



CEMC at Home

Grade 4/5/6 - Tuesday, May 26, 2020

Catching a Code

Try out the following two-player game involving codebreaking!

You Will Need: Two players, paper and a pencil

How to Play:

- The two players in this game alternate between being the “Code Maker” and the “Code Breaker” in each round.
- The players start by choosing an *even* number of rounds to play in the game.
- At the start of each round, the Code Maker chooses a three-digit code, using only the digits 1 through 6 (for example, 146 or 222), and writes the code on a piece of paper, keeping it secret from the Code Breaker.
- The Code Breaker then gets up to ten attempts to guess the Code Maker’s code. After each guess, the Code Maker provides two pieces of information about the guess:
 - the number of digits in the guess that appear in the code and are in the correct place, and
 - the number of digits in the guess that appear in the code but are in the wrong place.

For example, suppose that the Code Maker’s code is 263. If the Code Breaker guesses 361, then the Code Maker would give the following information: one of the digits in the guess is in the correct place, and one of the digits in the guess appears in the code but is in the wrong place. If the Code Breaker guesses 336, then the Code Maker would give the following information: no digits are in the correct place, and two digits appear in the code but are in the wrong place. *Note that the two digits here are the 6 and one of the 3s. The Code Maker does not say that all three digits appear in the code because there is only one 3 in the code.*

- The round ends when either the Code Breaker correctly guesses the code or the Code Breaker has made ten incorrect guesses. If the Code Breaker guesses the code in ten or fewer attempts, then the Code Breaker’s score for the round is equal to the total number of attempts needed. If the Code Breaker does not guess the code in ten or fewer attempts, then the Code Breaker’s score for the round is 11. (The Code Maker does not score.)
- The game ends when the chosen even number of rounds are completed. The winner is the player with the *lowest* total score.

Example: Here is a sample game of Catching a Code, organized in a table.

Code Maker’s Code: 234			
Guess #	Guess	Correct Digit – Correct Place	Correct Digit – Wrong Place
1	566	0	0
2	113	0	1
3	423	0	3
4	243	1	2
5	234	3	0

Here, the Code Breaker found the correct code after five attempts. This means the Code Breaker scores 5 points for this round.



Play this game a number of times.

Below, you will find some questions to think about that relate to the sample game provided.

A blank table is also given below for you to use while you play.

Questions:

1. Based on the first guess in the sample game provided, the Code Breaker decides that the correct secret code only contains the digits 1 through 4. Why is this true?
2. After the third guess in the sample game provided, how many possibilities remain for the Code Maker's code? What are they?
3. After the fourth guess in the sample game provided, how many possibilities remain for the Code Maker's code? What are they?

Sample Table:

Guess #	Guess	Correct Digit – Correct Place	Correct Digit – Wrong Place
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

More Info:

Check out the CEMC at Home webpage on Tuesday, June 2 for answers to the questions above.

This game is a pencil-and-paper version of a popular board game. The advantage to the pencil-and-paper version is that you can easily change the rules as you wish. For example, the length of the secret code can be made longer, consisting of four, five, or even more digits. Or, you can increase or decrease the number of possible digits allowed in the code (for example, you can use only the digits 1 through 4, or you can use all of the digits 0 through 9).