Geometry Unit 3: Proofs

MORE PLANNING FOR PROOFS

Warm-up

- From the GIVEN, write in the next statement that you can write as a result of what was given (some statements may vary). Then write the reason that explains the statement you made.
- Ex:

GIVEN Information	**STATEMENT To Be Written**	**REASON**
$\overrightarrow{BY}$ is the bisector of <ABC	m <ABY = ½m <ABC m <YBC = ½m <ABC	Angle Bisector Theorem

Warm-up

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GIVEN Information	**STATEMENT To Be Written**	**REASON**
$\overline{OP} \perp \overline{RS}$	m <OPR = 90°	Definition of Perpendicular Lines

Structure of a Proof

- As seen from the last few sections, the proof of a theorem consists of 5 parts:

1. *Statement* of the theorem.
2. A *diagram* that illustrates the given information.
3. A list, in terms of the figure, of what is *given*.
4. A list, in terms of the figure, of what you need to *prove*.
5. A series of *statements* and *reasons* that lead from the *given* information to the *statement* that is to be *proved*.

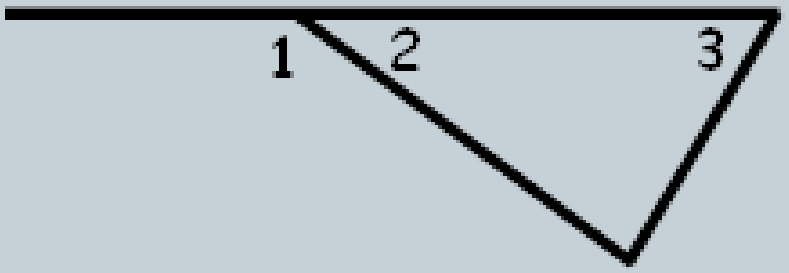
A Plan for handling a Blank Proof

- 1st: Remember to Fill in the "Obvious" Blanks (1st statement is the Given; 1st reason is that it was "Given")
  - If you have multiple "Givens" put the first line in the 1st statement, then put all other lines in separate statements.
  - NEVER put "Prove" as the final reason. That is not a thing.
- Keep in mind what kinds of objects you are dealing with. You will stay with those objects (i.e. If you begin with angles, you will not suddenly change to working with segments).
- Constantly keep an eye on what was said in the "Given" and in the "Prove". You will either be able to say something from what is given, or work backwards from what you need to prove.

Blank Proof Example:

Given: $m < 1 + m < 3 = 180$

Prove: $m < 2 = m < 3$



Statements	**Reasons**
1. $m < 1 + m < 3 = 180$	1. Given
2. $m < 1 + m < 2 = 180$	2. Angle Addition Postulate
3. $m < 1 + m < 2 = m < 1 + m < 3$	3. Substitution Property
4. $m < 1 = m < 1$	4. Reflexive Property
5. $m < 2 = m < 3$	5. Subtraction Property

Blank Proof Example:

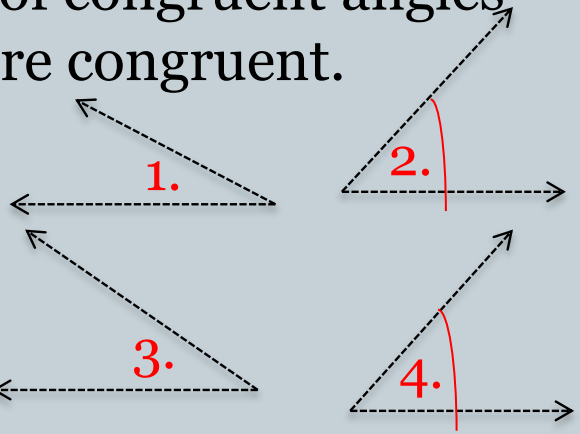
Given: $PT = MN$

Prove: $PM = TN$

Statements	**Reasons**
1. $PT = MN$	1. Given
2. $TM = TM$	2. Reflexive Property
3. $PT + TM = MN + TM$	3. Addition Property
4. $PM = PT + TM$; $TN = TM + MN$	4. Segment Addition Postulate
5. $PM = TN$	5. Substitution Property

Proving Theorem 2-8

- Theorem 2-8: If two angle are compliments of congruent angles (or of the same angle), then the two angles are congruent.



Given: $\angle 1$ and $\angle 2$ are complementary;

$\angle 3$ and $\angle 4$ are complementary;

$\angle 2 \cong \angle 4$

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

Statements	**Reasons**
1. $\angle 1$ and $\angle 2$ are complementary; $\angle 3$ and $\angle 4$ are complementary	1. Given
2. $m\angle 1 + m\angle 2 = 90°$ $m\angle 3 + m\angle 4 = 90°$	2. Def. of Comp. $\angle$'s
3. $m\angle 1 + m\angle 2 = m\angle 3 + m\angle 4$	3. Subst. Prop.
4. $\angle 2 \cong \angle 4$, or $m\angle 2 = m\angle 4$	4. Given
5. $m\angle 1 = m\angle 3$, or $\angle 1 \cong \angle 3$	5. Subtr. Prop.

