

Check Your Understanding 2.3

Covers all rubric rows introduced through 2.3. Students begin in class.

Basic	Intermediate	Advanced
<i>Evaluating Arguments — Basic</i> 1. Identify each argument as valid, sound, or invalid: a. <i>All birds have wings. A penguin is a bird. $\therefore$ A penguin has wings.</i> b. <i>All fish live in water. A shark lives in water. $\therefore$ A shark is a fish.</i> c. <i>If a shape is a square, then it has four sides. This shape has four sides. $\therefore$ This shape is a square.</i>	<i>Evaluating Arguments — Intermediate</i> 2. For each invalid argument in problem 1, name the fallacy and explain in one sentence why the conclusion does not follow. 3. Argument H from class (moon/cheese) is valid but not sound. Explain the difference. What would need to change to make it sound?	<i>Evaluating Arguments — Advanced</i> 4. <i>All athletes train regularly. Ella trains regularly. $\therefore$ Ella is an athlete.</i> a. Is this valid or invalid? Name the fallacy if invalid. b. Draw a Venn diagram to show why this argument fails. c. Rewrite the argument so it is valid.
<i>Fallacies — Identify</i> 5. Name the fallacy in each: a. <i>If a student is in 12th grade, they have taken algebra. Kara is not in 12th grade. $\therefore$ Kara has not taken algebra.</i> b. <i>If someone is a firefighter, they are brave. Liam is brave. $\therefore$ Liam is a firefighter.</i> c. <i>All astronauts are scientists. All doctors are scientists. $\therefore$ All doctors are astronauts.</i>	<i>Fallacies — Explain and Connect</i> 6. For each fallacy in problem 5: a. Identify which of the four conditional forms the argument is incorrectly using. b. Draw a Venn diagram for one of them to show why the conclusion does not follow.	<i>Fallacies — Construct</i> 7. Write your own example of each fallacy and explain in one sentence why it fails: a. Affirming the consequent b. Denying the antecedent c. Undistributed middle

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<i>Spiral — Conditional Statements</i> 8. Write the converse, inverse, and contrapositive of: "If an animal is a shark, then it lives in water." Which forms are true? Give a counterexample for any false forms.	<i>Spiral — Reasoning</i> 9. "If you eat peanuts, you get a rash. You got a rash. $\therefore$ You ate peanuts." a. Is this valid or invalid? Name the fallacy. b. Write a valid version of this argument. c. Is the original version inductive or deductive reasoning?	<i>Extension</i> 10. "All superheroes wear capes. Dracula wears a cape. $\therefore$ Dracula is a superhero." a. Is this valid or invalid? Sound? Name any fallacy. b. Can a valid argument produce a false conclusion? Use this example. c. Rewrite the premises to make the argument both valid and sound.

CYU 2.3 — Answer Key

- 1a.** Sound — valid structure (law of detachment), true premises.
1b. Invalid — affirming the consequent. Living in water does not make something a fish.
1c. Invalid — affirming the consequent. Having four sides does not make something a square.
- 2.** 1b: affirming the consequent — q (lives in water) does not guarantee p (is a fish). 1c: same fallacy — q (four sides) does not guarantee p (is a square).
3. Valid = conclusion follows IF premises are true. Sound = valid AND premises actually are true. The moon is not made of cheese, so the premise is false — valid structure, not sound. This argument can never be made sound without changing the premises to something true.
- 4a.** Invalid — affirming the consequent. Training regularly is the consequent, not the antecedent.
4b. Venn diagram: athlete-circle inside trains-regularly circle. Being in the outer ring doesn't place you in the inner ring.
4c. All athletes train regularly. Ella is an athlete. $\therefore$ Ella trains regularly.
- 5a.** Denying the antecedent.
5b. Affirming the consequent.
5c. Undistributed middle.
- 6a.** 5a uses the inverse ($\sim p \rightarrow \sim q$). 5b uses the converse ($q \rightarrow p$). 5c is the undistributed middle — not one of the four forms, but the same error of assuming a shared property creates equivalence.
- 7.** Answers vary. Check: correct symbolic form used, explanation identifies why conclusion doesn't follow.
- 8.** Converse: If an animal lives in water, then it is a shark. (FALSE — counterexample: dolphin.)
Inverse: If an animal is not a shark, then it does not live in water. (FALSE — same counterexample.)
Contrapositive: If an animal does not live in water, then it is not a shark. (TRUE.)
- 9a.** Invalid — affirming the consequent.
9b. If you eat peanuts, you get a rash. You ate peanuts. $\therefore$ You got a rash.
9c. Deductive — the structure is a conditional argument.
- 10a.** Invalid — affirming the consequent. Wearing a cape is the consequent.
10b. Yes — an invalid argument can stumble onto a true or false conclusion by accident. This argument is invalid, so we cannot rely on the conclusion.
10c. Valid and sound version requires swapping the structure: All superheroes wear capes. Dracula is a superhero. $\therefore$ Dracula wears a cape. (Sound only if Dracula is in fact a superhero — depends on your definitions.)