Math Explorations

Fair or Not?

Nothing teaches like disequilibrium. This lesson asks the questions
What is luck?
Do you believe in luck?
What does luck have to do with probability?
What does it mean to be mathematically fair?

Materials:

- One game board with the numbers 1-6. You can use the template at the end or create your own
- 18 - 36 counters for each student
- One fair die for each student
- One teacher created die for each student. Template included. Hold these until part II. You will need a penny for each die you make.

Choose questions from above to open the class with. Be sure to ask about mathematical fairness. What does it mean for a die to be fair?

Part I: Testing the idea of mathematical fairness

1. In groups of 2, students place their counters in any configuration on the numbers 1-6 of their game board.
2. Both players role their fair dice at the same time and remove a counter from the number shown on their die.
3. If there are no counters on the number shown on their die, no counters are removed from the board.
4. The player who removes all their counters first, wins.
5. Students may replay if there is time.
6. Discuss results and strategies as a class.

Part II: Testing the idea of unfairness with teacher made cubes.

1. Collect the fair dice. Have students reload their game boards.
2. Give students the teacher made dice.
3. Allow them to play at least two more times following the same rules as above.
4. Ask:
   - What happened?
   - Are these dice fair? Why or why not?
   - What does fair or unfair mean, mathematically?
   - How did unfairness change the game?
   - How do you determine probability for fair dice?
   - How could you determine the probability for these dice?

Part III: Students determine the probability for their dice
1. Students roll their unfair die 96 times and collect data.
2. Data is turned into probabilities for each number of the die.

Part IV: Students apply their understanding of probability
1. Students exchange dice sharing the probability of their die with the new owner.
2. Students play the dice game again using the probability data of the new die.
3. The class discusses what they felt, experienced, and learned.

Teachers:

Cut out the die template on cardstock. Tape a penny on the back of one of the numbered squares. Fold up the die and tape it shut. Try the dice out by rolling them a couple of times. Try to make the folds as crisp as possible. If you don't have the patience for making the dice, enlist a detail oriented friend.

Print a game board for each student.

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Gameboard

1	2	3	4	5	6