2-7

Flowchart and Paragraph Proofs

OBJECTIVES

- To prove and apply theorems about angles and segments
- To use two-column proofs to write flowchart and paragraph proofs

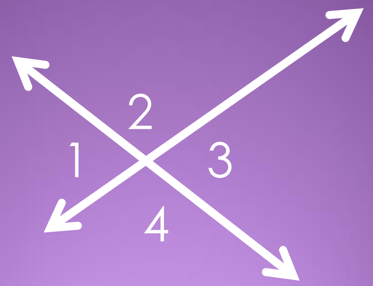
2-7-1 Common Segments Theorem

Given collinear points A, B, C, and D arranged as shown:

If $\overline{AB} \cong \overline{CD}$, then $\overline{AC} \cong \overline{BD}$.

2-7-2
Vertical Angles Theorem.

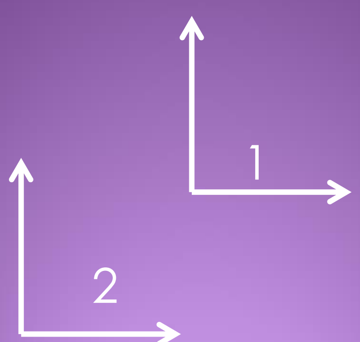
Vertical angles are congruent.



$\angle 1 \cong \angle 3$;
$\angle 2 \cong \angle 4$

2-7-3

If two congruent angles are supplementary, then each angle is a right angle.



If $\angle 1$ and $\angle 2$ are supplementary,

and $\angle 1 \cong \angle 2$,

then $\angle 1$ and $\angle 2$ are right angles.

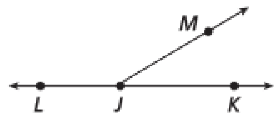
G-CO.3.9

1 PROOF Linear Pair Theorem

If two angles form a linear pair, then they are supplementary.

Given: $\angle MJK$ and $\angle MJL$ are a linear pair of angles.

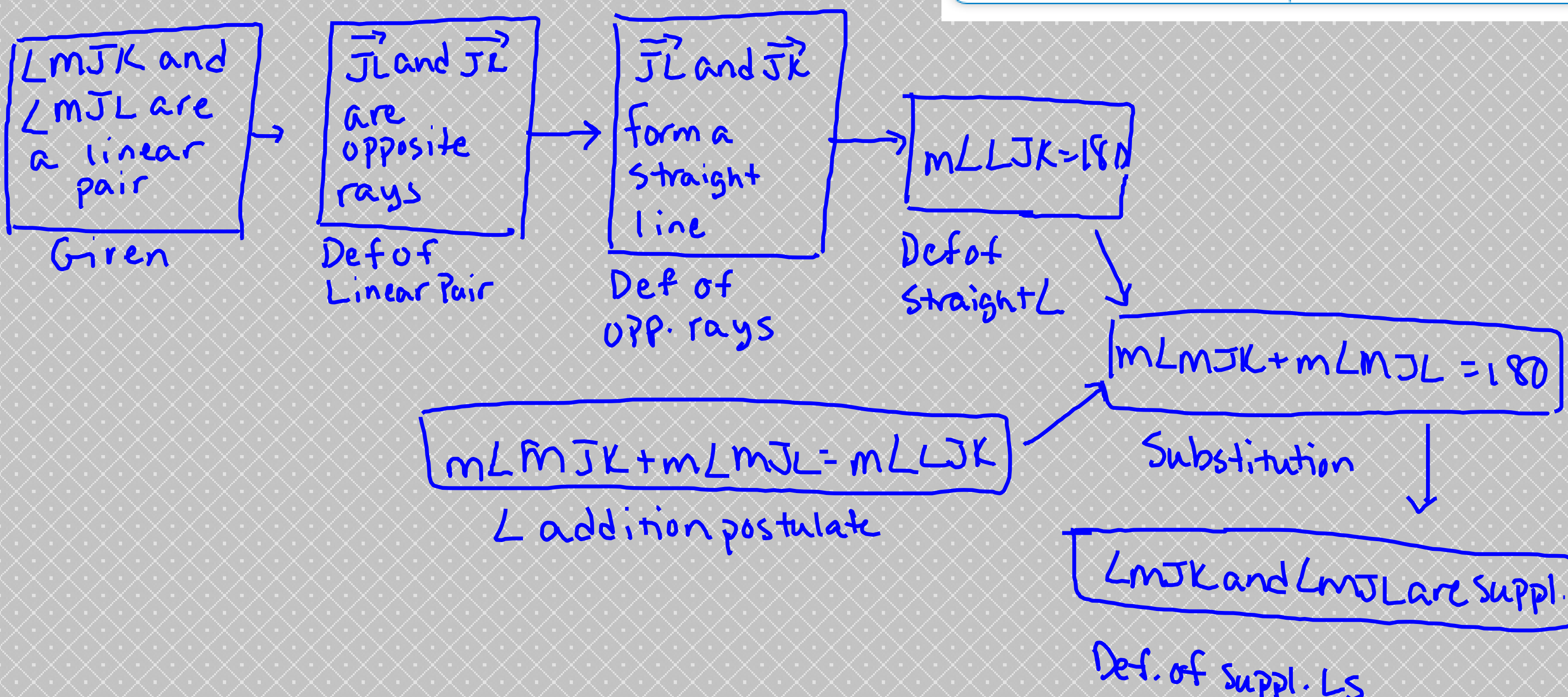
Prove: $\angle MJK$ and $\angle MJL$ are supplementary.



