COASTMETRO

ELEMENTARY MATH PROJECT

Grade 4
Patterning and Algebra
Key Number Concept 1: Increasing & Decreasing Patterns
Sample Week at a Glance

Students have had an array of experiences with creating patterns with a variety of materials since kindergarten. They have created and described increasing patterns in grade 2 and grade 3 and decreasing patterns in grade 3. In primary grades, students have looked at charts and graphs for patterns (e.g., in a calendar or 100 chart). This week at a glance is a suggested first week of exploring patterning in grade 4. There may have been some discussion of patterns when exploring number concepts, including patterns in the 100 chart and the multiplication chart. Students will have worked on concepts of multiplication and division to support number patterns after this first week of formal instruction on patterning.

Monday	**Focus:** creating and describing patterns with a variety of materials and modalities **Before:** Body percussion patterns Teacher uses body percussion moves (stamp foot, pat thighs, clap hands, snap fingers) in both repeating and increasing patterns. For repeating patterns, students join in when they have figured out the core (e.g., clap-snap-clap-pat [vary the length of the core on different examples]). Pause and discuss how they knew when to join in. For increasing patterns, teacher demonstrates the first 3 or 4 terms (e.g., snap-clap, snap-snap-clap-clap, snap-snap-snap-clap-clap-clap) and students repeat the sequence and extend it. Pause and discuss how the pattern changed. Discuss what 'pattern' means and how identifying the pattern and its rule helps continue the pattern. If time allows, invite individual students to be the leader of the patterns. **During:** Math workshop with pattern stations Students engage with prepared stations to explore creating and identifying patterns. Have enough stations so each station has 4-6 students at a time. Stations could include: - Creating patterns with pattern blocks, loose parts, or natural materials (with prompts such as "create a repeating pattern with 4 items as its core", "create a pattern that increases (grows)", "create a pattern that decreases (shrinks)") and documenting them on paper in pictures - Describing and extending visual patterns such as those from Fawn Nguyen's Visual Patterns website (https://www.visualpatterns.org/); print out images from the website and provide paper and pencils crayons for students to record their descriptions and extension of patterns

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Poems with a variety of rhyming patterns; students represent the patterns with materials (e.g., pattern blocks or loose parts), pictures, and/or symbols
Body percussion patterns - students work in pairs in the same manner as the ‘before’ part of this lesson; provide prompts to create repeating, increasing, and decreasing patterns
Number patterns - provide cards with different number patterns (e.g., and paper and pencils for students to record a rule for the pattern and to extend the pattern; provide cards with rules for students to translate to a number pattern (e.g., “start at 3 and add 2 each time”); provide prompts for students to create their own number pattern (e.g., “create a decreasing pattern starting at 65 and describe the rule you used to make the pattern”)

Students might only experience 2 or 3 stations during this lesson. Stations can continue to be available to students throughout the week (and further) to engage with during choice times.

After: Invite students to share the patterns they created or described in the stations. Teacher facilitates class discussion about what students noticed about the patterns they created and ones created by classmates. Incorporate vocabulary such as repeating pattern, increasing pattern, decreasing pattern, term, core, and extend in the discussion.

Formative assessment is important on this first day for the teacher to gauge the students’ incoming understanding of patterns. Look for students who rely on creating repeating patterns and those who have a strong understanding of how to describe and create increasing and decreasing patterns. A checklist with student names and these three types of patterns, ‘create’, ‘describe’, and ‘extend’ on a clipboard may help track what you notice through observations, conversations, and student work (see image below). You may not collect evidence for each section for every student and you may collect evidence over the week if the stations are offered another time. Adjust upcoming lessons and plan for whole class, small group, or individual instruction based on what is observed today.

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<tr><th>Name</th><th colspan="3">Repeating Patterns</th><th colspan="3">Increasing Patterns</th><th colspan="3">Decreasing Patterns</th></tr>
<tr><td></td><td>Create</td><td>Describe</td><td>Extend</td><td>Create</td><td>Describe</td><td>Extend</td><td>Create</td><td>Describe</td><td>Extend</td></tr>
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<td>Tuesday</td>
<td>Focus: increasing and decreasing visual patterns

