Grade 9 Mathematics Research Project
TDSB/OISE

Coding Workshop 3

Please sign in:

bit.ly/oisetdsbday3attendance

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Land Acknowledgement

We acknowledge the land we work on at the University of Toronto; and remember that, for thousands of years, it has been the traditional land of the Huron-Wendat, the Seneca, and the Mississaugas of the Credit. Today, this meeting place is still the home to many Indigenous people from across Turtle Island and we are grateful to have the opportunity to work on this land.

Agenda

- Welcome
- Review of Coding from Session #2
- Spiral or Sprinkle in Coding
- While/For Loops
- Coding Practice
- Focus Group Conversations
- Concluding remarks

Review of Coding from Session #2

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Warmup

Create **STEPS** for the following coding question:

Input two numbers, create a program to check which number is larger.

Warmup

Input two numbers, create a program to check which number is larger.

STEPS

1. Input two numbers into the program.
2. If the first number is larger than the second number say: “The first number is larger than the second.”
3. If the first number is equal to the second number then say: “The first and second number are equal.”
4. If not either of the cases above, then say: “The second number is larger than the first number.”

Warmup

Create **PSEUDOCODE** for the following coding question:

Input two numbers, create a program to check which number is larger.

Warmup

Input two numbers, create a program to check which number is larger.

PSEUDOCODE

1. Input number one and input number two.
2. If number one is greater than number two

   Output: “Number one is greater than number two.”
3. Elif number one is equal to number two

   Output: “Number one and number two are equal.”
4. Else

   Output: “Number two is greater than number one.”

Warmup

Create **CODE (on Google Colab)** for the following coding question:

Input two numbers, create a program to check which number is larger.

Login to Google Colaboratory:

https://colab.research.google.com/

If Statements (Conditional Statements) in Python

- Equals: a == b
- Not Equals: a != b
- Less than: a < b
- Less than or equal to a <= b
- Greater than: a > b
- Greater than or equal to: a >= b
- Returns True if both statements are true: a<5 and a<10
- Returns True if one of the statements is true: a<5 or a<4

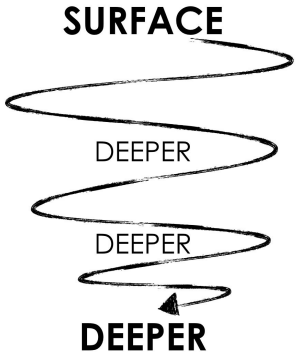
Activity

There are different questions from various strands around the room.

Instructions:

1. Walk around the room and choose a question that speaks to you.
2. Work together with those who have chosen the same question to create the STEPS, PSEUDOCODE, and CODE using Google Colab.
3. You can move on to complete more than one question if time allows.

Resources for you
& Time to Spiral or Sprinkle in Coding!



