Name_____ Date _____

2.2 Inductive and Deductive Reasoning

For use with Exploration 2.2

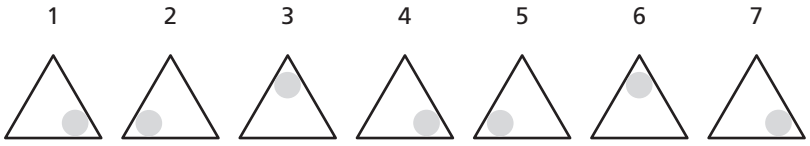
Essential Question How can you use reasoning to solve problems?

A **conjecture** is an unproven statement based on observations.

1 EXPLORATION: Writing a Conjecture

Work with a partner. Write a conjecture about the pattern. Then use your conjecture to draw the 10th object in the pattern.

a.



b.

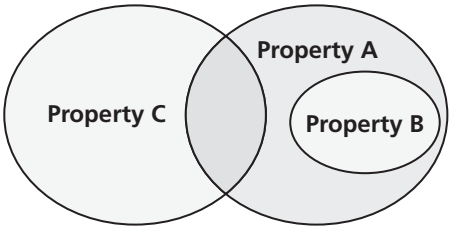
c.

2 EXPLORATION: Using a Venn Diagram

Work with a partner. Use the Venn diagram to determine whether the statement is true or false. Justify your answer. Assume that no region of the Venn diagram is empty.

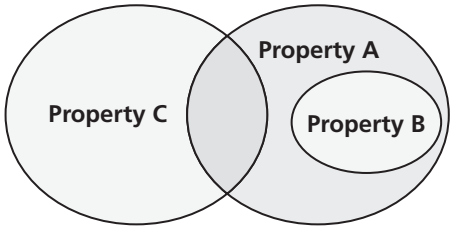
a. If an item has Property B, then it has Property A.

b. If an item has Property A, then it has Property B.



2 EXPLORATION: Using a Venn Diagram (continued)

c. If an item has Property A, then it has Property C.



d. Some items that have Property A do not have Property B.

e. If an item has Property C, then it does not have Property B.

f. Some items have both Properties A and C.

g. Some items have both Properties B and C.

3 EXPLORATION: Reasoning and Venn Diagrams

Work with a partner. Draw a Venn diagram that shows the relationship between different types of quadrilaterals: squares, rectangles, parallelograms, trapezoids, rhombuses, and kites. Then write several conditional statements that are shown in your diagram, such as "If a quadrilateral is a square, then it is a rectangle."

Communicate Your Answer

4. How can you use reasoning to solve problems?

5. Give an example of how you used reasoning to solve a real-life problem.

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2.2 Notetaking with Vocabulary

For use after Lesson 2.2

In your own words, write the meaning of each vocabulary term.

conjecture

inductive reasoning

counterexample

deductive reasoning

Core Concepts

Inductive Reasoning

A **conjecture** is an unproven statement that is based on observations. You use **inductive reasoning** when you find a pattern in specific cases and then write a conjecture for the general case.

Notes:

Counterexample

To show that a conjecture is true, you must show that it is true for all cases. You can show that a conjecture is false, however, by finding just one *counterexample*. A **counterexample** is a specific case for which the conjecture is false.

Notes:

Name _____ Date _____

2.2 Notetaking with Vocabulary (continued)

Deductive Reasoning

Deductive reasoning uses facts, definitions, accepted properties, and the laws of logic to form a logical argument. This is different from *inductive reasoning*, which uses specific examples and patterns to form a conjecture.

Laws of Logic

Law of Detachment

If the hypothesis of a true conditional statement is true, then the conclusion is also true.

Law of Syllogism

If hypothesis p, then conclusion q.

If hypothesis q, then conclusion r.

} If these statements are true,

If hypothesis p, then conclusion r. ← then this statement is true.

Notes:

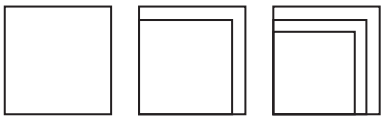
Extra Practice

In Exercises 1–4, describe the pattern. Then write or draw the next two numbers, letters, or figures.

1. 20, 19, 17, 14, 10, …

2. 2, −3, 5, −7, 11, …

3. C, E, G, I, K, …

4. 

Name_____ Date _____

2.2 Notetaking with Vocabulary (continued)

In Exercises 5 and 6, make and test a conjecture about the given quantity.

5. the sum of two negative integers

6. the product of three consecutive nonzero integers

In Exercises 7 and 8, find a counterexample to show that the conjecture is false.

7. If n is a rational number, then n^2 is always less than n.

8. Line k intersects plane P at point Q on the plane. Plane P is perpendicular to line k.

In Exercises 9 and 10, use the Law of Detachment to determine what you can conclude from the given information, if possible.

9. If a triangle has equal side lengths, then each interior angle measure is $60°$. $\triangle ABC$ has equal side lengths.

10. If a quadrilateral is a rhombus, then it has two pairs of opposite sides that are parallel. Quadrilateral $PQRS$ has two pairs of opposite sides that are parallel.

In Exercises 11 and 12, use the Law of Syllogism to write a new conditional statement that follows from the pair of true statements, if possible.

11. If it does not rain, then I will walk to school.

If I walk to school, then I will wear my walking shoes.

12. If $x > 1$, then $3x > 3$.

If $3x > 3$, then $(3x)^2 > 9$.