

## PATTERNS

### **OVERALL HW ASSESSMENT**

- 0 – No Homework
- 1 – Poor Homework and/or Not Attempted at Home
- 2 – Adequate Homework, Some Attempted at Home
- 3 – Satisfactory Homework, Mostly Attempted at Home
- 4 – Satisfactory HW, ALL Completed at Home
- 5 – Excellent HW, ALL Completed at Home

# HW#1 – Past Experiences

## 1. Mathematical Autobiography

### a. Describe your past experiences in learning and using mathematics

0 – No description

1 – A limited and/or vague description with no supporting examples

2 – A limited description with few supporting examples

3 – A satisfactory description with several supporting examples, however examples tend to rather general

4 – A detailed description with many specific supporting examples

## 2. Favorite and Least Favorite Classes

### a. Describe your experiences working in math and other subjects that you liked and did not like

0 – No description

1 – A limited and/or vague description with no supporting examples

2 – A limited description with few supporting examples

3 – A satisfactory description with several supporting examples, however examples tend to rather general

4 – A detailed description with many specific supporting examples

## 3. Comparison of Experiences in Groups and Alone

### a. Describe the advantages and disadvantages of working in groups and working alone

0 – No description

1 – A limited and/or vague description with no supporting examples

2 – A limited description with few supporting examples

3 – A satisfactory description with several supporting examples, however examples tend to rather general and a limited discussion of your preference

4 – A detailed description with many specific supporting examples, including a discussion of your preference

# HW#2 – Who’s Who?

## 1. PROCESS

(how you got started?, where you got stuck?, how you got unstuck?, how you knew when to stop?, efforts that did not work or seemed like a waste of time)

a. **Describe your initial ideas concerning the problem**

(how you got started?)

- 0 – No initial ideas expressed
- 1 - Poorly written/incomplete/vague statement of ideas
- 2 - Complete and thorough explanation of initial ideas

b. **Describe all of your attempts to solve the problem**

(where you got stuck?, how you got unstuck?, how you knew when to stop?, and efforts that did not work or seemed like a waste of time)

- 0 – No methods described
- 1 – Poor overall description that is incomplete and vague, with no specific examples
- 2 – A satisfactory description of your processes, with adequate examples
- 4 – A complete and thorough description of your methods, with comprehensive explanations that used specific examples

c. **Provide all diagrams and sketches that helped you in your attempt to solve the problem** (Merely stating the answer is not enough)

- 0 – No diagrams provided
- 1 - Poor diagrams with little if any labels/explanations/comments
- 2 - Complete diagrams with clear and concise labels/explanations/comments

## 2. SOLUTION

a. **State the solution (as clearly as you can)**

- 0 – No statement of solution
- 1- Solution is incorrect, within a reasonable limit of error (limit needs to be given)
- 2- Solution is correct

b. **Describe why your solution(s) is correct and complete, include all supporting data**

- 0 – No description of why solution is considered to be correct
- 1 – Poor and incomplete explanation of why your solution is correct with few attempts considered for solving the problem
- 2 – Minimal explanation of why your solution is correct, with most attempts considered for solving the problem
- 4 – A satisfactory explanation of why your solution is correct, with all attempts considered for solving the problem

## HW#3 – Describing Patterns

### 1 – 6 Identifying and Describing Patterns for each Sequence

**a. Describe a pattern you found for each sequence**

- 0 – No patterns described or no correct patterns described
- 1 – Two correct patterns described
- 2 – Four correct patterns described
- 3 – Six correct patterns described

**b. Describe a method for finding next few terms of each sequence**

- 0 – No method described
- 1 – Two correct methods described
- 2 – Four correct methods described
- 3 – Six correct methods described

**c. State at least the next three terms for each sequence**

- 0 – No additional terms stated
- 1 – Additional terms correctly stated for 2 sequences
- 2 – Additional terms correctly stated for 4 sequences
- 3 – Additional terms correctly stated for 6 sequences