This lesson is designed to take place outdoors but can be modified to be done indoors with classroom materials.
Before: Provide books, printouts of (in plastic sleeves to protect against weather), or digital links (as technology is available) to the works of sculpturists who work in nature, such as James Brunt or Andrew Goldsworthy. In small groups, students look at the images and describe patterns they see in</td>
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	the artwork. Alternatively this can be done with one image at a time for a whole group discussion. **During:** Play - students work in pairs or groups of 3 to use natural materials from the surrounding area to create sculptures (may be flat) that utilize patterning. They describe the pattern to each other and to the teacher as needed. Debrief - allow groups to visit the sculptures made by others and describe the patterns they see. Bring the whole class together to discuss the patterns they saw. Specifically draw students' attention to sculptures that use increasing or decreasing patterns. Replay - in the same or different groups, students engage in creating new sculptures that specifically use increasing and/or decreasing patterns **After:** Have volunteer groups describe the pattern(s) in their sculpture and confirm with the whole class whether the sculpture illustrates an increasing or decreasing pattern. Discuss challenges and successes in using increasing and decreasing patterns in the students' sculpture art. *Formative assessment - you may wish to continue observing, looking at the products, and having conversations and use the chart suggested in Monday's lesson to track what you are learning about students' understanding of patterns.*
Wednesday	**Focus:** describing, representing (pictorial and symbolic), and extending increasing and decreasing patterns **Before:** Using Fawn Nguyen's website, Visual Patterns (https://www.visualpatterns.org/), choose a visual pattern (such as the one pictured below) to project for a class discussion. Discuss how the pattern grows, how students would build the pattern with classroom materials, and how they would extend to create the next two elements..  *(image from Visual Patterns website)* **During:** Present students with the Squares Upon Squares task from Youcubed https://www.youcubed.org/tasks/squares-upon-squares/ as a handout. Students work individually or in pairs to explore how the pattern can be built and how they would describe it. Refer to link for task instructions. **After:** Debrief Squares Upon Squares task in a class discussion. On a projected surface, allow students to demonstrate their approach for increasing the pattern. Discuss how many squares the next element would have and predictions for the 10th element.

Thursday	**Focus:** representing visual patterns in T-charts **Before:** Visual Patterns discussion - choose a visual pattern from Faye Nguyen's website (https://www.visualpatterns.org/) or other source and project for a class discussion. Ask students to describe how the pattern is changing and what the next two terms would look like. Can they predict what the 10th term will look like? **During:** Using the visual pattern from the 'Before' part of the lesson, demonstrate how the elements can be translated to a T-chart. Discuss how putting the pattern into a T-chart can support identifying the pattern rule and extending the pattern. Do the same by revisiting the elements from the Squares Upon Squares task from Wednesday's lesson. Print a number of Visual Patterns from Faye Nguyen's site - working in pairs, students represent these in T-charts. Provide a variety of materials (tiles, pattern blocks, paper and pencil crayons, natural materials, etc.) and have students (individually or in pairs) create and record their own increasing and decreasing patterns and record the terms in a T-chart, describe the rule in words, and continue the T-chart for three terms. Have students look at another student's pattern and create the T-chart, including extending it by three terms. **After:** Exit ticket - provide students with a new visual pattern and ask them to describe the rule for extending the pattern, to extend the pattern visually for 2 more terms, and to translate the pattern to a T-chart. *Formative Assessment: use the exit tickets, observations, and conversations to gather evidence of understanding of increasing and decreasing patterns, translation of patterns to T-charts, and ability to extend patterns. Plan focus for small group and one-to-one instruction for Friday.*
Friday	**Focus:** introduction to increasing and decreasing number patterns, review and exploring pattern stations, small group and 1-1 instruction **Before:** Count Around the Circle routine from Number Sense Routines: Building Mathematical Understanding Every Day in Grades 3-5 (Jessica Shumway, Pembroke). Use a variety of increasing and decreasing patterns (e.g., "start at 16 and go up by 3 each time", "start at 90 and decrease by 5 each time") and have students predict what the last student in the circle might say. **During:** Set up the stations that were introduced on Monday and allow students to continue to explore the stations. While students work with the stations, pull small groups and individual students based on formative assessment data for instructions and review of increasing and decreasing visual patterns and translating these to T-charts. **After:** Math games - time for math games to reinforce and extend understanding of basic facts of addition, subtraction, multiplication, division and larger number operations. This may be established as a weekly routine

	throughout the year.

Following this set of lessons, students will continue to explore increasing and decreasing number patterns. They will also explore how patterns are found and can be described in graphs, tables, and charts (e.g., 100 chart, multiplication chart, calendars, number lines), including looking at graphs, tables and charts related to content in science and social studies.