Two-Column Proof

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What is a Proof?

Proof: a form of logical reasoning in which each statement is organized and backed up by given information, definitions, axioms, postulates, or theorems

What is a Direct Proof?

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- is a sequence of statements which are either givens or deductions from previous statements, and whose last statement is the conclusion to be proved

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- can be done in three ways: paragraph form, flowchart form, and two column form

How to Write a Direct Proof?

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1. Take the original conditional statement.

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2. Assume that the hypothesis is true, and show that the conclusion is true.

How to Write a Two-Column Proof?

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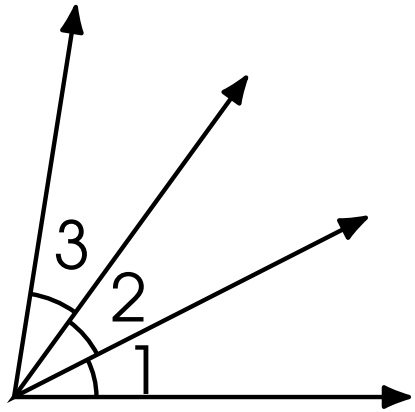
1. Write all the series of statements in the first column of the table in a logical order starting with the given statements and ends it with the statement that needs to be proven.

How to Write a Two-Column Proof?

1. Write all the series of statements in the first column of the table in a logical order starting with the given statements and ends it with the statement that needs to be proven.
2. In a step-by-step manner, write all the reasons for each statement.

Example 1

Given: $m\angle 1 + m\angle 2 = m\angle 2 + m\angle 3$
Prove: $m\angle 1 = m\angle 3$
Proof:



Statements	Reasons

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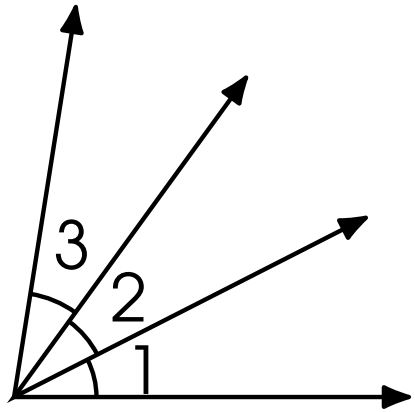
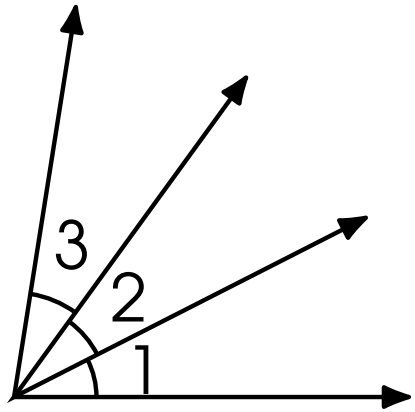


Statements	**Reasons**
1. $m\angle 1 + m\angle 2 = m\angle 2 + m\angle 3$	1. Given

Example 1



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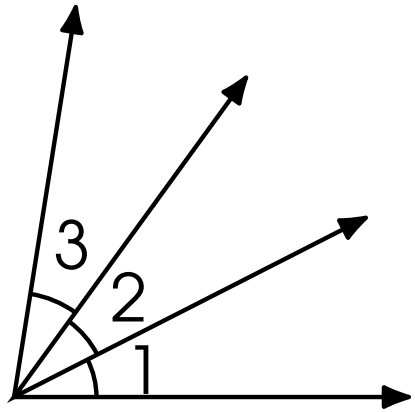
Prove: $m\angle 1 = m\angle 3$
Proof:

Statements	**Reasons**
1. $m\angle 1 + m\angle 2 = m\angle 2 + m\angle 3$	1. Given
2. $m\angle 1 + m\angle 2 - m\angle 2 = m\angle 2 - m\angle 2 + m\angle 3$	2. Subtraction Property

Example 1



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2. $m\angle 1 + m\angle 2 - m\angle 2 = m\angle 2 - m\angle 2 + m\angle 3$	2. Subtraction Property
3. $m\angle 1 = m\angle 3$	3. Simplification

