

RUBIK'S RIDDLES

FESTIVAL GUIDE

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Materials and Setup

Per table (assuming 5 students per table), you will need:

Per Table	Material Preparation	
5 changeable building cubes	Setup each cube in the starting pattern.	
1 cube face separator tool		
3 copies of Instructions	1-page sheet	p. 5
5 copies of Rubik's Riddles tasks	2-page sheet <i>can be printed double-sided</i>	p. 6-7
1 copy of Table Sign	1-page sheet <i>print on cardstock for sturdiness</i>	p. 8

Per Table	Purchasing Materials		
1 changeable cube with separating tool	1 cube \$9.98 each		The separating tool helps you disassemble the cube faces. You should have at least one tool.
4 changeable cubes	pack of 2 \$8.37 each pack (order two packs)		
8 plastic sheet protectors	pack of 100 for \$7.67	pack of 500 for \$26.99	These are recommended in order to protect the documents that students will be handling.



Objective

Make the pattern in the puzzle by rotating rows or columns on the cube.

Rules:

1. The pattern should be made on the front side of the cube. It doesn't matter what the other sides look like.
2. After making the pattern in the puzzle, make the starting pattern again before moving on to the next puzzle.

Materials

Each Rubik's Riddles table should be prepped for 5 stations.

Each station needs:

1. Rubik's cube with starting pattern in place.
2. Rubik's Riddles instructions.
3. Rubik's Riddles tasks.

How to Play

Introduce the activity without overexplaining it and without telling what strategies students might want to use. As much as possible, avoid giving away answers. Students should be encouraged to explore, experiment, and learn from their mistakes.

1. Have the student rotate the cube faces to create the patterns in the tasks.

Standards

1. Make sense of problems and persevere in solving them. CCSS.MP1
2. Attend to precision. CCSS.MP6
3. Look for and make use of structure. CCSS.MP7

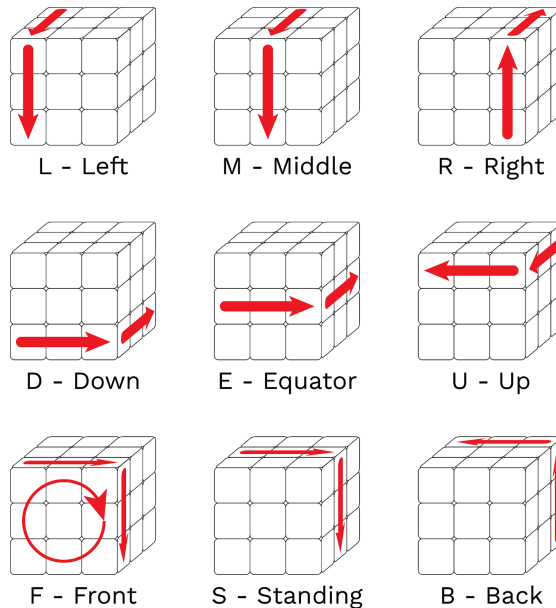
Asking Good Questions

1. Ask questions about confidence.
 - a. When a student asks you “Is this right?”, instead of saying “yes” or “no” right away, ask them how confident they are in their answer. Here are some examples:
 - i. “Maybe. What do you think? How confident are you?”
 - ii. “On a scale of 1-5, how confident are you in your answer?”
 - b. If a student is not confident in their answer, follow up by asking “What would help you feel more confident in your answer?” or “Why do you not feel confident?” This helps you determine how best to help the student through their explorations.
2. Ask students about choices.
 - a. When a student is stuck or shows you a wrong answer, instead of jumping in and showing the student the correct answer, start by asking about the choices that the student made along the way. Here are some suggested steps to follow:
 - i. Start from the beginning.
 - ii. Ask students to show you what they’ve tried so far.
 - iii. When the student gets to a point where they have different choices, ask the student “What other choices can you make here?”
 - iv. Have the student make a different choice and try to solve the puzzle. This helps the student see that they have the power to make different choices during an activity, and they’ll start to do this on their own in the future.
 - v. If you’re familiar with the puzzle or a particular solution, stop the student only when a different choice will help them get to the solution. This will help them feel successful faster without you giving away too much of the answer.
3. Ask students about strategies.
 - a. If a student is getting into the activity and has been doing it for a while, ask the student if there are any strategies they’ve come up with to help them solve the puzzle or win the game.
 - b. Follow up by asking if they think their strategies will work for all puzzles and/or larger puzzles, more complex puzzles, etc. Have the student explore more complex puzzles to test out their strategies.
 - c. This is a great way to encourage a student to dive deeper into an activity and to start looking for patterns, structure, and proofs.

Answers

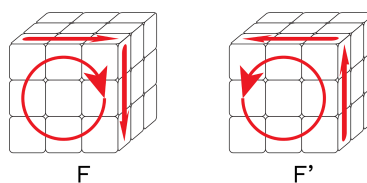
We're going to use Rubik's cube notation to write the answers to this activity, so we'll start with a quick overview of Rubik's cube notation.

Each turn on a Rubik's cube can be represented using a single letter.



