

**CODE/MOE/UOIT Makerspaces Project**

**Lesson Plan: Grade 8: Mathematics—Number Sense—Coding**

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| **Lesson Objectives:**  Be able to logically represent your thinking to solve a problem.  **Mathematics Curriculum Expectations:**  Overall:  -Solve problems involving whole numbers, decimal numbers, fractions, and integers, using a  variety of computational strategies  Specific:  -Solve multi-step problems arising from real-life contexts and involving whole  numbers and decimals, using a variety of tools (e.g., graphs, calculators) and strategies (e.g., estimation, algorithms)  Learning Skills: organization, independent work, initiative, self-regulation  Math Process Expectations: problem solving, reasoning and proving, selecting tools and computational strategies, representing | |
| **Learning Goals:**  “We are learning to…”  code in Scratch models of our thinking to complete a task. | **Success Criteria:**  “We will be successful when…”  we can get our programs to work without errors and represent a math calculation. |
| **Lesson Overview:**  After becoming familiar with Scratch, students will read code, copy code and write code. | |
| **Materials and Technology:**  Chromebook or computer. | |
| **Student Accommodations/Modifications:**  If accommodations are needed students could pair up with each other to create their calculator. | **Lesson will be differentiated by:**   * **Content, specifically:** * **Process, specifically:** * **Product, specifically:** Students will choose what math formula they want to represent. * **Environment, specifically:** |
| **MINDS ON: Getting Started** | |
| During this phase, the teacher may:  • activate students’ prior knowledge;  • engage students by posing thought-provoking questions;  • gather diagnostic and/or formative assessment data through observation and questioning;  • discuss and clarify the task(s). | During this phase, students may:  • participate in discussions;  • propose strategies;  • question the teacher and their classmates;  • make connections to and reflect on prior learning. |
| Describe how you will introduce the learning activity to your students. What key questions will you ask? How will you gather diagnostic or formative data about the students’ current levels of understanding? How will students be grouped? How will materials be distributed?  This lesson is most appropriate if students are already familiar with Scratch Coding.  Day 1   1. Share with students the handout ‘Decoding Coding’ (Appendix A). 2. Have students individually identify what the lines of code mean and how they know it. | |
| **ACTION: Working on it** | |
| During this phase, the teacher may:  • ask probing questions;  • clarify misconceptions, as needed, by redirecting students through questioning;  • answer students’ questions (but avoid providing a solution to the problem);  • observe and assess;  • encourage students to represent their thinking concretely and/or pictorially;  • encourage students to clarify ideas and to pose questions to other students. | During this phase, students may:  • represent their thinking (using numbers, pictures, words, manipulatives, actions, etc.);  • participate actively in whole group, small group, or independent settings;  • explain their thinking to the teacher and their classmates;  • explore and develop strategies and concepts. |
| Describe the task(s) in which your students will be engaged. What misconceptions or difficulties do you think they might experience? How will they demonstrate their understanding of the concept? How will you gather your assessment data (e.g., checklist, anecdotal records)? What extension activities will you provide?  Day 2   1. Return the ‘Decoding Coding’ page and have student create the Sales Tax program by copying the code off the page. 2. Students may need some support understanding the calculation line to make sure they understand how to add each layer so the calculation is completed in the correct order.   Day 3   1. Have students choose a math formula of their choice and write the code to create their own math calculator. 2. Once completed have students ‘share’ the program and hand-in the link to Google Classroom.   Extension   1. Can you write a program that allows the user to choose the operation or formula they want to use? 2. Can you write the program so it will represent the answer as well as show the number answer? | |
| **CONSOLIDATION: Reflecting and Connecting** | |
| During this phase, the teacher may:  • bring students back together to share and analyse strategies;  • encourage students to explain a variety of learning strategies;  • ask students to defend their procedures and justify their answers;  • clarify misunderstandings;  • relate strategies and solutions to similar types of problems in order to help students generalize concepts;  • summarize the discussion and emphasize key points or concepts. | During this phase, students may:  • share their findings;  • use a variety of concrete, pictorial, and numerical representations to demonstrate their understandings;  • justify and explain their thinking;  • reflect on their learning. |
| How will you select the individual students or groups of students who are to share their work with the class (i.e., to demonstrate a variety of strategies, to show different types of representations, to illustrate a key concept)? What key questions will you ask during the debriefing?  Debriefing   1. What parts were challenging? What parts were easy? 2. When faced with a challenge how did you solve it? 3. Could you write a similar program, but with less commands? (Can you be more efficient in your coding?) 4. What would you like to learn how to do?   Process may be assessed through observations/conversations and anecdotal notes. Product may be assessed through a rubric or checklist. | |

**Appendix A**

**Decoding Coding**

What does the following code mean in Scratch? Be specific and explain how you know. 