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Resources

- https://shorturl.at/BGPQ1

Approach 1: Spiraling in Coding

- https://www.dcp.edu.gov.on.ca/en/g9-sample-course-plans/scp#spiralling

Cycle 1 **Connections to prior learning and introduction to mathematical concepts from the course.**	**Cycle 2** **Introduction to mathematical concepts from the course and applications of mathematical concepts from Cycle 1.**	**Cycle 3** **Introduction to mathematical concepts from the course and applications of mathematical concepts from Cycles 1 and 2.**	**Cycle 4** **Consolidation of mathematical concepts from the course.**
Cluster 1: Types of Numbers and Applications of Integers in Real Life **Students will:** • **research a number concept** • **make connections between different types of numbers** • **solve problems involving integers** **B1.1, B1.2, B3.1** **Possible connections to B1.3, E1.1**	Cluster 1: Relationship of Numbers and their Application in Measurement Systems Students will: • develop an understanding of density, infinity and limit • apply an understanding of positive fractions • solve problems involving different measurement systems B1.3, B3.2, B3.4, E1.3 Possible connection to E1.1	Cluster 1: Geometric Designs and Measurement Problems Students will: • research a geometric concept or a measurement system • apply understanding of solving equations and operations with positive rational numbers when solving problems involving geometric designs and measurements E1.1, C1.5, B3.4, E1.2, E1.5, E1.6	Cluster 1: Application of Number and Algebra to Solve Problems Students will: • pose and solve problems involving rates, percentages, and proportions and make connections to financial literacy • simplify numeric expressions, involving rational bases and integral exponents • solve problems involving the simplification of algebraic expressions and the solving of equations with rational numbers • solve problems involving measurement B3.5, F1.3, B2.1, B2.2, C1.4, C1.5, E1.4 Possible connection to E1.3
Cluster 2: Relations in Real life **Students will:** • **create algebraic expressions to generalize relationships** • **solve equations involving integers** • **represent linear relations that model real-life situations, and solve related problems** • **make connections to proportional relationships** • **make connections to financial literacy** **C1.2, C1.5, C3.2, B3.1, B3.5, F1.1**	Cluster 2: Patterning and Applications of Linear and Non-Linear Relations Students will: • develop an understanding of powers with integral bases and exponents and make connections to algebraic expressions • compare and simplify algebraic expressions • compare the shapes of graphs of linear and non-linear relations that model real-life situations, and make connections to powers • make connections to appreciation and depreciation B2.1, B2.2, C1.3, C1.4, C3.1 F1.2 Possible connection to C1.5	Cluster 2: Characteristics of Linear and Non-Linear Relations Students will: • research an algebraic concept • solve real-life problems involving pairs of linear relations • compare characteristics of linear and non-linear relations • determine the equations of lines • solve problems involving rational numbers, including those involving linear relations C1.1, C3.3, C4.1, C4.4, B3.3, B3.4	Cluster 2: Connections Between Various Relations Students will: • graph equations that have been defined as well as their associated inequalities • translate the line defined by y = ax • represent and analyse data involving two-variables C4.2, C4.3, D1.3 Possible connection to C4.4
Cluster 3: Real-life Applications of Data **Students will:** • **develop an understanding of big data** • **analyse data involving one-variable connected to financial literacy** • **apply operations of integers and decimal numbers** **D1.1, D1.2, F1.1, B3.1** **Possible connection to B3.5**	Cluster 3: Data and Mathematical Modelling Students will: • represent and analyse data involving one-variable and apply proportional reasoning • identify examples of mathematical modelling used in real-life • apply an understanding of operations to modify budgets displayed in various ways, including in a circle graph, and in a spreadsheet • apply the process of mathematical modelling to solve a problem of interest related to data involving one-variable D2.1, B3.5, D2.2, D2.3, D2.4, D2.5	Cluster 3: Mathematical Modelling Students will: • apply the process of mathematical modelling to solve a problem of interest related to measurement and/or linear relations D2.2, D2.3, D2.4, D2.5 Possible connections to E1.4, C3.2, C3.3	Cluster 3: Mathematical Modelling Students will: • apply the process of mathematical modelling to solve a problem of interest, applying their understanding of the mathematical concepts in the course D2.2, D2.3, D2.4, D2.5
Suggested Timing: **20 – 25 hours**	Suggested Timing: 25 – 30 hours	Suggested Timing: 25 – 30 hours	Suggested Timing: 20 – 25 hours

Approach 2: Sprinkle in Coding

- https://www.dcp.edu.gov.on.ca/en/g9-sample-course-plans/scp

STRAND B: Number B *By the end of this course, students will:*
B1. demonstrate an understanding of the development and use of numbers, and make connections between sets of numbers
Development and Use of Numbers
B1.1 research a number concept to tell a story about its development and use in a specific culture, and describe its relevance in a current context
Number Sets
B1.2 describe how various subsets of a number system are defined, and describe similarities and differences between these subsets
B1.3 use patterns and number relationships to explain density, infinity, and limit as they relate to number sets
B2. represent numbers in various ways, evaluate powers, and simplify expressions by using the relationships between powers and their exponents
Powers
B2.1 analyse, through the use of patterning, the relationship between the sign and size of an exponent and the value of a power, and use this relationship to express numbers in scientific notation and evaluate powers
B2.2 analyse, through the use of patterning, the relationships between the exponents of powers and the operations with powers, and use these relationships to simplify numeric and algebraic expressions

sprinkle

sprinkle

Spiral or Sprinkle in Coding

- With your school team or table team, look through the resources and find (or create) one activity that you can “sprinkle” or integrate into your current MTH1W plan (before April 25)

https://shorturl.at/BGPQ1

Assignment for April 25

- 1) For Session #4 (April 25), please bring your Grade 9 Mathematics Plans
- 2) In our next session, there will be time for teachers to share activities that they have done with their own students regarding coding. If you have anything you would like to share, please bring it to Session #4 (April 25).

