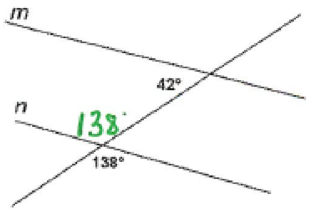
Name KEY

Date

CC Geometry H

HW #4

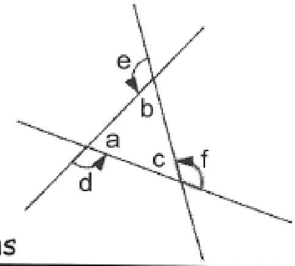
1. In the figure at the right, explain why m ll n.



138
+42
180°

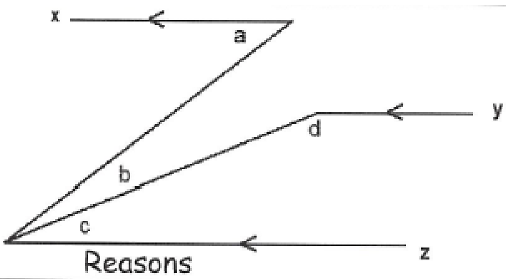
When lines are cut by a transversal such that same-side interior $\measuredangle$s sum to 180°, the lines are parallel.

2. In the diagram at the right, prove that the sum of the angles marked by arrows is 360°.



Statements	Reasons
1. $m\measuredangle a + m\measuredangle d = 180^\circ$	1. Linear pair of $\measuredangle$s sums to 180°
2. $m\measuredangle b + m\measuredangle e = 180^\circ$	2. same as (1)
3. $m\measuredangle c + m\measuredangle f = 180^\circ$	3. same as (1)
4. $m\measuredangle a + m\measuredangle d + m\measuredangle b + m\measuredangle e + m\measuredangle c + m\measuredangle f = 540^\circ$	4. Addition Property
5. $m\measuredangle a + m\measuredangle b + m\measuredangle c = 180^\circ$	5. $\triangle$ $\measuredangle$ Sum Theorem
6. $m\measuredangle d + m\measuredangle e + m\measuredangle f = 360^\circ$	6. Subtraction Property

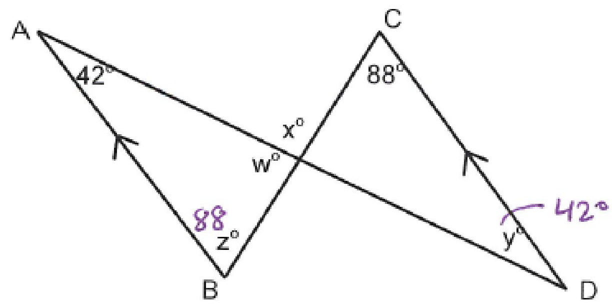
3. In the diagram at the right, prove that $m\measuredangle a - m\measuredangle b + m\measuredangle d = 180^\circ$



Statements	Reasons
1. x ll y ll z	1. Given
2. $m\measuredangle c + m\measuredangle d = 180^\circ$	2. If two parallel lines are cut by a transversal, then same-side interior angles sum to 180°.
3. $m\measuredangle c + m\measuredangle b = m\measuredangle a$	3. when ll lines are cut by a transv., alt. int. $\measuredangle$s are equal.
4. $m\measuredangle b = m\measuredangle b$	4. Reflexive Prop.
5. $m\measuredangle c = m\measuredangle a - m\measuredangle b$	5. Subtraction Prop.
6. $m\measuredangle a - m\measuredangle b + m\measuredangle d = 180^\circ$	6. Substitution Prop.

Mixed Review:

1) Complete the table. $\overline{AB} \parallel \overline{CD}$



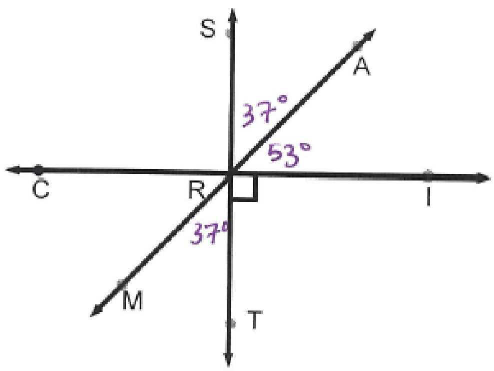
$88 + 42 + w = 180$

$130 + w = 180$

$w = 50$

Angle	Angle Measure	Reason
∡y	42°	When ∥ lines are cut by a transv., alt. int. ∡s are =.
∡z	88°	same as above
∡w	50°	△ ∡ Sum Thm
∡x	130	Linear pairs of ∡s sum to 180°.

