



The CENTRE for EDUCATION in
MATHEMATICS and COMPUTING



UNIVERSITY OF
WATERLOO

Coding in MTH1W - Read, Alter and Write

CEMC: Bringing Teachers Together Virtually
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scratch.mit.edu

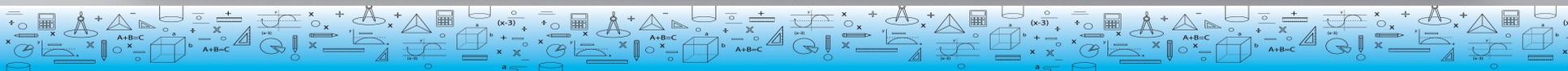
Today's Deck:
<https://bit.ly/CEMC9Wcoding>

Coding in MTH1W

- » Or really in any course
- » Goals
 - » survey Ontario coding curriculum
 - » brief look pseudocode
 - » use Scratch to read, write and alter code
 - » view collection of resources

Progression of Coding Expectations from Grade 1-8

Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8
<p>C3.1 solve problems and create computational representations of mathematical situations by writing and executing code, including code that involves sequential events</p>	<p>C3.1 solve problems and create computational representations of mathematical situations by writing and executing code, including code that involves sequential and concurrent events</p>	<p>C3.1 solve problems and create computational representations of mathematical situations by writing and executing code, including code that involves sequential, concurrent, and repeating events</p>	<p>C3.1 solve problems and create computational representations of mathematical situations by writing and executing code, including code that involves sequential, concurrent, repeating, and nested events</p>	<p>C3.1 solve problems and create computational representations of mathematical situations by writing and executing code, including code that involves conditional statements and other control structures</p>	<p>C3.1 solve problems and create computational representations of mathematical situations by writing and executing efficient code, including code that involves conditional statements and other control structures</p>	<p>C3.1 solve problems and create computational representations of mathematical situations by writing and executing efficient code, including code that involves events influenced by a defined count and/or sub-program and other control structures</p>	<p>C3.1 solve problems and create computational representations of mathematical situations by writing and executing code, including code that involves the analysis of data in order to inform and communicate decisions</p>
<p>C3.2 read and alter existing code, including code that involves sequential events, and describe how changes to the code affect the outcomes</p>	<p>C3.2 read and alter existing code, including code that involves sequential and concurrent events, and describe how changes to the code affect the outcomes</p>	<p>C3.2 read and alter existing code, including code that involves sequential, concurrent, and repeating events, and describe how changes to the code affect the outcomes</p>	<p>C3.2 read and alter existing code, including code that involves sequential, concurrent, repeating, and nested events, and describe how changes to the code affect the outcomes</p>	<p>C3.2 read and alter existing code, including code that involves conditional statements and other control structures, and describe how changes to the code affect the outcomes</p>	<p>C3.2 read and alter existing code, including code that involves conditional statements and other control structures, and describe how changes to the code affect the outcomes and the efficiency of the code</p>	<p>C3.2 read and alter existing code, including code that involves events influenced by a defined count and/or sub-program and other control structures, and describe how changes to the code affect the outcomes and the efficiency of the code</p>	<p>C3.2 read and alter existing code involving the analysis of data in order to inform and communicate decisions, and describe how changes to the code affect the outcomes and the efficiency of the code</p>