‘Crowdsource’ Coding Tool with Greg

- We welcome Greg to introduce the ‘crowdsource’ coding tool

- https://docs.google.com/spreadsheets/d/14xp9KJZm-ZNfSGOfe0HLuS5cQwUPgTg-YJjz0OhjLXg/edit#gid=1291704165

Enter to Win Wipebook Flipchart

- https://wipebook.com/Knb314

Please return in 15 minutes.
Enjoy the break!

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Repetition in Computer Programs (While/For Loops)

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Coding and Mathematics

- Coding can involve **repeating procedures** based on certain conditions

Details of data usage on Rogers network

	Date		Rate prd	Volume (KB)	Total charges ($)
1	Sat	Jun 12	OD	31.00	0.00
2	Sun	Jun 13	OD	4340.00	0.00
3	Mon	Jun 14	OD	2761.00	0.00
4	Tue	Jun 15	OD	115.00	0.00
5	Wed	Jun 16	OD	1961.00	0.00
6	Thu	Jun 17	OD	1219.00	0.00
7	Fri	Jun 18	OD	2050.00	0.00
8	Sat	Jun 19	OD	425.00	0.00
9	Sun	Jun 20	OD	838.00	0.00
10	Mon	Jun 21	OD	971.00	0.00
11	Tue	Jun 22	OD	480.00	0.00
12	Wed	Jun 23	OD	1311.00	0.00
13	Fri	Jun 25	OD	5631.00	0.00
14	Sat	Jun 26	OD	1835.00	0.00
15	Sun	Jun 27	OD	1991.00	0.00
16	Mon	Jun 28	OD	2777.00	0.00
17	Tue	Jun 29	OD	6107.00	0.00
18	Wed	Jun 30	OD	580.00	0.00
19	Thu	Jul 01	OD	1997.00	0.00
20	Sat	Jul 03	OD	1841.00	0.00
21	Sun	Jul 04	OD	2019.00	0.00
22	Mon	Jul 05	OD	2418.00	0.00
23	Tue	Jul 06	OD	1269.00	0.00
24	Wed	Jul 07	OD	1413.00	0.00
25	Thu	Jul 08	OD	836.00	0.00
26	Fri	Jul 09	OD	1059.00	0.00
27	Sat	Jul 10	OD	806.00	0.00
28	Sun	Jul 11	OD	2924.00	0.00
Total:				**52005.00**	**0.00**

Python Loops

Python has two simple loop commands that are good to know:

- While loops
- For loops

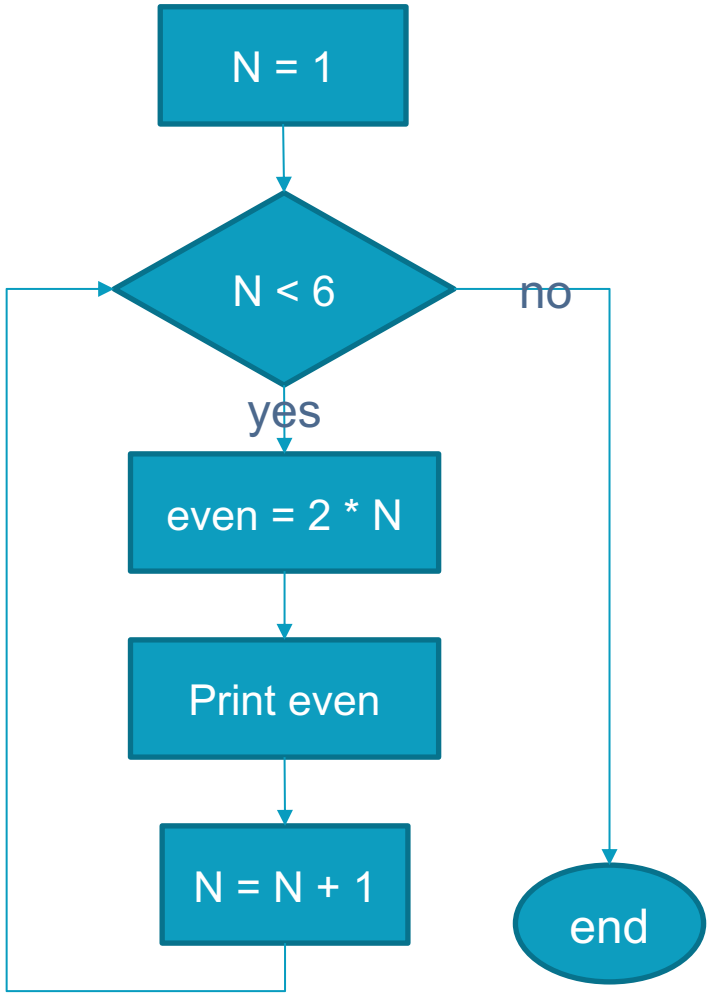
Let's take a look at each of these.

