GRADE 11 Workplace Math: Probability Game Project

Summary of Learning Opportunity

Students first learned about principles of probability and statistics through instruction and classwork about measures of tendency and their use in analyzing data, statistical vocabulary such as “event” and “sample space” and strategies to determine probability using tree diagrams, tables and fractions. Integrated throughout this prior learning were examples and experiences with probability games such as Lotto 649.

In this multi-day assessment project, pairs of students applied and demonstrated their knowledge to design a game of probability based purely on chance. Students solved for and presented the probability of each event in the game, the overall probability of winning and assumptions and limitations in their calculations. Students were highly engaged in the collaborative process and applied feedback that helped them to communicate their numerate thinking in different ways.

Workplace Mathematics 11	**Learning Standards**	• Develop thinking strategies to solve puzzles and play games • Model with mathematics in situational contexts • Develop, demonstrate and apply conceptual understanding of mathematical ideas through play, story, inquiry and problem solving • Represent mathematical ideas in concrete, pictorial and symbolic forms • Reflect on mathematical thinking • How probability and statistics are used in different contexts

Numeracy Connections	Instruction and Assessment	Competencies Developed Practiced, and/or Assessed
NUMERACY: Applies—Develops a plan of approach; Solves—Solves the mathematical problem; Analyzes—Revises approach as needed	Day 1: Through class discussion and hands on work, students explore probability in game design: • Type of game: board, toss, digital, etc. • Game play: spinner, dice, draw, etc. • Project parameters: purely based on probability, not skill or strategy; minimum 2 types of probabilities; winnable; clear communication of rules; fun and inviting for players; can be played in 10-20 minutes Day 2: • Students work in groups to build, test and revise their game. They create a final copy for presentation.	• Develop thinking strategies to solve puzzles and play games • Model with mathematics in situational contexts • Develop, demonstrate and apply conceptual understanding of mathematical ideas through play, story, inquiry and problem solving • Represent mathematical ideas in concrete, pictorial and symbolic forms

NUMERACY:
Communicates—Represents processes and solution, Explains the approach taken

Day 3:

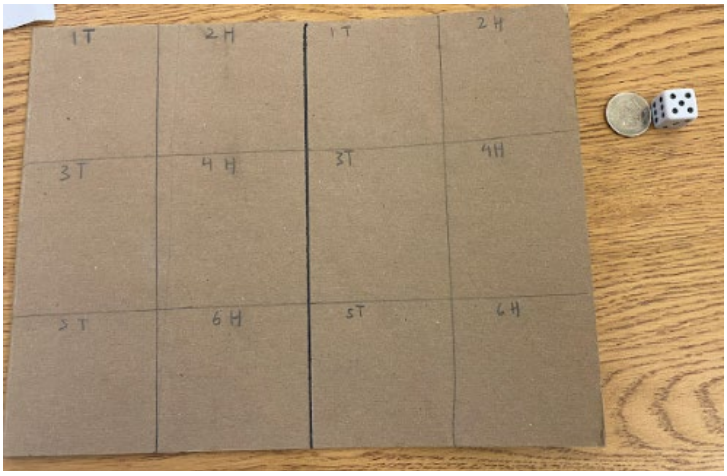
- Students described the math behind their game. They identified the events, sample space and size; solved for and presented the probability of each event in the game, the overall probability of winning and described and explained their assumptions and limitations of the assumptions.

Day 4:

- Students presented their game and completed a self-evaluation.

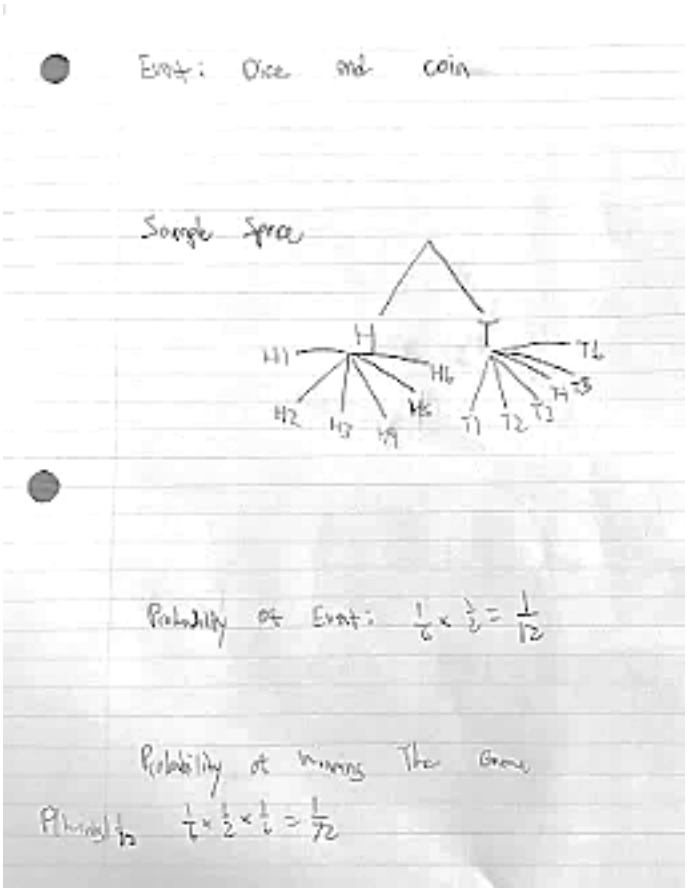
- Represent mathematical ideas in concrete, pictorial and symbolic forms
- Reflect on mathematical thinking

Demonstration of Student Learning, Teacher Assessment, and Reflection



Perfect Pair: coin toss and dice roll

Players race to fill all 6 squares on their side by rolling the dice to match the corresponding number AND flipping the coin to heads (H) or tails (T).



