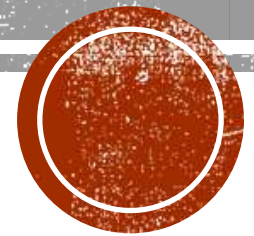
TWO- COLUMN PROOF

Geometry Unit 2: Reasoning and Proof



TWO- COLUMN PROOF

- Proof with numbered statements and reasons in logical order.

Statements	Reasons
The items we include in this portion of our two-column geometric proof will show the progression of our argument. They are the claims we believe to be true.	The items we include in this portion of our two-column geometric proof will explain why the corresponding statements are true. They justify any claims we make.

GIVEN AND PROOF

- Write a two column proof for the following:
  - If A, B, C, and D are points on a line, in the given order, and AB = CD, then AC = BD.
    - NOTE: The if part of the statement is the given part. The then part it the section you must prove. Use a diagram to show the given information.

DIAGRAMS

- It is helpful to draw a diagram before you begin your proof. Draw the diagram for the example below:
  - If A, B, C, and D are points on a line, in the given order, and AB = CD, then AC = BD.

BEGINNING A TWO- COLUMN PROOF

- If A, B, C, and D are points on a line, in the given order, and AB = CD, then AC = BD.
  - Start by writing the given and prove statements at the top.
    - Given: A, B, C, and D are points in a line in the order given. AB = CD.
    - Prove: AC = BD.

CONTINUING A TWO-COLUMN PROOF

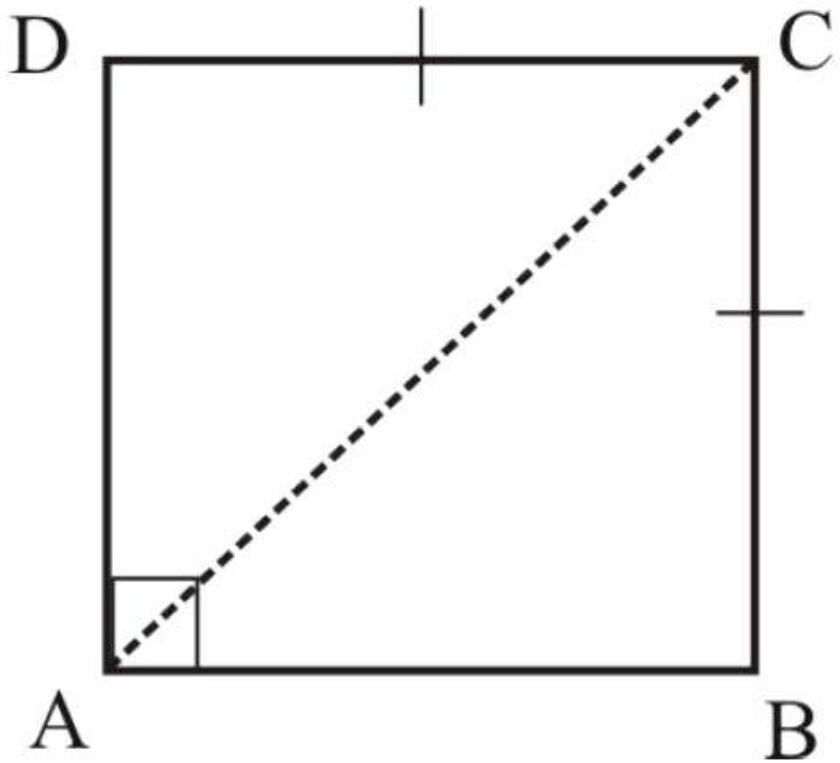
- Begin by creating two columns; a statement column and a proof column.
- The first statement will ALWAYS be your given statement with the reasoning being given.
- The continuing statements will be from your reasoning from postulates, definitions, and theorems.

SYMBOLS

- Segment, Angle, Ray, Line, Point, etc.
- Tick Marks
  - Segments
  - Angles
- Parallel
- Perpendicular
- Measure of Angles

USING DIAGRAMS

- Which can you assume true?
  - AD ≈ BC
  - AB ≈ CD
  - CD ≈ BC
  - AB || CD
  - AB $\perp AD$
  - ABCD is a square
  - ABCD is a rectangle
  - M<DCA = 45°
  - M<CAB = 45°



TWO- COLUMN PROOF

- If A, B, C, and D are points on a line, in the given order, and AB = CD, then AC = BD.

Statement	Reason
1. AB = CD	1. Given
2. A, B, C, D are collinear in that order	2. Given
3. BC = BC	3. Reflexive Property of Segments
4. AC = AB + BC and BD = CD + BC	4. Segment Addition Postulate
5. AB+ BC = CD + BC	5. Addition Property of Equality
6. AC = BD	6. Substitution Property

TWO- COLUMN PROOF EXAMPLE 1

- Given: BF bisects <ABC; <ABD ≈ <CBE.
- Prove: <DBF ≈ <EBF.

Statement	Reason
1.	1. Given
2.	2.
3.	3.
4.	4.
5.	5.
6.	6.
7.	7.
8.	8.
9.	9.

TWO- COLUMN PROOF EXAMPLE 2

- Given: $\angle A \cong \angle B$ and $\angle C \cong \angle D$.
- Prove: $m\angle A + m\angle C = m\angle B + m\angle D$.