Practice #1: Number Patterns

Stage Number (N)	Even Number
1	2
2	4
3	6
4	8
5	10

Even Number = 2 * N

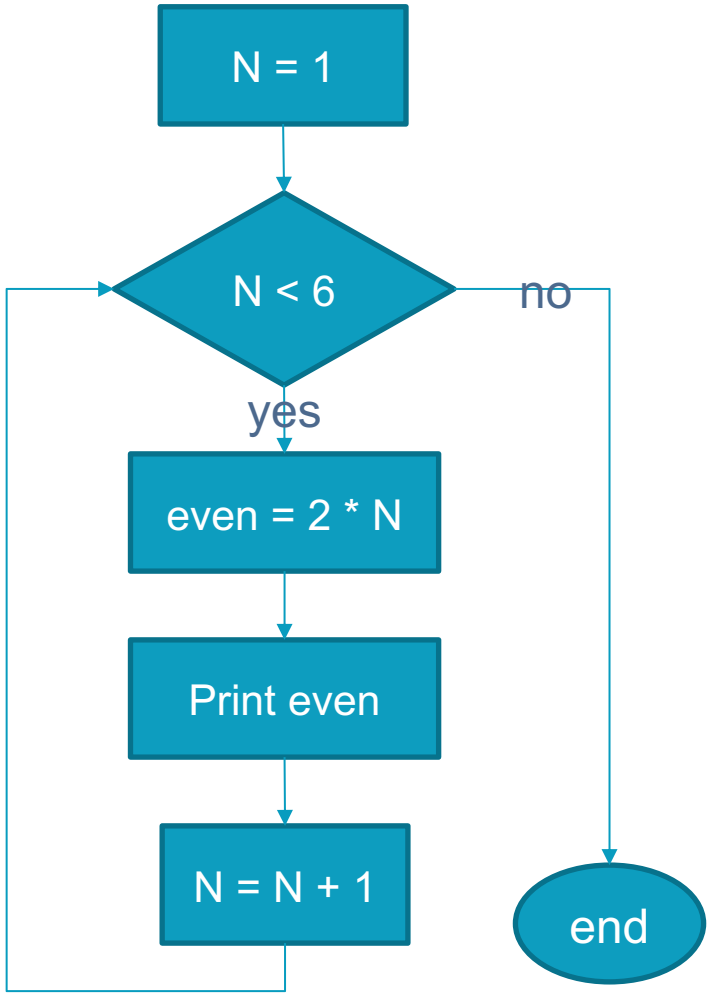
Let's try a while loop:




```
N = 1
while N < 6:
  even = 2 * N
  print (even)
  N = N + 1
```

```
2
4
6
8
10
```

Let's try a for loop:




```
# Even Numbers
for N in range(1,6):
  even = 2 * N
  print(even)
```

```
2
4
6
8
10
```

Practice #2: Sum Patterns

Stage Number (N)	Even Number	Sum
1	2	2
2	4	6
3	6	12
4	8	20
5	10	30

even = 2 * N

Sum = Sum + even

Let's try a while loop:

```
N = 1
sum = 0
while N < 6:
  even = 2 * N
  sum = sum + even
  print (N, even, sum)
  N = N + 1
```

```
1 2 2
2 4 6
3 6 12
4 8 20
5 10 30
```

Let's try a for loop:

```
# Even Numbers and their sum
sum = 0
for N in range(1,6):
  even = 2 * N
  sum = sum + even
  print(N, even, sum)
```

```
1 2 2
2 4 6
3 6 12
4 8 20
5 10 30
```

Practice #3: Ball's Height Problem

The height of a ball (in metres), t seconds after it is thrown, is given by the equation

$h = -4.9t^2 + 20t + 2$.