2) In the diagram, m∡SRA = 37°.



a. Name an angle complementary to ∡SRA.

∡ARI

b. Name an angle supplementary to ∡MRI.

∡CRM, ∡ARI

c. Name an angle that is a supplement to ∡TRI.

∡TRC, ∡SRI, ∡SRC

d. Find m∡ARI.

$90 - 37 = \boxed{53°}$

e. Why is the m∡CRM = 53°? Explain. ∡CRM = ∡ARI bc Vertical ∡s are =.

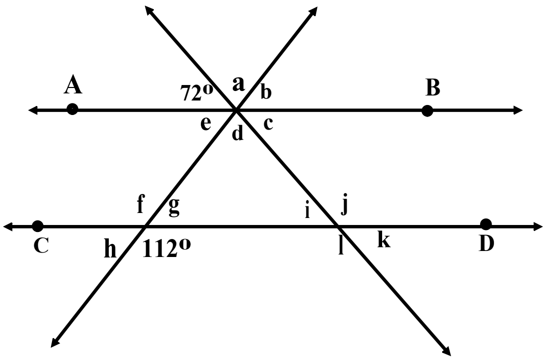
f. Find the m∡CRA.

$90 + 37 = \boxed{127°}$

Aim #5: How do we do write proofs of angle theorems? CC Geometry H

Do Now:

1. Solve for the variables if $\overleftrightarrow{AB} \parallel \overleftrightarrow{CD}$.



a = 40°   b = 68°
c = 72°   d = 40°
e = 68°   f = 112°
g = 68°   h = 68°
i = 72°   j = 108°
k = 72°   l = 108°

2. How many lines are there passing through A parallel to $\overleftrightarrow{CD}$? 1

Complete: Through a point not on a line, there is exactly one line parallel to the given line.

(This is known as the **PARALLEL POSTULATE**.)

A **postulate** is a mathematical statement accepted as true without proof.

A **theorem** is a mathematical statement that can be proven.

Once a theorem has been proven, it can be added to our list of known facts and used in proofs.

We previously accepted the following:

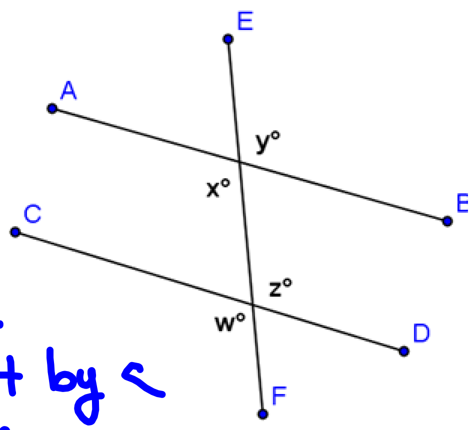
- Vertical angles are of equal measure.
- If two parallel lines are cut by a transversal, alternate interior angles are equal.

Let's prove:

If two parallel lines are cut by a transversal, corresponding angles are equal.

Given: $\overline{AB} \parallel \overline{CD}$

Prove: $x = w$



Statements	Reasons
① $\overline{AB} \parallel \overline{CD}$	① Given
② $w = z$	② Vertical ∡s are =.
③ $x = z$	③ When ∥ lines are cut by a transv., alt. int. ∡s are =.
④ $x = w$	④ Substitution Prop.

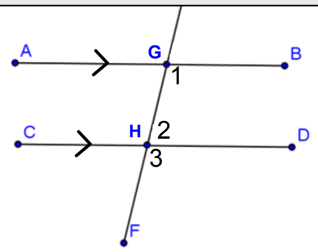
You have available the following facts:

- Vertical angles are equal in measure.
- If two parallel lines are cut by a transversal, then alternate interior angles are equal.
- If two parallel lines are cut by a transversal, corresponding angles are equal

Let's prove: **If two parallel lines are cut by a transversal, same-side interior angles sum to 180°.**