### 7. Make Up a Picture Sequence

**a. Draw the first few terms of your picture sequence**

- 0 – No made-up picture sequence described
- 1 – A very basic picture sequence is drawn or a poorly drawn picture of an interesting or complex picture sequence
- 2 – An interesting or complex picture sequence is drawn that follows a definite pattern

**b. Describe how to find more terms in your picture sequence**

- 0 – No description of how to find more pictures in your sequence
- 1 – A poor description of how to find more pictures in your sequence
- 2 – A detailed description of how to find more pictures in your sequence

### 8. Make Up a Number Sequence

**a. State the first few terms of your number sequence**

- 0 – No made-up number sequence is described
- 1 – A very simple number sequence is stated or a complex sequence is stated with incorrect term(s)
- 2 – A interesting or complex sequence is stated

**b. Describe how to find more terms in your number sequence**

- 0 – No description of how to find more terms in your sequence
- 1 – A poor description of how to find more terms in your sequence
- 2 – A detailed description of how to find more terms in your number sequence

## HW#4 – POW Beginnings

### 1. Write a **PROBLEM STATEMENT** for POW 1: Broken Eggs

#### a. Restate the story or situation of the POW in your own words

- 0 – No story or situation stated
- 1 – Story or situation is copied from text
- 3 – Story or situation is restated but lacks some necessary information
- 4 – Story or situation was written in students own words and includes all necessary information

#### b. Restate the specific problem/task in your own words

- 0 – No problem stated
- 1 – Problem is copied from text or incomplete
- 2 – Problem is stated in student's words, and is clear and concise

### 2. Initial Thoughts on an Incorrect Answer

#### a. Explain why some people might first think the answer is 49 eggs

- 0 – No explanation provided
- 1 – A poor or incomplete explanation
- 2 – A complete and thorough description

#### b. Explain why the answer cannot be 49 eggs

- 0 – No explanation provided
- 1 – A poor or incomplete explanation
- 2 – A complete and thorough description

# **HW#5 – Inside Out**

## **1. In-Out Tables (a-e)**

**Supply the missing entries for each incomplete In-Out Table (a-e)**

- 0 – No missing entries provide
- 1- All correct entries for 2 tables
- 2 – All correct entries for 4 tables
- 3- All correct entries for 6 tables

**Write a rule for each table (a-e) that tells what to do with the In to get the Out.**

- 0 – No rules given
- 1- Two correct rules stated in complete sentences
- 2 – Four correct rules stated in complete sentences
- 3 – Six Correct rules stated in complete sentences

## **2. Your Own In-Out Tables**

**Create two In-Out tables based on rules of your own**

- 0 – No tables created
- 1 – One correct table based on your rule
- 2 – Two correct tables based on two different rules

## HW#6 – Getting' On Down to One

- 1. Use the pair of rules to generate and record sequences for each of the numbers (a – d)**
  - 0 – No sequences reported
  - 1 – 2 correct sequences
  - 2– 4 correct sequences
- 2. For each of the sequences (1a – 1d), record the number of steps it took to reach 1**
  - 0 – Number of steps not reported
  - 1 - 2 correct number of steps reported
  - 2 – 4 correct number of steps reported
- 3. State the starting numbers that will get down to one in 3, 4, and 5 steps**
  - 0 – No numbers stated
  - 1- Number for three steps is correctly stated
  - 2 – Numbers for three and four steps are correctly reported
  - 3– Numbers for three, four, and five steps are correctly reported
- 4. Describe a way to find starting numbers that will produce very long sequences, such as 100 steps.**
  - 0 – No description provided
  - 1 – A poor, limited, or vague description
  - 2 – A satisfactory description
  - 4- A detailed description showing many one specific example
- 5. Describe other observations that you made about how this procedure works.**
  - 0 – No description provided
  - 1 – A poor, limited, or vague description
  - 2 – A satisfactory description with limited examples
  - 4 – A detailed description with several key examples noted

## HW#7 – Extended Bagels

- 1. Make and In-Out table (in which the In is the number of bagels Marcella has when she gets home and the Out is the number of bagels she must have started with) when the number of bagels Marcella gets home with is different from the original problem.**
  - 0 – No table made
  - 1 – A table is made with incorrect values
  - 2 – A table is made with correct values for 0, 3, 4, and 5
  - 3 – A table is made with correct values for 0, 3, 4, 5, and additional values
  
