Lesson 1 Assignment

Game Strategies

Use strategic thinking to play the games below and answer the questions that follow.

The following rubric will be used to assess your grade.

Total marks: 40

Category	Strategy and Procedures	Mathematical Reasoning
	The student...	*The student...*
4	• uses efficient and effective strategies to solve the problem(s) and complete the questions	• presents complex and refined mathematical reasoning
3	• uses effective strategies to solve the problem(s) and complete the questions	• presents effective mathematical reasoning
2	• uses effective strategies inconsistently to solve the problem(s) and complete the questions	• presents some evidence of mathematical reasoning
1	• does not use effective strategies to solve the problem(s) and complete the questions	• presents superficial or confusing evidence of mathematical reasoning

Some of the following games and puzzles may be familiar to you. If you have not played some of these games, use a search engine on the Internet to help you become more familiar with the game and/or puzzle.

1.   The Water Jug Game

3 litres   5 litres

Using a $3\,\mathrm{L}$ jug and a $5\,\mathrm{L}$ jug, how would you measure exactly $4\,\mathrm{L}$ of water?

2.   Suduko

Every Suduko has a solution that can be found logically. Enter numbers into the blank spaces so that each row, column, and 3×3 box contains the numbers 1 to 9.

	2	8	6	4	7	1	9	3
9	4	1	8				5	6
6		7	5	9	1	2	8	
2	8				9	3	1	7
7	5	3	2	1		6		9
				6			2	
8		5			6		3	
3	6	4	1	8	5	9	7	
1				7		8	6	

What was your first move in solving this puzzle? Why did you choose this as your first move?

3. The Game of Nim

   This version of Nim begins with 12 nickels (other coins will do) arranged in three horizontal rows as shown.

   a. Two players take turns removing one or more coins according to the following rules.
      - On any turn, the coin(s) removed must be from the same horizontal row.
      - The person who takes the last coin wins. Only one coin can be removed by the winner.

   In case the game is still unclear, here is a game scenario between two players, Logan and Amber.

   Start:

Amber takes 2 from Row A	Logan takes 2 from Row B
A ● B ● ● ● C ● ● ● ●	A ● B ● ● C ● ● ● ●
Amber takes 2 from Row B	Logan takes 4 from Row C
A ● B C ● ● ● ●	A ● B C ●
Amber takes 1 from Row C	Logan WINS because he has one coin left to take…
A ● B C	●
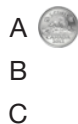
   Now it is your turn.

    b. Play a minimum of five games of Nim with a friend or family member.

    c. Answer the following questions after completing your games.

        i. Is there a winning strategy? Explain.

        ii. Does it matter who goes first? Why or why not?

        iii. Suppose the rules were changed to whoever ends up with the last coin loses. Is there a winning strategy? Explain.

4.   Number Patterns

a. A student makes the following statement:

"The word PROBABILITY compares to the word TRAP as the number 12345467689 compares to the number _____."

i.   The four-digit number that completes the statement is _____.

ii. Develop a number pattern problem similar to the question above. A repeating letter must be included in your original word. Provide a solution to this problem.

b. The diagram below shows the first three steps of a pattern.

Figure 1   Figure 2   Figure 3
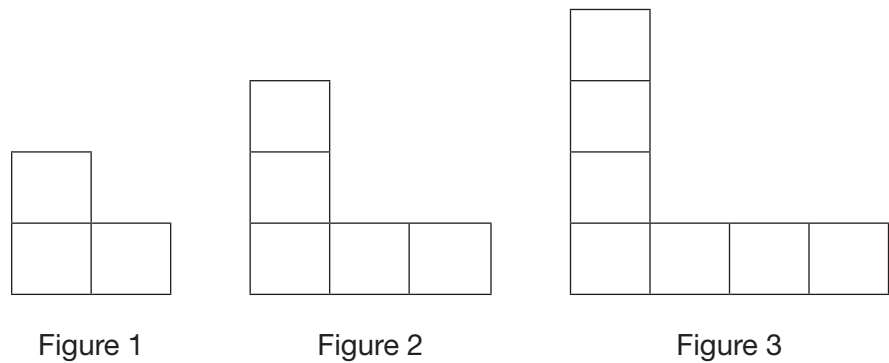
i. Describe the pattern above by relating the figure number to the number of squares in the figure. If the pattern were to continue, how many squares would there be in the 9th figure?

Figure Number	Number of Squares
1	
2	
3	
4	
5	
6	
7	
8	
9	

Pattern:

ii. Develop a number pattern problem similar to the question above. Draw the first three figures as part of your problem. Provide a solution and include the description of the pattern to your problem.

5.   Nonogram

A nongram is a type of logic puzzle where the cells of a grid are filled according to numbers on the side and top of the puzzle. The numbers on the side and top indicate the number and size of groups of filled cells in the row or column.

How to read nonogram clues.	
• The clue 3, 1 means there will be a group of 3 cells without a break in it and a group of 1 cell in the row. There will be at least one empty cell between the two. The clue also tells you the group of 3 will be to the left of the group of 1.	
• The clue $\begin{smallmatrix}4\\1\\2\end{smallmatrix}$ tells you there will be a group of 4 nearest the top, then a group of 1, and then a group of 2 closest to the bottom.	
• The clues do not tell you how far apart the groups will be, but there will always be at least 1 cell between each group.	

Below is a nonogram puzzle and its solution.

		0	3	1 3	5	1 3	3	0
0								
1								
5								
1, 1, 1								
1, 1, 1								
1								
1, 1								
1, 1								
1, 1								

		0	3	1 3	5	1 3	3	0
0								
1				■				
5		■	■	■	■	■		
1, 1, 1		■		■		■		
1, 1, 1		■		■		■		
1				■				
1, 1			■		■			
1, 1			■		■			
1, 1			■		■			

When solving a nonogram, it helps to mark cells that cannot be filled as well as cells that must be filled. It is a good idea never to mark a box until you are absolutely sure of its contents.

Complete the following nongram puzzle.

	1	2	4	6	3	3	4	5	6	7	8	9	10	11	12	2 8	1 1 7	1 1 7	2 2 4	6 4	6 3	5 2	3 2	2 1	1
1, 7																									
2, 3, 4																									
4, 3, 2, 4																									
3, 4, 5																									
2, 7, 7																									
2, 14																									
14																									
16																									
19																									
17																									
14																									
8																									