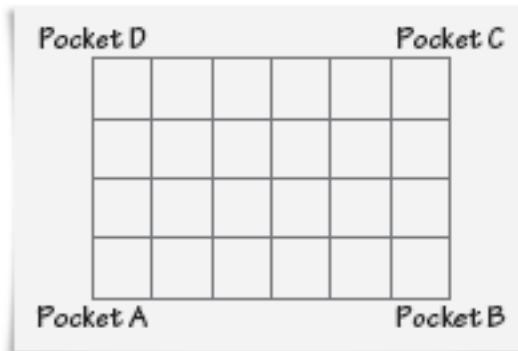


Comparing and Scaling Unit Project**Student's Guide, Part 1**

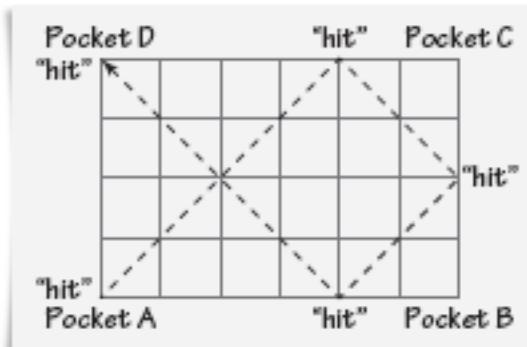
Kim made up a game called *Paper Pool*. Her “tables” are rectangles traced on grid paper. There are “pockets” at each corner of the table. The pool table pockets are labeled A (bottom left corner), B (bottom right corner), C (upper right corner), and D (upper left corner). One of Kim’s Paper Pool Tables is shown below.



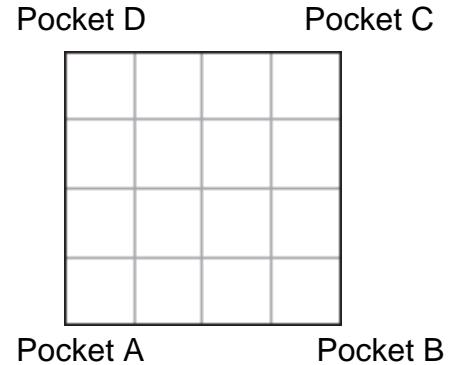
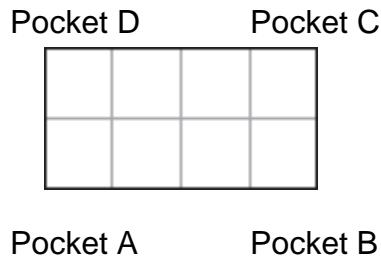
Kim’s game has the following guidelines:

- The ball always starts at Pocket A.
- To move the ball, “hit” it as if you were playing pool.
- The ball always moves on a 45° diagonal across the grid.
- When the ball hits a side of the table, it bounces off at a 45^\times angle and continues to move.
- If the ball moves to a corner, it falls into the pocket at that corner.

Kim has played her Paper Pool game on the table below. The lines show the path that the ball traveled on the table. She notices that the ball dropped in Pocket D and that the ball has a total of 5 hits: the initial hit to get the ball moving, three hits from the ball bouncing off the sides of the table, and one hit when the ball hits into the pocket and drops.



Draw the path a ball would take on the two Paper Pool Tables below. Record what pocket the ball drops into, how many hits occur on its journey, and the dimensions labeled A (bottom left corner), B (bottom right corner), C (upper right corner), and of the tables, giving the bottom length first and the side length second.



Pocket _____

Pocket _____

Number of Hits _____

Number of Hits _____

Table Dimensions _____

Table Dimensions _____

After playing Paper Pool on several different-sized tables, Kim wonders if there is a way to predict which pocket the ball would drop into and how many hits would occur by the time the ball drops.

Investigate:

Explore the questions about Paper Pool that are listed below.

- Into what pocket will the ball drop?
- How many hits will occur by the time the ball drops?

Each question is asking you to notice what is happening to the ball as it travels on the Paper Pool tables. Some tables are provided (Labsheets Paper Pool A–C) to get you thinking about these questions. **Make conjectures** about **what pocket** the ball will drop into and **how many hits** will occur by the time the ball drops. You may need to **draw additional tables** on grid paper to check out any ideas you have and to test any conjectures you make.

When you think you can predict outcomes, write a rule that you could use to determine what will happen to the ball as it travels on the Paper Pool table. This means that your rule should tell you, *without drawing the path*, the number of hits and the dropping pocket for the ball on a Paper Pool table of any size. Remember:

- The ball always starts in the bottom left hand corner of the table (at Pocket A).
- The ball travels on a diagonal path across the square grids.
- If the ball hits the side of the table, it bounces off at a 45° angle.
- When the ball comes to a pocket, it drops in.

Checklist of Things to Do

A new table is created for each rule.



All three labsheets (A, B, C) are completed.