Complete the proof by writing the missing reasons. Choose from the following reasons.

Angle Addition Postulate | Definition of opposite rays | Substitution Property of Equality | Given

Statements	Reasons
1. $\angle MJK$ and $\angle MJL$ are a linear pair.	1. Given
2. $\overrightarrow{JL}$ and $\overrightarrow{JK}$ are opposite rays.	2. Definition of linear pair
3. $\overrightarrow{JL}$ and $\overrightarrow{JK}$ form a straight line.	3. Def. of opposite rays
4. $m\angle LJK = 180°$	4. Definition of straight angle
5. $m\angle MJK + m\angle MJL = m\angle LJK$	5. ∠ Add. Postulate
6. $m\angle MJK + m\angle MJL = 180°$	6. Substitution
7. $\angle MJK$ and $\angle MJL$ are supplementary.	7. Definition of supplementary angles



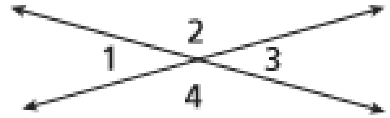
PROOF OF LINEAR PAIR THEOREM

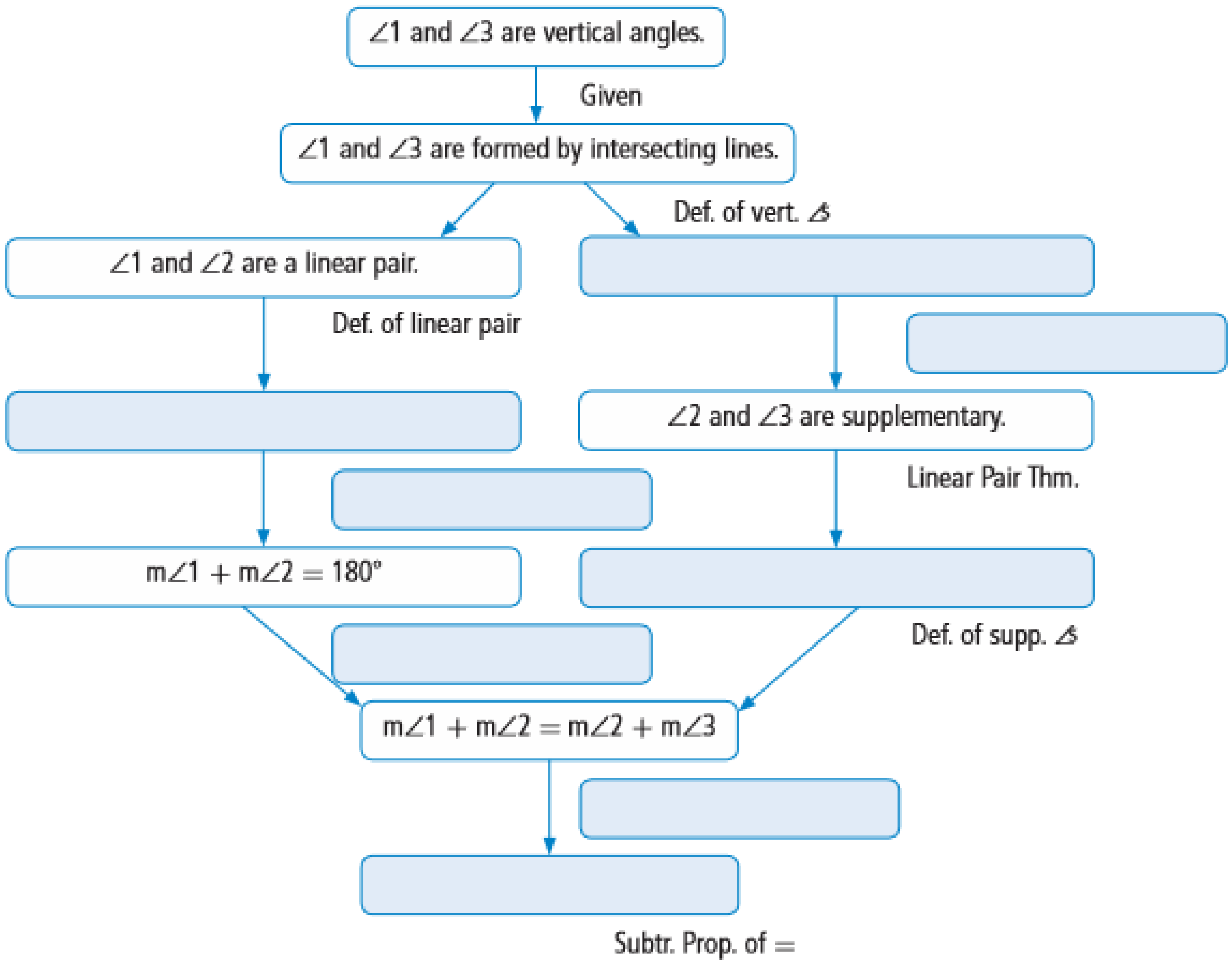
Proof of Vertical Angles Theorem

If two angles are vertical angles, then they are $\cong$.

Given: $\angle 1$ and $\angle 3$ are vertical angles.

Prove: $\angle 1 \cong \angle 3$



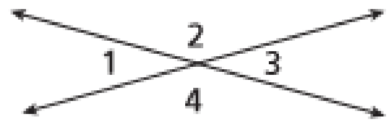


Proof of Vertical Angles Theorem

If two angles are vertical angles, then they are ≅.

Given: ∠1 and ∠3 are vertical angles.

Prove: ∠1 ≅ ∠3



∠1 and ∠3 are vertical angles.

↓ Given

∠1 and ∠3 are formed by intersecting lines.

↓ Def. of vert. ∠s

∠1 and ∠2 are a linear pair.	∠2 and ∠3 are a linear pair
