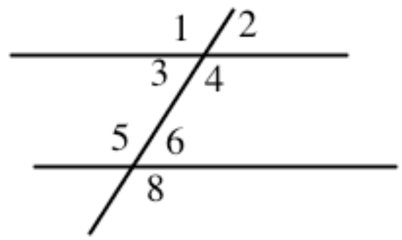
Parallel Lines

The chapter on parallel (and perpendicular) lines starts with two proofs:

1. If alternate interior angles are congruent, then two lines are parallel.
2. If two lines are parallel, then alternate interior angles are congruent.



Which angles are alternate interior?

<3 with <6 and <4 with <5

Which angles are alternate exterior?

<2 with <7 and <1 with <8

Which angles are same side interior?

<4 with <6 and <3 with <5

Name some corresponding angles.

<1 with <5 and <2 with <8 etc.

Proof 1 (p. 96) depends on idea that an exterior angle of a triangle is greater than either remote interior angle (p. 86).

Pay attention to the "how" and the "why!!!" Don't just "blow and go," and get the "what," the content. Pay attention to how things are proven and what methods of proof and logic are used!!!

We have the very important "reductio ad absurdum" argument on p. 96!!

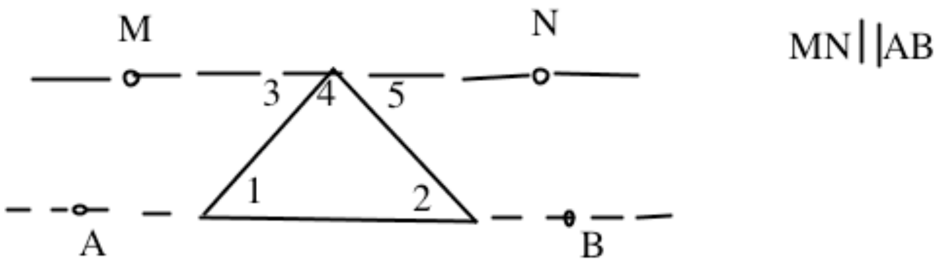
Some things we can prove straight out, as with the triangle congruence theorems; but some things are more fundamental and subtle, so we need to prove them true or false by showing that if things were otherwise, they would entail a contradiction.

Reductio ad absurdum is important in philosophy and law -- and was used by Galileo to show that the traditional theory of motion was wrong.

<u>Corollaries</u> are immediate consequences of a theorem. They require very little reasoning from the theorem and would use the same methods.

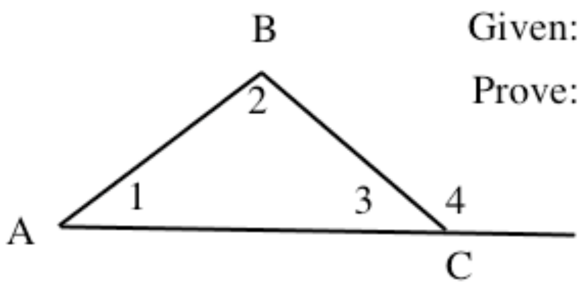
Proof 2 (p. 98) depends on the idea that you can have only one parallel to a given line through a point not on the line. This theorem uses reductio ad absurdum as well.

On p. 102, we prove that the angles of a triangle add to 180, i.e., make a straight angle. This is a proof because it relates triangles to other concepts in geometry and it shows the proposition is true by developing the idea from fundamentals -- it "adduces" axioms and postulates, as Dr. Drew McCoy reported Lincoln did in law and politics.



We see that <1 and <3 are AIA, as are <2 and <5.
Therefore <1 = <3 and <2 = <5.
But <3 + <4 + <5 = 180.
Therefore, by substitution, <1 +<4 + <2 = 180. QED

Let's show Corollary II (p. 102) true as an immediate consequence of Proposition IV (p. 102).



Given: triangle ABC and exterior <4.

Prove: <4 = <1 + <2.

From prop. IV, <1 + < 2 + <3 = 180.
But <3 and <4 are supp., so <3 + <4 = 180.
But then by Ax. 6, <1 + <2 + <3 = <3 + <4.
But by Ax. 2 we can subtract away <3, leaving us with <4 = <1 + <2.
QED

Pythag Thm