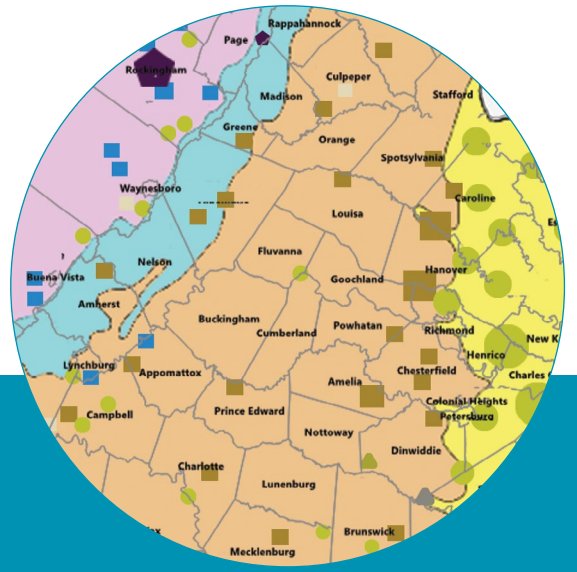

LESSON THREE — TEACHER GUIDE

VIRGINIA NATURAL RESOURCES

EMPOWER

LESSON 3: PLAN

VIRGINIA NATURAL RESOURCES

OVERVIEW

Students will work on further understanding what can cause natural resources, like rocks and minerals, to move downhill/downstream. Students will also get to speak to an expert about their local (Virginia) land resources, and then examine maps to tell their own story of a pebble's journey.

ESSENTIAL QUESTIONS

What are your local (Virginia) natural land resources?
- How can these natural resources be used?
- What can maps tell us about our land?
- How can the water affect movement of rocks/minerals, life (e.g. bones, seashells), or pollution?

TIME

210 minutes (+ teacher preparation).
This lesson is intended to be done over several days.

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LESSON 3: **VIRGINIA NATURAL RESOURCES**

STEM CT FRAMEWORK

The below framework incorporates Next Generation Science Standards (NGSS),Common Core State Standards (CCSS) for mathematics, and Computational Thinking (CT) concepts and characteristics adapted by the International Society for Technology in Education (ISTE) and Computer Science Teachers Association (CSTA).

4-ESS2 EARTH'S SYSTEMS

4-ESS2-2. Analyze and interpret data from maps to describe patterns of Earth's features.

Investigation: Students will learn about different types of rocks and minerals in Virginia and their journey downstream.

Disciplinary Core Ideas
Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around.

Crosscutting Concepts

1) patterns; 2) cause and effect; and 7) stability and change

Mathematics	Computational Thinking Characteristics and Dispositions	Science & Engineering Practices
4. NBT: Order and round large numbers; add and subtract multi-digit whole numbers **Practices:** • Make sense of problems and persevere in solving them; examining data set, sequencing • Model with mathematics; complete mathematics problems • Attend to precision; use appropriate unit of measure, computation, ordering/rounding	**Characteristics:** • Logically organizing and analyzing data; work with making and analyzing maps • Automating solutions through algorithmic thinking; sequencing/retelling story, then writing one • Identifying, analyzing, and implementing possible solutions with the goal of achieving the most efficient and effective combination of steps and resources; mapping water flow and writing about the journey of a pebble based on map data. • Generalizing and transferring this problem solving process to a wide variety of problems; using knowledge about soil, slope, water flow (i.e. downstream) and applying it to a pebble's journey **Dispositions:** • Confidence in dealing with complexity; pebble journey (writing) • Persistence in working with difficult problems; pebble journey (writing) • Tolerance for ambiguity; map areas (water movement) and pebble journey (writing) • The ability to communicate and work with others to achieve a common goal or solution; sharing and working together with peers with different maps; sequencing activity	**Asking Questions and Defining Problems:** • Students will ask an expert questions about rocks and minerals in Virginia • Compare maps of Virginia to determine possible problem areas for runoff. **Analyzing and Interpreting Data:** • Analyze and interpret data from various Virginia maps. **Obtaining, Evaluating, and Communicating Information:** • Record and collect information on Virginia's rocks and minerals and communicate findings.

Technology

- Digital tools (e.g., Google Draw) for KWL chart and/or sequencing
- WikiWaterShed Tools (Stroud Water Research Center, 2019) can be used to model watershed data.
  - Model My Watershed - Runoff Simulation
  - Model My Watershed
- Google Maps

VIRGINIA STANDARDS

Virginia (2018) Science SOL. 4.8 The student will investigate and understand that Virginia has important natural resources. Key resources include a) watersheds and water.