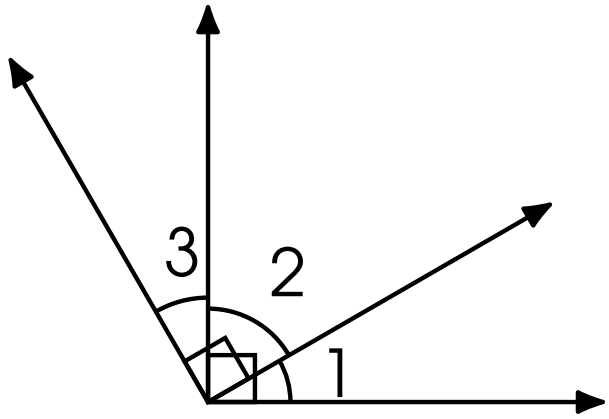
Example 2

Given: $m\angle 1 + m\angle 2 = 90°$

$m\angle 3 + m\angle 2 = 90°$

Prove: $m\angle 1 = m\angle 3$

Proof:



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Given: $m\angle 1 + m\angle 2 = 90°$
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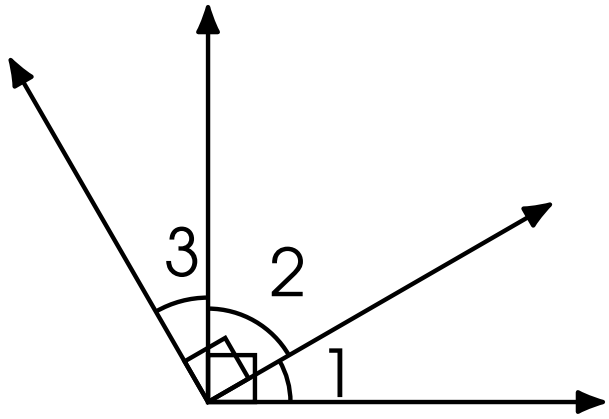

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Given: $m\angle 1 + m\angle 2 = 90°$

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Prove: $m\angle 1 = m\angle 3$

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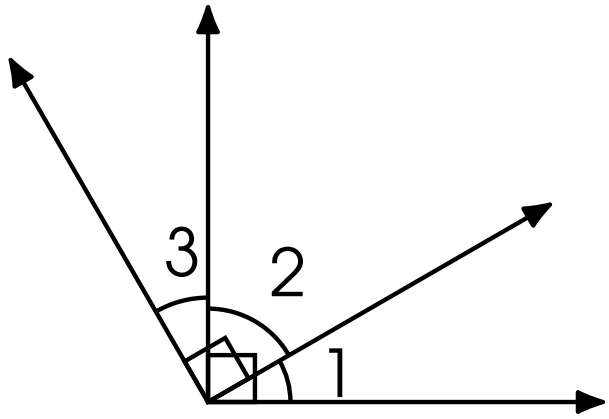

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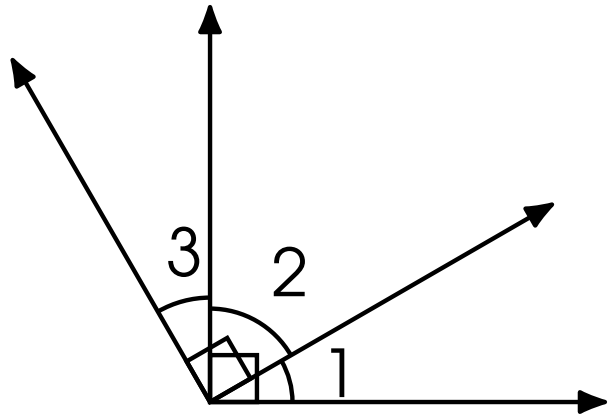

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3. $m\angle 1 + m\angle 2 = m\angle 3 + m\angle 2$	3. Transitive Property

