Programs to Code and (Ontario) Mathematics Curriculum Expectations (Grades 7/8)

All programs can be found at http://techthings.ca/Coding/elementaryprograms/ProgramInventory.html unless otherwise indicated.

Program/Description	Gr	Curriculum Expectation	Differentiation		
			Red	Yellow	Green
Introductory Tutorials					
Adding Two Numbers – This program will ask the user for two numbers, adds them together and outputs the answer.	6-8	N/A – A simple program to get students accustomed to math operations and variables in Scratch	Video and Algorithm	Algorithm	Give Program Description
Odd or Even – Program asks the user for a number and outputs whether the number is odd or even.	6-8	N/A – Teaches Modulus Division, which is required for many calculations in computer science (e.g. median)	Video and Algorithm	Algorithm	Give Program Description
Guessing Game with Random Number – The program asks the user for a number between 1 and 10. It then checks if the guess is equal to the number and tells the user if it's correct or not. Options: let user guess more than once (loop), tell user if the number is greater than or less than.	6-8	N/A – Program that teaches many computer science concepts – random numbers, loops, decision structures (if… then…), variables	Video and Algorithm	Algorithm	Give Program Description

Program/Description	Gr	Curriculum Expectation	Differentiation		
			Red	Yellow	Green
Measurement					
Kilograms/Grams Converter – The program will ask the user if they want to convert from Kg to g or g to Kg, will get the value from the user and then will convert it to the desired unit.	7	– solve problems that require conversion between metric units of measure (e.g., millimetres and centimetres, grams and kilograms, millilitres and litres) (***Sample problem:*** At Andrew's Deli, cheese is on sale for $11.50 for one kilogram. How much would it cost to purchase 150 g of cheese?);	Video and Algorithm	Algorithm	Give Program Description
Unit Conversion (Basic) – This program will ask the user for the number metres and convert this value to centimetres	6	– solve problems requiring conversion from larger to smaller metric units (e.g., metres to centimetres, kilograms to grams, litres to millilitres)	See Grade 6 Assignment – Coding Unit Conversions		
24 Hr Clock to 12 Hr Clock Converter – This program will ask the user of the hour on a 24 hour clock and convert it to the hour on a 12 hour clock time, along with whether the hour is AM or PM	5	-solve problems involving the relationship between a 12-hour clock and a 24-hour clock (e.g., 15:00 is 3 hours after 12 noon, so 15:00 is the same as 3:00 p.m.)	See Grade 5 – Applying a Problem Solving Model to a Program		

Program/Description	Gr	Curriculum Expectation	Differentiation		
			Red	Yellow	Green
Data Management and Probability					
Coding a Coin Flipper – Probability Simulator This program simulates flipping a coin to determine the outcome after several flips. – Example by B. Aspinall	8 7	***Probability*** By the end of Grade 8, students will: – compare, through investigation, the theoretical probability of an event (i.e., the ratio of the number of ways a favourable outcome can occur compared to the total number of possible outcomes) with experimental probability, and explain why they might differ (***Sample problem:*** Toss a fair coin 10 times, record the results, and explain why you might not get the predicted result of 5 heads and 5 tails.); – represent in a variety of ways (e.g., tree diagrams, tables, models, systematic lists) all the possible outcomes of a probability experiment involving two independent events (i.e., one event does not affect the number cube and spin a spinner that is equally divided into four different colours?); – perform a simple probability experiment involving two independent events, and compare the experimental probability with the theoretical probability of a specific outcome (***Sample problem:*** Place 1 red counter and 1 blue counter in an opaque bag. Draw a counter, replace it, shake the bag, and draw again. Compare the theoretical and experimental probabilities of drawing a red counter 2 times in a row.).	Video		Give Program Description Extend after to try something with Dice

Mean, Median, Mode This is a series of three tutorials… The program will determine the mean, median and mode given a series of numbers. – Example by B. Aspinall	7 8	- determine, through investigation, the effect on a measure of central tendency (i.e., mean, median, and mode) of adding or removing a value or values (e.g., changing the value of an outlier may have a significant effect on the mean but no effect on the median) (***Sample problem:*** Use a set of data whose distribution across its range looks symmetrical, and change some of the values so that the distribution no longer looks symmetrical. Does the change affect the median more than the mean? Explain your thinking.); – determine, through investigation, the appropriate measure of central tendency (i.e., mean, median, or mode) needed to compare sets of data (e.g., in hockey, compare heights or masses of players on defence with that of forwards);	*Video Challenging		Program Description

