

Check Your Understanding 2.2a

Students begin this in class. The CYU covers three rubric rows now in play: **Inductive Reasoning** (spiral), **Deductive Reasoning**, and **Conditional Statements** (Basic only — converse/inverse/contrapositive come in 2.2b).

Basic	Intermediate	Advanced
<i>Inductive Reasoning — Spiral</i> 1. Last week your friend Jim drank a milkshake and got sick. On Tuesday he felt unwell after eating cheese. Yesterday he complained of stomach pain after an ice cream social. a. What logical conclusion can Jim make? b. Which piece of additional information would most make you rethink that conclusion? A. Jim ate tortilla chips and got sick. B. Jim ate tortilla chips and felt fine. C. Jim ate a buttery pastry and got sick. D. Jim ate a buttery pastry and felt fine.	<i>Deductive Reasoning — Define and Contrast</i> 2. Define deductive reasoning in your own words. 3. Explain the key difference between inductive and deductive reasoning. Use the skyscraper puzzle and the circle task from Lesson 2.1 as your two examples.	<i>Deductive Reasoning — Evaluate</i> 4. A student says: "Every math teacher I've had has given homework. Therefore, all math teachers give homework." a. Is this inductive or deductive reasoning? Explain. b. Is the conclusion reliable? What would need to be true for it to be guaranteed?
<i>Conditional Statements — Identify</i> 5. Identify the hypothesis and conclusion in each statement. a. If a triangle is equilateral, then all three sides are equal. b. If you are in New Hampshire, then you are in New England.	<i>Conditional Statements — Write and Rewrite</i> 6. Write each statement in if-then form. a. All squares have four right angles. b. Vertical angles are congruent. c. A number divisible by 6 is divisible by 3.	<i>Conditional Statements — Precision of Language</i> 7. Consider the statement: "If it doesn't rain, we will go outside." a. What does this statement logically guarantee? b. What does it NOT logically guarantee, even though most people would assume it does? c. Rewrite the statement so that it also covers what happens when it does rain.

Basic	Intermediate	Advanced
<i>Spiral — Unit 1</i> 8. Find the midpoint between (3, 4) and (−5, 1).	<i>Spiral — Unit 1</i> 9. Given endpoint (3, 4) and midpoint (−1, 2.5), find the missing endpoint.	<i>Extension — Programming Connection</i> 10. In computer programming, conditional statements control the flow of a program: IF (temperature > 100) THEN display "Too hot" Identify the hypothesis and conclusion. Does this follow the same structure as a mathematical conditional statement? Explain what would happen in the program if the temperature is exactly 100.

CYU 2.2a — Answer Key

1a. Jim is likely intolerant of dairy/lactose — the pattern connects milkshake, cheese, and ice cream (all dairy).

1b. B — Jim ate tortilla chips and felt fine. *This doesn't directly challenge the dairy conclusion. Actually the most challenging counterexample is D — Jim ate a buttery pastry and felt fine, since butter is dairy. Accept B or D with clear reasoning; the key is identifying what type of evidence would undermine the conjecture.*

2. Strong answers will include: starting from accepted facts or rules, using logic to reach a conclusion that must follow, not just probably follows.

3. Circle task: observed cases, generalized a pattern — inductive. Skyscraper puzzle: started from accepted rules (no duplicate heights per row/column, visibility clues), reasoned to necessary placements — deductive. Key distinction: in the circle task the conclusion might be wrong; in the skyscraper puzzle, a correctly reasoned placement must be correct.

4a. Inductive — the student generalized from a limited set of observations.

4b. The conclusion is not reliable — it would need to be true that the student has observed every math teacher, which is impossible. A single counterexample (a math teacher who does not give homework) would disprove the conjecture.

5a. Hypothesis: a triangle is equilateral. Conclusion: all three sides are equal.

5b. Hypothesis: you are in New Hampshire. Conclusion: you are in New England.

6a. If a figure is a square, then it has four right angles.

6b. If two angles are vertical angles, then they are congruent.

6c. If a number is divisible by 6, then it is divisible by 3.

7a. If it does not rain, we will go outside.

7b. It does not guarantee what happens when it does rain. The statement is silent about that case.

7c. Answers will vary. Example: "If it doesn't rain, we will go outside. If it does rain, we will stay inside." Note: this requires two separate statements, not one.

8. Midpoint = $(-1, 2.5)$

9. Missing endpoint = $(-5, 1)$

10. Hypothesis: temperature > 100 . Conclusion: display "Too hot". Same structure as a mathematical conditional. If temperature is exactly 100, the condition is false — the program does nothing (or executes an ELSE branch if one exists). This illustrates why precision matters in both programming and logic.