Virginia (2016) Mathematics SOL. 4.7 The student will solve practical problems that involve determining perimeter and area in U.S. Customary and metric units **4.8a** Estimate and measure length and describe the result in U.S. Customary and metric units.

Virginia (2017) English SOL. 4.1 The student will use effective oral communication skills in a variety of settings. **4.5** The student will read and demonstrate comprehension of fictional texts, itinerary nonfiction texts, and poetry. **4.6** The student will read and demonstrate comprehension of nonfiction texts. **4.7** The student will write in a variety of forms to include narrative, descriptive, opinion, and expository.

Virginia (2015) History & Social Science SOL. VS 2c Locating and identifying water features important to the early history of Virginia (Atlantic Ocean, Chesapeake Bay, James River, York River, Potomac River, Rappahannock River, and Lake Drummond and the Dismal Swamp)

Virginia (2018) Science Vertical Alignment The importance of resources is a consistent theme in all elementary years, with third grade focusing on the importance of water and soil as resources (3.8). In sixth grade, students deepen their understanding of human impact on the environment and learn how individuals can influence public policy decisions related to energy and the environment (6.9).

LESSON PLAN SUMMARY

3.1 - Virginia Natural Resources :

Teacher(s) will read *The Pebble in my Pocket* and discuss and ask questions about natural resources and organize it into a K-W-L chart.

STEM CT	Supplies	Technology Resources	Presentation & Slides
Science: natural resources, erosion Math: n/a CT: data analysis; abstraction; data analysis; data representation; data collection	The Pebble in My Pocket (book), Computer with audio and video projection system, Optional - Pencils	3 -VA Resources - KWL chart (handout or digital)	3.1 - VA Natural Resources Presentation Slides

3.2 Looking At The Locals:

Next, the students will **organize and analyze** local mine production data.

STEM CT	Materials	Technology Resources	Presentation & Slides
Science: natural resources Math: ordering numbers through millions, rounding, solving multi-step problems, writing numbers through millions CT: data analysis; data representation; data collection, large data set, sorting algorithms	Internet, Computer with video and audio projection system *Printables*: Virginia Mine Production Data 2019, Exploring Virginia Mine ProductioClipboard, Pencil/marker, Group (made) map from Activity 2.1	Annual Production Data 3 -VA Resources - KWL chart (from Activity 3.1) Mineral Baby Mine Production Data 2018 Bardon Mining Data	

3.3 Ask An Expert!:

Next, the students will use their questions from the K-W-L chart to communicate with an expert about the kinds of rocks and minerals found in Virginia.

STEM CT	Materials	Technology Resources	Presentation & Slides
Science: natural resources Math: n/a CT: abstraction; data collection	Internet, Computer with video and audio projection system	3 -VA Resources - KWL chart (from Activity 3.1)	

3.4 Minerals, Rock!:

The students will analyze a Virginia Mineral Map and discuss it after examining it with a partner.

STEM CT	Materials	Technology Resources	Presentation & Slides
Science: natural resources Math: regions are areas of land, interpreting data CT: data analysis; data representation; data collection	Optional - Internet, Computers,Trade Books, Pencils	Virginia Mineral Map Mineral Cart (printable or digital)	3.4 VA Natural Resources Activity Presentation Slides

3.5 Simulations Help Scientists!:

The students will learn about the physical characteristics of land and how it affects water runoff and infiltration, then use **problem solving to analyze** various simulation scenarios.

STEM CT	Materials	Technology Resources	Presentation & Slides
Science: engineering practices Math: units (cm), interpreting graphs CT: simulation; data analysis; data representation	Computer with | projection system	Model My Watershed - Runoff Simulation	

3.6 Where Will My Pebble Go?:

Students will work in pairs to analyze maps and communicate what they have learned about rock and mineral resources in Virginia and how the physical characteristics of Virginia's land are affected by the flow of water through applying algorithmic thinking.

