

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

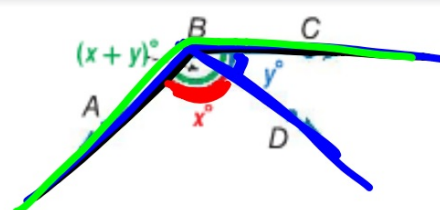
scrambled proofs

Given: (hyp) 
Prove: (cond.)

Postulate 2.11 Angle Addition Postulate

D is in the interior of $\angle ABC$ if and only if

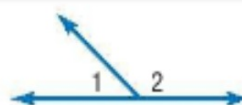
$m\angle ABD + m\angle DBC = m\angle ABC.$



Theorems

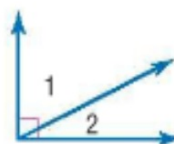
2.3 Supplement Theorem If two angles form a linear pair, then they are supplementary angles.

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

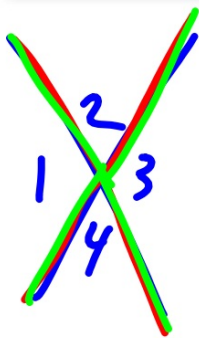


You will prove Theorems 2.3 and 2.4 in Exercises 16 and 17, respectively.

ReadingMath

Abbreviations and Symbols

The notation $\angle$ means angles.



$$\angle 1 + \angle 2 = 180$$
$$\angle 3 + \angle 2 = 180$$

Theorems

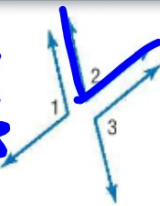
2.6 Congruent Supplements Theorem

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

Abbreviation $\angle$ suppl. to same $\angle$ or $\cong \angle$ are $\cong$.

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

$$\angle 1 + \angle 2 = 180$$
$$\angle 3 + \angle 2 = 180$$
$$\angle 1 = \angle 3$$



2.7 Congruent Complements Theorem

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

Abbreviation $\angle$ compl. to same $\angle$ or $\cong \angle$ are $\cong$.

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

$$\angle 4 + \angle 5 = 90$$
$$\angle 6 + \angle 5 = 90$$
$$\angle 4 = \angle 6$$



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

You have trusted me until now. It is time to PROVE it!

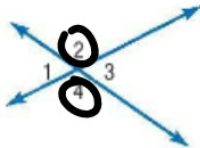
Given **Cl. = Prove**

Theorem 2.8 Vertical Angles Theorem

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

Abbreviation Vert. $\angle$ s are $\cong$.

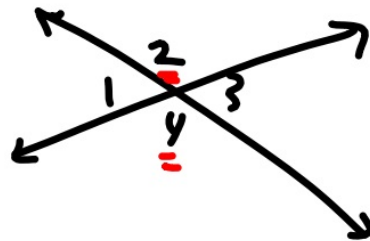
Example $\angle 1 \cong \angle 3$ and $\angle 2 \cong \angle 4$



James Emmanuel Mayomataks/Alamy

Proof:

Given: $\angle 2$ & $\angle 4$ are vert
 Prove: $\angle 2 \cong \angle 4$

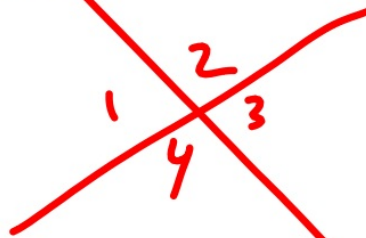


- | | |
|---|----------------|
| 1. $\angle 2$ & $\angle 4$ are vert | 1. given |
| 2. $\angle 1 + \angle 2 = 180$
$\angle 1 + \angle 4 = 180$ | 2. lin pair |
| 3. $\angle 1 + \angle 2 = \angle 1 + \angle 4$
$- \angle 1$ $- \angle 1$ | 3. Subs. |
| 4. $\angle 2 = \angle 4$ | 4. Subtr. |
| 5. $\angle 2 \cong \angle 4$ | 5. def $\cong$ |

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Given $\angle 1 + \angle 3 \text{ are } \text{v.a.}$

Prove $\angle 1 \cong \angle 3$



1. $\angle 1 + \angle 3 \text{ are } \text{v.a.}$ 1. given

2. $\angle 1 + \angle 2 = 180$ 2. Lin pr.

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

3. $\angle 1 + \angle 2 = \angle 2 + \angle 3$ 3. Subs

$$-\angle 2 \quad -\angle 2$$

4. $\angle 1 = \angle 3$ 4. Subtr.

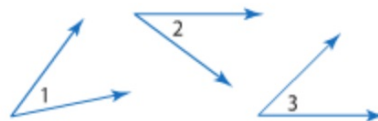
5. $\angle 1 \cong \angle 3$ 5. def $\cong$

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:



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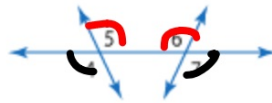
Statements	Reasons
a. $\angle 1$ and $\angle 3$ are complementary. $\angle 2$ and $\angle 3$ are complementary.	a. <u>given</u>
b. $m\angle 1 + m\angle 3 = 90$; $m\angle 2 + m\angle 3 = 90$	b. <u>def comp</u>
c. $m\angle 1 + m\angle 3 = m\angle 2 + m\angle 3$	c. <u>own.</u>
d. $-\angle 3 = -\angle 3$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



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

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

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



1. $\angle 4 \cong \angle 7$

1. given

2. $\angle 4 \cong \angle 5$ $\angle 6 \cong \angle 7$

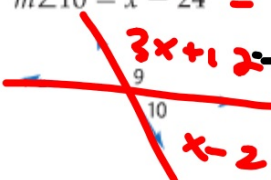
2. VA

3. $\angle 5 \cong \angle 6$

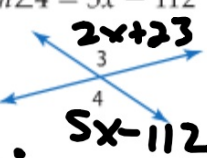
3. subs

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

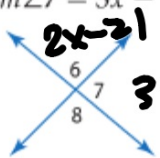
11. $m\angle 9 = 3x + 12$ $m\angle 10 = x - 24$



12. $m\angle 3 = 2x + 23$ $m\angle 4 = 5x - 112$



13. $m\angle 6 = 2x - 21$ $m\angle 7 = 3x - 34$

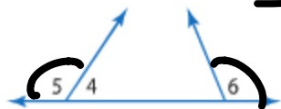


$$\begin{aligned}
 3x + 12 + x - 24 &= 180 \\
 4x - 12 &= 180 \\
 +12 \quad +12 & \\
 \hline
 4x &= 192 \\
 x &= 48
 \end{aligned}$$

$$\begin{aligned}
 5x - 112 &= 2x + 23 \quad \text{VP} = 180 \\
 -2x \quad +112 \quad -2x \quad +112 & \\
 \hline
 3x &= 135 \\
 x &= 45
 \end{aligned}$$

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

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



1. $\angle 5 \cong \angle 6$

2. $\angle 5 + \angle 4 = 180$

3. $\angle 6 + \angle 4 = 180$

4. $\angle 4$ & $\angle 6$ are supp

1. given

2. L.P. = 180

3. subs

4. def supp

WB 2.8
P. 30 1-4 prac.
P. 29 1-6 skills