Turns are in the clockwise direction (from the perspective of facing the side you're turning) except for the middle layers. For the middle layers, M is in the same direction as L, E is in the same direction as D, and S is in the same direction as F.

When you turn a layer in the opposite direction of what's shown above, you write the letter with an apostrophe (pronounced "prime"). Below is an example comparing F and F'.



Below are example answers. Each puzzle has multiple solutions.

Puzzle 1: M E

Puzzle 2: M' B S' M

Puzzle 3: M B M' M' B' M

Puzzle 4: R B S' R' L B S' L'

Puzzle 5: M' B E' D' M

Puzzle 6: L' R B E' D' L R'

Puzzle 7: M U M' M' D M

Puzzle 8: M' S' D' M M U M'

Puzzle 9: M' B E' M M B' M'

Puzzle 10: E M' M' E F E' M M E'

Puzzle 11: M' M' B B E E

Puzzle 12: M' M' B B E E D D

Puzzle 13: R R L' L' B B M' E E M

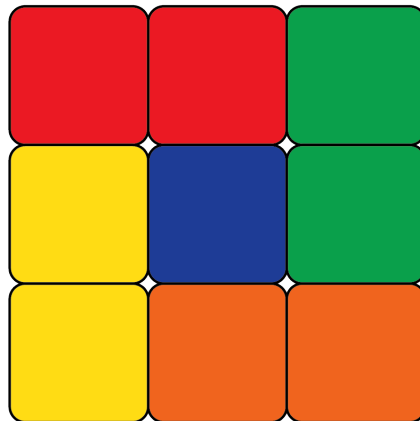


Rubik's Riddles Instructions

Rules:

- Start each puzzle by making the front of your cube look like the starting pattern below. All other sides should be blank.

Starting Pattern

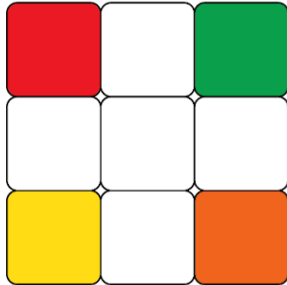


- Then, try to make the pattern in the puzzle by rotating rows or columns on your cube.
- The pattern should be made on the front side of your cube. It doesn't matter what the other sides look like.
- After you make the pattern in the puzzle, make the starting pattern again before moving on to the next puzzle.

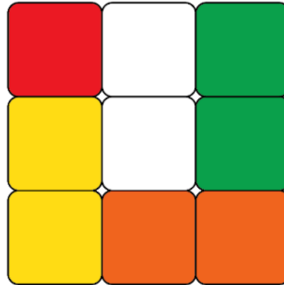
Rubik's Riddles

Try to make each of the patterns below on the front of your cube. Before moving on to the next puzzle, reset your cube by making the starting pattern on the instructions sheet.

