**Lesson 2 Notes: Patterns and Sequences**

**ANSWER KEY**

1 person in the room = 0 handshakes 4 people in the room = 3 + 3 = 6 handshakes

2 people in the room = 1 handshake 5 people in the room = 6 + 4 = 10 handshakes

3 people in the room = 1 + 2 = 3 handshakes

**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?

Look for and EXPLAIN Patterns

**Problem Solving Strategy #8:**

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

contrast

compare

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

Compare the features that remain constant

* Compare

Contrast the features that are changing

* 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.

EXPLAIN

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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Edward, Frances…



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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, ……….…

This is a repeating pattern, cycling through the numbers 2, 4, 8 and then starting over with 2.

* 2, 4, 8, 32, 256, 8192, ……….…

To get the next number, multiply the previous two numbers together.

* 2, 4, 8, 16, 32, 64, 128, 256, 512, 1024, …….

Can you identify the pattern here? (multiply each number by 2)

* 2, 4, 8, 14, 22, 32, 44, 58, 74 …

What pattern is happening here??? Allow Discussion (adding 2, then 4, then 6, then 8, then 10 each time….)

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

There are many patterns that are in nature. One famous sequence of numbers are the Fibonacci numbers.

The first numbers are 0 and 1. After this, the next numbers are obtained by adding the two previous numbers.

0, 1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, \_\_\_, \_\_\_\_, \_\_\_\_, \_\_\_

**Fibonacci numbers**

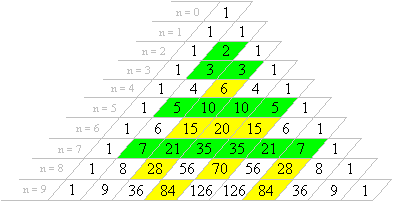
Describe how the **Fibonacci numbers** were discovered:

Leonardi Fibonacci, Italian mathematician, 12th century. Studied birth rate of rabbits.

List the first 15 terms of the Fibonacci numbers:

0, 1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89,144, 233, 377

Blaise Pascal, French mathematician, created this triangular pattern of numbers:



**Pascal’s Triangle**

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

**Arithmetic Sequence**

Each new number in a sequence is obtained from the previous number by adding (or subtracting) a selected number throughout.

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

Add 5: 28, 33, 38

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

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

Subtract 2: 7, 5, 3

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:

an = a + (n – 1)d

Where an = nth term of the sequence

a = first term of the sequence

d = common difference

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

n=10

a=1

d=3

1+ (10 - 1) 3 = 28

1, 4, 7, 10, 13, 16, 19, 22, 25, 28

**Explanation:**

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

**Geometric Sequence**

Each new number is obtained by multiplying a previous number by a selected number throughout

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

Multiply by 4: 1024, 4096, 16384

4, 16, 64, 256……