↓ Def. of linear pair	↓ Def. of Linear Pair
∠1 and ∠2 are supplementary	∠2 and ∠3 are supplementary.
↓ Linear Pair Theorem	↓ Linear Pair Thm.
m∠1 + m∠2 = 180°	m∠2 + m∠3 = 180
↓ Def. of Supplementary	↓ Def. of supp. ∠s

m∠1 + m∠2 = m∠2 + m∠3

↓ Substitution prop of =

m∠1 = m∠3

Subtr. Prop. of =

→ ∠1 ≅ ∠3

Def of ≅ ∠s

Proof of Common Segments Theorem

If A, B, C, and D are collinear, as shown in the figure, with $AB = CD$, then $AC = BD$.

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

Prove: $\overline{AC} \cong \overline{BD}$

Statements	Reasons
$\overline{AB} \cong \overline{CD}$	Given
$AB = CD$	Definition of congruent segments
$AB + BC = BC + CD$	Addition property of equality
$AB + BC = AC$ $BC + CD = BD$	Segment addition postulate
$AC = BD$	Substitution
$\overline{AC} \cong \overline{BD}$	Definition of congruent segments

$\overline{AB} \cong \overline{BC}$ because it is given. $AB = CD$ by definition of $\cong$ segments. $AB + BC = BC + CD$ because of the addition property of $=$. $AB + BC = AC$ and $BC + CD = BD$ by Segment addition postulate. $AC = BD$ by substitution. $\overline{AC} \cong \overline{BD}$ because of the Definiton of $\cong$ Segments.

Angles and segments can be proven congruent in several different ways.

The proofs can be written as two-column proofs, flowchart proofs, and paragraph proofs.

SUMMARY

HOMEWORK

- Pages 123-125: 8-18 even; 22