

7 Reasoning to Solve Problems

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FOM 11

Ch1: INDUCTIVE and DEDUCTIVE REASONING Page 18

Day 7: Reasoning to solve problems (1.6)

- A **conjecture** is a conclusion based on example.
- **Inductive reasoning**: Making a conjecture based on examples, which may be proven by deductive reasoning or disproven by a counterexample.
- **Deductive reasoning**: Using known facts or assumptions to draw a logical conclusion.

Example 1: Decide whether the process used is inductive reasoning or deductive reasoning.

- a) Show that the sum of 2 even numbers is even by using several examples.
- b) No mathematician is boring. You are a mathematician. Therefore, you are not boring.
- c) One counterexample proves that a conjecture is false.
- d) You show why your statement makes sense.
- e) You give evidence that your statement is true.
- f) You give six other examples to show that your conjecture is true.
- g) What three coins have a value of \$0.60?

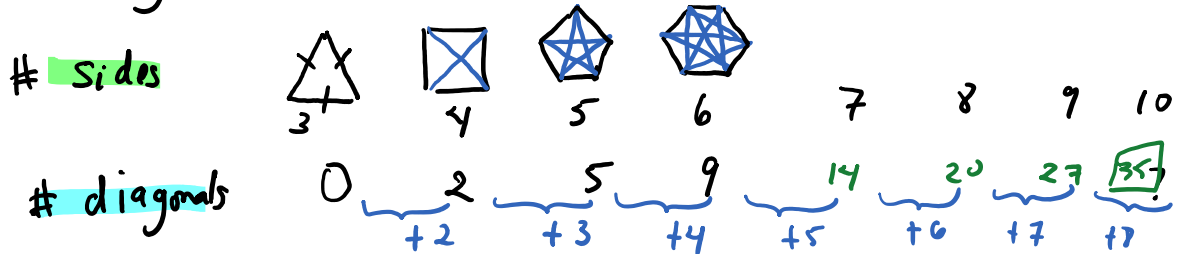


Using **Inductive Reasoning** to **Solve Problems**

- Solve a **similar or simpler problem**; uses **evidence**
- Find and use a **pattern**

Example 2: How many **diagonals** will a **regular** (equal sides/angles) **decagon** (10-sided shape) have?

Try a simpler case.



Look for a pattern!

⇒ decagon has 35 diagonals.

Using **Deductive Reasoning** to Solve Problems

- Develop a logical argument using known **facts**
- Use a logical **conclusion** that is the solution to the problem

Example 3: Alec, Bob, Carl, and Dave are on four sports teams.

- Each play on just 1 team.
- They play football, basketball, baseball, & hockey.
- Bob is a goalie.
- The tallest player plays basketball.
- The shortest plays baseball.
- Carl is taller than Dave but shorter than Alec and Bob.



What sport does each play?

Make a chart!

✓ = possible
x = not possible

	football	basket	base	hockey
Alec	x	✓	x	x
B	x	x	x	✓
C	✓	x	x	x
D	x	x	✓	x

height ↑ Alec, Bob
Carl
Dave ↑ shortest

Alec plays basketball
Bob " hockey
Carl " football
Dave " baseball

Example 4: Alec, Bob, Carl, and Dave live in the same apartment. They are a **manager**, **teacher**, **artist**, and **musician**. Alec and Carl watch TV with the teacher. Bob



Example 4: Alec, Bob, Carl, and Dave live in the same apartment. They are a **manager**, **teacher**, **artist**, and **musician**. Alec and Carl watch TV with the teacher. Bob and Dave go to the hockey game with the manager. Carl jogs with the manager and teacher. Who is the manager?!



	Manager	Teacher	Artist	Musician
Alec	✓	X		
Bob	X			
Carl	X	X		
Dave	X			

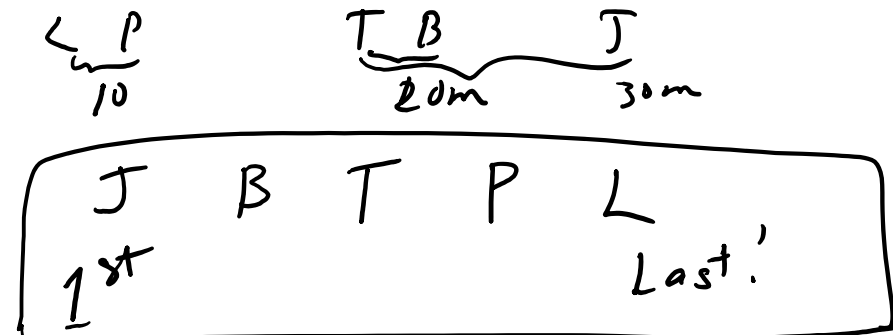
Alec is manager.

Example 5: Barry, Larry, Jerry, Terry, and Perry are position on a track meet.

- Terry is 20 m behind Barry.
- Barry is 50 m ahead of Larry.
- Larry is 10 m behind Perry.
- Jerry is 30 ahead of Terry.
- Perry is 50 m behind Jerry.



At this point in the race, who is winning? What is the order of all the racers?



Assignment: Logic Puzzles Worksheet