

Chapter 2.1: Inductive Reasoning

Objective: I can describe patterns and use inductive reasoning.

Inductive Reasoning: process of finding a pattern for specific cases and then writing a Conjecture (hypothesis) for the general cases.

- Conjecture: unproven statement based on Observations.
- Counterexample: specific example that proves a conjecture false.

Pattern Examples: Continue the pattern.

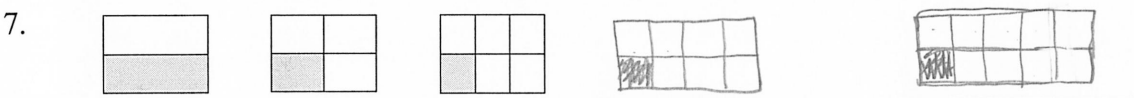
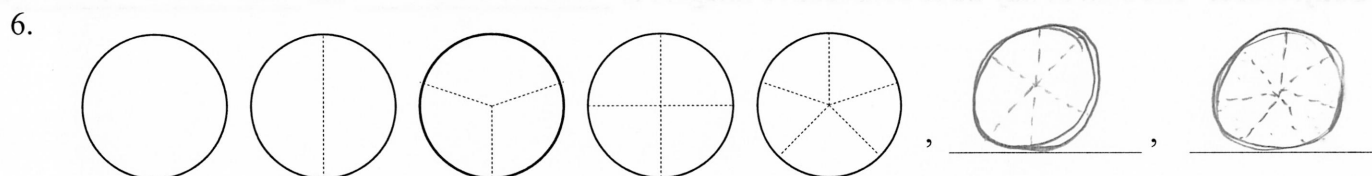
1. -1, -4, -16, -64, -256, -1,024, -4,096... multiplying by 4

2. 1, 2.5, 4, 5.5, 7, 8.5, 10, ... adding 1.5

3. 1, 3, 7, 13, 21, 31, 43, 57, ...

4. 1, 4, 9, 16, 25, 36, 49, 64, 81, ... perfect squares

5. 1, 1, 2, 3, 5, 8, 13, 21, 34, 55, ... adding the two previous #'s



Show that that conjecture is false by finding a counterexample.

Example #8: **Conjecture:** The difference of any two numbers is always smaller than the larger number

Subtraction Ex. $4 - 2 = 2$ Countex. $4 - (-2) = 6$
 $4 > 2$ $4 > 6$

Example #9: **Conjecture:** The quotient of two whole numbers is a whole number

division Ex. $\frac{8}{2} = 4$ Countex: $\frac{1}{2} = 0.5$

Example #10: **Conjecture:** The difference of the absolute value of two numbers is positive.






Subtraction Ex. $||0| - |-8|| = 10 - 8$ Countex: $|-8| - |10| = 8 - 10$
 $= 2$ $= -2$

Example #11: Make and test a conjecture of the product of any four negative numbers.

$$(-1)(-2)(-3)(-4) = 24 \quad (-1)(-1)(-1)(-1) = 1$$

Conjecture: The product of any 4 negative numbers is positive

Example #12: Given five collinear points make a conjecture about the number of ways to connect different pairs of the points.

Number of points	1	2	3	4	5
Picture					
Number of connections	0	1	3	6	?

$\underbrace{\hspace{1.5cm}}_{+1} \quad \underbrace{\hspace{1.5cm}}_{+2} \quad \underbrace{\hspace{1.5cm}}_{+3} \quad \underbrace{\hspace{1.5cm}}_{+4}$

Conjecture: You can connect five collinear point $6+4 = 10$ different ways

Example #13: Number such as 3, 4, and 5 are called consecutive numbers. Make and test a conjecture about the sum of any three consecutive numbers.

$$3 + 4 + 5 = 12$$

$$-1 + 0 + 1 = 0$$

$$100, 101, 102 = 303$$

$$7 + 8 + 9 = 24$$

$$120 + 121 + 122 = 363$$

$$14, 15, 16 = 45$$

Conjecture: The sum of any three consecutive integers is 3 times the second number