- 2. Describe a relationship between the Out number and the In number in your In-Out Table**
  - 0 – No relationship described
  - 1 – A vague or incorrect relationship is described
  - 2 – A satisfactory relationship is described
  
- 3. State a rule to describe the relationship between the Out and In numbers**
  - 0 – No rule stated
  - 1 – An incorrect rule is stated
  - 2 – A correct rule is stated, but lacks depth in its explanation
  - 4 – A correct rule is stated in detail using specific examples to support it
  
- 4. State a pattern within the Out column**
  - 0 – No pattern stated
  - 1 – An incorrect pattern is stated
  - 2 – A correct pattern is stated

## **HW#8 – Group Reflection**

**1. Describe a time when someone in a group was left out of a discussion, how the group tried to include that person, and if they weren't what could have been done to help the situation**

0 – No description

1 – Some parts of the description were addressed or the entire description was address in a limited way

2 – All parts of the description were completely addressed

**2. Describe what happens when someone in your group makes a mistake and how your group should handle mistakes made by the members**

0 – No description

1 – Some parts of the description were addressed or the entire description was address in a limited way

2 – All parts of the description were completely addressed

**3. Describe a situation in which you were afraid to speak out and how you wished you handled the situation**

0 – No description

1 – Some parts of the description were addressed or the entire description was address in a limited way

2– All parts of the description were completely addressed

**4. Describe your participation in your group as compared to other group members and why you think you participate as much or as little as you do so**

0 – No description

1 – Some parts of the description were addressed or the entire description was address in a limited way

2 – All parts of the description were completely addressed

**5. Describe how the amount of homework preparation you do for class affects your participation in group discussions**

0 – No description

1 – Some parts of the description were addressed or the entire description was address in a limited way

2 – All parts of the description were completely addressed

## HW#9 – Uncertain Answers

### 1. Rewrite the mathematical statements (a-e) as correct equations

- 0 – No statements are written correctly as equations
- 1 – One statement written correctly as an equation
- 2 – Two statements written correctly as an equations
- 3 - Three statements written correctly as an equations
- 4 – Four statements written correctly as an equations
- 5 - Five statements written correctly as an equations

### 2. Rewrite the expressions (a and b) using parenthesis to obtain at least three different values for each expression

- 0 – No expression rewritten for different values
- 1– One expression rewritten to obtain three different values
- 2– Both expressions rewritten to obtain three different values for each
- 3 -Both expressions rewritten to obtain more than three different values for each

# **HW#10 – Pulling Out Rules**

## **1. In-Out Tables (a-c)**

**Write a rule for each table (a-c) that tells what to do with the In to get the Out.**

- 0 – No rules given
- 1- One correct rule stated in a complete sentence
- 2 – Two correct rules stated in complete sentences
- 3 – Three correct rules stated in complete sentences

## **2. In-Out Tables (a-b)**

**Write five rules for each In-Out table**

- 0 – No rules written
- 1 – Five rules written for one table
- 2– Five rules written for both tables

## **3. Write an In-Out Table for the word problem**

- 0 – No table written
- 1 – A table that incorrectly represents the information
- 2– A table that correctly represents the information without solving the problem
- 4- A table that correctly represents the information and solves the problem

## HW#11 – Add It Up

**1. Write each of the summation problems (a-c) as a string of numbers added together**

- 0- No correct sums
- 1 – One correct sum
- 2 – Two correct sums
- 3 – Three correct sums

**2. Write an expression using summation notation to describe the number of squares in the picture**

- 0– No expression written
- 1- An incorrect expression with a minor error
- 2- 2 – A correct expression

**3. Write an expression using summation notation for each of these sums (a-c)**

- 0- No correct expression
- 1– One correct expression
- 2– Two correct expressions
- 3– Three correct expressions

**4. Write an expression using summation notation to describe the total number of small squares in the picture**

- 0– No expression written
- 1 -An incorrect expression with a minor error
- 2 – A correct expression

