Geometry 2.8

Write proofs involving complementary and supplementary angles

Write proofs involving congruent and right angles

complementary Sum 90°

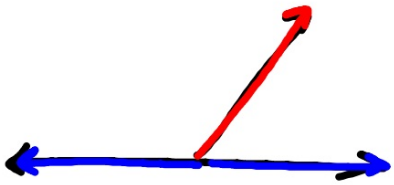
supplementary Sum 180°

linear pair

adjacent angles

protractor postulate

angle addition postulate



scrambled proofs

activity: plates, stirring sticks, circles

scrambled proofs

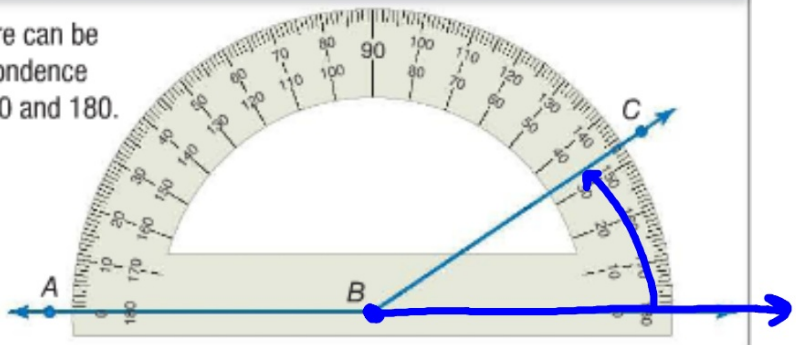
1 Supplementary and Complementary Angles

The Protractor Postulate illustrates the relationship between angle measures and real numbers.

Postulate 2.10 Protractor Postulate

Words Given any angle, the measure can be put into one-to-one correspondence with real numbers between 0 and 180.

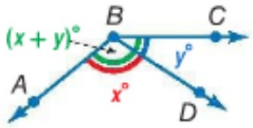
Example If $\overrightarrow{BA}$ is placed along the protractor at 0°, then the measure of $\angle ABC$ corresponds to a positive real number.



One small angle + other small angle = whole thing
(The ray inside doesn't take up any of the angle.)

Postulate 2.11 Angle Addition Postulate

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



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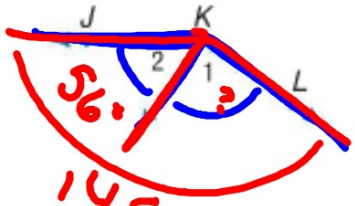
Example 1 Use the Angle Addition Postulate

Find $m\angle 1$ if $m\angle 2 = 56$ and $m\angle JKL = 145$.

89°

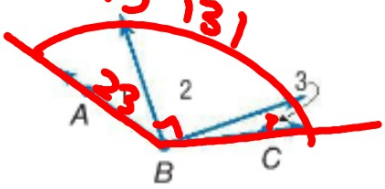
145
−56
89



Guided Practice

1. If $m\angle 1 = 23$ and $m\angle ABC = 131$, find the measure of $\angle 3$. Justify each step.

145 131

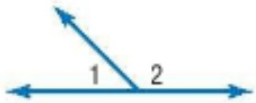


$90 + 23 + x = 131$ ∠ add
$113 + x = 131$ Subs
$-113 \quad -113$ Subtr.
$x = 18$ Subs

plates P 1 S 2

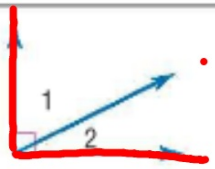
Theorems

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

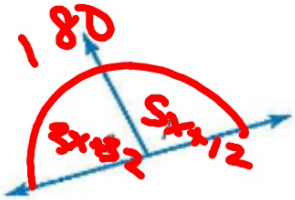
You will prove Theorems 2.3 and 2.4 in Exercises 16 and 17, respectively.

