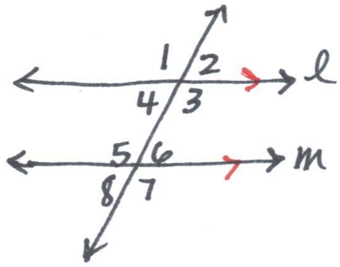
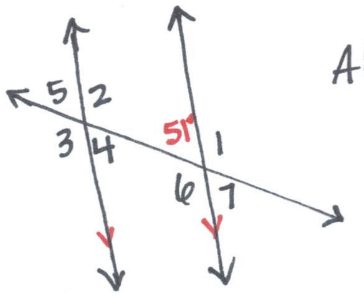
Properties of Parallel Lines (Section 6-4)

* Same-side Interior Angles Postulate: If $l \parallel m$, then the same-side interior angles are supplementary.



If $l \parallel m$, then $m\angle 3 + m\angle 6 = 180$ and $m\angle 4 + m\angle 5 = 180$.

#1 ex:



All angles $\cong$ to the given angle (51°) & why.

$\angle 7 \cong$ by Vertical Angles

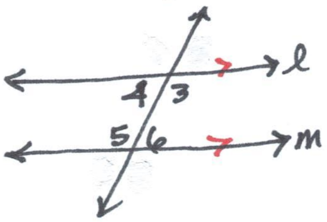
$\angle 4 \cong$ by Alt. Int. Angles

$\angle 5 \cong$ by Corresponding Angles

What is the measure of all remaining angles?

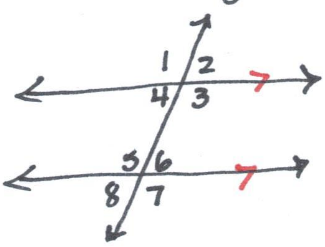
$m\angle 2 = m\angle 3 = m\angle 6 = m\angle 1 = 129°$

* Alternate Interior Angles Theorem: If $l \parallel m$, then the alternate interior angles are congruent.



If $l \parallel m$, then $\angle 4 \cong \angle 6$ & $\angle 3 \cong \angle 5$

* Corresponding Angles Theorem: If $l \parallel m$, then corresponding angles are congruent



If $l \parallel m$, then $\angle 1 \cong \angle 5$

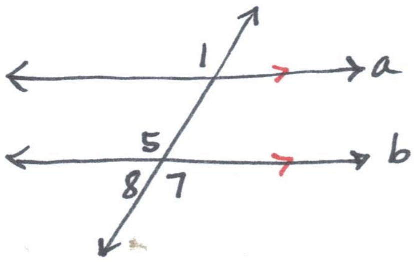
$\angle 2 \cong \angle 6$

$\angle 3 \cong \angle 7$

$\angle 4 \cong \angle 8$

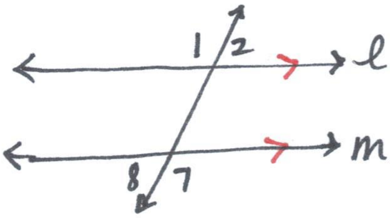
Got it?

ex: Let $a \parallel b$. Prove $\angle 1 \cong \angle 7$



Statement	Reason
$a \parallel b$	Given
$\angle 1 \cong \angle 5$	Corresp. Angles
$\angle 5 \cong \angle 7$	Vertical Angles
$\angle 1 \cong \angle 7$	Transitive

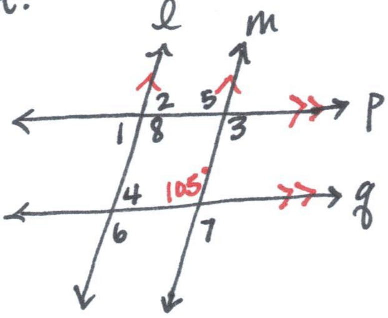
* Alternate Exterior Angles Theorem: If $\ell \parallel m$, then alternate exterior angles are congruent.



If $\ell \parallel m$, then $\angle 1 \cong \angle 7$ & $\angle 2 \cong \angle 8$

#3/Got it?

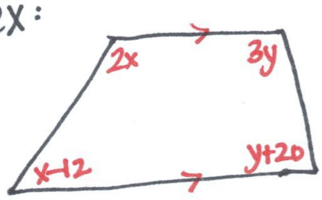
ex:



measure	why?
② $\angle 1 = 75°$	alt. int. angles (to $\angle 4$)
③ $\angle 2 = 75°$	corr. angles (to $\angle 4$)
④ $\angle 3 = 105°$	alt. int. angles (to given)
① $\angle 4 = 75°$	same-side int. are supp.
⑤ $\angle 5 = 105°$	corr. angles (to given)
⑥ $\angle 6 = 105°$	supp. angles to ($\angle 4$)
⑦ $\angle 7 = 105°$	vertical angles (to given)
⑧ $\angle 8 = 105°$	corr. angles (to $\angle 6$)

Got it?

ex:



by same-side int.:

$2x + (x-12) = 180$

$3x - 12 = 180$

$\frac{3x}{3} = \frac{192}{3}$

$x = 64°$

$3y + (y+20) = 180$

$4y + 20 = 180$

$\frac{4y}{4} = \frac{160}{4}$

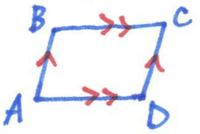
$y = 40°$

Properties of Parallelograms (Section 9-2)

* Parallelogram: a quadrilateral whose opposite sides are $\parallel$.