	1	2	3	4	5	6	7	8
What is it?	Sequential events	Add: concurrent events	Add: repeating events	Add: nested events	Add: conditional statements	Efficiency	Counting and subprograms	Analyze data and make decisions
What does that mean?	One instruction after another	Instructions happening at the same time	Repeating instructions	Nested means an instruction within an instruction	Conditional means making decisions based on something (if... then...)	Making the code "sharp and shiny" - avoiding unnecessary repetition, etc.	Use a variable that counts Subprogram: A piece of code that is used over and over again	Input a list of data Determine math results and use to make decisions.
"Pseudo Code" example	Dog walks 10 steps. Says 'Hello'. Turns around. Walk 10 steps.	Dog walks 10 steps... at the same time as... Cat walks 10 steps	Repeat 3 times: Dog walks 10 steps. End repeat. Dog sits.	Repeat 3 times: Dog walks 10 steps forward. Repeat 5 times: Dog jumps up and down. End repeat. Dog sits.	Repeat 3 times: walk 10 steps. If it's raining lie down Otherwise jump up and down. End if. End repeat.	Dog turns 90° right. Dog turns 90° right. Dog turns 90° right. Can be done more efficiently as: Dog turns 90° left.	Set counter to 1 Repeat until counter = 5: If counter < 3 Do Dog1 End if Increase Counter . Walk counter steps. End repeat Subprogram Dog1 Jump 3 times	input value a. Input value b. If a > b Dog jumps a times. Otherwise Dog spins b times. End if.

Grade 9 Expectations

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Overall Expectation

C2 apply coding skills to represent mathematical concepts and relationships dynamically, and to solve problems, in algebra and across the other strands

C2.1

- use coding to demonstrate an understanding of **algebraic concepts including variables, parameters, equations, and inequalities**

C2.2

- **create code by decomposing situations into computational steps** in order to represent mathematical concepts and relationships, and to solve problems

C2.3

- **read code to predict its outcome**, and **alter code** to adjust constraints, parameters and outcomes to represent a similar or new mathematical situation

Task Bank Slide Layout

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- » Pseudocode
- » Read Code
- » Alter Code
- » Write Code



Title:

Problem:

Use **pseudocode** to detail the plan that could be used to code this problem.

Read the code shown and describe its function

Modify the code shown to

Write the complete code for the above problem.

Pseudocode

Specific Expectation

C2.2 create code by **decomposing situations into computational steps** in order to represent mathematical concepts and relationships, and to solve problems

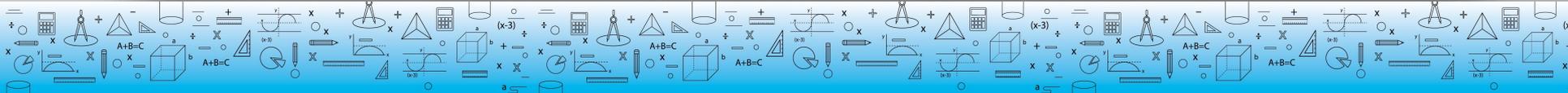
Computational steps, could also be **Pseudocode**, consists of short English phrases used to explain specific tasks/steps within a program.

Ideally, pseudocode does not include keywords exclusive any specific computer language.

Pseudocode should be written as a **list** of consecutive phrases; we may also draw **arrows** to show direction or clarify repeating processes.

Pseudocode

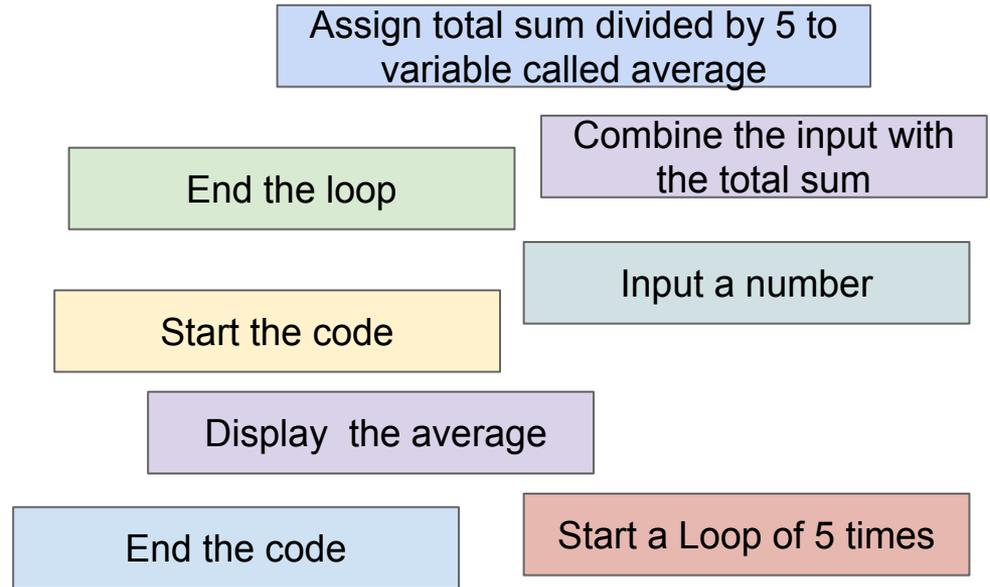
**Making A Peanut
Butter Sandwich**
Decomposing situations
into computational steps



