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Arithmetic Sequence and Series

Final Project: Hands-on Activity

MTH 4040: Coordinating Seminar

April 2017

**Arithmetic Sequence and Series:**

**Square Pyramidal**

Goal:

The students will demonstrate the ability to recognize patterns in a sequence and derive formulas for the sum of a series.

Objective:

The students will formulate an equation to represent an arithmetic sequence.

The students will build a summation to represent an arithmetic series.

The students will calculate the sum of the series.

Standards:

**NCTM:**

**Algebra (Grades 9-12)**

**Understand patterns, relations, and functions**

1. Generalize patterns using explicitly defined and recursively defined functions

**CCSS:**

**Building Functions F-BF**

**Building a function that models a relationship between two quantities.**

1. Write a function that describes a relationship between two quantities.

a) Determine an explicit expression, a recursive process, or steps for calculation from a context.

b) Combine standard function types using arithmetic operations. For example, build a function that models that temperature of a cooling body by adding a constant function to a decaying exponential, and relate these functions to the model.

Material:

* + Activity packet (1 per student)
  + Starburst: Pink (9 per group)
  + Starburst: Yellow (4 per group)
  + Starburst: Orange (1 per group)
  + Calculator (Optional)

Assignment:

* + The students will be working in groups of 3 to 4 to complete this activity. Each student will need their own copy of the activity packet, but will share the physical material amongst the group.

Terms to Know:

* **Sequence:** A list of numbers or objects in a special order.
* **Series:** The value you get when you add all the terms of a sequence, this value is called the “sum”.
* **Summation:** The addition of a sequence of numbers, the result is their sum or total.
* **Arithmetic Patterns:** A pattern made by adding the same value to each term.
* **Common Difference:** The difference between two numbers in an arithmetic sequence.

Resources:

Love, D. (2014). 400 years ago, a famous mathematician couldn't confirm his theory computers did it two days ago. Retrieved from https://ca.finance.yahoo.com/news/400-years-ago-famous-mathematician-180433456.html

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_        Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

*Activity Sheet*

Directions: Before completing this worksheet with your group, predict solutions for the two questions below.

Cannonball problem: PREDICT

1. Predict how many cannonballs are in the 5th row.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

2. Predict how many cannonballs were used to build the figure in the picture? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Sequences and Series**

1. Build your pyramid. Place all your pink on the bottom, and then place your yellow starburst on top of the pink. Next place your orange starbursts on the top to finish off our pyramid.
2. Examine the starburst in each row. What is the pattern that you notice?
3. What is the relationship between the number of starbursts in the row and the location of the figure in the sequence?
   1. Row number: \_\_\_\_\_\_\_\_\_\_\_\_\_        Starbursts in the row: \_\_\_\_\_\_\_\_\_\_\_\_
4. Now that we have examined the starburst in each row and have discovered a pattern. Can we notice a pattern between the figures in this sequence?
   1. What is the relationship between the number of starbursts in the figure and the location of the figure in the sequence?
      1. Term number: \_\_\_\_\_\_\_\_\_\_\_\_\_        Starbursts in the figure: \_\_\_\_\_\_\_\_\_\_\_\_

|  |  |  |
| --- | --- | --- |
|  | Sequence of the Rows | Sequence of the Square Pyramid |
| Figure 1 |  |  |
| Figure 2 |  |  |
| Figure 3 |  |  |
| Figure n |  |  |

**Cannonball Problem**

1. Determine how many cannonballs are in the 5th row.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

2. How many cannonballs are needed to build the figure in the picture? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Practice:

1. How many starbursts would be required to build the 300th figure in this sequence?
2. How many starbursts will be in the 18th row of this square pyramidal?
3. How many starbursts will be in the 100th row of this square pyramidal?
4. How many starbursts would be required to build the 54th figure in this sequence?

**Row 1**

**Row 2**

**Row 3**