**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.**

|  |  |
| --- | --- |
| **a.** |  **1 2 3 4** |
|  | **Observation:** The direction of the arrow rotates by 45° clockwise each time.**Conjecture:** Next figure is:  |
| **b.** |  **1 2 3 4** |
|  | **Observation:** Each next figure has two more triangles than previous.**Conjecture:** Next figure is:  |
| **c.** |  **1 2 3 4** |
|  | **Observation:** **Each next figure has two more pink circles than previous.****Conjecture:**  **Next figure is:**  |

**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.

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

|  |  |  |
| --- | --- | --- |
| **a.** | The difference between two integers is always positive. | **Counterexample**$: $$$ -7-9=$$$$=-7+\left(-9\right)=$$$$=-16$$ |
| **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**$ $$$ -4\*(-5)=$$$$= -4\*(-5)=$$$$=20$$ |

***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.** |

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

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