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Inductive and Deductive Reasoning

Organizing topic Reasoning and Proof
Overview Students practice inductive and deductive reasoning strategies.
Related Standard of Learning G.1

Objectives

- The student will use inductive reasoning to make conjectures.
- The student will use logical arguments to prove or disprove conjectures.
- The student will justify steps while solving linear equations, using properties of real numbers and properties of equality.
- The student will solve linear equations as a form of deductive proof.

Prerequisite Understandings/Knowledge/Skills

- Students must be able to differentiate between inductive and deductive reasoning.
- Students must be familiar with the definitions of addition and multiplication properties.
- Students must know how to read and analyze word problems.
- Students must be able to recognize and identify the use of variables in equations.

Instructional activity

- Review the basic vocabulary included on the activity sheets.
- Have students work in pairs or small groups to complete the activity sheets.
- Use the algebraic properties of equality (shown on Activity Sheet 3) for matching, concentration, or filling in the steps of a proof in addition to writing.

Follow-up/extension

- Have students investigate practical problems involving inductive or deductive reasoning.
- Have students create their own conjectures to prove or disprove.

Sample assessment

- Have students work in pairs to evaluate strategies.
- Use activity sheets to help assess student understanding.
- Have students complete a journal entry comparing and contrasting inductive and deductive reasoning strategies.

Specific options for differentiating this lesson**Technology**

- Allow students to use a calculator to make simple calculations and compare their findings.

Multisensory

- Use an overhead projector to illustrate the steps in deductive and inductive reasoning.
- Place two extra large triangles on the board. One triangle is red; place it on the board, point side up. The other triangle is blue; place it on the board point side down. Place 4 green boxes

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12 Inductive vs. Deductive Reasoning

Review: To distinguish between inductive and deductive reasoning, look at the structure of the argument.

- **Inductive reasoning** moves from specific facts to a broad conclusion or generalization.
- **Deductive reasoning** begins with a general premise, then moves forward with specific facts to reach a specific conclusion.

Directions: Read each example. Respond to the prompt that follows.

Inductive Reasoning

The bakery sold 325 apple pies last week. The bakery sold 225 lemon cakes. No more than 200 more sold of any other kind of product. Apple pies are currently the most popular item in the bakery.

1. Underline the specific facts. Circle the conclusion.

Deductive Reasoning

Humans cannot survive in temperatures over 200°C. Temperatures on the planet Mercury average over 200°C. Humans, therefore, cannot survive unprotected on the planet Mercury.

2. Underline the general premise. Double underline the specific situation. Circle the specific conclusion.

Deductive Reasoning

All snakes lay eggs. Chickens lay eggs too. Therefore, chickens must be snakes.

3. Explain why the conclusion is flawed.

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Inductive vs. Deductive Reasoning

Some advantages and disadvantages of Inductive grammar approach are:

Table 4 The Advantages and Disadvantages of Inductive Grammar Approach

(Widodo¹⁹, 2006)

Advantages	<ol style="list-style-type: none"> 1. Learners are trained to be familiar with the rule discovery; this could enhance learning autonomy and self-reliance. 2. Learners' greater degree of cognitive depth is "exploited". 3. The learners are more active in the learning process, rather than being simply passive recipients. In this activity, they will be motivated. 4. The approach involves learners' pattern-recognition and problemsolving abilities in which particular learners are interested in this challenge. 5. If the problem-solving activity is done collaboratively, learners get an opportunity for extra language practice.
Disadvantages	<ol style="list-style-type: none"> 1. The approach is time and energy-consuming as it leads learners to have the appropriate concept of the rule. 2. The concepts given implicitly may lead the learners to have the wrong concepts of the rule taught. 3. The approach can place emphasis on teachers in planning a lesson. 4. It encourages the teacher to design data or materials taught carefully and systematically. 5. The approach may frustrate the learners with their personal learning style, or their past learning experience (or both) would prefer simply to be told the rules.

¹⁹ Widodo, H.P. Approaches and Procedures for Teaching Grammar. *English Teaching: Practice and Critique*. May 2006, Volume 5, Number 1. 2006, p. 129

Inductive and deductive reasoning worksheet kuta software.

Problem 1 :Sketch the next figure in the pattern. Problem 2 :Describe a pattern in the sequence of numbers. Predict the next number.1. 4, 16, 64, Problem 3 :Let p be "the value of x is -5" and let q be "the absolute value of x is 5" (i) Write p -> q in words.(ii) Write q -> p in words.(iii) Decide whether the biconditional statement p q is true.Problem 4 :State whether the argument is valid.Michael knows that if he misses the practice the day before a game, then he will not be a starting player in the game. Michael misses practice on Tuesday so he concludes that he will not be able to start in the game on Wednesday.Problem 5 :Write some conditional statements that can be made from the following true statements using the Law of Syllogism.1. If a bird is the fastest bird on land, then it is the largest of all birds.2. If a bird is the largest of all birds, then it is an ostrich.3. If a bird is a bee hummingbird, then it is the smallest of all birds.4. If a bird is the largest of all birds, then it is flightless.5. If a bird is the smallest bird, then it has a nest the size of a walnut half-shell. 1. Answer : Each figure in the pattern looks like the previous figure with another row of squares added to the bottom. Each figure looks like a stairway.So, the sixth figure in the pattern must have six squares in the bottom row. 2. Answer :Each number is four times the previous number.So, the next number is 256.3. Answer :(i) If the value of x is -5, then the absolute value of x is 5.(ii) If the absolute value of x is 5, then the value of x is -5.(iii) The conditional statement in part (a) is true, but its converse in part (b) is false. So, the biconditional statement p q is false.4. Answer :This logical argument is a valid use of the Law of Detachment. It is given that both a statement (p -> q) and its hypothesis (p) are true. So it is valid for Michael to conclude that the conclusion is true.5. Answer :Here are the conditional statements that use the Law of Syllogism.a. If a bird is the fastest bird on land, then it is an ostrich. (Use 1 and 2.)b. If a bird is a bee hummingbird, then it has a nest the size of a walnut half-shell. (Use 3 and 5.)c. If a bird is the fastest bird on land, then it is flightless. (Use 1 and 4.) Kindly mail your feedback to v4formath@gmail.comWe always appreciate your feedback. ©All rights reserved. onlinemath4all.com

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