Given: $\overline{AB} \parallel \overline{CD}$, transveral $\overline{EF}$

Prove: $m\measuredangle 1 + m\measuredangle 2 = 180°$



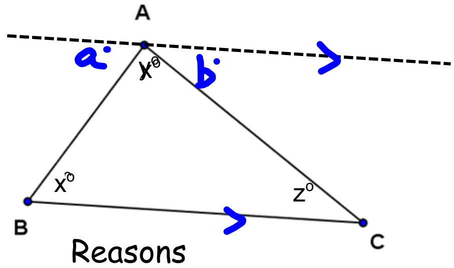
Statements	Reasons
① $\overline{AB} \parallel \overline{CD}$	① Given
② $m\measuredangle 1 = m\measuredangle 3$	② When ∥ lines are cut by a transv., corr. ∡s are =.
③ $m\measuredangle 2 + m\measuredangle 3 = 180$	③ Lin. prs. of ∡s sum to 180.
④ $m\measuredangle 1 + m\measuredangle 2 = 180$	④ Substitution Prop

Let's prove: **The three angles of a triangle sum to 180°.**

You will need to draw an auxiliary line parallel to one of the triangle's sides and passing through the vertex opposite that side. Add any necessary labels and write out your proof.

Given: Triangle ABC

Prove: $x + y + z = 180°$

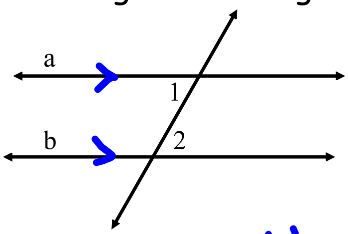


Statements	Reasons
① $\triangle ABC$	① Given
② $a = x$, $b = z$	② When ∥ lines are cut by a transv., alt. int. ∡s =.
③ $a + x + b = 180$	③ Consecutive adjacent ∡s on a line sum to 180°.
④ $x + y + z = 180°$	④ Subst. Prop.

Each of the three parallel line theorems has a **CONVERSE** (or reversing) theorem as follows:

Original

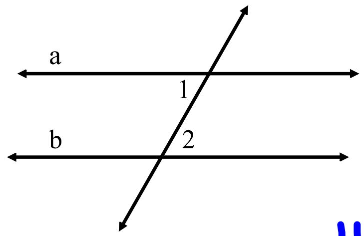
If two parallel lines are cut by a transversal, then alternate interior angles are congruent.



If a ll b, then ∡1=∡2

Converse

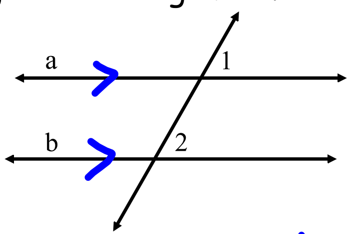
If two lines are cut by a transversal such that alternate interior angles are congruent, then the lines are parallel.



If m 1 = m 2, then a∥b

Original

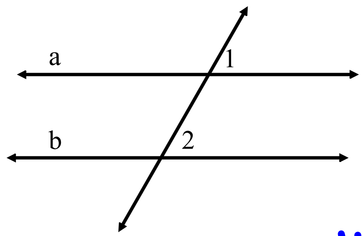
If two parallel lines are cut by a transversal, then corresponding angles are congruent.



If a ll b, then ∡1=∡2

Converse

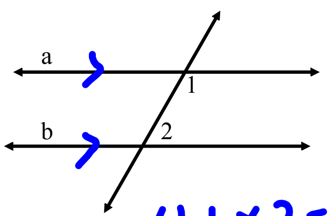
If two lines are cut by a transversal such that corresponding angles are congruent, then the lines are parallel.



If m 1 = m 2, then a∥b

Original

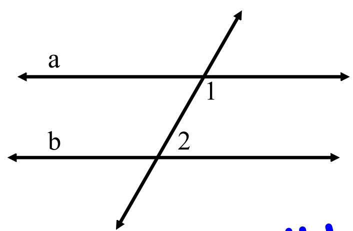
If two parallel lines are cut by a transversal, then same-side interior angles sum to 180°.



If a ll b, then ∡1+∡2=180°

Converse

If two lines are cut by a transversal such that same-side interior angles sum to 180°, then the lines are parallel.



If m∡1 + m∡2 = 180°, then a∥b

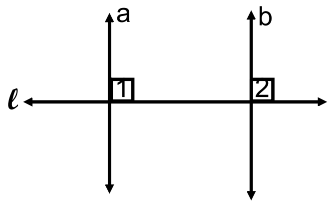
Let's prove:

If two lines are perpendicular to the same line, they are parallel to each other.

