**Lesson 2 Notes: Patterns and Sequences**

**Opening Question:**

There are 5 people in a room and each person shakes hands exactly once with everyone else. How many handshakes take place?

Try to solve this! What do you think? How many handshakes will take place if there are 10 people in a room? What if there are 11 people in the room? Is there a pattern here?

**Problem Solving Strategy #8:**

*Patterns play a major role in the solution of problems in all areas of life!*

To find patterns, you need to \_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_.

* Compare
* Contrast

Mathematicians love looking for patterns and finding them! We get excited by patterns, but we are also very skeptical of patterns! If we cannot \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ why a pattern would occur, then we are not willing to believe it.

CAN YOU FIND A PATTERN HERE? What is the same? What is different? Find the next few terms in each example. Can you EXPLAIN your answer?

Patterns appear in many forms:

  \_\_\_\_\_\_\_\_\_\_

AJ, Bri, Cole, Diana, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**Another Example:**

Let’s look at this number pattern: 2, 4, 8, … we can find a lot of ways to continue the pattern, each of which makes sense in some contexts. Here are some possibilities:

* 2, 4, 8, 2, 4, 8, 2, 4, 8, 2, 4, 8, ……….…
* 2, 4, 8, 32, 256, 8192, ……….…
* 2, 4, 8, 16, 32, 64, 128, 256, 512, 1024, …….
* 2, 4, 8, 14, 22, 32, 44, 58, 74 …

Each of these examples are a logical pattern with a logical explanation!

**Fibonacci numbers**

Describe how the **Fibonacci numbers** were discovered:

List the first 15 terms of the Fibonacci numbers:

**Pascal’s Triangle**

Let’s examine some number patterns known as **Arithmetic Sequences**.

**Arithmetic Sequence**

**Example**: Identify the arithmetic pattern and find the next three terms.

3, 8, 13, 18, 23...

**Example**: Identify the arithmetic pattern and find the next three terms.

15, 13, 11, 9, ...

**Finding the nth term in an Arithmetic Sequence**

An arithmetic sequence has a common difference.

The formula for the nth term is:

How do you find the nth term of the following pattern: 1, 4, 7, 10, 13? Find the 10th term.

**Explanation:**

Another type of number pattern is known as **Geometric Sequences.**

**Geometric Sequence**

**Example**: Identify the geometric pattern and find the next three terms.

4, 16, 64, 256…