Investigate how the ball's height changes over time.

For Loop

Use a **for** loop to calculate and print several values.

- ★ **for** loop
- ★ **range** function

! **range(10)** uses integers from 0 through 9

```
1  # Calculate and print several heights.
2  for t in range(10):
3      h=round(-4.9*t**2+20*t+2,1)
4      print(t,h)
```

While Loop

Use a **while** loop to calculate and print several values.

- ★ **while** loop
- ★ **and** operator

```
1  # Set initial values.
2  t=0
3  h=0
4
5  # Calculate and print several heights.
6  while t>=0 and h>=0:
7      h=-4.9*t**2+20*t+2
8      print(round(t,1),"---",round(h,2))
9      t=t+0.1
```

Please return in 1 hour.

Enjoy the break!

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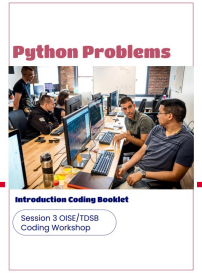
Practice Time

Time to work together!



Problem 1

Write a program that accepts the perimeter and length of a rectangle and outputs the corresponding width.

Note: If length inputted is not possible for the perimeter of the rectangle given, an error message should be printed to let the user know their information needs to be checked.

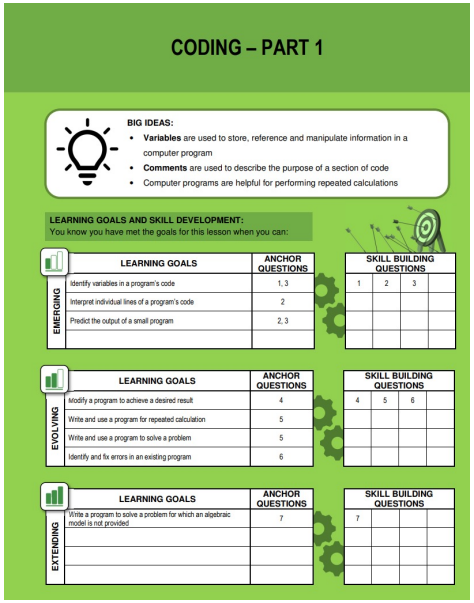
Practice Time!

Python Problems

Introduction Coding Booklet

Session 3 OISE/TDSB Coding Workshop

OR



CODING – PART 1

BIG IDEAS:
- **Variables** are used to store, reference and manipulate information in a computer program
- **Comments** are used to describe the purpose of a section of code
- Computer programs are helpful for performing repeated calculations

LEARNING GOALS AND SKILL DEVELOPMENT:
You know you have met the goals for this lesson when you can:

	LEARNING GOALS	ANCHOR QUESTIONS	SKILL BUILDING QUESTIONS
EMERGING	Identify variables in a program's code	1, 3	1, 2, 3
	Interpret individual lines of a program's code	2	
	Predict the output of a small program	2, 3	
EVOLVING	Modify a program to achieve a desired result	4	4, 5, 6
	Write and use a program for repeated calculation	5	
	Write and use a program to solve a problem	5	
	Identify and fix errors in an existing program	6	
EXTENDING	Write a program to solve a problem for which an algebraic model is not provided	7	7

OR

Open ended Problems

- #1: Investigate how changing a cylinder's dimensions affects its surface.
- #2: Repeatedly calculate the average of several numbers.
- #3: Repeatedly find unknown side lengths for right triangles.
- #4: Compare the growth of an investment with simple interest to that with

Focus Group (Short Session)

Experience with Coding Sessions

KEEP – What was beneficial to your learning and teaching?

CHANGE – What would you change?

ADD – What would you add?

Experience with Grade 9 Destreaming

Share any differentiated practices that is working for supporting the range of learners in your classroom

Focus Groups

- https://forms.gle/fPPc2fEPWFZNpvtP7

- Please fill out the consent form if you have not done so before.

Concluding Remarks

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Before you go…

- Exit ticket: Google Form on today's session

https://forms.gle/A5rDMRmXMe9iiubr6