State the given facts and the conjecture to be proven:

Given: $a \perp \ell$, $b \perp \ell$

Prove: $a \parallel b$



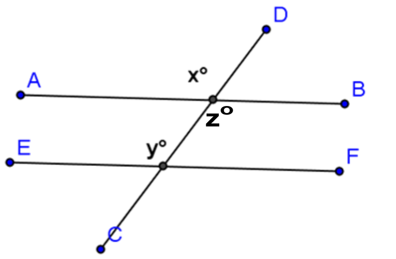
Statements	Reasons
① $a \perp \ell$, $b \perp \ell$	① Givens
② $\measuredangle 1 = 90°$, $\measuredangle 2 = 90°$	② $\perp$ lines form $90°$ $\measuredangle$s.
③ $\measuredangle 1 = \measuredangle 2$	③ Substitution Prop.
④ $a \parallel b$	④ If 2 lines are cut by a transv, such that corr. $\measuredangle$s are =, the lines are $\parallel$.

Prove the "converse" of the theorem we proved on page 1:

If two lines are cut by a transversal such that corresponding angles are equal, then the lines are parallel.

Given: $x = y$

Prove: $\overleftrightarrow{AB} \parallel \overleftrightarrow{EF}$



Statements	Reasons
① $x = y$	① Given
② $x = z$	② Vert. $\measuredangle$s are =.
③ $z = y$	③ Subst. Prop.
④ $\overleftrightarrow{AB} \parallel \overleftrightarrow{EF}$	④ When 2 lines are cut by a transv., such that alt. int. $\measuredangle$s are =, the lines are $\parallel$.

Let's Sum it up!!

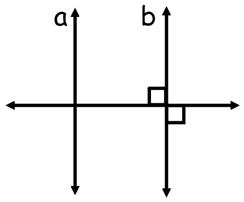
If two parallel lines are cut by a transversal:

- same side interior angles are __supplementary__ or add up to __180__°.
- alternate interior angles are __equal__
- corresponding angles are __equal__.

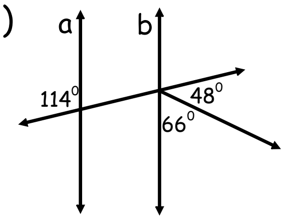
Name ________________________ CC Geometry H
Date ________________________ HW #5

1) Is it possible to prove lines a and b parallel? Explain your answer.

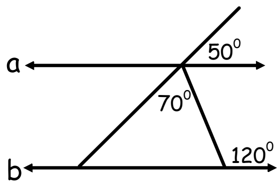
a)



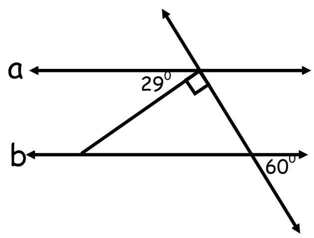
b)



c)



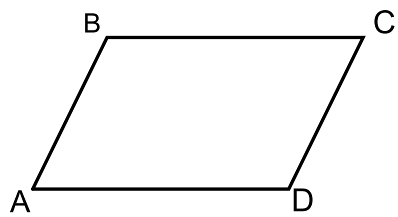
d)



2) Given: $m\angle C + m\angle D = 180^\circ$

$m\angle B = m\angle D$

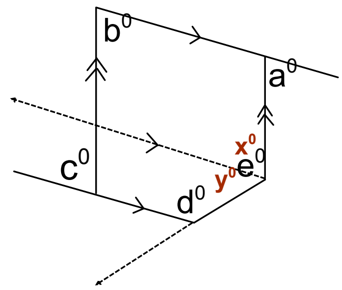
Prove: $\overline{AB} \parallel \overline{CD}$



statements	reasons

3) Prove: $d + e - a = 180^\circ$ (Suggested auxiliary lines have been drawn.)

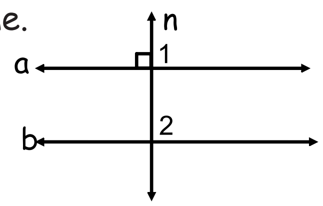
Statements	Reasons
1. $d + y = 180^\circ$	1.
2. $e = x + y$	2.
3. $x = x$	3.
4. $y = e - x$	4.
5. $d + e - x = 180^\circ$	5.
6. $a = x$	6.
7. $d + e - a = 180^\circ$	7.



4) Prove: If a line is perpendicular to one of two parallel lines and intersects the other, then it is perpendicular to the other parallel line.

Complete. Given: $a \parallel b$, $a \perp n$

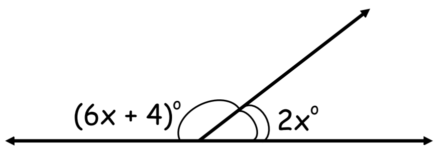
Prove: $b \perp n$



Statements	Reasons

Review:

6) Find the measure of the smaller angle.



7) Find m∢x and m∢y.