Proving Statements about Angles

Properties of Angle Congruence

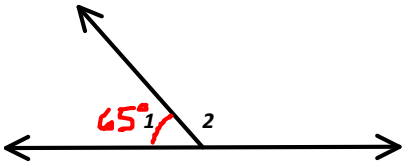
Reflexive - For any angle A, $\measuredangle A \cong \measuredangle A$.

Symmetric - If $\measuredangle A \cong \measuredangle B$, then $\measuredangle B \cong \measuredangle A$.

Transitive - If $\measuredangle A \cong \measuredangle B$ and $\measuredangle B \cong \measuredangle C$ then $\measuredangle A \cong \measuredangle C$.

Linear Pair Postulate - If two angles form a linear pair, then they are supplementary.

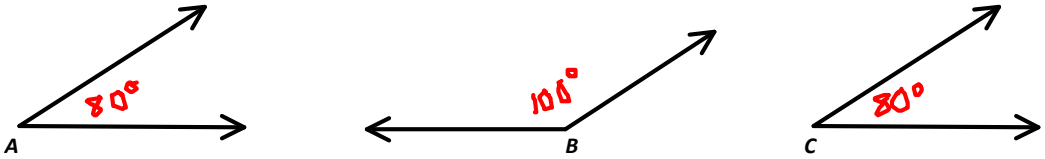
If $\measuredangle 1$ and $\measuredangle 2$ form a linear pair and $m\measuredangle 1 = 65^\circ$, find $m\measuredangle 2$.



180
- 65
115

$m\measuredangle 2 = 115^\circ$

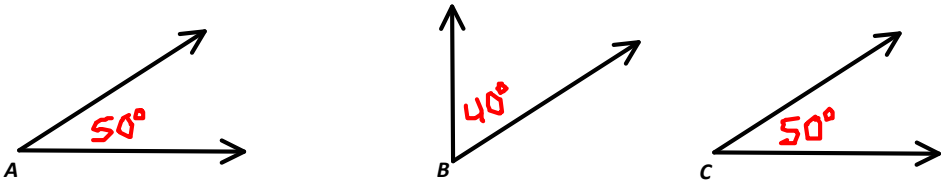
Congruent Supplements Theorem - If two angles are supplementary to the same angle or to congruent angles, then they are congruent.



$m\measuredangle A = m\measuredangle C$

$\measuredangle A \cong \measuredangle C$

Congruent Complements Theorem - If two angles are complementary to the same angle or to congruent angles, then they are congruent.



$m\measuredangle A = m\measuredangle C$

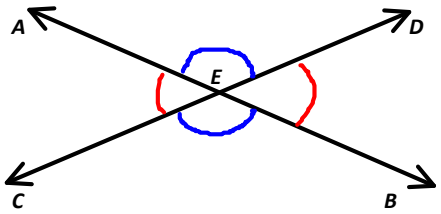
$\measuredangle A \cong \measuredangle C$

Right Angle Congruence Theorem - All right angles are congruent.

$m\angle A = m\angle B$

$\angle A \cong \angle B$

Vertical Angles Theorem - Vertical angles are congruent.

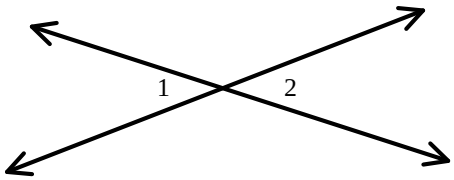


$\angle AED \cong \angle CEB$

$\angle AEC \cong \angle DEB$

Directions: Find the measure of each numbered angle.

