

# Teaching and Learning with *Secret Code 13+4*



## About the Game

Players: 2 - 4  
Age: Elementary

Time: 15 min.  
Subject: Math

Jürgen P. Grunau and HABA created *Secret Code 13+4* as a robust math game carefully concealed behind an attractive theme of secret agents breaking into a museum to steal the mask of Amun Re. To be successful, though, players will have to use some serious math skills.

## The Math Behind the Game

The dice in *Secret Code 13+4* are not regular dix-sided dice. Instead, these custom dice offer numbers up to nine for players to use in their math operations. As dice are used to crack the codes and deactivate the lasers, they are set aside. The goal is to find efficient operations that make use of the fewest possible dice for each barrier thereby letting a player advance more quickly than others as they all race towards the treasure. Diverging paths on the board also offer another decision point for players. Which path of codes might be easier to unlock and therefore allow further travel?

Think about the factors involved in the unlocking process. Codes one through nine can be unlocked with a single die showing the desired number. But what about other numbers? 12 or 18 have multiple factors:  $2 \times 6$  and  $3 \times 4$  for 12,  $2 \times 9$  and  $3 \times 6$  for 18. Being a prime number, 13 only has itself and 1 as possible factors; reaching 13 will involve addition and subtraction. The code tiles go up to 18, but the higher numbers offer fewer opportunities for addition and will likely require multiplication along with addition and subtraction. 18 has only one possible addend pair, two dice showing 9s; 12 on the other hand can be unlocked with 4 sets of addend pairs,  $3+9$ ,  $4+8$ ,  $5+7$ , or  $6+6$ . Have fun on a first play through, but for later games encourage players to think strategically using probability to inform their decisions.



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# Lesson Plan

**Standards:** Examples are drawn from the Common Core, but are also found in most state/local standards

CCSS.Math.Practice.MP1: Make sense of problems and persevere in solving them

CCSS.Math.Grade3: Solve problems involving the four operations, and identify and explain patterns in arithmetic.

CCSS.Math.Grade4: Use the four operations with whole numbers to solve problems.

**Instruction:** Teach the mechanism of the game, combining numbers with operations to reach targets, in a group exercise. Stress that there are often multiple solutions for each situation, but that some solutions may be more efficient in terms of resource allocation allowing the capture of additional target numbers. Demonstrate how this works by talking through your thinking as you consider a set of dice and target numbers. For example, describe your thinking about how different numbers could be combined, but that some are more efficient. Talk about how using a certain operation and set of numbers on the first laser gate might be better as it leaves other dice for later gates.

**Guided Practice:** Break the class into groups and create sets of simulated dice rolls and target numbers for students to practice with. Use an interactive whiteboard or other method for students to share different solutions with the class. Discuss the efficiency of different solutions. Then introduce *Secret Code* as a game that uses this type of math as the mechanism for moving through the game. *Secret Code* is a race, so players will want to make the most efficient use of their dice rolls each turn! Have students play the first game working together as a team using a single character in the game. Each turn, one student in the group will roll the dice and then each individual student in the group will plan out their usage on paper. The group can then report out and decide as a group the solution set to implement. Spend about 15-20 minutes on this...it is okay if they don't get all the way through. We are using the game as an instructional resource at this point rather than strictly playing the game.

**Independent Practice:** Play the game! On following days, give students time for independent or small group play experiences with *Secret Code*. The real secret to this game is that it requires a great deal more math than a worksheet. Instead of a single problem with a single answer, each turn in *Secret Code* will require multiple math problems as players seek the correct operands for the target answer.

**Assessment:** Assessment using *Secret Code* is both simple and powerful. The beauty is that you can assess student learning within the same context as practice. Simply pick out three lasers and offer pre-set dice that can be used to reach the three targets.

Increase difficulty as needed to challenge different levels of learners. You can select specific targets and dice to require different operations.

## Extending Learning

- 1) Extend the math of gameplay by having students roll the dice and then identify at least three different ways to reach a target number. Bonus points for most dice and fewest dice used.
- 2) Create a worksheet showing combinations of three dice, have players list three reachable targets for each set of dice explaining the operations involved.
- 3) Increase the complexity by creating a new set of laser gates that range from 21 to 40. This will require more multiplication or even exponents.



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## 3 to 5 Lesson Ideas



CardLine: Animals

- Use CardLine: Animals to teach the idea of estimation as a critical thinking skill. What can you infer about the animal to help you figure out the data point? For example, animals that fly tend to weigh less, insects tend to be smaller, and larger mammals often live longer than smaller ones. Be sure to use any picture clues!
- Most of the CardLine and TimeLine games end up being played almost cooperatively, so don't hesitate to encourage helping others during play.



Catan: Junior

- This junior version of the classic Catan offers an introduction to both strategic thinking and economics. As with the regular game, Catan: Junior requires trading to be most successful.
- Players will need to think critically about supply and demand, relative worth of items, and the economic concept of goodwill. Extend the learning by creating a classroom economy built around relative worth of different snack foods.



Code Master

- A single player puzzle that can also work as a cooperative play experience, Code Master introduces advanced computational thinking around conditional statements. Make the learning more interactive by creating floor-sized puzzles in this style for players to work through as mazes.
- Wonderful opportunity for collaboration with PE teachers to create a big game!



Number Chase

- Deduction is harder for young students than you might think. Make use of Number Chase as a way for students to explain their thinking in a game journal or aloud with teammates. Is there full understanding of what each clue means in terms of what numbers can be eliminated from consideration?
- To extend the concept, introduce classic logic puzzles using clues and grids to mark off possible and impossible combinations.



**Numeracy Legends**

- A new series of games that each examine a mathematical concept. In The Rainbow Unicorn, players work through graph theory and routing. Build connections from game play to computational thinking through classic problems including The Seven Bridges of Königsberg and The Traveling Salesman.
- Your school does this math every year setting up the most efficient bus routes. Bring in someone from transportation to talk about the real life applications.



**Quiddler**

- Scrabble meets Gin Rummy in this now classic word game. Quiddler, like Secret Code, excels as a game for classrooms because the open-ended nature of the problem means students are running through lists of vocabulary words.
- Reinforce the differentiation in the rules (longest word and most words are the same bonus points) by having daily challenges in your classroom or library.
- Add in bonus point rules for words related to current classroom instruction.



**Roller Coaster Challenge**

- This STEM game stresses engineering. The only issue is that the challenges as written typically have only one possible solution. Can you use other parts from the game to create different solutions for a challenge? Can you create a more thrilling solution as well as a more gentle solution?
- Bring in a physics teacher to talk about the math behind engineering drops and curves.



**Rory's Story Cubes**

- These dice provide a scaffold for storytelling and creative writing. But don't let students get away with just naming the dice!
- As a variation, present dice one at a time and have students roll for setting, plot, and characters. Have them interpret each die roll and how it reflects that idea before moving on. This encourages a more symbolic approach rather than a literal telling of the dice.



**Scrambled States**

- One of the more didactic games included here, Scrambled States of America still manages to provide fun while teaching about geography.
- As a variation (with a nod to the now out-of-print 10 Days series) have students create a path for a vacation trip across a set number of states. Or, add a layer of interpretation by having students lay out a path from Dover to Raleigh where they have to first recognize the capitals and then create the path.



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