

Geometry 2.8

Write proofs involving complementary and supplementary angles

Write proofs involving congruent and right angles

complementary

supplementary

linear pair

adjacent angles

protractor postulate

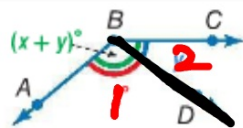
angle addition postulate

activity: whiteboards

scrambled proofs

Postulate 2.11 Angle Addition Postulate

D is in the interior of $\angle ABC$ if and only if
 $m\angle ABD + m\angle DBC = m\angle ABC$.

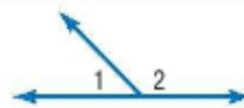


$$m\angle 1 + m\angle 2 = m\angle ABC$$

Theorems

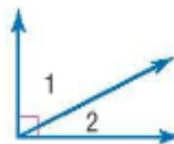
2.3 Supplement Theorem If two angles form a linear pair, then they are supplementary angles.

Example $m\angle 1 + m\angle 2 = 180$



2.4 Complement Theorem If the noncommon sides of two adjacent angles form a right angle, then the angles are complementary angles.

Example $m\angle 1 + m\angle 2 = 90$



You will prove Theorems 2.3 and 2.4 in Exercises 16 and 17, respectively.

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ReadingMath

Abbreviations and Symbols

The notation \sphericalangle means angles.

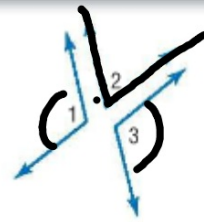
Theorems

2.6 Congruent Supplements Theorem

Angles supplementary to the same angle or to congruent angles are congruent.

Abbreviation \sphericalangle *suppl. to same \sphericalangle or $\cong \sphericalangle$ are \cong .*

Example If $m\angle 1 + m\angle 2 = 180$ and $m\angle 2 + m\angle 3 = 180$, then $\angle 1 \cong \angle 3$.

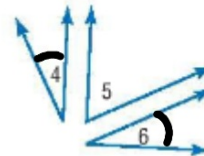


2.7 Congruent Complements Theorem

Angles complementary to the same angle or to congruent angles are congruent.

Abbreviation \sphericalangle *compl. to same \sphericalangle or $\cong \sphericalangle$ are \cong .*

Example If $m\angle 4 + m\angle 5 = 90$ and $m\angle 5 + m\angle 6 = 90$, then $\angle 4 \cong \angle 6$.



You will prove one case of Theorem 2.6 in Exercise 6.

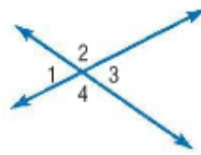
Given

Theorem 2.8 Vertical Angles Theorem

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

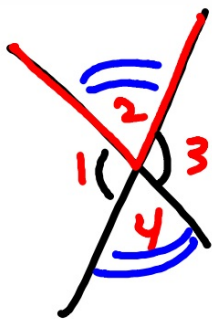
Abbreviation Vert. \angle are \cong .

Example $\angle 1 \cong \angle 3$ and $\angle 2 \cong \angle 4$



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You will prove Theorem 2.8 in Exercise 28.



prove VA \cong

$$m\angle 1 + m\angle 2 = 180$$

$$m\angle 2 + m\angle 3 = 180$$

$$m\angle 1 + m\cancel{2} = m\cancel{2} + m\angle 3 \quad \text{Subs.}$$

$$m\angle 1 = m\angle 3$$

$$\angle 1 \cong \angle 3$$

def lin pair

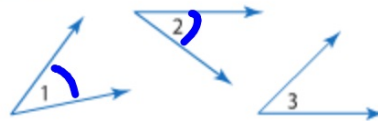
Subtr.

def \cong

6. **PROOF** Copy and complete the proof of one case of Theorem 2.6.

Given: $\angle 1$ and $\angle 3$ are complementary.
 $\angle 2$ and $\angle 3$ are complementary.

Prove: $\angle 1 \cong \angle 2$



Proof:

Statements	Reasons
a. $\angle 1$ and $\angle 3$ are complementary. $\angle 2$ and $\angle 3$ are complementary.	a. <u>given</u>
b. $m\angle 1 + m\angle 3 = 90$; $m\angle 2 + m\angle 3 = 90$	b. <u>def Comp</u>
c. $m\angle 1 + m\angle 3 = m\angle 2 + m\angle 3$	c. <u>Subs</u>
d. <u>? - m\angle 3 = m\angle 3</u>	d. <u>Reflexive Property</u>
e. $m\angle 1 = m\angle 2$	e. <u>Subtr</u>
f. $\angle 1 \cong \angle 2$	f. <u>def ?</u>

6

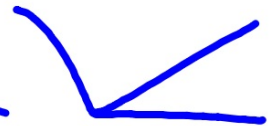
7. **CCSS ARGUMENTS** Write a two-column proof.

Given: $\angle 4 \cong \angle 7$

Prove: $\angle 5 \cong \angle 6$



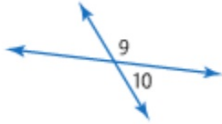
$m\angle 1 = 38$



St.	Reas
1. $\angle 4 \cong \angle 7$	1. given
2. $\angle 4 \cong \angle 5$ $\angle 6 \cong \angle 7$	2. $\forall \cong$
3. $\angle 5 \cong \angle 6$	3 subs

Find the measure of each numbered angle and name the theorems used that justify your work.

~~$m\angle 9 = 3x + 12$~~ $\rightarrow 156$
 ~~$m\angle 10 = x - 24$~~ $\rightarrow 24$



$$3x + 12 + x - 24 = 180$$

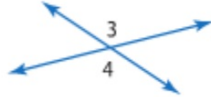
$$4x - 12 = 180$$

$$\quad +12 \quad +12$$

$$4x = 192$$

$$x = 48$$

~~$m\angle 3 = 2x + 23$~~ $\rightarrow 113$
 ~~$m\angle 4 = 5x - 112$~~ $\rightarrow 113$



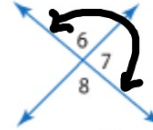
$$2x + 23 = 5x - 112$$

$$-2x + 112 \quad -2x + 112$$

$$135 = 3x$$

$$45 = x$$

~~$m\angle 6 = 2x - 21$~~ $\rightarrow 73$
 ~~$m\angle 7 = 3x - 34$~~ $\rightarrow 107$



$$2x - 21 + 3x - 34 = 180$$

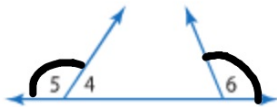
$$5x - 55 = 180$$

$$5x = 235$$

$$x = 47$$

15. Given: $\angle 5 \cong \angle 6$

Prove: $\angle 4$ and $\angle 6$ are supplementary.



ST	Reas.
1. $\angle 5 \cong \angle 6$	1. given
2. $m\angle 5 = m\angle 6$	2. def \cong
3. $m\angle 4 + m\angle 5 = 180$	3. lin. pr
↓	
4. $m\angle 4 + m\angle 6 = 180$	4. subst
5. $\angle 4$ is sup to $\angle 6$	5. def supp