# HW#12 – That’s Odd!

## 1. Consecutive Sums

*“Any odd number greater than 1 can be written as the sum of two consecutive numbers”*

### a. State whether you accept or reject this statement

- 0 – No statement given
- 1 – An incorrect statement with no support
- 2 – A correct statement with valid support

**If you reject this statement:**

**Required Task:** State a counterexample

**If you accept this statement:**

**Required Task:** Create a general set of instructions

### b. State required task

- 0 – No task stated
- 1 – An incorrect or poorly-stated task
- 2 – A correct and/or well-stated task

## HW#13 – Do It the Chef’s Way

1. Explain each problem (1-9) using the hot and cold cube model by describing the action and how the temperature changes

0 - No problems described

1 - 2 problems described correctly in terms of action and temperature change

2 - 4 problems described correctly in terms of action and temperature change

3 - 6 problems described correctly in terms of action and temperature change

4 - 8 or 9 problems described correctly in terms of action and temperature change

# HW#14 – You’re the Chef

## **Making a Manual for an Assistant Chef**

1. Describe procedures to raise or lower the temperature of the cauldron
  - 0 – No description provided
  - 1 – An incorrect, limited or vague description
  - 2 – A correct description that could be described in greater detail
  - 4 – A correct description that is complete and thorough
  
2. **State specific examples by which the cauldron temperature is raised and lowered**
  - 0 – No examples stated
  - 1- Incorrect examples or examples not stated for all procedures to raise and lower the temperature
  - 2- Correct examples stated for most procedures to raise and lower the temperature
  - 4 – Correct examples stated for ALL procedures to raise and lower the temperature

# HW#15 – Rules, Rules, Rules

## 1. In-Out Table #1

Write 10 rule for the first table that tells what to do with the In to get the Out.

- 0 – No rules given
- 1- Two correct rules stated
- 2 – Four correct rules stated
- 3 – Six correct rules stated
- 4 – Eight correct rules stated
- 5- Ten correct rules stated

## 2. In-Out Table #2

Write as many rules as you can with the second In-Out table

- 0 – No rules written
- 1 – One correct rule written for the table
- 2– Two correct rules written for the tables
- 3 – Three or more correct rules written for the table

## 4. Write an In-Out Table for the word problem

- 0 – No table written
- 1 – A table that incorrectly represents the information
- 2– A table that correctly represents the information without solving the problem
- 4- A table that correctly represents the information and solves the problem

# HW#16 – Another In-Outer

## **In-Out Tables (1-6)**

**Supply the missing entries for each incomplete In-Out Table (1-6)**

- 0 – No missing entries provide
- 1- All correct entries for 2 tables
- 2 – All correct entries for 4 tables
- 3- All correct entries for 6 tables

**Write a description for tables 1, 4, and 5 that tells what to do with the In to get the Out.**

- 0 – No rules given
- 1- One correct rule stated in a complete sentence
- 2 – Two correct rules stated in complete sentences
- 3– Three Correct rules stated in complete sentences

**Write an algebraic expression for tables 2, 3, and 6 that tells what to do with the In to get the Out.**

- 0 – No expression given
- 1- One correct algebraic expression stated
- 2 – Two correct algebraic expressions stated
- 3– Three correct algebraic expressions stated

## HW#17 – Diagonally Speaking

**1. a. Draw various polygons and find out how many diagonals each has.**

- 0 – No polygons drawn
- 1 – 2 polygons with diagonals drawn
- 2 – 4 polygons with diagonals drawn
- 3 – 6 polygons with diagonals drawn
- 4 – 8 or more polygons with diagonals drawn

**b. Organize the results in an In-Out table in which the In is the number of sides of the polygon and the Out is the number of diagonals.**

- 0 – No In-Out Table drawn
- 1 – In-Out Table drawn with incorrect values
- 2 – In-Out Table drawn with correct values for both columns

**2. a. Find a pattern in your In-Out Table.**

- 0 – No pattern stated
- 1 – An incorrect or vague pattern stated
- 2 – A correct pattern stated

