Chapter 2
Reasoning and Proofs

2.1 - Conditional Statements

2.2 - Inductive and Deductive Reasoning

2.3 - Postulates and Diagrams

2.4 - Algebraic Reasoning

2.5 - Proving Statements about Segments and Angles

2.6 - Proving Geometric Relationships

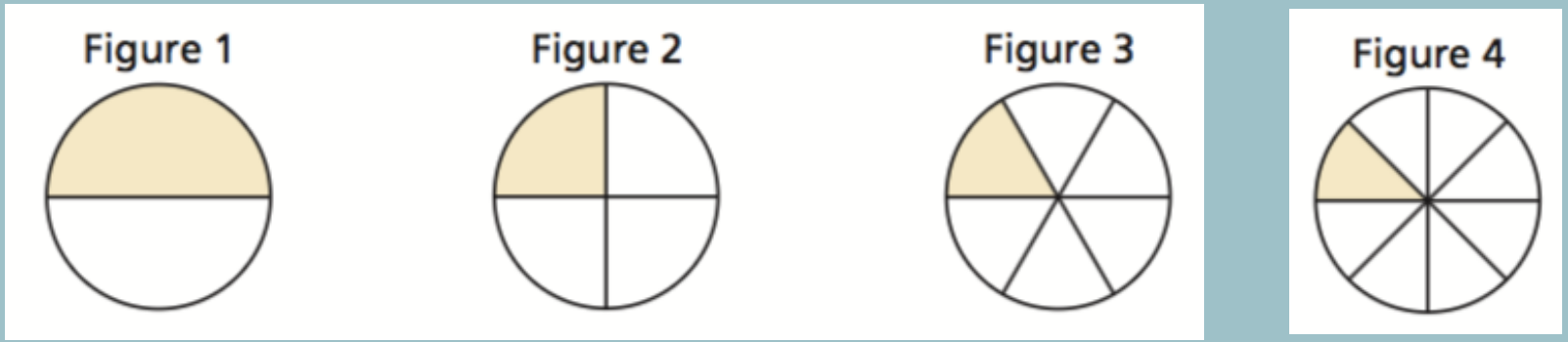
2.2 - Inductive and Deductive Reasoning

Vocabulary

Conjecture - an unproven statement based on observations.

Inductive reasoning - when you find a pattern in specific cases and then write a conjecture for the general case.

Example: Describe how to sketch the next figure below.



2.2 - Inductive and Deductive Reasoning

Use Inductive Logic

The table below shows the sum of the measures of interior angles in various polygons.

What conclusion can you make about the sum of the interior angles of an n-sided polygon?

Polygon	Number of sides	Sum of interior angles
Triangle	3	180°
Quadrilateral	4	360°
Pentagon	5	540°
Hexagon	6	720°

2.2 - Inductive and Deductive Reasoning

Conjecture

- To show a conjecture is **true**, you must show it is **true for all cases**.
- To show a conjecture is **false**, you only have to find **one false case**.
- A **counterexample** is a specific case in which the conjecture is false.

Conjecture: The sum of two numbers is always greater than the bigger number. True or false?

Counterexample: -2 + (-3) = -5 and -5 is not bigger than -2.

2.2 - Inductive and Deductive Reasoning

Vocabulary

Deductive reasoning - to use facts, definitions, accepted properties, and the laws of logic to form a logical argument.

Example:
There is a myth that the Great Wall of China is the only man-made object visible from the moon. The Great Wall is barely visible in photographs taken from 180 miles above Earth. The Moon is about 237,000 miles away. Therefore the myth can't be true.

2.2 - Inductive and Deductive Reasoning

Truth Table of Conditional Statement

Hypothesis p	Conclusion q	Conditional p -> q
T	T	T
F	T	T
T	F	F
F	F	T

Law of Detachment - Suppose a conditional is true and the hypothesis is true, then the conclusion is also true.

Example:
Conditional: If two segments have the same length, then they are congruent.
Hypothesis: You know that BC = XY.
Using the Law of Detachment, you can conclude BC and XY are congruent.

2.2 - Inductive and Deductive Reasoning

Law of Syllogism

If $p \rightarrow q$ is true and $q \rightarrow r$ is true, then $p \rightarrow r$ is true.

Example:

If $x > 5$ (p), then $x^2 > 25$ (q). $p \rightarrow q$

If $x^2 > 25$ (q), then $x^2 > 20$ (r). $q \rightarrow r$

Both are true

By the Law of Syllogism:

If $x > 5$ (p), then $x^2 > 20$ (r). $p \rightarrow r$

then also true

Try this:

If soccer practice is cancelled, then you can go to the mall after school.

If it is raining today, then soccer practice is cancelled.

By the Law of Syllogism:

2.2 - Inductive and Deductive Reasoning

Logic Problem #1

A milkman has two empty jugs: a three gallon jug and a five gallon jug. How can he measure exactly one gallon without wasting any milk?

2.2 - Inductive and Deductive Reasoning

Logic Problem #2

You are in the dark, and on the floor there are six shoes of three colors, and a heap of twenty-four socks, black and brown. How many socks and shoes must you take into the light to be certain that you have a matching pair of socks and a matching pair of shoes?