Teacher's Assessment

The students demonstrated **proficiency** by designing their game based on the parameters and limitations outlined in the project and representing their game concept with a tree diagram and calculations to show the probability of each event. I observed them revisiting the project parameters and redesigning their game as needed. They are still developing in their calculations for winning the game overall (not shown).

Game of probability Project:

Introduction:

Our game is called "thrill of the jungle" . Our game is a four player board game and it works by flipping two coins. The result of the coins (HH, TT, HT) determine if you step forward or backwards.

Probability:

H,H = 1/4

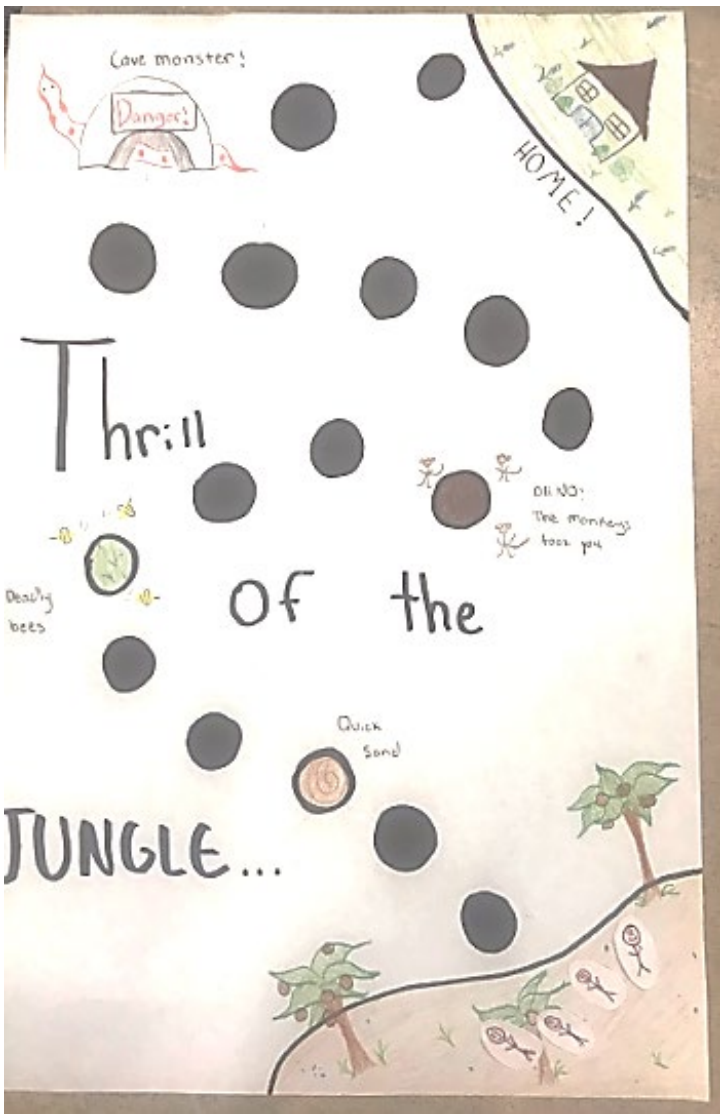
T,T = 1/4

H,T = 2/4

Probability of winning:

¼ x 1/4 x ¼ x ¼ x ¼ x ¼ x1/4 x ¼ x 2/4 = 1/32 chance of winning

With these probabilities we assume that the players would roll two heads 8 times and then roll heads and tails.



Thrill of the Jungle:

Players flip two coins to move their piece: HH= 2 steps forward, TT= 1 step back, HT= 1 step forward.

Special squares (mountains, monster, monkeys, bees) indicate a loss of a turn, back to the start, or immediate disqualification.

Teacher's Assessment

The students demonstrated **proficient** thinking in this project. The students strategized to apply probability concepts in deciding on the rules of the game. The students proficiently showed how to solve the probability of winning or the least number of moves in order to reach "home." However, the students struggled to reflect on the reasonableness of solution in this particular context.

Teacher's Reflection

I used the Numeracy Learning Progressions to help students identify what proficient understanding looks like, and how to achieve it in the math competencies I am assessing. In my practice, I focus a lot on thinking deeply about a problem and being able to proficiently communicate ideas in a variety of ways. This encouraged questions and led to a better understanding of the curricular competencies. I gave students feedback to support them in developing proficient thinking or communication. Students enjoyed the feedback and were keen to showcase what they are able to do. Students also commented that they enjoyed the reflective process of learning. This way, it helps them to set goals and reach them in an attainable way.