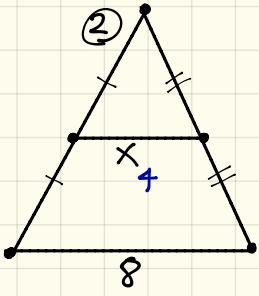
[Examples] Find the unknown.

① 

$\text{midseg} = \frac{1}{2}PS$

$12 = \frac{1}{2}PS$

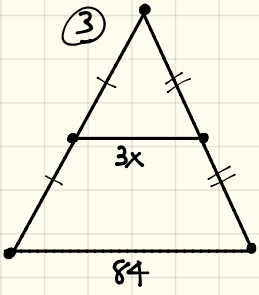
$24 = PS$

② 

$\text{midseg} = \frac{1}{2}PS$

$\text{midseg} = \frac{1}{2}(8)$

$\text{midseg} = 4$

③ 

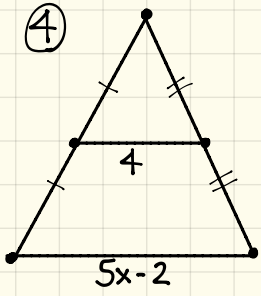
$\text{midseg} = \frac{1}{2}PS$

$3x = \frac{1}{2}(84)$

$3x = 42$

$x = 14$

④



midseg = $\frac{1}{2}$ PS

$4 = \frac{1}{2}(5x-2)$

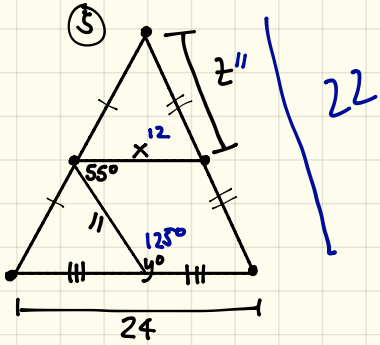
$4 = \frac{5x}{2} - 1$

$5 = \frac{5x}{2}$

$10 = 5x$

$2 = x$

⑤



22

midseg = $\frac{1}{2}$ PS

$x = \frac{1}{2}(24)$

$x = 12$

$y + 55 = 180°$

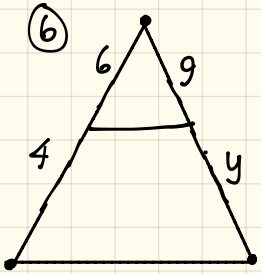
$y = 125°$

$11 = \frac{1}{2}$ PS

$22 = PS$

$z = \frac{22}{2} = 11$

⑥



$\frac{6}{10} = \frac{9}{9+y}$

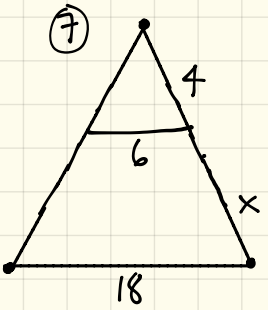
$9(10) = 6(9+y)$

$90 = 54 + 6y$

$36 = 6y$

$6 = y$

⑦



$\frac{4}{6} = \frac{x+4}{18}$

$6(x+4) = 72$

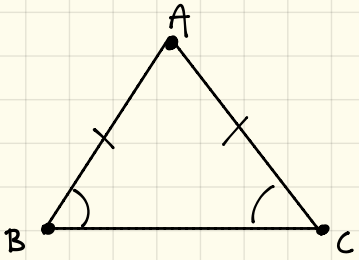
$6x + 24 = 72$

$6x = 48$

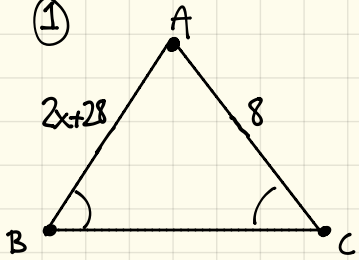
$x = 8$

Base Angles (Isosceles Triangle)

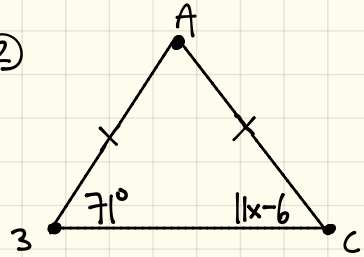
Opposite of the congruent angles are congruent sides



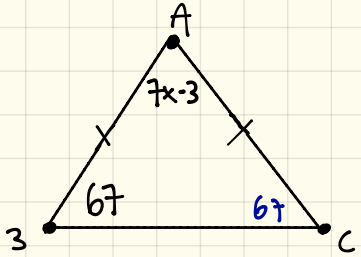
[Examples] Solve for the unknown.

① 

$2x+28 = 8$
$2x = -20$
$x = -10$

② 

$11x-6 = 71$
$11x = 77$
$x = 7$

③ 

$67 + 67 + ? = 180$
$134 + ? = 180$
$? = 46$

$7x-3 = 46$
$7x = 49$
$x = 7.$