**b. Find the number of diagonals a 12-sided polygon has by using your pattern.**

- 0 – No answer given, or an incorrect answer not within a reasonable limit
- 1 – An incorrect answer within a reasonable limit
- 2 – A correct answer

**3. Explain why you think this pattern holds.**

- 0 – No explanation given
- 1 – A poor, vague, or incomplete explanation of why think your pattern holds
- 2 – A satisfactory explanation of why your pattern is correct

## HW#18 – Polygon Angles

- 1. Draw polygons with more than four sides measuring the angles and finding their sum.**
  - 0 – No polygons drawn and sums found
  - 1 – 5 and 6-sided polygons drawn and sum of angles is not found, incomplete, or incorrect
  - 2 – Three or more 5-sided polygons drawn and correct angle sums found
  - 4 – Three or more of both, 5 and 6-sided polygons, drawn and correct angle sums found
- 2. State “anything you notice” (observations) about the polygons and their angle sums**
  - 0 – No observations stated
  - 1 – Poor or vague observations stated
  - 2 – Several well stated observations
- 3. State any conjectures you have about the polygons you’ve drawn and their angle sums**
  - 0 – No conjectures stated
  - 1 – Poor or vague conjectures stated
  - 2 – Several well stated conjectures
- 4. State any generalizations you feel you can make about your polygons and their angle sums**
  - 0 – No generalizations stated
  - 1 – A poor or vague generalization is stated
  - 2 – A satisfactory generalization is stated and supported with examples
- 5. Write an expression for the sum of the angles of a polygon as a function of the number of sides.**
  - 0 – No expression stated
  - 1 – An incorrect expression with a minor error
  - 2 – A correct expression
- 6. State the sum of the angles of various polygons and write down why you think they are true.**
  - 0 – No sum stated and justification given
  - 1 – Incorrect sums stated with poor or vague justification
  - 2 – Correct sum stated with limited justification
  - 3 – Correct sum stated with adequate justification

# HW#19 - An Angular Summary

**1. a. Summarize what you know about the sum of the angles of a polygon.**

- 0 – No summary given
- 1 – A poor, vague, or incomplete summary
- 2 – A satisfactory summary

**b. Explain the reasoning behind the formula you included**

- 0 – No formulas given
- 1 – Formula stated with no explanation provided
- 2 – Formula stated with minimal explanation
- 3 – Formula stated with satisfactory explanation using specific examples

## **2. Regular Polygons**

**a. (i.) State the size of each angle in a regular pentagon and explain your reasoning**

- 0 – No angles stated or incorrect angles not within a reasonable limit stated
- 1 – Incorrect angles stated with poor, vague, or faulty reasoning
- 2 – Correct angles stated with limited explanation of reasoning
- 3 – Correct angles stated with satisfactory explanation of reasoning

**a. (ii.) State the size of each angle in a regular octagon and explain your reasoning**

- 0 – No angles stated or incorrect angles not within a reasonable limit stated
- 1 – Incorrect angles stated with poor, vague, or faulty reasoning
- 2 – Correct angles stated with limited explanation of reasoning
- 3 – Correct angles stated with satisfactory explanation of reasoning

**b. Draw the regular pentagon and regular octagon by using a protractor to get the angles to be the right size.**

- 0 – Regular pentagon and octagon not drawn
- 1 – One regular polygon drawn with all correct angles
- 2 – Both regular polygons drawn with all correct angles

## HW#20 – Squares and Scoops

1. **a. Use diagrams and / or a continuation of the In-Out Table provided to determine the number of squares in a “7- high” stack, a “10-high” stack and a “40-high” stack.**
  - 0 – No diagrams or In-Out Tables drawn
  - 1- Answers are all incorrect as either diagrams or tables
  - 2 – One answer is correct in a diagram or table format
  - 3 – Two answers are correct in a diagram or table format
  - 4- All three answers are correct in a diagram or table format
  
- b. Give a general description for how to find the number of squares in an “n-high” stack.**
  - 0 – No general description given
  - 1 – An incorrect or a poor/vague/incomplete description
  - 2 – A satisfactory description that use several new examples for support
  
