

READING ROCKS

LESSON OVERVIEW

OBJECTIVE

Students will recall what they learned on their field trip and apply it to an interactive rock cycle game.

RECOMMENDED GRADE LEVELS

2-4

DURATION

35 minutes

MATERIALS

- 5 tables or flat surfaces
- Rock cycle game pieces (provided)
- Student worksheet (provided)
- Tape
- Scissors
- Rock flash cards from pre-lesson (optional)

TOPIC BACKGROUND

The earth is made up of many rocks and minerals. A **mineral** is a naturally occurring, homogenous solid. It may be composed of one or many elements, but it is the same throughout. **Rocks** are made up of 2 or more different minerals.

Rocks are constantly being transformed and transported to different sections of the earth; this is known as the **rock cycle**.

The earth has 3 main layers: **crust**, **mantle**, and **core**. The center of the earth (the core) is extremely hot and under immense pressure. As rocks get pushed deeper into the earth, the heat and pressure causes the rocks to become folded, stretched and squeezed. Rocks that undergo such a change are called **metamorphic rocks**. Sometimes magma inside

the earth or lava that erupts from a volcano cools and solidifies into rocks known as **igneous rocks**. Other rocks form when different sediments accumulate or are compacted together at earth's surface. These rocks are called **sedimentary rocks**.

Rocks are constantly changing, especially through the processes of **weathering** and **erosion** which break rocks down into smaller sediments. The changes are slow, occurring over thousands and even millions of years.

GETTING READY

1. Print out the provided materials for the Rock Cycle Journey game: 5 station signs, 5 foldable dice cubes. (It is recommended to print two copies of each colored die.)
2. Assemble game dice: cut, fold and glue to create a cube.
3. Set up stations for the game. The five stations are: Sedimentary Rock, Sediment, Metamorphic Rock, Lava, and Igneous Rock.
4. Each station or table should include the station sign (provided) and at least one die matching in color to the sign. (Having multiple dice is suggested.)
5. Make copies of the worksheet for each student.
6. Read over and understand the game direction and rules.

PROCEDURE

REVIEWING THE ROCK CYCLE

1. Begin by going over with students what they remember from their visit to Brooklyn Bridge Park by asking the following questions:

- How can we describe different rocks?

Observing rock properties: size, weight, texture, luster, color

- What are the 3 rock types in the rock cycle?

Sedimentary, Metamorphic, Igneous

- How do rocks change from one type to another?

Rocks can undergo heat and pressure to become folded, squished or even melted into liquid. On earth's surface, wind and waves can cause rocks to break apart and move to different locations.

- Are there any special features of sedimentary rock? Metamorphic rocks? Igneous rocks?

Sedimentary rocks have layers of different sediments compacted on top of each other. Fossils are also found in sedimentary rocks. Metamorphic rocks tend to be very lustrous and have a lot of light and dark banding. Igneous rocks that form from volcanic lava often are porous. Sometimes they have polka dot patterns or look glossy.

2. (Optional) Using the rock flash cards from the pre-lesson packet, go over with students the names of some specific rocks and have students guess whether they are sedimentary, metamorphic, or igneous.

THE ROCK CYCLE JOURNEY GAME

1. Remind students that the earth made up of billions of rocks. Rocks change very slowly over time, but can change and move through the rock cycle many times and in many different ways!
2. Go over the rules of the activity: *Imagine you are a rock. You will each go on your own rock cycle journey. As you travel through the rock cycle you will stop at stations where you will roll a die to find out your fate. As you travel around the room you must also record your stops on the data sheet provided!*
3. Students can begin at any station they like but should spread out as to not crowd one area of the room when the game begins.
4. To reduce crowding or bottlenecking at stations, it is recommended to print and create multiple dice for each of the 5 stations.
5. Upon arriving a station, a student must FIRST record their station (i.e. Metamorphic rock), THEN roll the die, THEN record what the die says happens (i.e. Melting) and the location they must travel to (i.e. Lava).

PROCEDURE CON'T

6. Continue playing the game until students have recorded at least 8 transformations on their worksheet.
7. After students finish their rock cycle journey, have them reflect on their journey. Ask what patterns they notice. If time allows, have students share their observations with a partner or in small groups.
8. (Optional) As a connection to writing and storytelling, have students write or tell a story that explains their rock cycle journey. They can be as creative as they like. Challenge them to use the vocabulary from this unit!