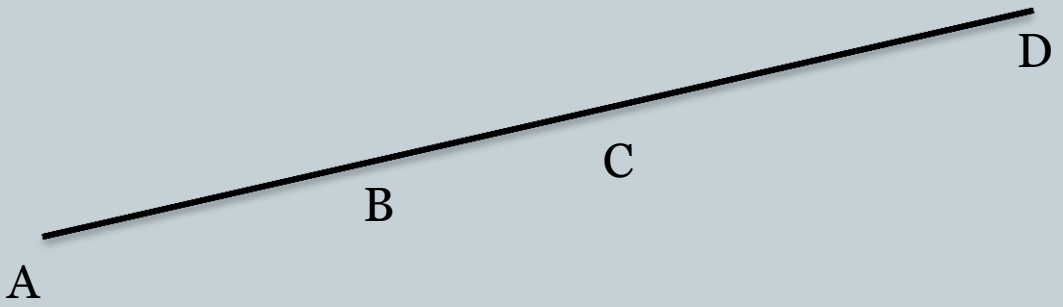
Proof Review Group Activity

- Directions: Work in your group to complete the following proof. Below are hints to help you proceed in your proof.
- Step 1: Copy the given and prove statements onto your work page. Label the diagram.
- Step 2: Mark your given information on the diagram, if possible.
- Step 3: Begin you proof with given information.
- Step 4: Make a statement based on the given information, if possible.
- Step 5: Look to the diagram for more information.
- Step 6. The last statement of your proof is your “prove Statement.

Proof 2

Given: $AB = CD$

Prove: $AC = BD$

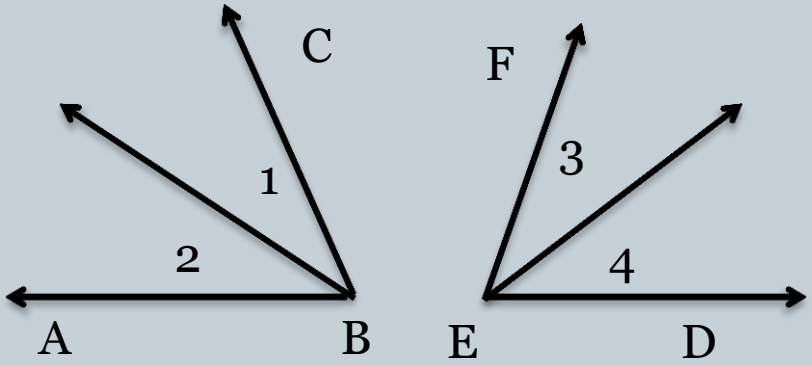


Statements	**Reasons**
1. $AB = CD$	1. Given
2. $BC = BC$	2. Reflexive Property
3. $AB + BC = BC + CD$	3. Addition Property
4. $AB + BC = AC$; $BC + CD = BD$	4. Segment Addition Postulate
5. $AC = BD$	5. Substitution Property

Proof 1

Given: $m < 1 = m < 3; m < 2 = m < 4$

Prove: $m < ABC = m < DEF$

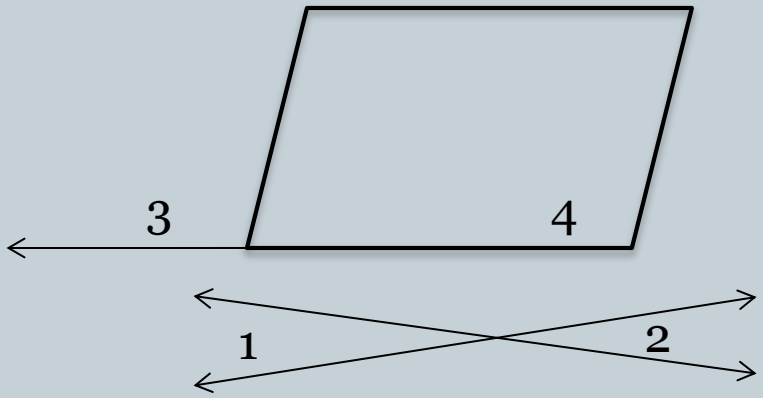


Statements	**Reasons**
1. $m < 1 = m < 3; m < 2 = m < 4$	1. Given
2. $m < 1 + m < 2 = m < 3 + m < 4$	2. Addition Property
3. $m < 1 + m < 2 = m < ABC$ $m < 3 + m < 4 = m < DEF$	3. Angle Addition Postulate
4. $m < ABC = m < DEF$	4. Substitution Property

Proof 3

Given: <1 is supplementary to <3;
<2 is supplementary to <4

Prove: $m < 3 = m < 4$



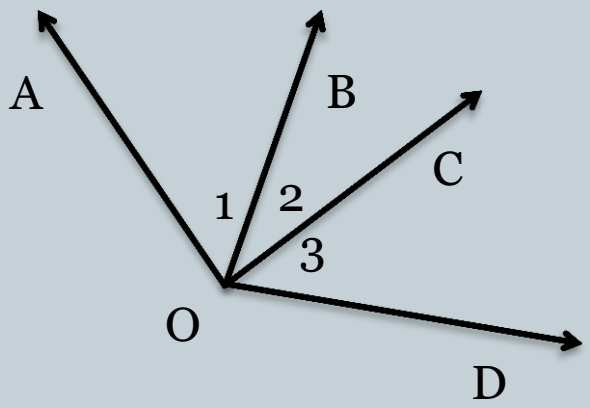
Statements	**Reasons**
1. < 1 is supplementary to < 3; < 2 is supplementary to <4	1. Given
2. $m < 1 + m < 3 = 180$; $m < 2 + m < 4 = 180$	2. Def. of Supp. <'s
3. $m < 1 + m < 3 = m < 2 + m < 4$	3. Substitution Property
4. $m < 1 = m < 2$	4. Vertical Angle Theorem
5. $m < 3 = m < 4$	5. Subtraction Property

Proof 4

Given: $\overrightarrow{OB}$ bisects $< AOC$;

$\overrightarrow{OC}$ bisects $< BOD$

Prove: $m < 1 = m < 3$



Statements	**Reasons**
1. $\overrightarrow{OB}$ bisects $< AOC$; $\overrightarrow{OC}$ bisects $< BOD$	1. Given
2. $m < 1 = m < 2; m < 2 = m < 3$	2. Def. of < bisector
3. $m < 1 = m < 3$	3. Substitution Property