STEM CT	Materials	Technology Resources	Presentation & Slides
Science: natural resources Math: numbers in the millions CT: algorithmic thinking; problem decomposition; parallelization; data analysis; data representation; data collection; abstraction	Computer with projection system	Virginia Slope Map 3 -VA Resources - KWL chart (from Activity 3.1) VA Natural Resources - Pebble Sequence_11 VA Natural Resources - Pebble Sequence_17 ThePebblePart1_480-380 ThePebblePart2_380-280 ThePebblePart3_280-180 ThePebblePart4_80-now	

3.7 My Pebble's Story?:

Students will examine multiple maps and write a story about a pebble's journey from the mountains to the sea by **generalizing and transferring** previous learning through algorithmic thinking to **automate a viable solution** (e.g., story) for their pebble's journey.

STEM CT	Materials	Technology Resources	Presentation & Slides
Science: photosynthesis Math: distance (miles) CT: simulation; data analysis; data collection; data representation; problem decomposition; abstraction; algorithmic thinking	Computer with projection system Printables: Story Planning Sheet	Model My Watershed Virginia Minerals Map (1-4) Virginia Elevation Map Virginia Slope Map Virginia Soil Map Virginia Stream Cover Map	3.7 - VA Resources Presentation Slides

3.1 INTRODUCTION - VIRGINIA NATURAL RESOURCES

Activity 3.1: (40 minutes) Teacher(s) will read The Pebble in my Pocket and connect to natural resources.

MATERIALS

The Pebble in My Pocket (book)	Computer with audio/video projection	3.1 - VA Natural Resources Presentation Slides*
3 -VA Resources - KWL chart (from Activity 3.1)	Pencils (optional)	

* Some of these slides have Peardeck activities in them

TEACHER PREPARATION

Provide paper copies of a 3-VA Resources - KWL chart for students or assign the 3-VA Resources - KWL chart (digital). You could do this whole group, small group, or individual. Add Pear Deck slides (optional).

LESSON PLAN

Read, The Pebble in my Pocket

- Discuss important details from the story.
    - References Meters
    - Weathering and erosion is also addressed

Discuss soil is made up of rocks and minerals (natural resources).

- Show examples of rocks and minerals by viewing the video:
    - Rocks and Minerals for Kids (7m19s)
        - Generation Genius: Rocks and Minerals Video (optional, 15m10s)
        - One Geology: Rocks and Minerals (optional, interactive website)

Students will use a 3 -VA Resources - KWL chart (K) what rock and mineral resources they know are in Virginia.

- Minerals come from the root word, Mine (hint)
- Show them examples of products made from Virginia minerals (slides 1-2). Open slides in Pear Deck* (optional).
- Ask them to predict what rocks and minerals provide specific resources (slide 3)
- Review slides and show them the rocks and minerals in Virginia and what products are created from them (slides 4-15).
- Have students record what they learned on their chart.

Students will use the K-W-L chart to record what they would like to learn (W) about rocks and minerals found in Virginia so they can ask an expert more about the natural resources in the state.

* Some of these slides have Peardeck activities in them

3.2 LOOKING AT THE LOCALS

Activity 3.2: (40 minutes) Next, the students will examine local mine production data.

MATERIALS

Internet	Computer with video and audio projection	3 -VA Resources - KWL chart (from Activity 3.1)
Annual Production Data	Exploring Virginia Mine Production (printable)	Mineral Baby (printable or digital)
Virginia 2019 Mine Production Data (printable)	2018 Bardon Mining Data	

TEACHER PREPARATION

Print *Virginia Mine Production*. Decide to print or project Mineral Baby.

LESSON PLAN

As a whole class, download the Annual Production Data* sheet or use an edited version, Virginia 2019 Mine Production Data (printable). The Virginia Division of Mineral Mining requires each mine to report information about their mines .

- What do you notice about this set of data?
    - It is very large with lots of rows and columns
    - There are county names the students recognize
    - There are different companies
    - There are different years of data
    - The tonnage produced by each mine
- Provide students with the 2019 Virginia Mine Production (printable) and the Exploring Virginia Mine Production (printable). Divide students into groups (no more than 3 per group) to solve the mathematics problems.
    - Problem 1: Give each group at least 15 post-it notes. (A few extra are helpful for if they copy a number incorrectly). Ask the students to write each of the tonnage numbers for Luck Stone on a different post-it. Students can then use their post-it notes to order this large data set from greatest to least.
        - Instead of telling students how to compare/order give them the freedom to figure out a way to order the large group of numbers written on their post-its.
        - As you walk around the room, observe the strategies the students are using to order their numbers. These are their student created sorting algorithms that are going to have similarities to how computers order numbers.
        - Have students share how they ordered the numbers.
            - Some may start by making several piles each with a certain number of digits
            - Some may start with two numbers and find which is higher and lower and then add a third card to the list and continue to add more and more numbers.
            - Some may start by giving each person in the group some of the post-its and doing smaller sorts that then become a larger sort when combined.
    - Problem 2: The computational thinking aspect of this problem is for the student to find the tonnage needed to answer the question on the 2019 Virginia Mine Production Data (printable) which is a table containing a large data set.
        - After groups find the tonnage and then round it to different place values, have them share how they

decided to round differently for each of the place values.