Program/Description	Gr	Curriculum Expectation	Differentiation		
			Red	Yellow	Green
Number Sense and Numeration					
Decimal to Binary Program – Ask the user to enter a number between 1 and 16. Convert the number to Binary with 8 bits shown (e.g. 16 would be 00001000) NOTE: Teacher will need to teach Decimal and Binary Number systems first (see Resource)	8	– express repeated multiplication using exponential notation (e.g., $2 \times 2 \times 2 \times 2 = 2^4$); – represent whole numbers in expanded form using powers of ten (e.g., $347 = 3 \times 10^2 + 4 \times 10^1 + 7$);	Video and Algorithm	Algorithm	Give Program Description
Perfect Squares – Ask the user to enter a number. The program will then determine and output whether it is a perfect square or not.	7	– estimate, and verify using a calculator, the positive square roots of whole numbers, and distinguish between whole numbers that have whole-number square roots (i.e., perfect square numbers) and those that do not (***Sample problem:*** Explain why a square with an area of 20 cm^2 does not have a whole-number side length.). – represent perfect squares and square roots, using a variety of tools (e.g., geoboards, connecting cubes, grid paper);	Video and Algorithm	Algorithm	Give Program Description
Sale Price and Tax Calculator – The program asks the user the price, percentage off. It then outputs the subtotal (sale price) and the total including taxes.	8	– solve problems involving percent that arise from real-life contexts (e.g., discount, sales tax, simple interest) (***Sample problem:*** In Ontario, people often pay a provincial sales tax [PST] of 8% and a federal sales tax [GST] of 7% when they make a purchase. Does it matter which tax is calculated first? Explain your reasoning.);	Video and Algorithm	Algorithm	Give Program Description
Unit Rates Comparison – The program will ask the user for the price of the first product and the number of items included, the price of the second product and the number of items included. It will then determine the unit price for both and tell the user which is the better deal.	6/7	– solve problems involving the calculation of unit rates (***Sample problem:*** You go shopping and notice that 25 kg of Ryan's Famous Potatoes cost $12.95, and 10 kg of Gillian's Potatoes cost $5.78. Which is the better deal? Justify your answer.).	Video & Algorithm	Algorithm	Give Program Description

	8	– solve problems involving rates (***Sample problem:*** A pack of 24 CDs costs $7.99. A pack of 50 CDs costs $10.45. What is the most economical way to purchase 130 CDs?).			
Unit Rate Calculator – This program will ask the user for the price and the number of items. It will then calculate and output the unit rate.	6	– represent relationships using unit rates (Sample problem: If 5 batteries cost $4.75, what is the cost of 1 battery?).	See Grade 6 Assignment – Coding Unit Rates		
Years to Hours Converter – This program will ask the user for their age in years and convert it to hours.	6	– solve problems that arise from real-life situations and that relate to the magnitude of whole numbers up to 1 000 000 (Sample problem: How would you determine if a person could live to be 1 000 000 hours old? Show your work.);	See Grade 6 Assignment – Magnitude of Numbers		
Litres of Blood Pumped Over a Given Amount of Time – This program will ask the user for the number of days and determine the amount of blood their heart has pumped over that time period.	6	– solve problems that arise from real-life situations and that relate to the magnitude of whole numbers up to 1 000 000 (Sample problem: How would you determine if a person could live to be 1 000 000 hours old? Show your work.);	See Grade 6 Assignment – Magnitude of Numbers		