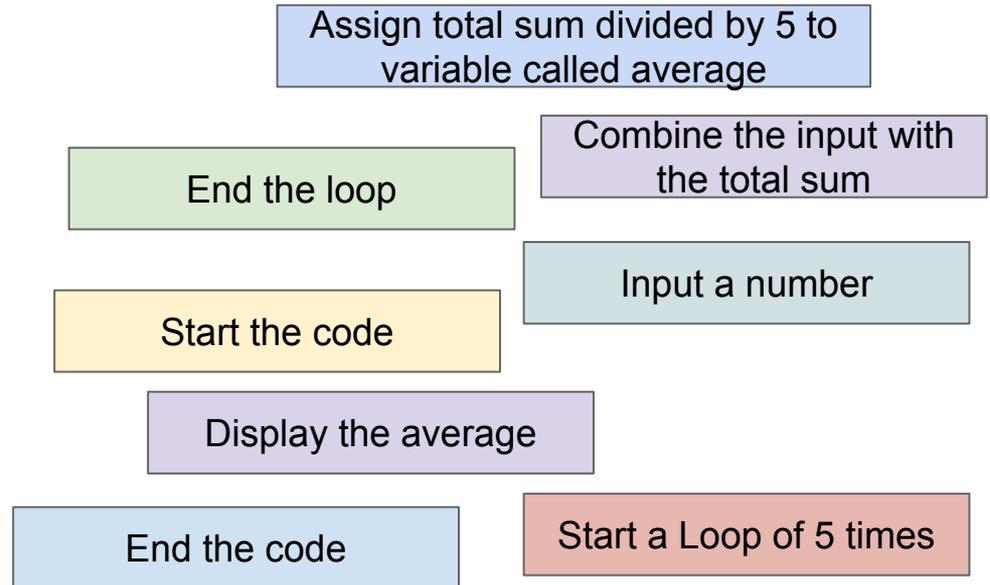
Pseudocode

Think about making a detailed plan as to how to sequence the steps in order to solve the problem.

*In what order would we put the blocks to **determine the average of 5 numbers that have been entered?***



Pseudocode



EQAO Sample Exam

*In what order would we put the blocks to **determine the average of 5 numbers that have been entered?***

Did your pseudocode look different?

A code is written to determine the average of five values that the user inputs.

Three blocks of code have not been placed in the code.

Drag and drop the three blocks of code to correctly complete the code.