- Ask students to choose one of the rounded numbers to use in an advertisement for the company. Discuss their reasons why. (There is no incorrect answer here).

- Problem 3: The computational thinking aspect of this problem is to have students compare the information on the 2019 Virginia Mine Production (printable) with the 2018 Barton Mining Data. Do not print the 2018 Barton Mining Data and instead have students use this Google Sheet. The 2019 Virginia Mine production (printable) is a data table. But the 2018 Barton Mining Data is a spreadsheet.
  - Compare/Contrast the similarities/differences of these two ways to record data.
  - Students work together to compare large numbers and add and subtract large numbers.
- Problem 4: This problem is a mult-step problem. Ask students where they have seenlarge trucks being weighed? (truck scales on the side of the highway). When the truck first gets to the mine it is empty and when it leaves the mine the new weight is how much the truck weighs with all the rock. (This is called indirect measurement). The numbers in this problem are realistic and were provided by a truck driver who delivers rock as a career.

- Provide students with a copy of the Mineral Baby or project a digital version to discuss
  - Ask them to reflect on the data they see
    - For example, prompt a Number Talk - What do you notice?; What do you wonder?; What is going on in this data visualization?
- Have them add any remaining questions to the K-W-L chart that may come up when analyzing the data sheet or with the Mineral Baby.

*You may choose to simplify the Annual Production Data sheet so that it is easier for your students to read and interpret (e.g., Virginia 2019 Mine Production Data, printable).

3.3 ASK AN EXPERT!

Activity 3.3: (20 minutes) Next, the students will get to ask an expert about the kinds of rocks and minerals found in Virginia.

MATERIALS

Internet	Computer/Projection and audio system	3 -VA Resources - KWL chart (from Activity 3.1)

TEACHER PREPARATION

Connect and communicate with an expert (e.g., Luckstone) to speak to students about the types of minerals and ores found in Virginia and the products made.

- Students will need to be prepared to ask questions.
  - Use items from K-W-L chart to lead discussion
    - Teachers may want to review and vet questions ('What do I Want to Know') before the live video conference.

LESSON PLAN

Students will meet and ask questions to an expert in regards to what they would like to know about rocks and minerals found in Virginia.

- Ask the expert to give an overview of their job (e.g,. education background, soft and hard skills, what a 'day' on the job is like)
- Connect to types of minerals and ores

3.4 MINERALS, ROCK!

Activity 3.4: (25 minutes) The students will discuss a Virginia Mineral Map after examining it with a partner.

MATERIALS

Virginia Mineral Map	3.4 VA Natural Resources Activity Presentation Slides	Internet (optional)
Computers (optional)	Trade Books (optional)	Pencils (optional)
Mineral Cart (printable or digital) (printable)	3.4 - Virginia Minerals By Resource (optional, folder)	Pencils (optional)

TEACHER PREPARATION

Print Virginia Mineral Map for students. Decide to print or project Mineral Cart.

LESSON PLAN

Examine the Virginia Mineral Map as a whole group to make sure students understand how to read it. Reference 3.4 VA Natural Resources Activity Presentation Slides.

- Ask students to report on what they find (e.g., sand is found all over Virginia's regions, but mostly in the coastal plains).
    - Challenge students to find products that are made from some of the unfamiliar rocks and minerals.
    - Provide students with Mineral Cart, or provide them with a printed copy to discuss

3.5 SIMULATIONS HELP SCIENTISTS!

Activity 3.5: (15 minutes) The students will learn about the physical characteristics of land and how it affects water runoff and infiltration.

MATERIALS

Computer with projection system

TEACHER PREPARATION

None.