2. **a. Explain why the Out for the ways to arrange 3 scoops of ice cream is 6.**
  - 0 – No explanation given
  - 1 – An incorrect or poor/vague/incomplete explanation
  - 2 – A satisfactory explanation
  
- b. Find a numerical pattern for the entries in the In-Out table provided and use that pattern to determine the number of ways to arrange seven scoops of ice cream and ten scoops of ice cream.**
  - 0 – No numerical pattern found
  - 1 – An incorrect numerical pattern based on a minor error that produces incorrect answers for 7 and 10 scoops
  - 2 – A correct numerical pattern that produces correct answers for 7 and 10 scoops
  
- c. Describe how you would find the number of ways to arrange the scoops if there were 100 scoops. (You should not try to find this number. Just describe how you would find it.)**
  - 0 – No description given
  - 1 – An incorrect or poor/vague/incorrect description given
  - 2 – A correct description

## HW#21 – The Garden Border

### **1. State how many one-foot square tiles are needed for the 10-foot square garden border**

- 0 – No number given or an incorrect answer given that is not within a reasonable limit
- 1 – An incorrect answer within a reasonable limit
- 2 – A correct answer

### **2. Describe different ways that the answer can be determined without individually counting the tiles**

- 0 – No methods described
- 1 – Three or more poorly described, vague, or incomplete methods described without describing the specific arithmetic involved in each method
- 2 – Three or more poorly described, vague, or incomplete methods described with incorrect or limited description the specific arithmetic involved in each method
- 3 – Five or more satisfactory descriptions of methods with adequate descriptions of the specific arithmetic involved in each method
- 4 – Five or more detailed descriptions of methods with complete and thorough descriptions of the arithmetic involved in each method

### **3. Draw a diagram for each method that you found that shows how the method works.**

- 0 – No diagrams drawn
- 1 – Three to four diagrams that do not clearly describe how each method works or 2 diagrams that clearly show how the methods work
- 2 – Three diagrams that clearly describe how the different methods work
- 3 – Four diagrams that clearly describe how different methods work
- 4 – Five or more diagrams that clearly describe how different methods work

## HW#22 – Border Varieties

- 1. State a general formula for each method (a-e) that describes the way of thinking about the problem. (Your formula should use  $s$  to represent the length of one side of the garden.)**
  - 0 – No general formulas stated
  - 1 – One correct general formula with adequate explanation of thinking
  - 2 – Two correct general formulas with adequate explanation of thinking
  - 3 – Three correct general formulas with adequate explanation of thinking
  - 4 – Four correct general formulas with adequate explanation of thinking
  - 5 – Five correct general formulas with adequate explanation of thinking
  
- 2. State another method to solve the problem that includes the arithmetic, a diagram and a general formula**
  - 0 – No additional method stated
  - 1 – An incorrect or a correct method that is poor/vague/incomplete without supporting materials provided (arithmetic involved, a diagram, and a general formula)
  - 2 – A correct method that has limited or poor/vague/incomplete supporting materials
  - 3 – A correct method that has adequate supporting materials

## HW#23 – Cutting Through the Layers

1. **Draw your own pictures of string with different numbers of layers and different numbers of cuts and add that information to the In-Out Table** (Gary, 1 point for each correct number of cuts from 1 to 5 entries.)
  - 0 – No pictures and In-Out Table
  - 1 – Pictures in which you changed either the number of layers or number of cuts, but did not make a new In-Out Table with the new information
  - 2 – Pictures in which you changed either the number of layers or the number of cuts, and you made a new In-Out Table including the new information
  - 4- Pictures in which you changed both the number of layers and the number of cuts, and you made a new In-Out Table including all the new information
  - 6 – An extensive survey of possibilities for the number of layers and the number of cuts, including pictures and In-Out Tables
  
2. **Find a rule or formula expressing the number of pieces as a function of the number of layers,  $l$ , and the number of cuts,  $C$ .**
  - 0 – No rule or formula expressed
  - 1 – An incorrect formula
  - 2 – A correct formula