RECOMMENDED BOOKS

National Geographic Kids: Everything Rocks and Minerals by Steve Tomecek (Gr. 3 - 7)

The Magic School Bus Inside the Earth by Joanna Cole (Gr. 2 - 5)

The Rock Factory: The Story About the Rock Cycle by Jacqui Bailey (Gr. 2 - 6)

Smithsonian Handbooks: Rocks & Minerals by Chris Pellant

RECOMMENDED WEBSITES

Bill Nye the Science Guy—Rock Cycle

https://www.youtube.com/watch?v=BsIHV_voMk

The Dr. Binocs Show—Types of Rocks

<https://www.youtube.com/watch?v=CeuYx-AbZdo>

Rocks and Minerals (For Teachers)

https://www.youtube.com/watch?v=ZkHp_nnU9DY

Mineralogy4kids—The Rock Cycle

<http://www.mineralogy4kids.org/rock-cycle>

Rocks and minerals interactive games for kids

<http://interactivesites.weebly.com/rocks-and-minerals.html>

Scholastic—Rocks, Minerals and Landform Lesson Plans

<http://www.scholastic.com/teachers/activity/rocks-minerals-and-landforms-12-studyjams-interactive-science-activities>

TEACHER NOTES:

VOCABULARY

Core: The innermost layer of the earth and composed of two parts. The outer core is a thick, liquid layer of iron. The inner core is under so much pressure that it remains solid iron. The core is about 7,000 degrees Fahrenheit.

Crust: The hard and rigid outermost layer of the Earth.

Deposition: The process of eroded material being added or settling someplace.

Erosion: The wearing away of Earth's surface by water, wind, glaciers, waves, etc.

Geologist: A scientist who deals specifically with the history of the Earth and its life especially as recorded in rocks.

Heat: A form of energy associated with the motion of atoms or molecules and capable of being transmitted through solid and fluid media by conduction.

Igneous: A type of rock having solidified from lava or magma.

Mantle: The semisolid and hot layer covering the outer core of the Earth.

Metamorphic: Rock altered by pressure and heat.

Mineral: A solid, inorganic substance of natural occurrence.

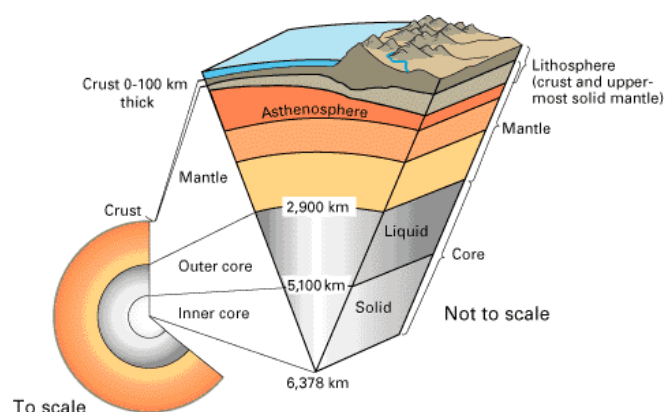
Petrologist: A scientist who deals specifically with the origin, history, occurrence, structure, chemical composition, and classification of rocks.

Pressure: The process by which heat or electricity is directly transmitted through a substance.

Properties: Characteristics used to describe something – size, shape, color, etc.

Rock Cycle: A fundamental concept in geology that describes the dynamic transitions through the geologic time among the three main rock types: metamorphic, sedimentary, and igneous.

Sedimentary : A type of rock formed by consolidated sediment deposited in layers.