Data collected is organized in a meaningful way.



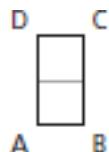
All group members contribute to work, discussion, and poster.



Completed poster is turned in on time.

Unit Project

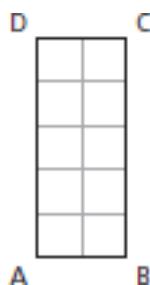
Paper Pool A



Pocket _____

of Hits _____

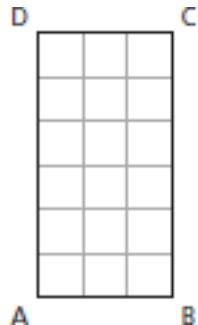
Table Dimensions _____



Pocket _____

of Hits _____

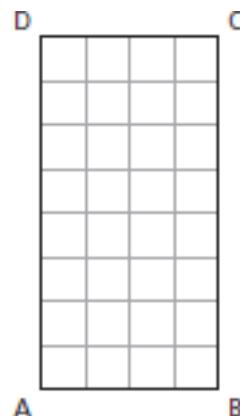
Table Dimensions _____



Pocket _____

of Hits _____

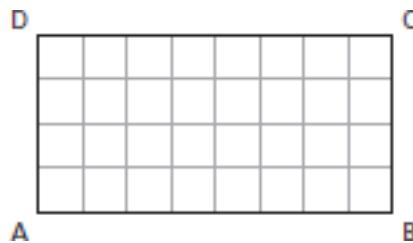
Table Dimensions _____



Pocket _____

of Hits _____

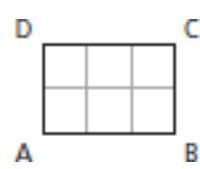
Table Dimensions _____



Pocket _____

of Hits _____

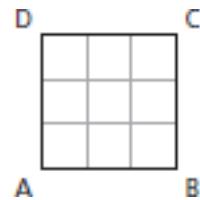
Table Dimensions _____



Pocket _____

of Hits _____

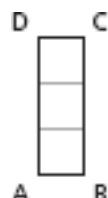
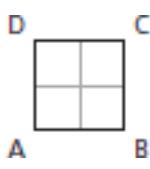
Table Dimensions _____



