7 Reasoning to Solve Problems (1.6)

January 3, 2020   5:58 PM

Day 7: Reasoning to solve problems (1.6)

- A **conjecture** is a conclusion based on ___examples (evidence)___
- **Inductive reasoning**: Making a c_onjecture_ based on e_xamples_,
  which may be proven by deductive reasoning or disproven by a
  c_ounterexample_
- **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.

$$2 + 4 = 6$$
$$8 + 14 = 22$$
→ inductive

b) No mathematician is boring. You are a

mathematician. Therefore, you are not boring.

no examples
→ statements
⟹ deductive

c) One counterexample proves that a conjecture is false.

↳ deductive

d) You show why your statement makes sense.

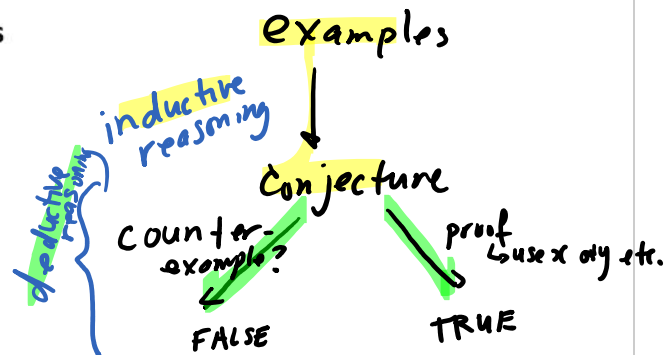↳ deductive

e) You give evidence that your statement is true.

↳ inductive

f) You give six other examples to show that your conjecture is true.

g) What three coins have a value of $0.60?

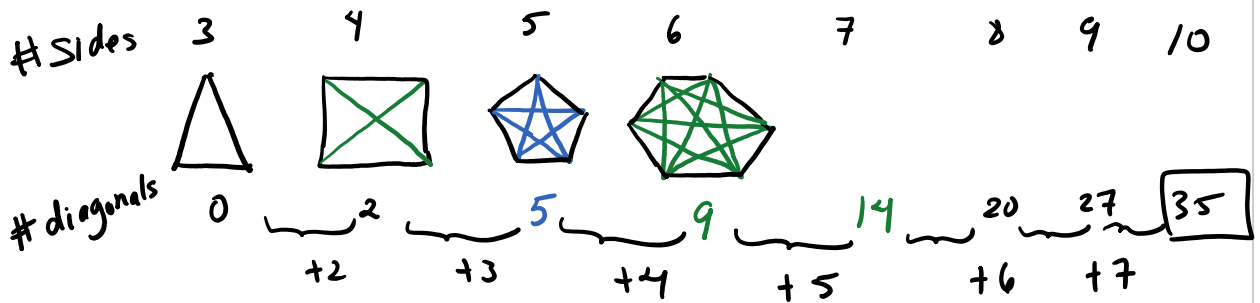(no examples)

$$= 25¢ + 25¢ + 10¢$$
deductive

Using Inductive Reasoning to Solve Problems

- Solve a similar or simpler problem
- Find and use a pattern

examples

inductive reasoning

deductive reasoning

Conjecture

counter-example?

proof
↳ use x ony etc.

FALSE

TRUE

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

Try a simpler problem

#Sides   3   4   5   6   7   8   9   10

#diagonals   0 ⌣ 2 ⌣ 5 ⌣ 9 ⌣ 14 ⌣ 20 ⌣ 27 ⌣ [35]
                +2   +3   +4   +5   +6   +7

Look for 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, Brandon, Carl, and Dave are on four sports teams.

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

What sports does each play?   Draw a chart!

height
A + B
C
D ← shortest

	foot	bask	base	hockey
A	X	✓	X	✓
B	X	X	X	✓
C	✓			
D	X	X	✓	X

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

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

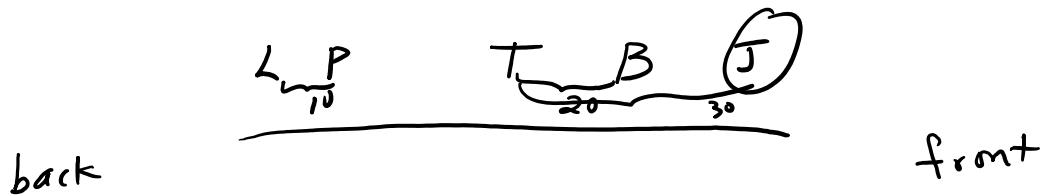|	Manager	Teacher	Artist	Musician
Alec	✓	X		
Brandon	X			
Carl	X	X		
Dave	X			

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?

L P   T   B   (J)
   10   20   30

back   front

Assignment: Sec 1.6, p. 48 # 1, 3, ~~5~~, 6, 8, 9, 15   or chart
odd