STANDARDS

NEXT GENERATION SCIENCE STANDARDS

2. Structure and Property of Matter

2. Earth's System: Processes that Shape the Earth

3. Forces and Interactions

NYC K-8 SCIENCE & SOCIAL STUDIES SCOPE & SEQUENCE

- Geology
- Earth Science
- Earth Materials
- Properties of Matter
- The Nature of Science

COMMON CORE MATH

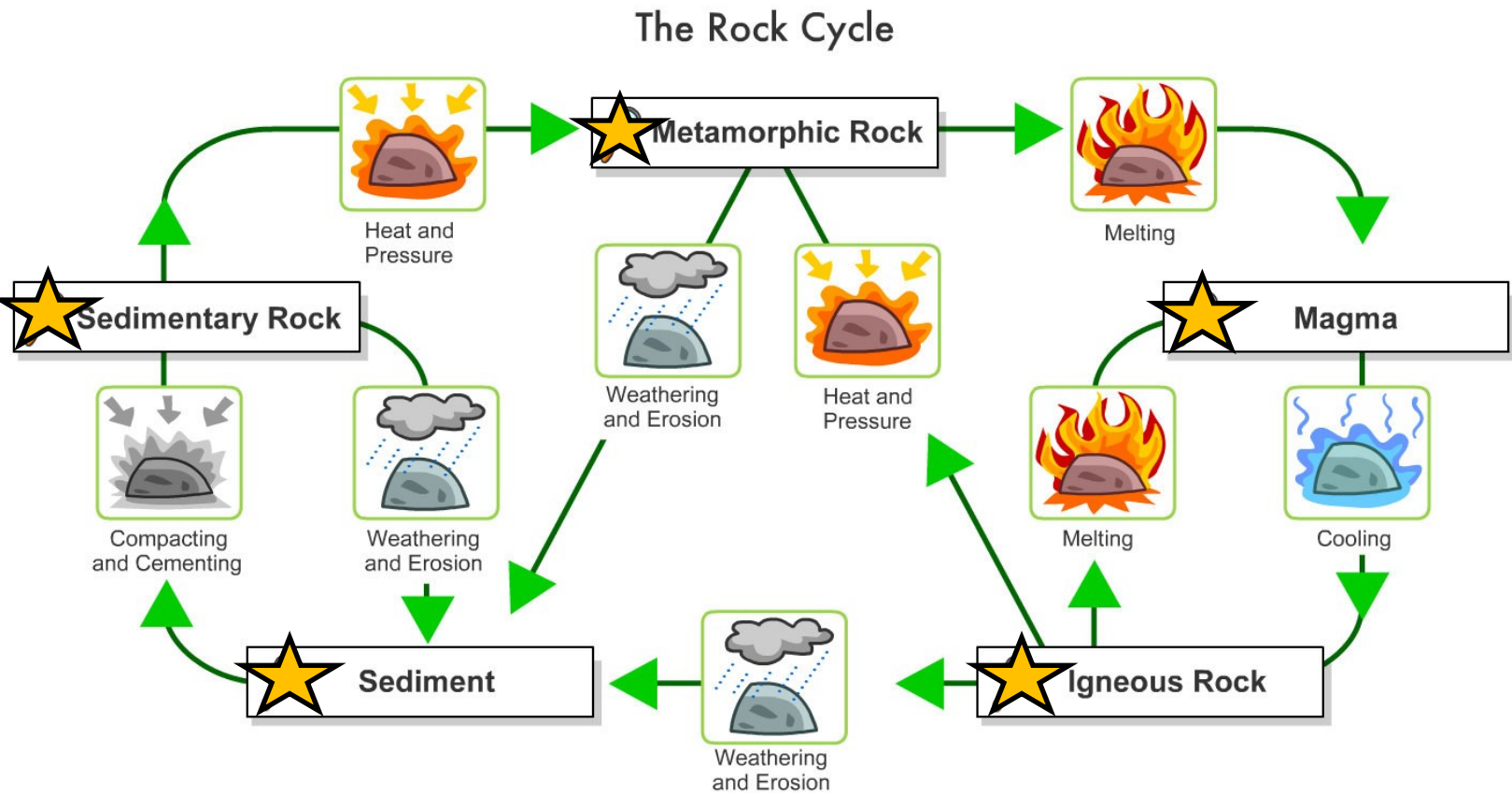
- Expressions and Equations
- Number System

COMMON CORE ENGLISH AND LANGUAGE ARTS STANDARDS

- Literacy in Science
- Literacy in Technical Subjects
- Speaking and Listening

THE ROCK CYCLE JOURNEY

GAME DIRECTIONS



DIRECTIONS

- **Objective:** Students travel to different stations or “parts of the rock cycle” where they roll a die to determine how their rock transforms and where to move to. Students should record their journey on the worksheet provided.
- The flowchart above shows how rocks transform and the different paths students might travel during this game.
- Stars represent the 5 stations/tables to set up for students to roll the dice at. Each station should have a station sign and at least one dice of corresponding color.
- To reduce crowding, be sure to have students evenly divide where they start.