LESSON PLAN

Go to: Model My Watershed - Runoff Simulation to demonstrate the following:

- The amount of water runoff is a result of the physical characteristics of the land and the amount of water that soaks into the surface.
    - Show runoff and infiltration by changing the *Hydrologic Soil Group and Land Cover*
        - Review what students know about soil (e.g. clay and sand)
            - The surface's ability to hold water is affected by factors such as the percentage of rock in the soil, the proximity to the surface of rock and ground-water, and the degree to which the soil is compacted.
        - If the water does not soak in (infiltrate), it can cause more runoff that can carry sediment and other pollutants.
        - Connect what you learned about water on land coverings and surfaces.

- Discuss how models and simulations can help scientists run experiments
- Discuss and connect that when water flows at high rates of speed, it can cause erosion and flooding of waters (e.g., *Pebble in my Pocket, How Steep Can you Go, The Slope We Live On*).

3.6 WHERE WILL MY PEBBLE GO?

Activity 3.6: (40 minutes) Students will work in pairs to examine maps and share what they have learned about rock and mineral resources in Virginia and how the physical characteristics of Virginia's land are affected by the flow of water.

MATERIALS

Computer with video projection	Virginia Slope Map	3 -VA Resources - KWL chart (from Activity 3.1)
VA Natural Resources - Pebble Sequence_11 (11 events, digital activity)	VA Natural Resources - Pebble Sequence_17 (17 events, digital activity)	ThePebblePart1_ 480-380 (3 events, digital activity)
ThePebblePart2_ 320-280 (3 events, digital activity)	ThePebblePart3_ 280 - 180 (5 events, digital activity)	ThePebblePart4_ 80-now (6 events, digital activity)

TEACHER PREPARATION

Print Virginia Slope Map. Decide how to assign the sequencing activity for the students (e.g., VA Natural Resources - Pebble Sequence_11, VA Natural Resources - Pebble Sequence_17) . Alternatively, when creating a Google Draw template for students, you could add some of the answers into the template to assist students in resequencing

LESSON PLAN

Revisit the story, *A Pebble in My Pocket*

- Use the sequencing activity, *Pebble Sequence**
  - Discuss with the students that the story, Pebble in My Pocket, has been broken down into time periods (e.g., between 480 - 380 million years, there are 3 events to sequence). This is taking the problem of resequencing the story, and breaking it down into smaller parts.
  - Each small group (or you could assign each person in a small group) will be responsible for resequencing the story in a section (i.e. blue, green, purple, orange)
    - Resequencing the whole story into small parts, then working together to complete each part will help us meet our goal quicker (i.e. parallelization)
    - Alternatively, students can resequencing into separate parts of the timeline, so students only have to concentrate on sequencing on their part and not have too many choices.
      - ThePebblePart1_480-380
      - ThePebblePart2_380-280
      - ThePebblePart3_280-180
      - ThePebblePart4_80-now
  - Once the sequencing activity is complete, review the 'timeline'
    - Be sure to point out the the cycle/iteration in each section

- Between years 480-380 and 180 and Now
- What changes occur (i.e., dinosaurs, mammals)?
- How does slope, water, rocks and minerals play a role in the story?

*The sequencing activity is broken into four sections (differentiated) for small learning groups, or whole class groups to complete.

- Students will be given a new map of Virginia's to compare the natural resources to the slope of the land (i.e., Virginia Slope Map)
- Students will use the K-W-L chart to record what they learned (L)
- Answer questions: What are some different rock and mineral resources in Virginia?
- Why are these natural resources so important?
- What ways can rock and mineral resources be used? Conserved?
- How does the land slope affect the runoff of sediment and other pollutants?

3.7 MY PEBBLE STORY

Activity 3.7: (30 minutes) Students will examine multiple maps and write a story about a pebble's journey from the mountains to the sea.

MATERIALS

Story Planning Sheet (printable)	3.7 - VA Resources Presentation Slides	Computer with projection system
Virginia Minerals Map (1-4)	Virginia Elevation Map	Virginia Slope Map
Virginia Soil Map	Virginia Stream Cover Map	

TEACHER PREPARATION

Print Virginia Soil, Elevation, and Stream Cover Maps (or provide digital versions, 3.7 - VA Resources Presentation Slides) and Story Planning Sheet; find examples of bodies of water and landforms in a poster or chart.

LESSON PLAN

Now, use the Model My Watershed to zoom in on Virginia. Use the Hydrologic Soil Group layer. Make observations:

- How does it change across the state of Virginia?
- What do you see near the bigger cities? Why?

