# Steps in an Informal Mathematical Proof

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## Classification of Steps in an Informal Mathematical Proof

Informal proofs often do not follow a rigid logical format but instead unfold through a sequence of rhetorical and epistemic moves. This move is encapsulated in the term explanatory chain. Each step follows from the previous one as a mathematical result. A good proof does not include an explanatory jump. Below is a classification of common steps that appear in informal proofs. The goal of creating graphs is to represent the flow of informal reasoning.

1. **Framing the Problem (Orientation)**
    - Rephrasing or interpreting the theorem informally.
    - Introducing notation and assumptions.
    - Describing intuitions or visualizing the problem.
2. **Assembling Tools**
    - Citing known results, definitions, or heuristics.
    - Stating useful lemmas or propositions.
    - Drawing analogies with familiar problems.
3. **Identifying the Key Insight or Strategy**
    - Highlighting the central idea or trick.
    - Suggesting a change of perspective or transformation.
    - Describing the planned method (e.g., contradiction, induction).
4. **Developing the Argument**
    - Proceeding step-by-step from assumptions to conclusion.
    - Using logical implications, definitions, and intermediate results.
    - Including intuitive commentary or explanatory remarks.
5. **Intermediate Constructions or Contradictions**

- Constructing objects (e.g., numbers, sets) with desired properties.
- Dividing into cases, if necessary.
- Deriving contradictions if proof by contradiction is employed.

**6. Classification of the Steps**

- A major mathematical fact is called a theorem.
- A minor mathematical fact is called a lemma.
- An easy conclusion of a theorem is a corollary.
- A true mathematical proposition is called a fact.

**7. Concluding the Proof**

- Summarizing how the result was obtained.
- Reiterating the initial goal and confirming its achievement.
- Optionally reflecting on the method or result.

**8. Optional: Explanatory or Pedagogical Enhancements**

- Motivational asides and remarks on intuition.
- Use of diagrams or informal sketches.
- Analogical reasoning or connections to related problems.