

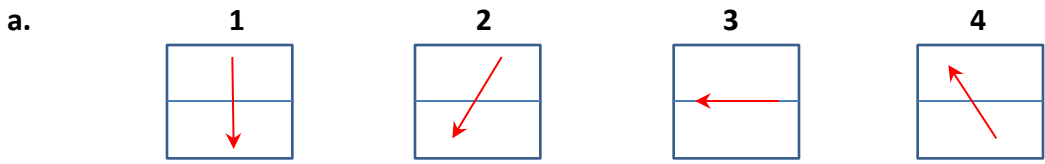
Inductive Reasoning Guided Notes

Inductive reasoning is a type of reasoning in which you look at a pattern and then make some type of prediction based on the pattern.

These predictions are also called **conjectures**.

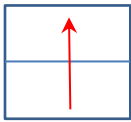
A **conjecture** is a statement about what you think will happen based on the pattern you observed.

Sample Problem 1: Make a conjecture about the next figure in the pattern. Then draw the figure.



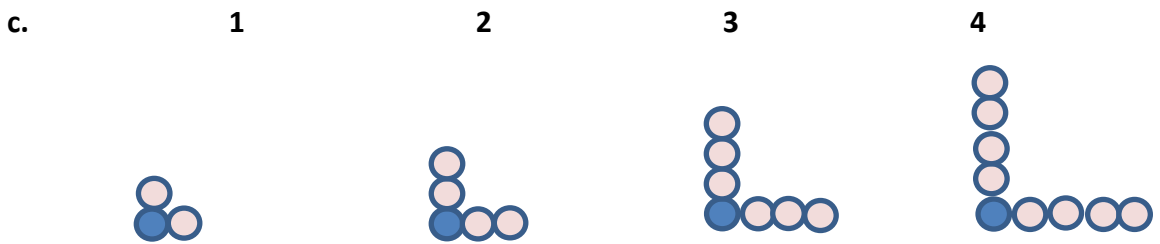
Observation: The direction of the arrow rotates by 45° clockwise each time.

Conjecture: Next figure is:



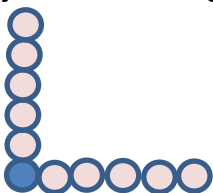
Observation: Each next figure has two more triangles than previous.

Conjecture: Next figure is:



Observation: Each next figure has two more pink circles than previous.

Conjecture: Next figure is:



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Sample Problem 2: Write a rule for each number pattern, and find the next number.

- a. 3, 7, 11, 15, 19

Start with 3, each number is obtained by adding 4 to the previous number.

$$3 + 4 = 7$$

$$7 + 4 = 11$$

$$11 + 4 = 15$$

$$15 + 4 = 19$$

$$19 + 4 = 23$$

The next number is **23**

- b. 1, 2, 4, 8, 16

Each number is two times the previous number.

$$1 * 2 = 2$$

$$2 * 2 = 4$$

$$4 * 2 = 8$$

$$8 * 2 = 16$$

$$16 * 2 = 32$$

The next number is **32**

- c. 10, 5, 2.5, .. 1.25

Each number is $\frac{1}{2}$ of the previous number.

$$10 * \frac{1}{2} = 5$$

$$5 * \frac{1}{2} = 2.5$$

$$2.5 * \frac{1}{2} = 1.25$$

$$1.25 * \frac{1}{2} = 0.625$$

The next number is **0.625**.

One way to show that a conjecture is not true is to find a counterexample.

A **counterexample** is an instance in which the conjectured pattern does not work.

Only one counterexample is needed to prove a conjecture false. A counterexample can be a drawing, a statement, or a number.

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Sample Problem 3: Find one counterexample to show that each conjecture is false.

- a. The difference between two integers is always positive. **Counterexample:**

$$\begin{aligned} -7 - 9 &= \\ &= -7 + (-9) = \\ &= \mathbf{-16} \end{aligned}$$

- b. All prime numbers are odd integers.

Counterexample

2 is prime number but it is even.

- c. If the product of two numbers is positive, then the two numbers must both be positive.

Counterexample

$$\begin{aligned} -4 * (-5) &= \\ &= \mathbf{-4 * (-5) =} \\ &= \mathbf{20} \end{aligned}$$

Finding the n term

Sample Problem 4: Find the n term.

a.

n	1	2	3	4	5	6	7
$4n - 2$	2	6	10	14	18	22	26

b.

n	1	2	3	4	5	6	7
$5n + 2$	7	12	17	22	27	32	37