Foundations of Math 11…Chapter 1 Definitions/Key Ideas

Conjecture – A testable expression that is based on available evidence but is not yet proved.

- More support for a conjecture strengthens the conjecture, but does not prove it.
- Some conjectures initially seem to be valid, but are shown not to be valid after more evidence is gathered.
- There is evidence either to support or deny a conjecture reached through inductive reasoning.
- A conjecture may be revised, based on new evidence.

Inductive Reasoning – Drawing a general conclusion by observing patterns and identifying properties in specific examples.

- Inductive reasoning involves solving a simpler problem, observing patterns, and drawing a logical conclusion from your observations to solve the original problem.
- Inductive reasoning is useful when analyzing games and puzzles that require recognizing patterns or creating a particular order.

Counterexample – An example that invalidates (disproves) a conjecture.

- A single counterexample is enough to disprove a conjecture.
- Even if you cannot find a counterexample, you cannot be certain that there is not one. Any supporting evidence you develop while searching for a counterexample, however, does increase the likelihood that the conjecture is true.

Proof – A mathematical argument showing that a statement is valid in all cases, or that no counterexample exists.

- A conjecture has been proved only when it has been shown to be true for every possible case or example. This is accomplished by creating a proof that involves general cases.
- A demonstration using an example is not a proof.

Generalization – A principle, statement, or idea that has general application.

Deductive Reasoning – Drawing a specific conclusion through logical reasoning by starting with general assumptions that are known to be valid.

- When you apply the principles of deductive reasoning correctly, you can be sure that the conclusion you draw is valid.
- The transitive property is often useful in deductive reasoning. It can be stated as follows: Things that are equal to the same thing are equal to each other. If $a = b$ and $b = c$, then $a = c$.
- Deductive reasoning involves using known facts or assumptions to develop an argument, which is then used to draw a logical conclusion and solve the problem.
- Deductive reasoning is useful when analyzing games and puzzles that require inquiry and discovery to complete.

Invalid Proof – A proof that contains an error in reasoning or that contains invalid assumptions.

- Division by 0 always creates an error in a proof, leading to an invalid conclusion.

Premise – A statement assumed to be true.

Circular Reasoning – An argument that is incorrect because it makes use of the conclusion to be proved.