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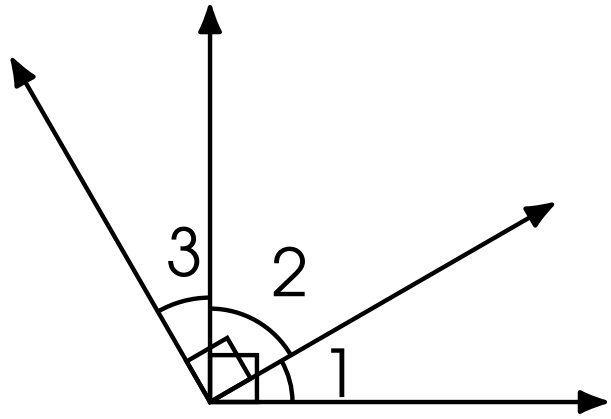

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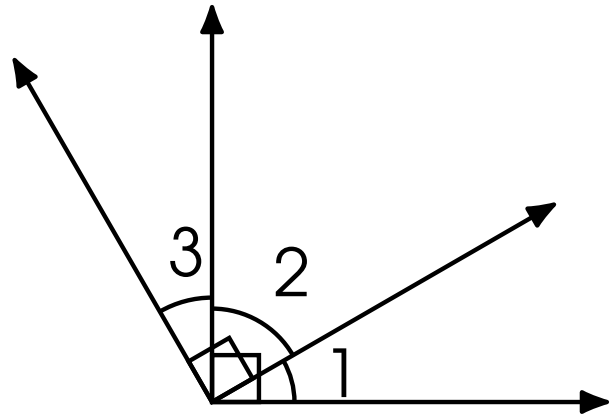

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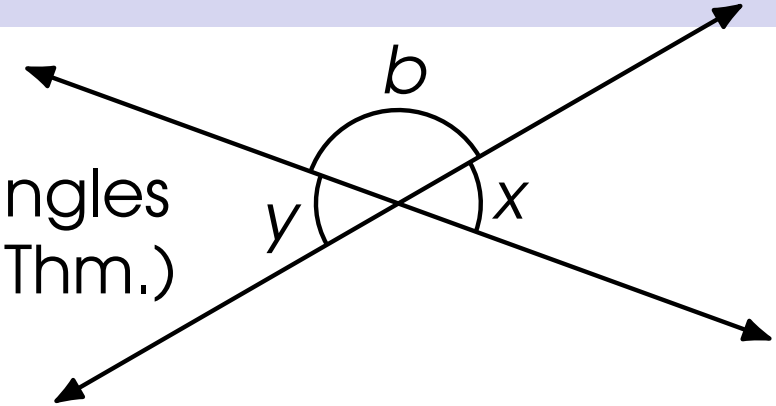
4. $m\angle 1 + m\angle 2 - m\angle 2 = m\angle 3 + m\angle 2 - m\angle 2$	4. Subtraction Property
5. $m\angle 1 = m\angle 3$	5. Simplification

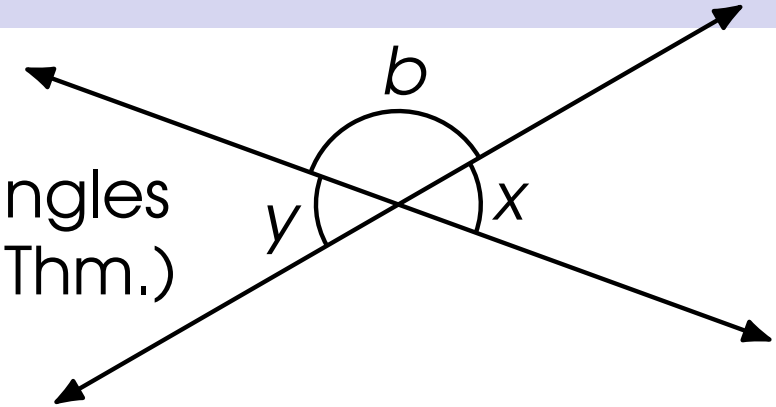
Example 3



Given: $\angle x$ and $\angle y$ are vertical angles
Prove: $\angle x \cong \angle y$ (Vertical Angles Thm.)
Proof:

Statements	**Reasons**

Example 3



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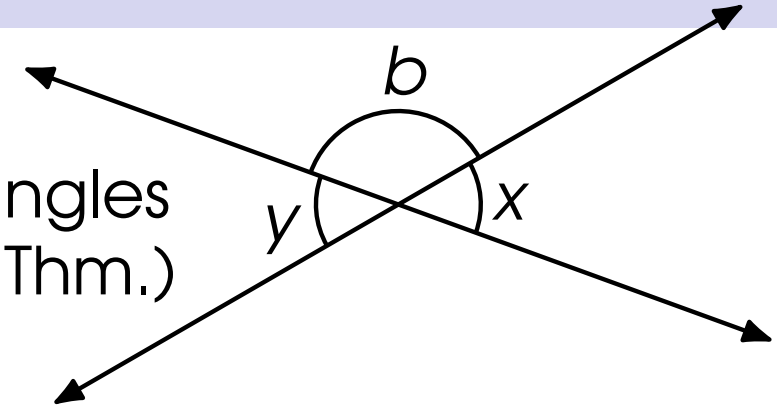
Proof:

Statements	**Reasons**
1. $m\angle x + m\angle b = 180°$	1. Linear Pair Post.

Example 3



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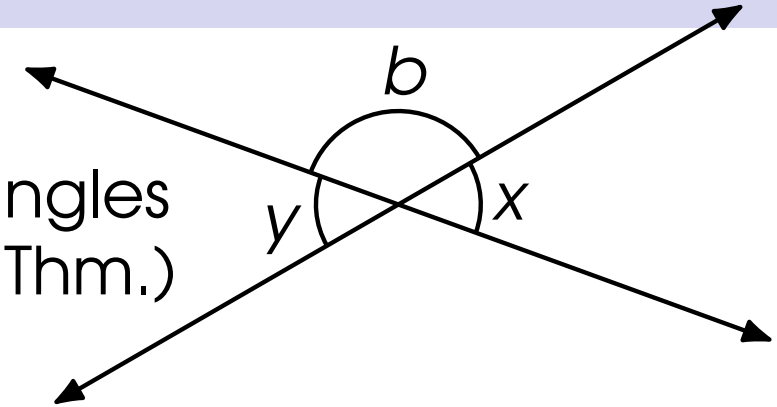

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3. $m\angle x + m\angle b = m\angle y + m\angle b$	3. Transitive Property

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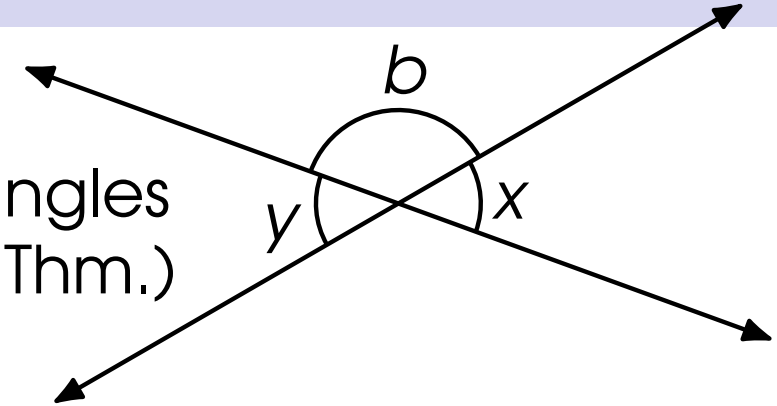