Theorem #38

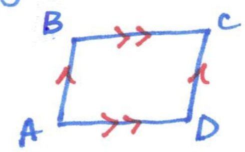
* If a quadrilateral is a parallelogram, then the opposite sides are congruent.



If ABCD is $\square$, then $\overline{AB} \cong \overline{CD}$ and $\overline{BC} \cong \overline{DA}$

Theorem #39

* If a quadrilateral is a parallelogram, then it's consecutive angles are supplementary.



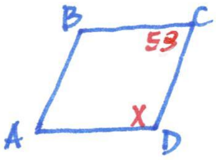
If ABCD is $\square$, then $m\angle A + m\angle B = 180°$

$m\angle B + m\angle C = 180°$

$m\angle C + m\angle D = 180°$

$m\angle D + m\angle A = 180°$

ex:



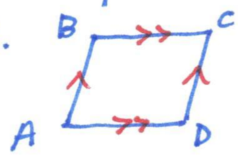
If ABCD is $\square$, find x.

$x + 53° = 180°$

$\boxed{x = 137°}$

Theorem #40

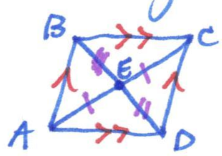
* If a quadrilateral is a parallelogram, then it's opposite angles are congruent.



If ABCD is $\square$, then $\angle A \cong \angle C$ and $\angle B \cong \angle D$

Theorem #41

* If a quadrilateral is a parallelogram, then it's diagonals bisect each other.

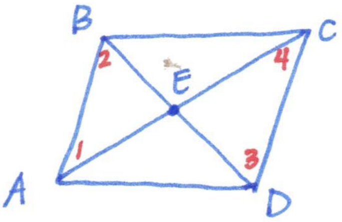


If ABCD is $\square$, then $\overline{AE} \cong \overline{CE}$ and $\overline{BE} \cong \overline{DE}$

#3

ex: Given: ▱ABCD

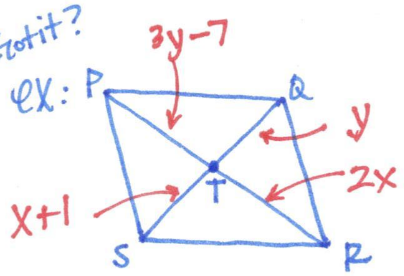
Prove: $\overline{AC}$ & $\overline{BD}$ bisect each other @ E.



Statements	Reasons.
ABCD is parallelogram	Given
$\overline{AB} \parallel \overline{CD}$	Def of Parallogram
$\angle 1 \cong \angle 4$, $\angle 2 \cong \angle 3$	Alt. Int. Angles
$\overline{AB} \cong \overline{DC}$	Opp sides of ▱ are ≅
$\triangle ABE \cong \triangle CDE$	ASA
$\overline{AE} \cong \overline{CE}$, $\overline{BE} \cong \overline{DE}$	CPCTC
$\overline{AC}$ & $\overline{BD}$ bisect each other	Definition of bisector

Got it?

ex:



Find PR & SQ.

$3y-7=2x$

$3(x+1)-7=2x$

$3x+3-7=2x$

$-3x \quad\quad -3x$

$-4=-x$

$\boxed{x=4}$

$x+1=y$

$4+1=y$

$\boxed{5=y}$

$\therefore PR=(3y-7)+(2x)$

$=3(5)-7+2(4)$

$\boxed{PR=16}$

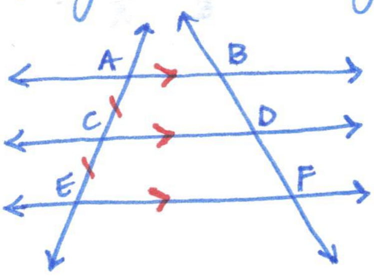
$SQ=(x+1)+y$

$=(4)+1+(5)$

$\boxed{SQ=10}$

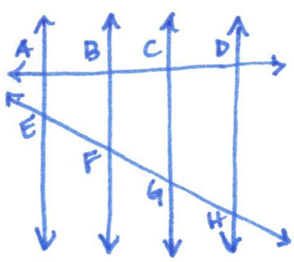
Theorem #42

* If three (or more) // lines cut off congruent segments on one transversal, then they cut off congruent segments on every transversal.



If $\overleftrightarrow{AB} \parallel \overleftrightarrow{CD} \parallel \overleftrightarrow{EF}$ and $\overline{AC} \cong \overline{CE}$, then $\overline{BD} \cong \overline{DF}$.

ex:



If $EF=FG=GH=6$ and $AD=15$, what is CD?

AD is split into 3 equal pieces

$\therefore CD=5$.