1. $m\angle 1 = 3x - 14$
   $m\angle 2 = 2x - 7$



$m\angle 1 = m\angle 2$

$3x - 14 = 2x - 7$

$-2x \quad -2x$

$x - 14 = -7$

$+14 \quad +14$

$x = 7$

$m\angle 1 = 3(7) - 14$

$= 21 - 14$

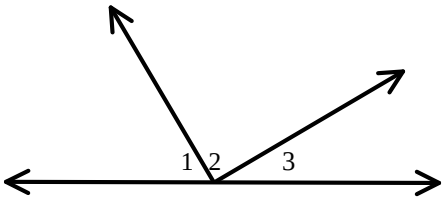
$\boxed{m\angle 1 = 7^\circ}$

$m\angle 2 = 2(7) - 7$

$= 14 - 7$

$\boxed{m\angle 2 = 7^\circ}$

2. $m\angle 1 = 5x$
$m\angle 2 = 3x + 30$
$m\angle 3 = 2x + 10$



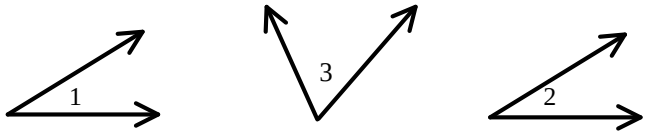
$m\angle 1 + m\angle 2 + m\angle 3 = 180$
$5x + 3x + 30 + 2x + 10 = 180$
$10x + 40 = 180$
$-40 \quad -40$
$\frac{10x}{10} = \frac{140}{10}$
$x = 14$

$m\angle 1 = 5(14)$
$m\angle 1 = 70°$

$m\angle 2 = 3(14) + 30$
$= 42 + 30$
$m\angle 2 = 72°$

$m\angle 3 = 2(14) + 10$
$= 28 + 10$
$m\angle 3 = 38°$

3. $\angle 1$ and $\angle 3$ are complementary
$\angle 2$ and $\angle 3$ are complementary
$m\angle 1 = 2x + 2$
$m\angle 2 = x + 32$



$m\angle 1 + m\angle 3 = 90$
$m\angle 2 + m\angle 3 = 90$
$m\angle 1 = m\angle 2$
$2x + 2 = x + 32$
$-x \quad -x$
$x + 2 = 32$
$-2 \quad -2$
$x = 30$

$m\angle 1 = 2(30) + 2$
$m\angle 1 = 62°$

$m\angle 2 = 30 + 32$
$m\angle 2 = 62°$

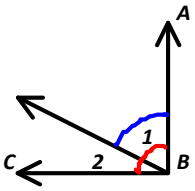
$m\angle 3 = 90 - 62$
$m\angle 3 = 28°$

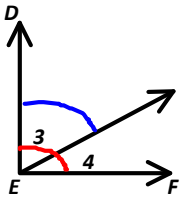
Directions: Write a two-column proof.

4. Given: $m\angle ABC = m\angle DEF$

$m\angle 1 = m\angle 3$

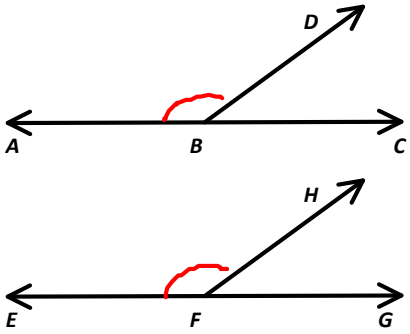
Prove: $m\angle 2 = m\angle 4$





Statement	Reason
1. $m\angle ABC = m\angle DEF$ $m\angle 1 = m\angle 3$	1. Given
2) $m\angle 1 + m\angle 2 = m\angle ABC$ $m\angle 3 + m\angle 4 = m\angle DEF$	2) Angle Addition Postulate
3) $m\angle 1 + m\angle 2 = m\angle 3 + m\angle 4$	3) Substitution Property of Equality
4) $m\angle 2 = m\angle 4$	4) Subtraction Property of Equality

5. Given: $\measuredangle ABD$ and $\measuredangle CBD$ form a linear pair
$\measuredangle EFH$ and $\measuredangle GFH$ form a linear pair
$\measuredangle ABD \cong \measuredangle EFH$
Prove: $\measuredangle CBD \cong \measuredangle GFH$



Statement	Reason
1. $\measuredangle ABD$ and $\measuredangle CBD$ form a linear pair $\measuredangle EFH$ and $\measuredangle GFH$ form a linear pair $\measuredangle ABD \cong \measuredangle EFH$	1. Given
2) ∠ABD + ∠CBD are supplementary ∠EFH + ∠GFH are supplementary	2) Supplement Theorem
3) ∠CBD ≅ ∠GFH	3) Angles Supplementary to Congruent Angles are Congruent