

**Proofs with the Basic Postulates and Theorems**

Remember to sketch out a plan for the proofs when you are not sure where you can go. Also remember that marking diagrams and using that is a useful tool, as congruence marks of the same type in the same area can indicate the use of the Addition or Subtraction Postulates.

1) Given:

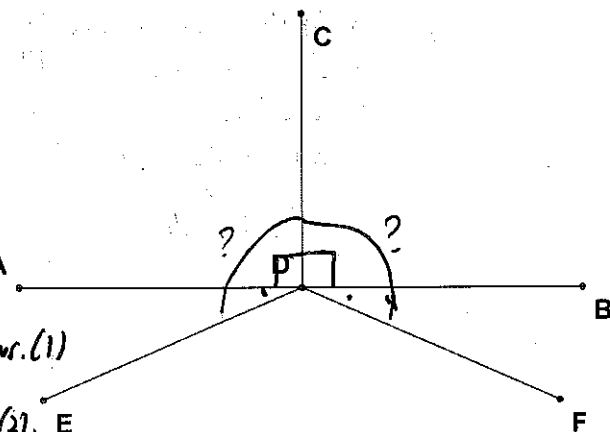
$$\overline{AB} \perp \overline{CD}$$

$$\angle ADE \cong \angle BDF$$

Prove:

$$\angle CDE \cong \angle CDF$$

Statements	Reasons
1. $\overline{AB} \perp \overline{CD}$	1. Given.
2. $\angle ADC$ and $\angle BDC$ are right angles.	2. Definition of perpendicular lines. (1)
3. $\angle ADC \cong \angle BDC$	3. All right angles are congruent. (2)
4. $\angle ADE \cong \angle BDF$	4. Given.
5. $\angle ADC + \angle ADE \cong \angle BDC + \angle BDF$ $\angle CDE \cong \angle CDF$	5. Addition Postulate (3, 4).



2) Given:

$$\overline{AC} \text{ bisects } \angle BAD$$

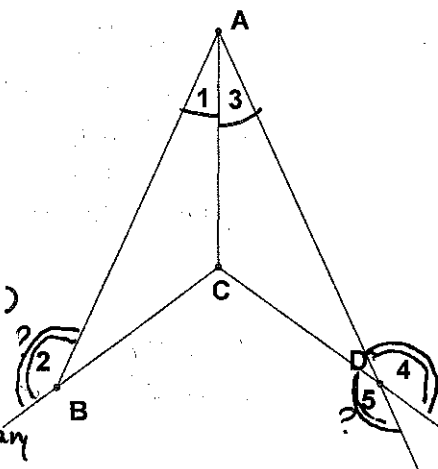
$$\angle 1 \text{ is supplementary to } \angle 2$$

$$\angle 3 \text{ is supplementary to } \angle 4$$

Prove:

$$\angle 2 \cong \angle 5$$

Statements	Reasons
1. $\overline{AC}$ bisects $\angle BAD$ .	1. Given.
2. $\angle 1 \cong \angle 3$	2. Definition of angle bisector. (1)
3. $\angle 1$ is supplementary to $\angle 2$ $\angle 3$ is supplementary to $\angle 4$	3. Given.
4. $\angle 2 \cong \angle 4$	4. If two angles are supplementary to congruent angles, then they are congruent. (2, 3).
5. $\angle 4 \cong \angle 5$	5. Vertical angles are congruent.
6. $\angle 2 \cong \angle 5$	6. Transitive Property. (4, 5).



3) Given:

$$\overline{ST} \perp \overline{TU}$$

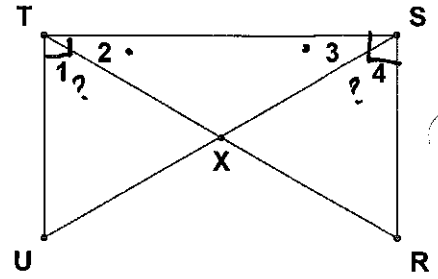
$\angle RST$  is a right angle

$$\angle 2 \cong \angle 3$$

Prove:

$$\angle 1 \cong \angle 4$$

Statements	Reasons
1. $\overline{ST} \perp \overline{TU}$	1. Given.
2. $\angle UTS$ is a right angle.	2. Definition of perpendicular lines. (1).
3. $\angle RST$ is a right angle.	3. Given.
4. $\angle UTS \cong \angle RST$	4. All right angles are congruent. (2,3).
5. $\angle 2 \cong \angle 3$	5. Given.
6. $\angle UTS - \angle 2 \cong \angle RST - \angle 3$ -or- $\angle 1 \cong \angle 4$	6. Subtraction Postulate. (4,5).



4) Given:

$\overline{DE}$  bisects  $\overline{AB}$  and  $\overline{AC}$

$$\overline{DF} \cong \overline{EG}$$

$$\overline{AB} \cong \overline{AC}$$

Prove:

$$\overline{AF} \cong \overline{AG}$$

Statements	Reasons
1. $\overline{DE}$ bisects $\overline{AB}$ and $\overline{AC}$ .	1. Given.
2. $D$ is the midpoint of $\overline{AB}$ , $E$ is the midpoint of $\overline{AC}$ .	2. Definition of segment bisector. (1)
3. $AD = \frac{1}{2} AB$ , $AE = \frac{1}{2} AC$	3. The midpoint of a line segment divides the segment into segments half as long as the original. (2).
4. $\overline{AB} \cong \overline{AC}$	4. Given.
5. $\overline{AD} \cong \overline{AE}$	5. Halves of congruent segments are $\times$ Division Postulate works here too. congruent. (3,4)
6. $\overline{DF} \cong \overline{EG}$	6. Given.
7. $\overline{AD} + \overline{DF} \cong \overline{AE} + \overline{EG}$ -or- $\overline{AF} \cong \overline{AG}$	7. Addition Postulate (5,6).