Students will be given a Virginia map with various overlays and be instructed to pick a spot (1-4) (digital or print):

- Virginia Minerals Map (1-4)
- Virginia Elevation Map
- Virginia Slope Map
- Virginia Soil Map
- Virginia Stream Cover Map

Students will write a story about how a pebble got to the beach. Students will use the maps to write about their pebble's journey and justify the journey based on the maps.

- Their pebble will start at one location (i.e., 1-4) and end up in Virginia Beach (into their pocket!). Include:
  - Story Planning Sheet
  - Discuss the Writing Checklist for students to use.
    - Details about where the pebble started
    - At least 2 water sources (e.g. stream, lake, river, bay)
    - At least 3 details from the maps to help you tell the story
    - Estimate the distance the pebble will travel during the story in miles (i.e. Google Maps)*
  - Briefly review landforms and examples of bodies of water by using a poster or chart.

* Allow students to use Google Maps to estimate their pebble's journey in miles.

Optional - Use the 3.7 - VA Resources Presentation Slides to provide visual sentence starters to compliment the rubric (see slide content below):

- Where did your pebble start?
  - In the Blue Ridge Mountains, a pebble _____.
  - My pebble's story began not too far from a stream.
  - Once upon a time, a pebble's story began on a big slope.
  - My pebble's story began in Northern Virginia.
- What water sources did your pebble travel through? (name 2)
  - For a short while, my pebble was in Lake Anna.
  - The pebble then traveled down the James River.
  - After coming down from the mountains, my pebble ended up in a stream.
- What details from the maps can you add? (look at each of the maps for information on soil, slope, or elevation) (name 3)
  - As the slope of the land got less, _____.
  - The land got flat, so _____.
  - It was here that my pebble was in a lot of wet soil (i.e. low infiltration)
  - Then my pebble was in _____ (name city or county).
- (optionally) Suggest that students Think about how you can:
  - change your voice volume
  - use voice expression
  - use body movement and actions
  - add in sound effects or props/illustrations
  - use punctuation, pauses and short sentences for effect
  - add in some repetition of particular lines
- (optionally) Suggest that students choose a short piece of the story to focus on:
  - Which words and phrases are powerful? What impact does it have on you as the reader?
    - Similes: like a river of stone
    - Verbs Alliteration: dragging river rushes; dripping; tumbles; rolls
    - Repetition: smaller and smaller cliffs crumble slowly; slowly clear crystals like giant plates
    - Adjectives: smooth; enormous; rounder; smaller; jagged.

EMPOWER

LESSON THREE — PRINTABLES

VIRGINIA NATURAL RESOURCES

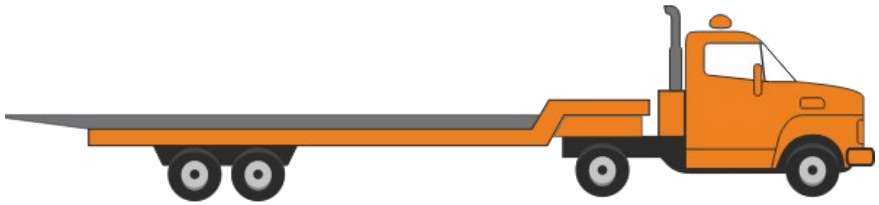
LESSON 3: 2019 VIRGINIA MINE PRODUCTION DATA