NAME: _____

THE ROCK CYCLE JOURNEY WORKSHEET

DIRECTIONS

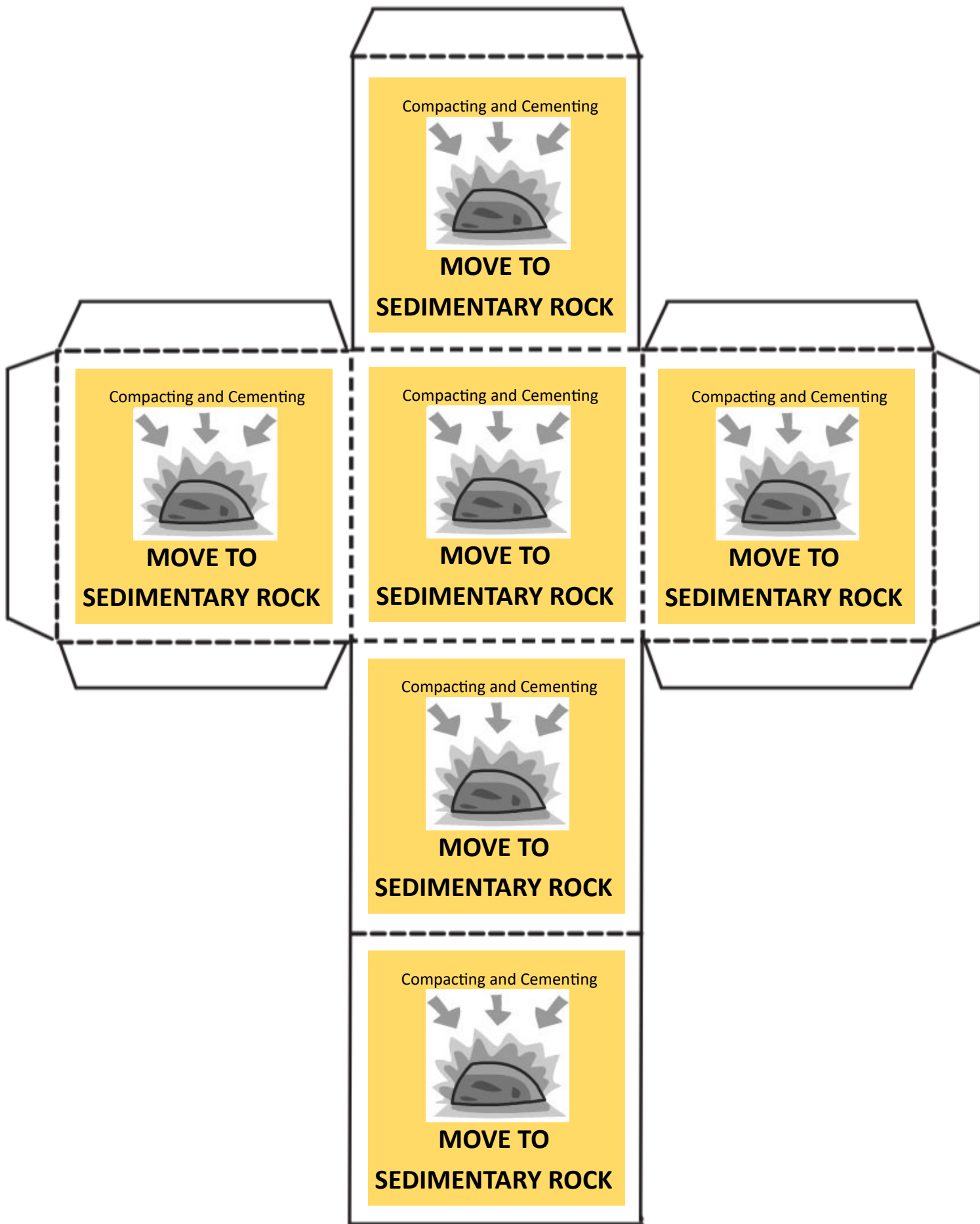
Once you arrive at a station:

1. Record your current rock cycle station in the first column below.
2. Roll the dice
3. The dice tells you how you transform and your next station to travel to. Record this info in the chart below.
4. Go to the instructed station and repeat steps 1-3

TRIP #	CURRENT ROCK CYCLE STATION	TRANSFORMATION (the effect listed on dice)	NEW ROCK TYPE (the station dice says to go to)
example	Lava	Cooling	Igneous Rock
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

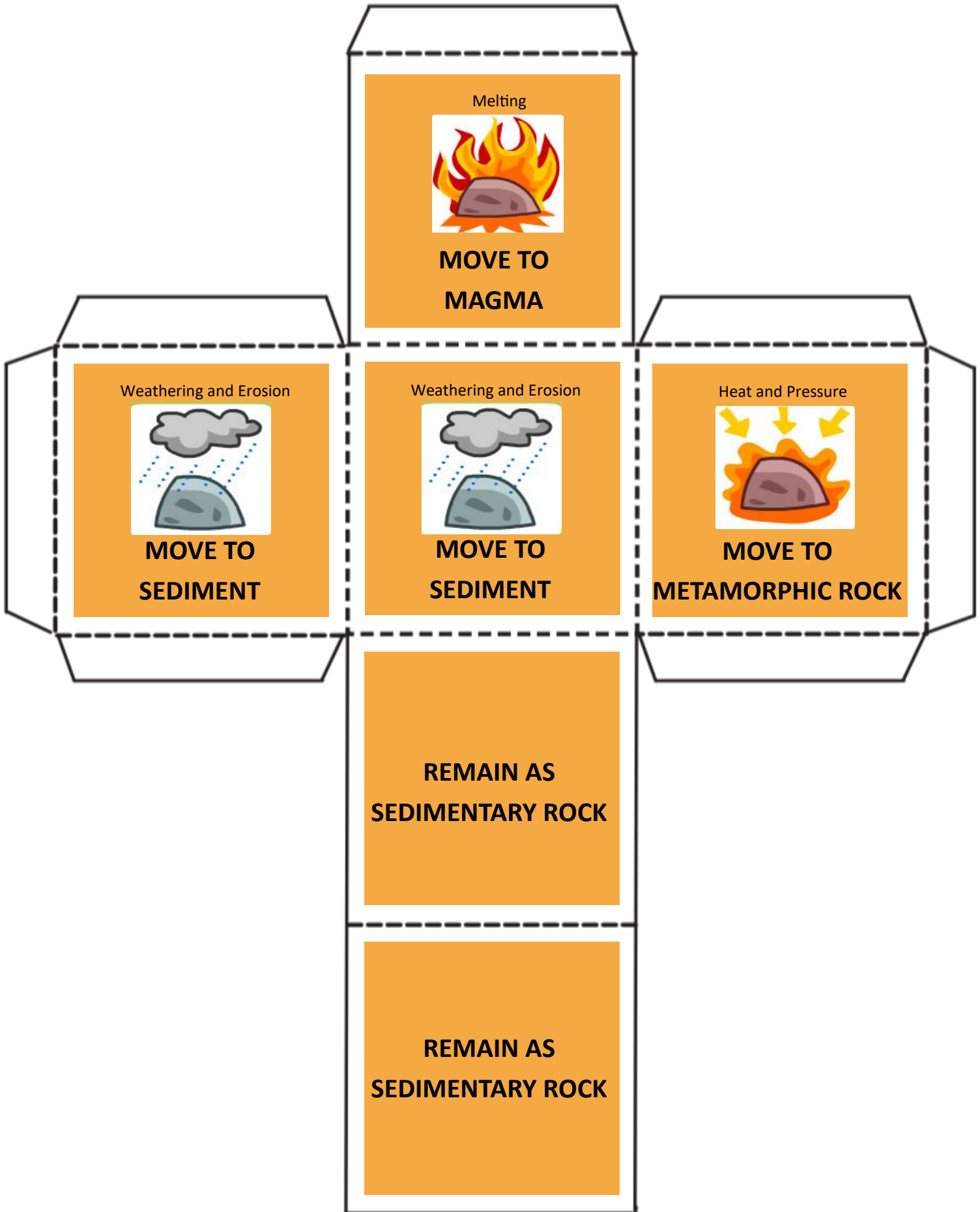
SEDIMENT DIE

CUT on solid lines, FOLD on dotted lines, GLUE flaps



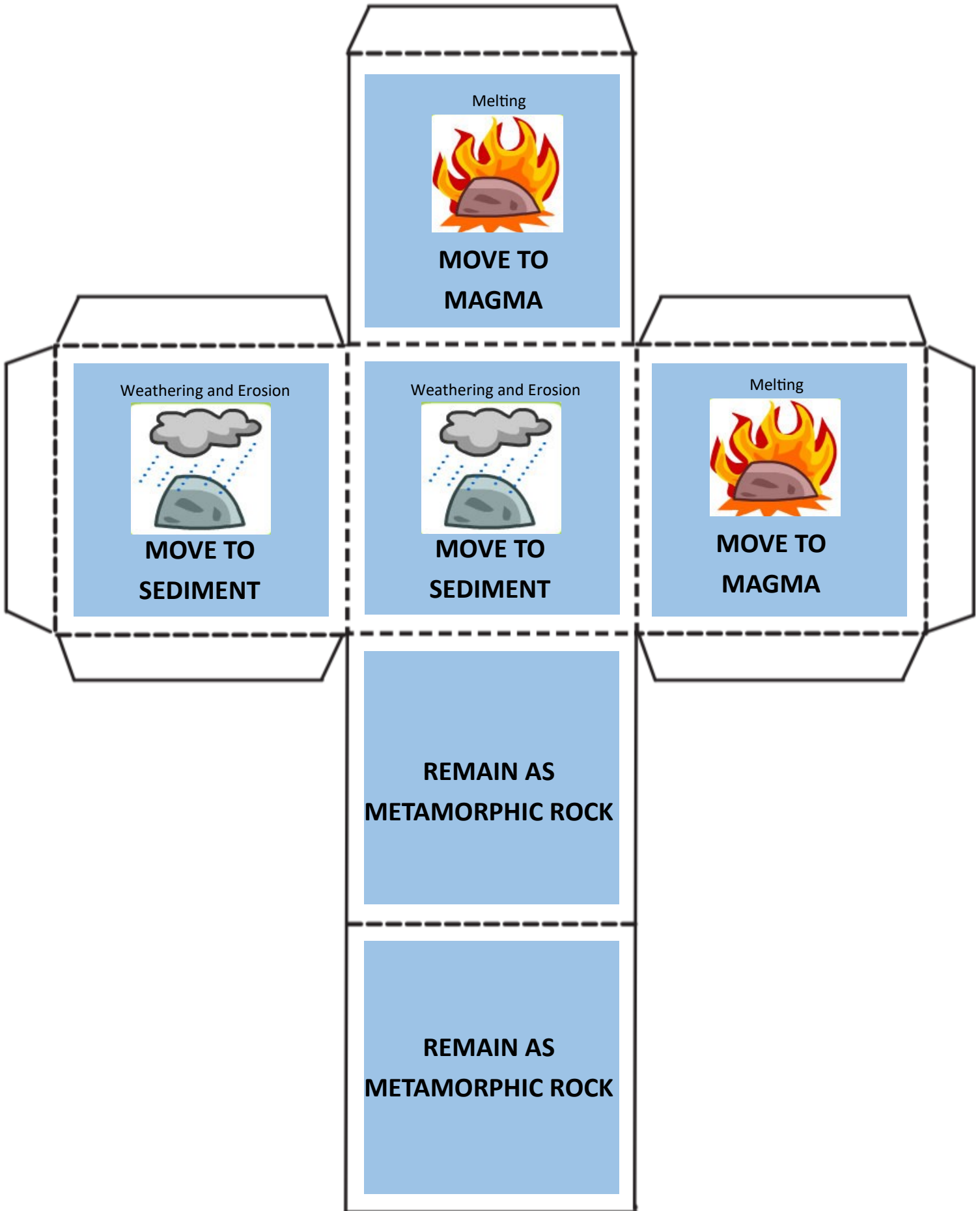