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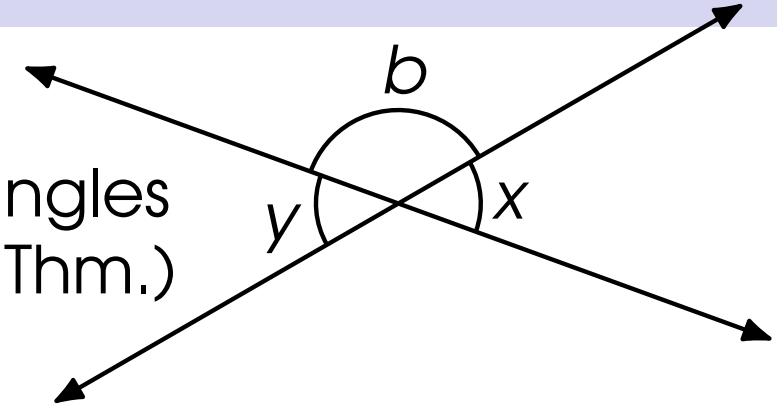

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4. $m\angle x + m\angle b - m\angle b = m\angle y + m\angle b - m\angle b$	4. Subtraction Property
5. $m\angle x = m\angle y$	5. Simplification

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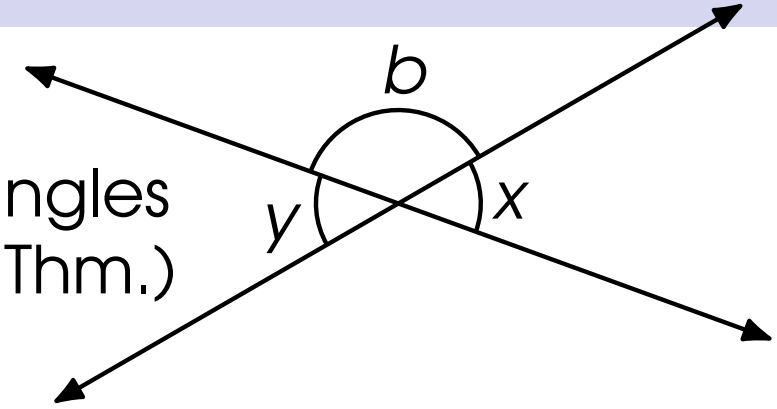

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4. $m\angle x + m\angle b - m\angle b = m\angle y + m\angle b - m\angle b$	4. Subtraction Property
5. $m\angle x = m\angle y$	5. Simplification
6. $\angle x \cong \angle y$	6. Definition of Congruent Angles

Example 4

Given: $4(2x + 3) + 4 = 8$
Prove: $x = -1$
Proof:

Statements	Reasons

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Example 4

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Statements	**Reasons**
1. $4(2x + 3) + 4 = 8$	1. Given
2. $8x + 12 + 4 = 8$	2. Distributive Prop.

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Statements	Reasons
1. $4(2x + 3) + 4 = 8$	1. Given
2. $8x + 12 + 4 = 8$	2. Distributive Prop.
3. $8x + 16 = 8$	3. Simplification

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Given: $4(2x + 3) + 4 = 8$
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Statements	**Reasons**
1. $4(2x + 3) + 4 = 8$	1. Given
2. $8x + 12 + 4 = 8$	2. Distributive Prop.
3. $8x + 16 = 8$	3. Simplification
4. $8x + 16 - 16 = 8 - 16$	4. Subtraction Prop.

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Statements	Reasons
1. $4(2x + 3) + 4 = 8$	1. Given
2. $8x + 12 + 4 = 8$	2. Distributive Prop.
3. $8x + 16 = 8$	3. Simplification
4. $8x + 16 - 16 = 8 - 16$	4. Subtraction Prop.
5. $8x = -8$	5. Simplification

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2. $8x + 12 + 4 = 8$	2. Distributive Prop.
3. $8x + 16 = 8$	3. Simplification
4. $8x + 16 - 16 = 8 - 16$	4. Subtraction Prop.
5. $8x = -8$	5. Simplification
6. $\frac{8x}{8} = \frac{-8}{8}$	6. Division Prop.

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5. $8x = -8$	5. Simplification
6. $\frac{8x}{8} = \frac{-8}{8}$	6. Division Prop.
7. $x = -1$	7. Simplification

Thank you for watching.