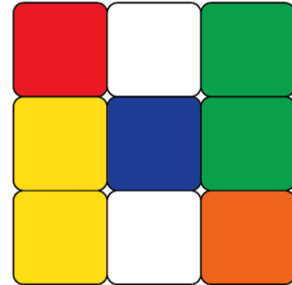
Puzzle 1



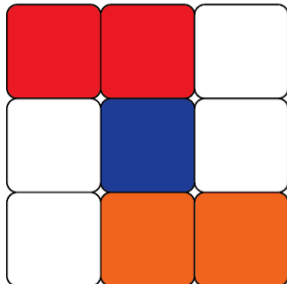
Puzzle 2



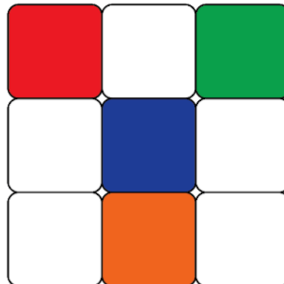
Puzzle 3



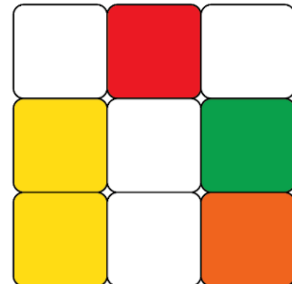
Puzzle 4



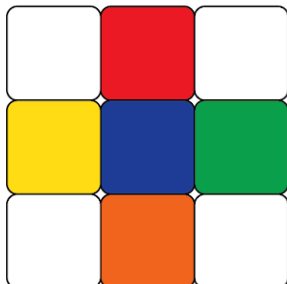
Puzzle 5



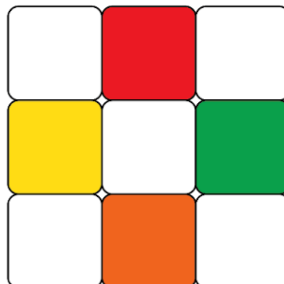
Puzzle 6



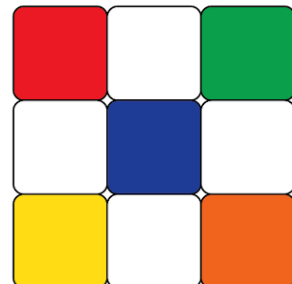
Puzzle 7



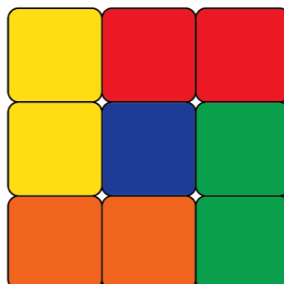
Puzzle 8



Puzzle 9



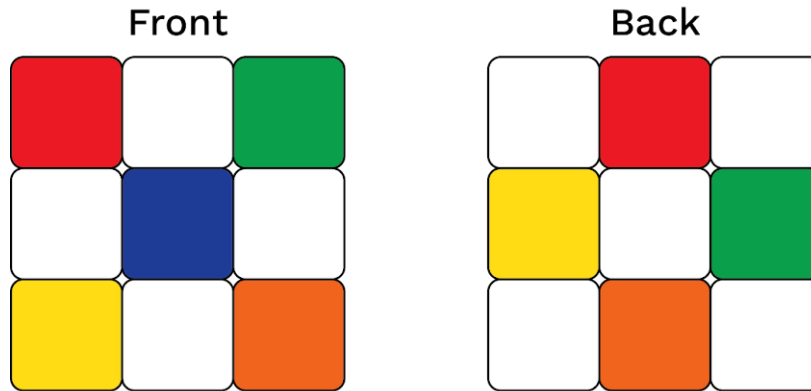
Puzzle 10



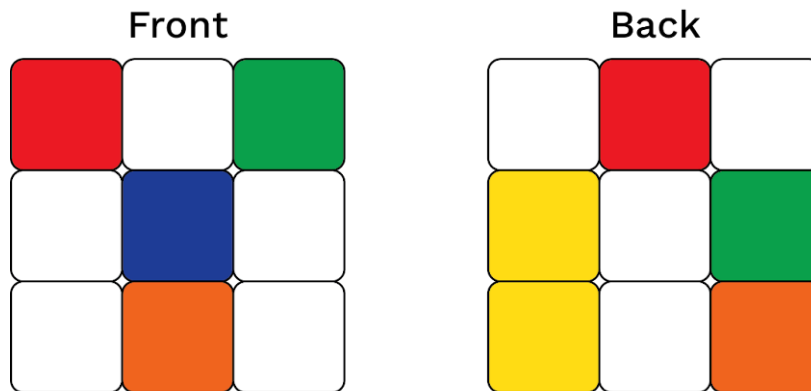
Rubik's Riddles

For Puzzles 11 - 13, make one pattern on the front of your cube and the other pattern on the back of your cube at the same time.

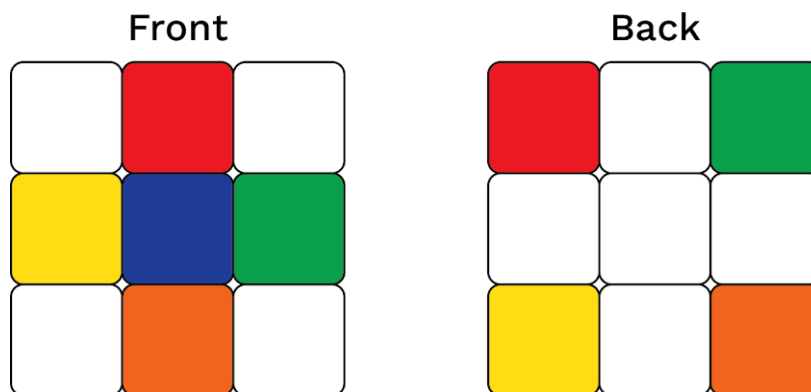
Puzzle 11



Puzzle 12

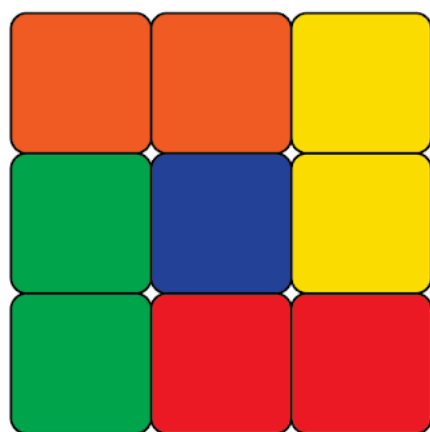


Puzzle 13





Play for free at
jrmf.org/puzzle/rubiks-riddles

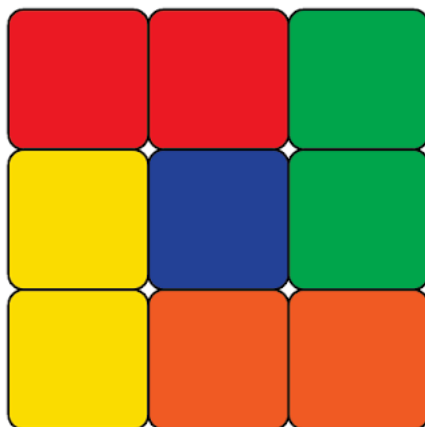


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