SEDIMENTARY ROCK DIE

CUT on solid lines, FOLD on dotted lines, GLUE flaps



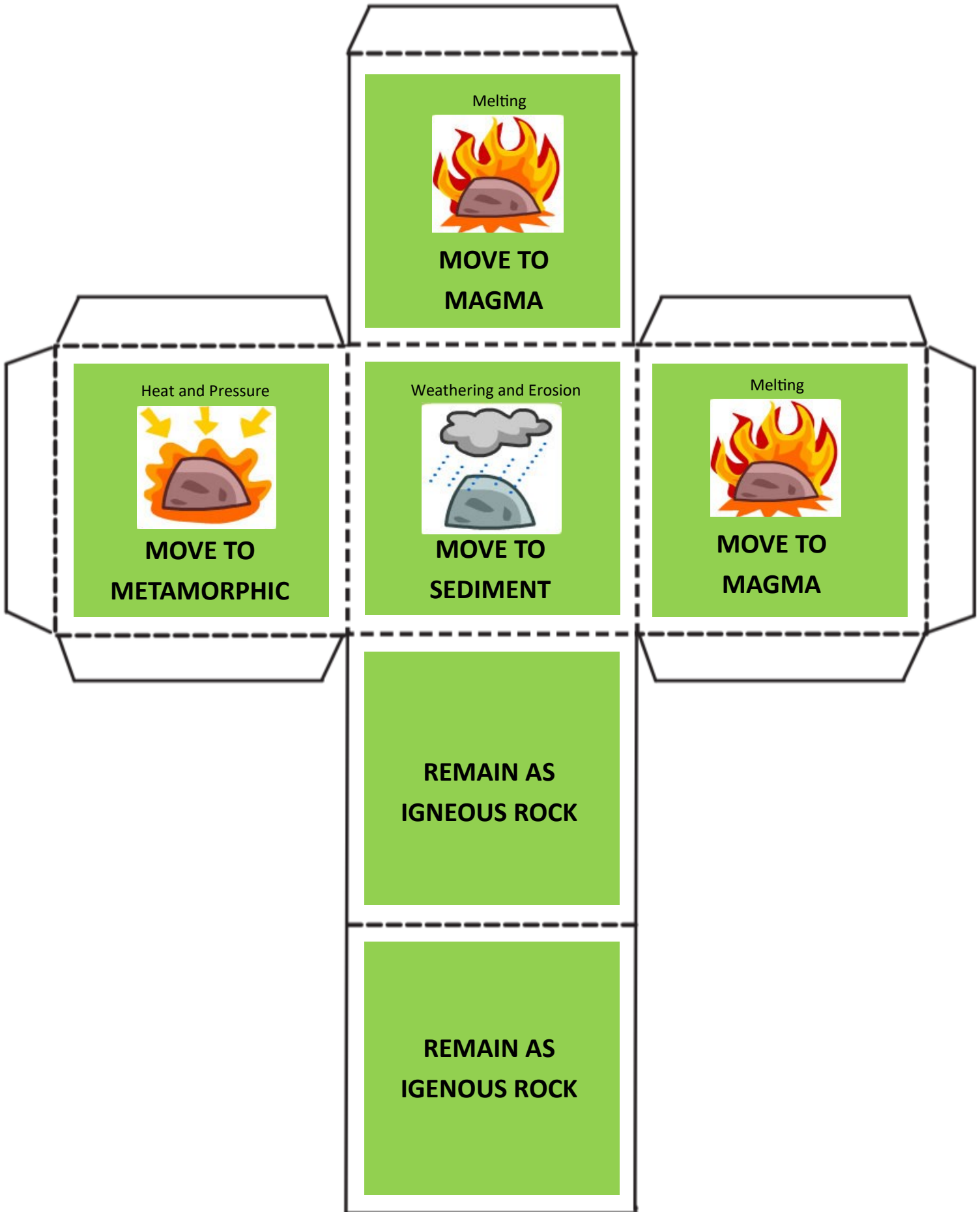
METAMORPHIC ROCK DIE

CUT on solid lines, FOLD on dotted lines, GLUE flaps



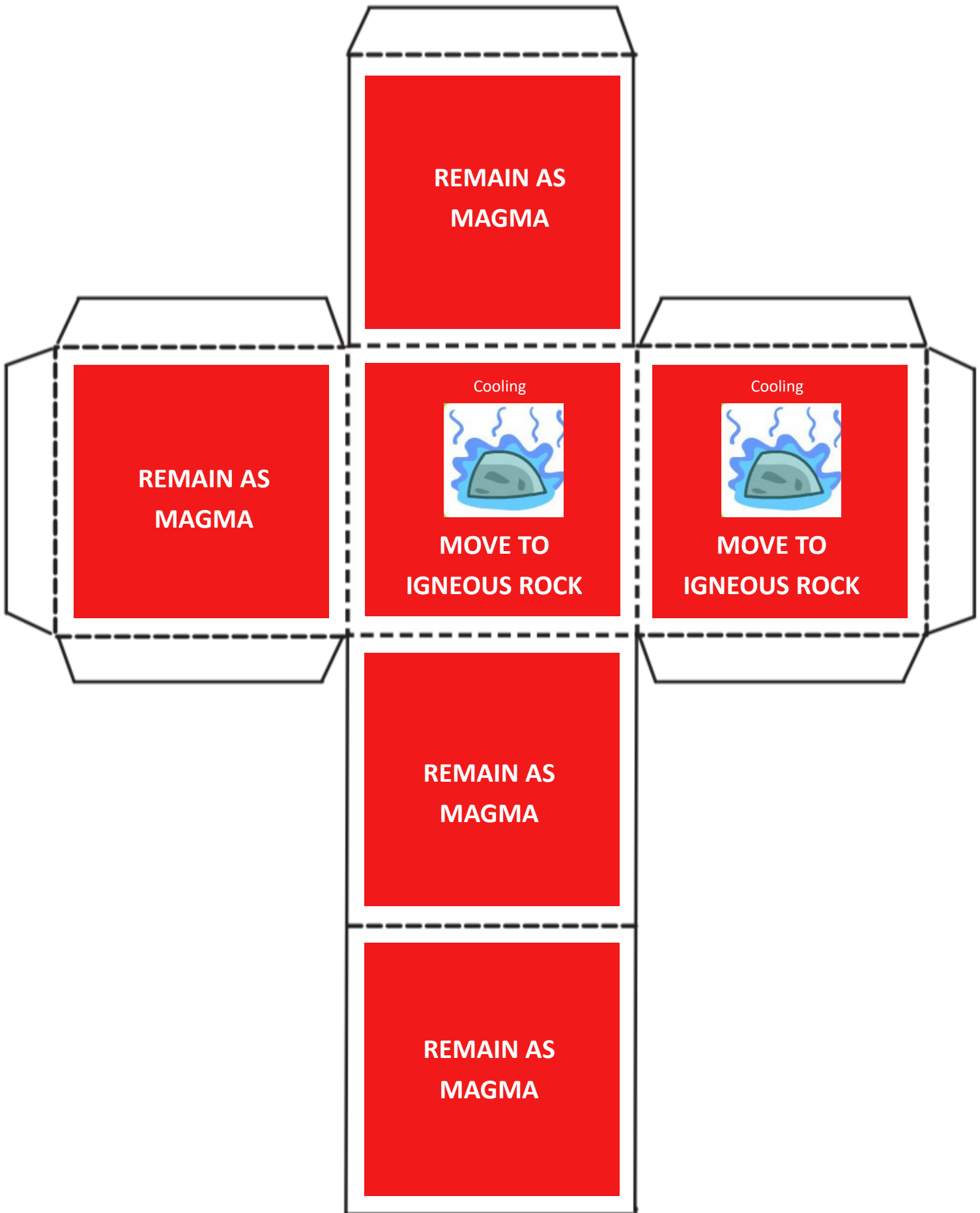
IGENOUS ROCK DIE

CUT on solid lines, FOLD on dotted lines, GLUE flaps



MAGMA DIE

CUT on solid lines, FOLD on dotted lines, GLUE flaps



SEDIMENTARY ROCK



Created by compacting and cementing

SEDIMENT



Created by weathering and erosion

METAMORPHIC ROCK



Created by heat and pressure

IGNEOUS ROCK



Created by cooling back into a solid

MAGMA



Created by melting