COMPANY NAME	MINE NAME	COUNTY	TONNAGE
Bardon, Inc.	King George	King George	0
Bardon, Inc.	Kenson	King George	0
Bardon, Inc.	Hayfield Farm Mine	Caroline	0
Bardon, Inc.	Ashland Plant	Hanover	0
Bardon, Inc.	Rappahannock Farm	King George	820443
Bardon, Inc.	Mattaponi Sand/Grave	King William	0
Bardon, Inc.	Charles City Plant	Charles City	334539
Bardon, Inc.	Hickory Hill Plant	Gloucester	171587
Bardon, Inc.	Fulks Pit	Spotsylvania	221989
Luck Stone Corporation	Charlottesville	Albemarle	820000
Luck Stone Corporation	Fairfax Plant	Fairfax	0
Luck Stone Corporation	Burkeville	Nottoway	640000
Luck Stone Corporation	Rockville Plant	Goochland	2110000
Luck Stone Corporation	Boscobel Plant	Goochland	1530000
Luck Stone Corporation	Richmond Quarry	Richmond City	570000
Luck Stone Corporation	Culpeper Plant	Culpepper	440000
Luck Stone Corporation	Luck Stone - Rivanna	Albemarle	0
Luck Stone Corporation	Leesburg Plant	Loudoun	1980000
Luck Stone Corporation	Goose Creek Plant	Loudoun	890000
Luck Stone Corporation	Bull Run Plant	Loudoun	2490000
Luck Stone Corporation	Spotsylvania Plant	Spotsylvania	1410000
Luck Stone Corporation	Greene Plant	Greene	730000
Luck Stone Corporation	Powhatan Plant	Powhatan	1390000
Luck Stone Corporation	Bealeton Plant	Fauquier	710000
Luck Stone Corporation	Louisa Plant	Louisa	0
Luck Stone Corporation	Caroline Sand & Grav	Caroline	330000
Luck Stone Corporation	Massaponax Plant	Spotsylvania	0
Luck Stone Corporation	Prince Edward Mine	Prince Edward	480000
Martin Marietta Materials, Inc.	Anderson Creek	Goochland	632744
Martin Marietta Materials, Inc.	Doswell Quarry	Hanover	1628679
Martin Marietta Materials, Inc.	ReRed Hill Quarryd Hill Quarry	Albemarle	541578
Martin Marietta Materials, Inc.	Midlothian Quarry	Chesterfield	10693776
Martin Marietta Materials, Inc.	Carmel Church Quarry	Caroline	0

LESSON 3: EXPLORING VIRGINIA MINE PRODUCTION

1) In 2019 Luck Stone reported production tonnage for nineteen mines. (Four of the mines did not produce anything in 2019.) Help Luck Stone by ordering the tonnage for their other fifteen mines in order from greatest to least.

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____
11. _____
12. _____
13. _____
14. _____
15. _____



LESSON 3: **EXPLORING VIRGINIA MINE PRODUCTION**

2) Find the number of tons Martin Marietta Materials, Inc produced at their Midlothian Quarry in 2019.

a. Now let's round the number!

Midlothian Quarry Tons Produced

_____

Round the tons to the:
Nearest million

_____

Nearest hundred-thousand

_____

Nearest ten-thousand

_____

Nearest thousand

_____

b. Martin Marietta wants to report their 2019 tonnage produce in an advertisement. Which of the rounded numbers do you think they should use in their advertisement and why?

_____

_____

_____

_____

_____

_____

_____

_____

_____

LESSON 3: EXPLORING VIRGINIA MINE PRODUCTION

3) Bardon Inc. owns the Rappahannock Farm Mine and wants to figure out if their mine produced more or less tonnage in 2018 compared to 2019. 2018 Bardon Mining Data

   a. Did their production go up or down from 2018 to 2019? _____

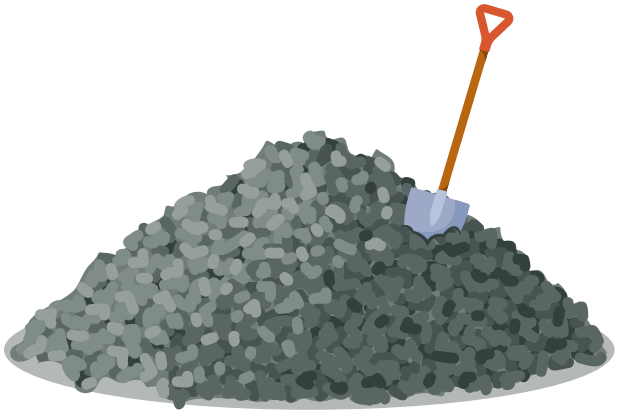
   b. How much did it go up or down? _____

   c. What was the total amount of tonnage they produced if you combine 2018 and 2019?

4) A homeowner has ordered a dump truck load of gravel for their driveway. When the dump truck enters the quarry the truck weighs 23,982 pounds. After the driver picks up the gravel the truck weighs 43,414 pounds.

   a. How many pounds of gravel will be delivered to the homeowner?

   b. Gravel is often sold by the ton. If the cost of the gravel is $35 for each ton and the homeowner needs 10 tons of gravel for their driveway, how much will the gravel cost for the driveway?