Statement	Reason
1.	1. Given
2.	2.
3.	3.
4.	4.

TWO- COLUMN PROOF EXAMPLE 3

- Given: A, B, C, and D are collinear and AB ≈ CD.
- Prove: AC ≈ BD.

Statement	Reason
1.	1. Given
2.	2.
3.	3.
4.	4.
5.	5.
6.	6.
7.	7.
8.	8.
9.	9.

TWO- COLUMN PROOF EXAMPLE 4

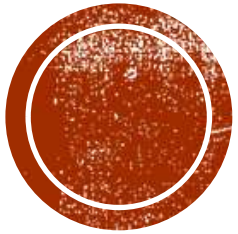
- Given: <A and <B are supplementary angles and < A and <C are supplementary angles.
- Prove: AC ≈ BD.

Statement	Reason
1.	1. Given
2.	2.
3.	3.
4.	4.
5.	5.
6.	6.

TWO- COLUMN PROOF EXAMPLE 5

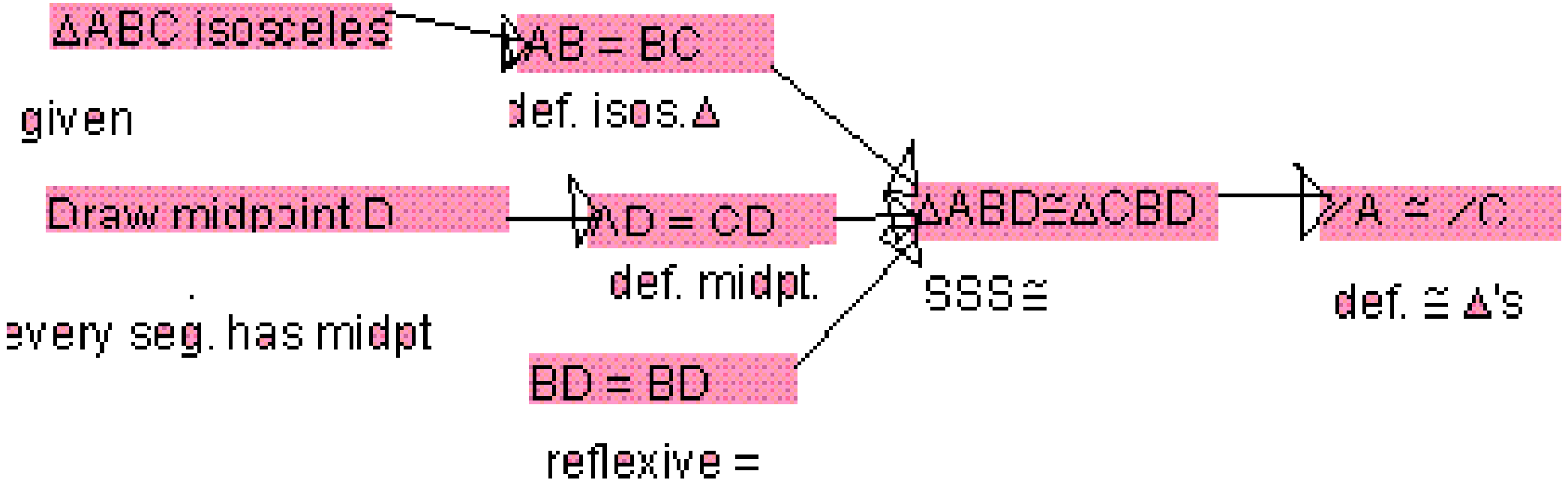
- Given: <A and <B are supplementary angles and < A and <C are supplementary angles.
- Prove: AC ≈ BD.

Statement	Reason
1.	1. Given
2.	2.
3.	3.
4.	4.
5.	5.
6.	6.



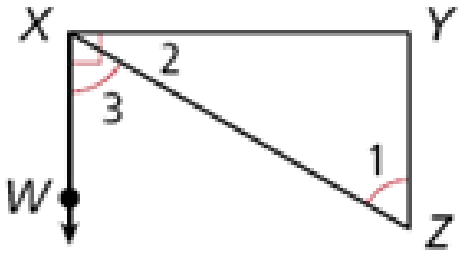
OTHER TYPES OF PROOFS

FLOW PROOF


ΔABC isosceles
given
AB = BC
def. isos.Δ
Draw midpoint D
every seg. has midpt
AD = CD
def. midpt.
BD = BD
reflexive =
ΔABD≅ΔCBD
SSS≅
∠A ≅ ∠C
def. ≅ Δ's

PARAGRAPH PROOF

Given: $\angle WXY$ is a right angle. $\angle 1 \cong \angle 3$
Prove: $\angle 1$ and $\angle 2$ are complementary.



Paragraph Proof: Since $\angle WXY$ is a right angle, $m\angle WXY = 90°$ by the definition of a right angle. By the Angle Addition Postulate, $m\angle WXY = m\angle 2 + m\angle 3$. By substitution, $m\angle 2 + m\angle 3 = 90°$. Since $\angle 1 \cong \angle 3$, $m\angle 1 = m\angle 3$ by the definition of congruent angles. Using substitution, $m\angle 2 + m\angle 1 = 90°$. Thus by the definition of complementary angles, $\angle 1$ and $\angle 2$ are complementary.