



Conditional Statements and Converses

Conditional statements =
"if - then" statements

ex. if it's cold then the heat is off.

two parts ↑ ↑
 p q
p = hypothesis q = conclusion

notation $p \rightarrow q$ "p implies q"
 "if p then q"

Converse - the conclusion / hypothesis
($q \rightarrow p$) are switched

ex. if the heat is off then it's cold

If and Only If statements ($p \leftrightarrow q$)

statement and it's converse must be true

if you get the most vote then you win

if you won then you got the most votes



Deductive and Inductive Reasoning

Deductive Reasoning

step by step logic used to prove statements

All people sleep, (if hypothesis is true)
I'm a person,
Therefore I sleep (the conclusion is true)

↓

Inductive Reasoning

logic to prove a statement based on observations and experience

Every year it snows in Alaska,
Therefore next year in Alaska it
will snow.

conclusion less certain than deductive logic



Properties of Algebra

Properties that define many of the steps and actions we use in algebra; we also use them in geometric proof.

Addition
Property

if $a=b$ and $c=d$ then
 $a+c = b+d$

Subtraction
Prop.

if $a=b$ and $c=d$ then
 $a-c = b-d$

Multiplication
Prop.

if $a=b$ then $ca=cb$

Division
Prop.

if $a=b, c \neq 0$ then
$$\frac{a}{c} = \frac{b}{c}$$

Substitution
Prop.

if $a=b$ then either a or b
may be substituted for
the other in any equation or
inequality

Reflexive Property

$$a = a$$

Symmetric Prop.

if $a=b$ then $b=a$

Transitive
Prop.

if $a=b$ and $b=c$ then
 $a=c$

Properties of Congruence

Reflexive
Prop. \cong

$$\overline{AB} \cong \overline{AB} \quad \angle A \cong \angle A$$

Symmetric
Prop. \cong

$$\text{if } \overline{AB} \cong \overline{CD}, \text{ then}$$
$$\overline{CD} \cong \overline{AB}$$

$$\text{if } \angle A \cong \angle B \text{ then } \angle B \cong \angle A$$

Transitive
Prop. \cong

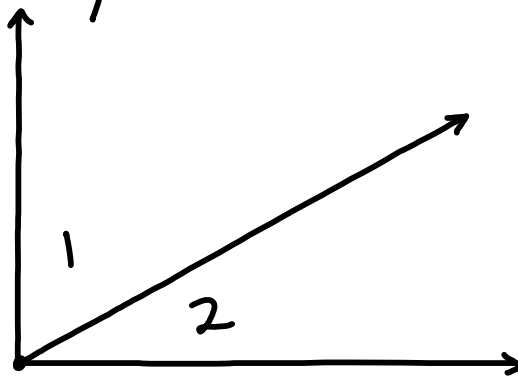
$$\text{if } \overline{AB} \cong \overline{CD} \text{ and } \overline{CD} \cong \overline{EF}$$
$$\text{then } \overline{AB} \cong \overline{EF}$$

$$\text{if } \angle A \cong \angle B \text{ and } \angle B \cong \angle C$$
$$\text{then } \angle A \cong \angle C$$



More on Angles and Lines

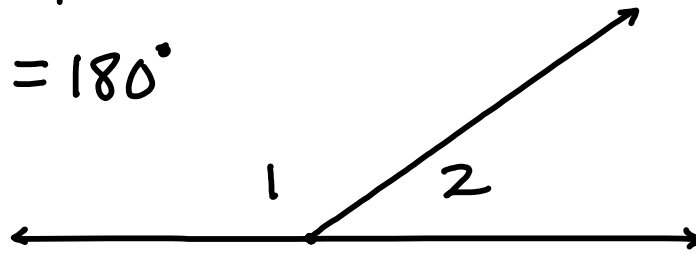
Complementary \angle 's add up to 90°



$$\angle 1 + \angle 2 = 90^\circ$$

Supplementary \angle 's - add up to 180°

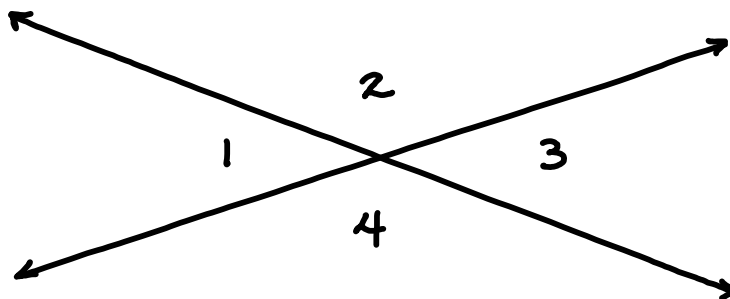
$$\angle 1 + \angle 2 = 180^\circ$$



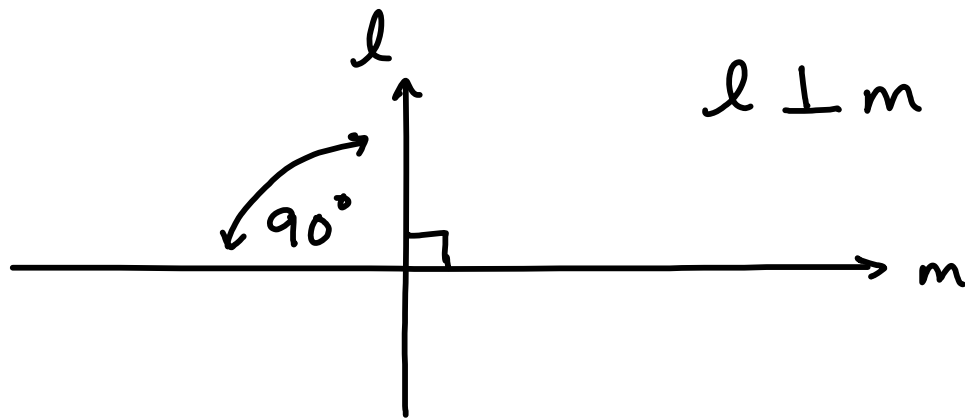
Theorem - Vertical Angles are congruent

$$\angle 1 \cong \angle 3$$

$$\angle 2 \cong \angle 4$$



Perpendicular Lines - form right \angle 's = 90°



How to write a Proof

Reason to justify statements in a proof

1. *Given information*
2. *Definitions*
3. *Postulates*
4. *Properties of Algebra*
5. *Theorems*

NOTE: many ways to write a proof;
follow these guidelines:

1. Draw a picture of given information
2. Have a statement/reason format (reasons must be from above list)
3. List Given information first
4. Use Deductive Reasoning to go step by step towards a conclusion (what's being asked to be proved).