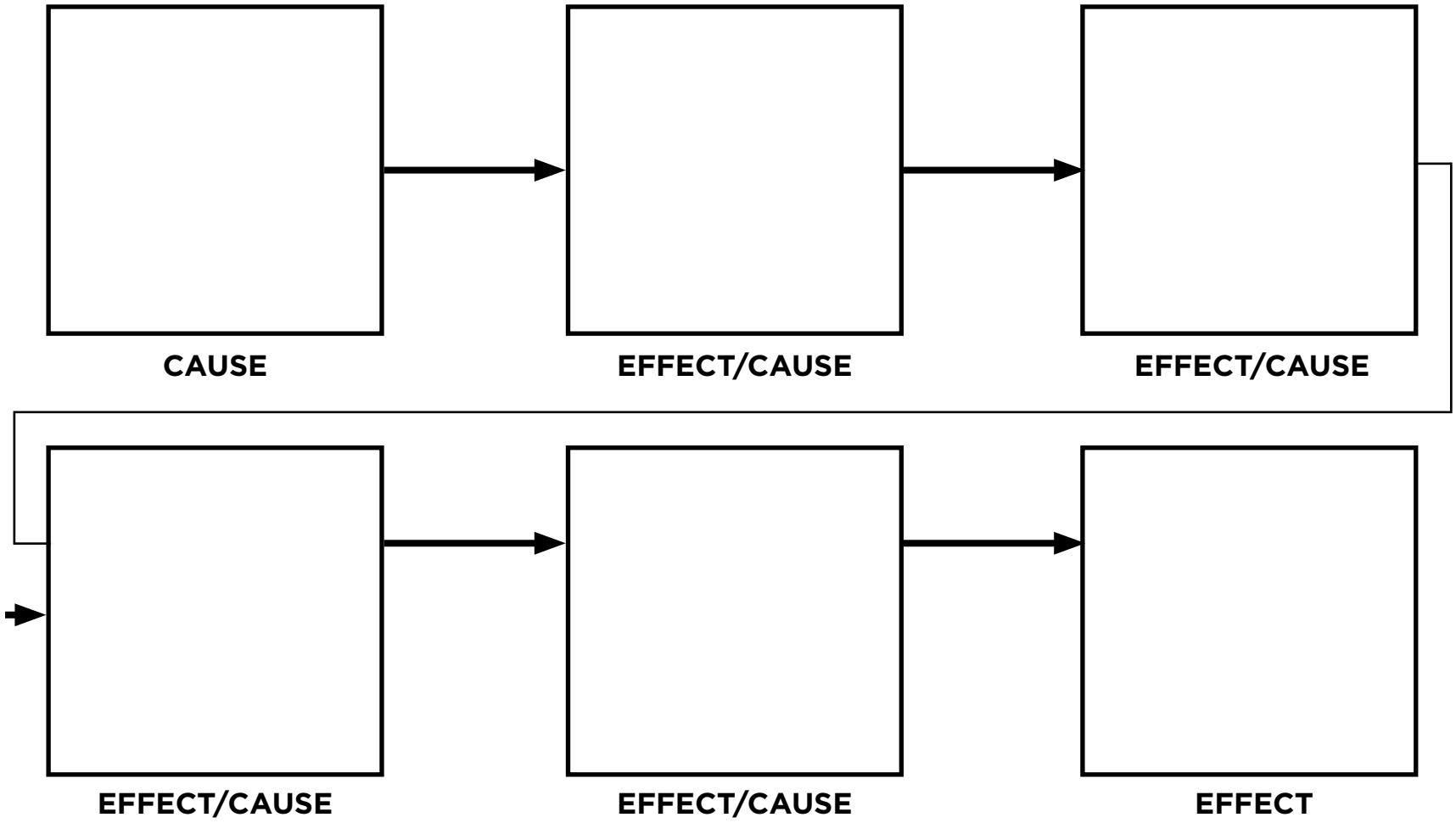


LESSON 3: EXPLORING VIRGINIA MINE PRODUCTION

STORY PLANNING SHEET

Name:

Map section starting point:



LESSON 3: EXPLORING VIRGINIA MINE PRODUCTION

Student Name:_____Date:_____

✓	Did I ...	3	2	1	Teacher Assessment
☐	Include details about where my pebble started.	All	1-2 details were missing	More than 2 details were missing	
☐	Include at least 2 water sources (e.g. stream, lake, river, bay).	All	1 water source was named	Water sources were not clear	
☐	At least 3 details from the maps to help you tell the story.	All	1-2 details were missing	More than 2 details were missing	
☐	Estimate the distance the pebble will travel during your story in miles (i.e. Google Maps).	Number of miles labeled correctly	Has only number or unit	Not clear	
Teacher comments.					**Total Score:**