Pocket _____

of Hits _____

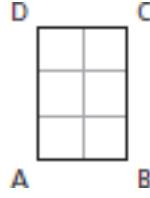
Table Dimensions _____



Pocket _____

of Hits _____

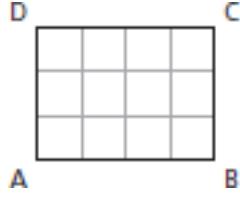
Table Dimensions _____



Pocket _____

of Hits _____

Table Dimensions _____



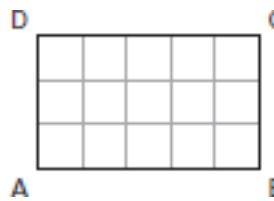
Pocket _____

of Hits _____

Table Dimensions _____

Unit Project

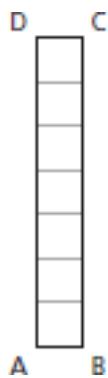
Paper Pool B



Pocket _____

of Hits _____

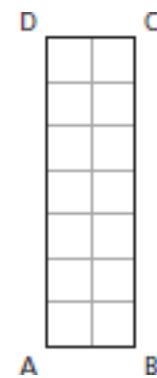
Table Dimensions _____



Pocket _____

of Hits _____

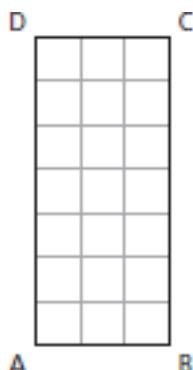
Table Dimensions _____



Pocket _____

of Hits _____

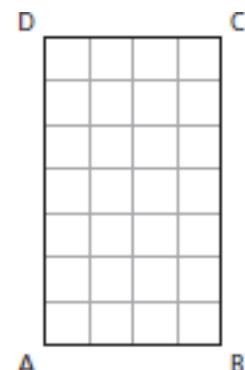
Table Dimensions _____



Pocket _____

of Hits _____

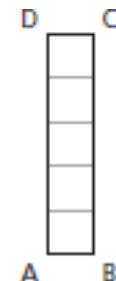
Table Dimensions _____



Pocket _____

of Hits _____

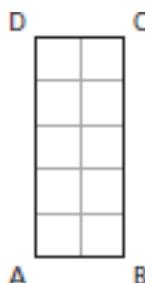
Table Dimensions _____



Pocket _____

of Hits _____

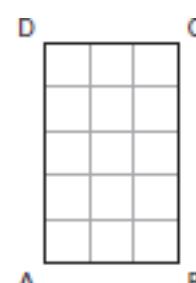
Table Dimensions _____



Pocket _____

of Hits _____

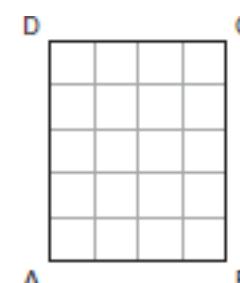
Table Dimensions _____



Pocket _____

of Hits _____

Table Dimensions _____



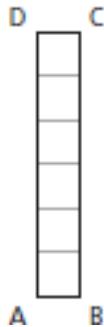
Pocket _____

of Hits _____

Table Dimensions _____

Unit Project

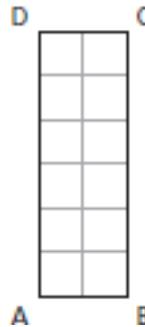
Paper Pool C



Pocket _____

of Hits _____

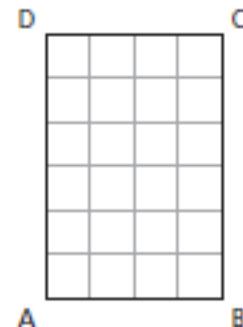
Table Dimensions _____



Pocket _____

of Hits _____

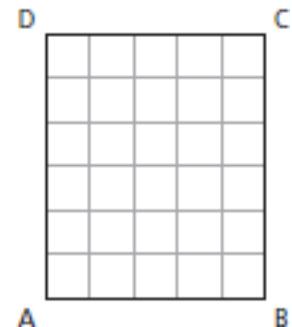
Table Dimensions _____



Pocket _____

of Hits _____

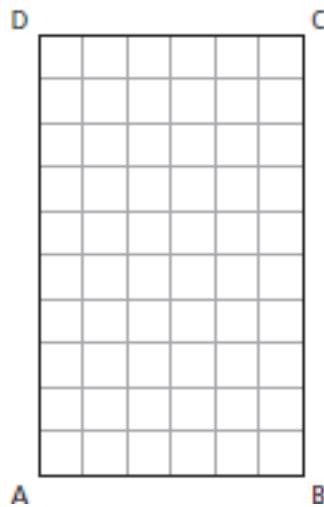
Table Dimensions _____



Pocket _____

of Hits _____

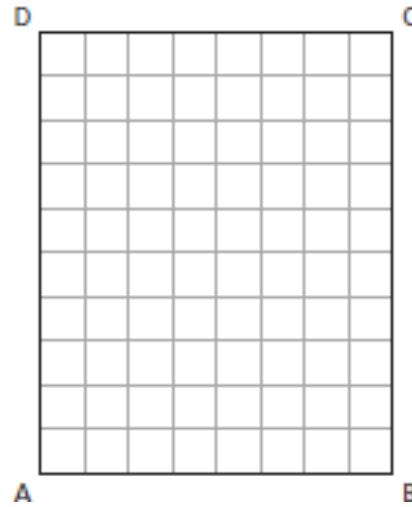
Table Dimensions _____



Pocket _____

of Hits _____

Table Dimensions _____



Pocket _____

of Hits _____

Table Dimensions _____

Poster Rubric:

Make a poster that includes each of the following.

The rules to predict the pocket the ball drops into.				
Mastery Addresses all possible situations for which corner the ball will drop into.	Proficient Addresses several possible situations for which corner the ball will drop into.	Developing States at least two correct rules for which corner the ball will drop into.	Beginning Shows evidence of searching for a pattern but states 1 or no correct rule.	Incomplete Student did not engage. No patterns or rules are given.

The rules to predict the total number of hits.				
Mastery Addresses all possible situations for the number of hits that will occur.	Proficient Addresses several possible situations for the number of hits that will occur.	Developing States at least two correct rules for the number of hits that will occur.	Beginning Shows evidence of searching for a pattern but states 1 or no correct rule.	Incomplete Student did not engage. No patterns or rules are given.

Problem Solving and Reasoning				
Mastery Provides a new example table for each rule, and specifically explains why the rules are correct.	Proficient Provides a new example table for each rule, and generally explains why the rules are correct.	Developing Shows reasoning about the rules, but does not address both situations.	Beginning Shows reasoning about the rules, but reasoning is incorrect or only reasons through one specific rule.	Incomplete Student did not engage. No reasoning is given.

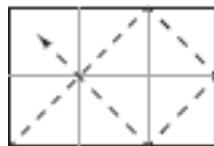
Communication				
Mastery Poster is clearly written and easy to follow.	Proficient Some extra effort is required to follow the information on the poster.	Developing Significant extra effort is required to follow the information on the poster.	Beginning The poster does not address the task presented.	Incomplete No poster is completed.

Extension Question **(Optional Challenge)**

Can you predict the length of the path of the ball will travel on any size Paper Pool table? Suppose each time the ball crosses a square, the distance it travels is “one diagonal unit.” How many diagonal units is the path of the ball?



One Diagonal Unit



Length of Path:
6 Diagonal units