Program/Description	Gr	Curriculum Expectation	Differentiation		
			Red	Yellow	Green
Geometry and Spatial Sense					
Equilateral Triangle – The program will have a sprite draw an equilateral triangle. *Example by: D. Lanovaz*	7 8	– identify, through investigation, the minimum side and angle information (i.e., side-side-side; side-angle-side; angle-side-angle) needed to describe a unique triangle (e.g., "I can draw many triangles if I'm only told the length of one side, but there's only one triangle I can draw if you tell me the lengths of all three sides."); – determine, through investigation using a variety of tools (e.g., dynamic geometry software, concrete materials, protractor) and strategies (e.g., paper folding), the angle relationships for intersecting lines and for parallel lines and transversals, and the sum of the angles of a triangle; Note: Total outside angles – need to be 360, all three sides the same, all three angles the same (interior 60, 60,60 and exterior 120, 120, 120)	Video		Program Description
Pythagorean Theorem The program will return the Hypotenuse (c) using the Pythagorean Theorem - Example by B. Aspinall	8	– determine the Pythagorean relationship, through investigation using a variety of tools (e.g., dynamic geometry software; paper and scissors; geoboard) and strategies; – solve problems involving right triangles geometrically, using the Pythagorean relationship;	Video		Program Description
Area of a Trapezoid This program will obtain the lengths and height of the trapezoid from the user and output the area. - Example by B. Aspinall	7	– solve problems involving the estimation and calculation of the area of a trapezoid;	Video		Program Description

Program/Description	Gr	Curriculum Expectation	Differentiation		
			Red	Yellow	Green
Geometry and Spatial Sense					
Patterns In this program, a growing pattern to determine the number of tiles in the "nth" figure will be determined - Example by B. Aspinall		– compare pattern rules that generate a pattern by adding or subtracting a constant, or multiplying or dividing by a constant, to get the next term (e.g., for 1, 3, 5, 7, 9, …, the pattern rule is "start at 1 and add 2 to each term to get the next term") with pattern rules that use the term number to describe the general term (e.g., for 1, 3, 5, 7, 9, …, the pattern rule is "double the term number and subtract 1", which can be written algebraically as $2 \times n - 1$) (***Sample problem:*** For the pattern 1, 3, 5, 7, 9, …, investigate and compare different ways of finding the 50th term.).	Video		Program Description
Basic Patterns – This program will ask the user for the number of cats "Cindy" will draw each day. It will then output the number of cats each day for five days.		– extend, describe, and create repeating, growing, and shrinking number patterns (e.g.,"I created the pattern 1, 3, 4, 6, 7, 9, ... I started at 1, then added 2, then added 1, then added 2, then added 1, and I kept repeating this."); – connect each term in a growing or shrinking pattern with its term number (e.g., in the sequence 1, 4, 7, 10, ..., the first term is 1, the second term is 4, the third term is 7, and so on), and record the patterns in a table of values that shows the term number and the term; – create a number pattern involving addition, subtraction, or multiplication, given a pattern rule expressed in words (e.g., the pattern rule "start at 1 and multiply each term by 2 to get the next term" generates the sequence 1, 2, 4, 8, 16, 32, 64, ...)	See Grade 4 Assignment – Coding Patterns		
Pattern – Doubling - This program codes a pattern that doubles the number of pet rabbits (starting at 2) that "Roger" has every month.		– extend, describe, and create repeating, growing, and shrinking number patterns (e.g.,"I created the pattern 1, 3, 4, 6, 7, 9, ... I started at 1, then added 2, then	See Grade 4 Assignment– Coding Patterns		

		added 1, then added 2, then added 1, and I kept repeating this."); – connect each term in a growing or shrinking pattern with its term number (e.g., in the sequence 1, 4, 7, 10, ..., the first term is 1, the second term is 4, the third term is 7, and so on), and record the patterns in a table of values that shows the term number and the term; – create a number pattern involving addition, subtraction, or multiplication, given a pattern rule expressed in words (e.g., the pattern rule "start at 1 and multiply each term by 2 to get the next term" generates the sequence 1, 2, 4, 8, 16, 32, 64, ...)	

Program/Description	Gr	Curriculum Expectation	Differentiation		
			Red	**Yellow**	**Green**
Quiz Game – Make a quiz game that asks the user a series of questions on a topic and checks if the user enters the correct answer for each question. Determine the user's total points, score, percentage correct.	6-8	Cross-Curricular *This is a large program. Topics include lists (like arrays), counters, loops, join (concatenation)	Videos		Program Description
EtchaScratch –Sprite can be moved with arrows, when gets to edge of screen it stops, draws as the sprite moves around (like Etchasketch)	6-8	A little bit of Geometry (angles, direction) *Topics include:* Moving sprite with keys pressed, repetition, selection, pen down, angles (for direction)			