

Three Constructions and Their Proofs

CONSTRUCTION 1 — *Copy an Angle*

Copy an Angle — Proposition 23

Proof that the construction works:

Conditional form: *If we have an angle and a ray, we can construct a copy of the angle on that ray.*

CONSTRUCTION 2 — *Parallel Line Through a Point*

Parallel Line Through a Point — Proposition 31

Proof that the construction works:

Conditional form: *If we have a line and a point not on it, we can construct a line through the point parallel to the given line.*

THE CHAIN IS CLOSED

The Deductive Chain — Now Complete

Proposition 23 (copy an angle) → **Proposition 31** (parallel through a point) →

Proposition 32 (triangle angle sum = 180°)

The conditional proof from Lesson 4.1 assumed we could construct a parallel line. That assumption is now established. The chain from our axioms is closed.

From Proposition 32, the following follow immediately:

▶ Exterior angle theorem ▶ Polygon interior angle sum formula

CONSTRUCTION 3 — Altitude of a Triangle — Proposition 12 (if time allows)

Altitude of a Triangle — Proposition 12

Proof that the construction works:

Conditional form: *If we have a vertex and a non-adjacent side we can create an altitude to that side or an extension of it.*