GuidedPractice

2. $\angle 6$ and $\angle 7$ form linear pair. If $m\angle 6 = 3x + 32$ and $m\angle 7 = 5x + 12$, find x, $m\angle 6$, and $m\angle 7$. Justify each step.

3·17+32

5·17+12



∠ add $3x+32+5x+12=180$

Subs $8x+44=180$

Subtr. $-44 \quad -44$

div prop $\frac{8x}{8} = \frac{136}{8}$

$x=17$ subs

$x = 17$

$\angle 6 = 85°$

$\angle 7 = 95°$

2 Congruent Angles The properties of algebra that applied to the congruence of segments and the equality of their measures also hold true for the congruence of angles and the equality of their measures.

Theorem 2.5 Properties of Angle Congruence

Reflexive Property of Congruence

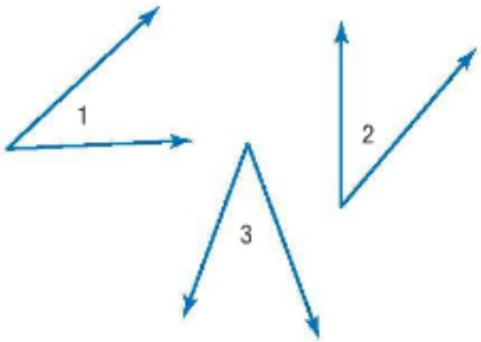
$\angle 1 \cong \angle 1$

Symmetric Property of Congruence

If $\angle 1 \cong \angle 2$, then $\angle 2 \cong \angle 1$.

Transitive Property of Congruence

If $\angle 1 \cong \angle 2$ and $\angle 2 \cong \angle 3$, then $\angle 1 \cong \angle 3$.



You will prove the Reflexive and Transitive Properties of Congruence in Exercises 18 and 19, respectively.

Draw an acute angle. Label it Angle A.
Use a protractor to find the measure of A.

ReadingMath

Abbreviations and Symbols

The notation ∡ means *angles*.

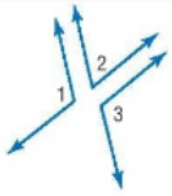
Theorems

2.6 Congruent Supplements Theorem

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

Abbreviation ∡ *suppl. to same* ∠ *or* ≅ ∡ *are* ≅.

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

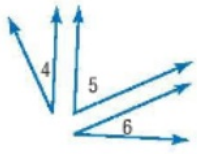


2.7 Congruent Complements Theorem

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

Abbreviation ∡ *compl. to same* ∠ *or* ≅ ∡ *are* ≅.

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.

Proof One Case of the Congruent Supplements Theorem

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

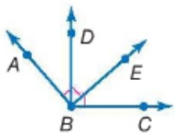
Prove: $\angle 1 \cong \angle 3$

Proof:

Statements	Reasons
1. $\angle 1$ and $\angle 2$ are supplementary.	**1.** Given

GuidedPractice

3. In the figure, $\angle ABE$ and $\angle DBC$ are right angles. Prove that $\angle ABD \cong \angle EBC$.



Required:
You MUST include the given, prove, and drawing

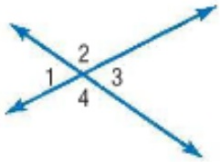
stirring sticks

Theorem 2.8 Vertical Angles Theorem

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

Abbreviation *Vert. ∡s are ≅.*

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

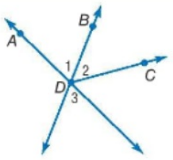


You will prove Theorem 2.8 in Exercise 28.

What does "bisect" tell us?

Example 4 Use Vertical Angles

Prove that if $\overrightarrow{DB}$ bisects $\angle ADC$, then $\angle 2 \cong \angle 3$.



Given: $\overrightarrow{DB}$ bisects $\angle ADC$.

Prove: $\angle 2 \cong \angle 3$

Proof:

Statements	Reasons
1. $\overrightarrow{DB}$ bisects $\angle ADC$.	**1.** Given