calculate **Result** = **Result** + **Number**

calculate **Result** = **Result** /5

set **Result** = 0

start loop
repeat 5 times
input **Number**

end loop

display **Result**

Read Code

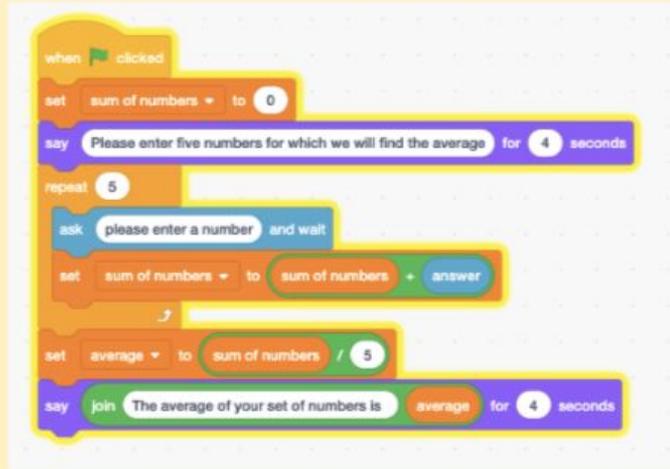
Which one doesn't belong ?
Justify your thinking.

The image displays four Scratch code snippets, each designed to calculate the mean of three numbers. The snippets are labeled 1, 2, 3, and 4.

- Snippet 1:** Triggered by a click. It asks for three numbers (a, b, c), sets them to variables, and calculates the mean as $(a + b + c) / 3$.
- Snippet 2:** Triggered by a space key press. It sets a to 0, then repeats three times: asks for a number and adds it to a. Finally, it calculates the mean as $a / 3$.
- Snippet 3:** Triggered by an up arrow key press. It sets total to 0, then repeats three times: asks for a number and adds it to total. Finally, it calculates the mean as $total / 3$.
- Snippet 4:** Triggered by a sprite click. It asks for three numbers (a, b, c), sets them to variables, and calculates the mean as $total / 3$, where total is the sum of a, b, and c.

Read Code

Read the code shown
and describe its function



```
when clicked
  set sum of numbers to 0
  say Please enter five numbers for which we will find the average for 4 seconds
  repeat 5
    ask please enter a number and wait
    set sum of numbers to sum of numbers + answer
  set average to sum of numbers / 5
  say join The average of your set of numbers is average for 4 seconds
```

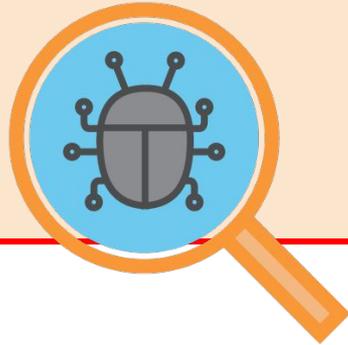
The code is a Scratch script that calculates the average of five numbers. It starts with a 'when clicked' event, followed by a 'set' block to initialize 'sum of numbers' to 0. A 'say' block prompts the user to enter five numbers. A 'repeat' loop with a count of 5 contains an 'ask' block for user input and a 'set' block to add the input to the sum. After the loop, a 'set' block calculates the average by dividing the sum by 5. Finally, a 'say' block displays the result.



DeBug it! Is a number positive or negative?

Problem: Find the error in the “Determining whether a number is negative or positive” problem

Read the code shown and describe its function.



REFLECTION PROMPTS

- What was the problem
- How did you identify the problem ?
- How did you fix the problem ?
- Did others have alternative approaches to fixing the problem

```
when clicked
  set sign to 0
  repeat until answer = n
    ask Please enter a number to be classified as positive or negative and wait
    if answer > 0 then
      set sign to positive
    else
      set sign to negative
  say join The value join answer join is sign for 6 seconds
  ask Would you like to classify another number? y/n and wait
  say Take care and stay safe!
```



Write Code

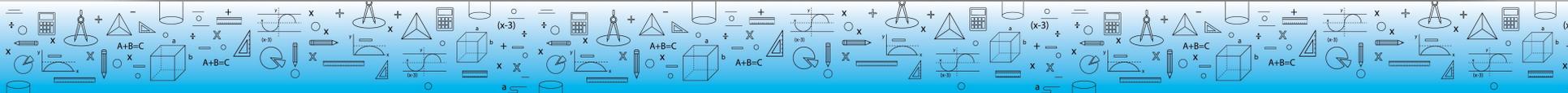
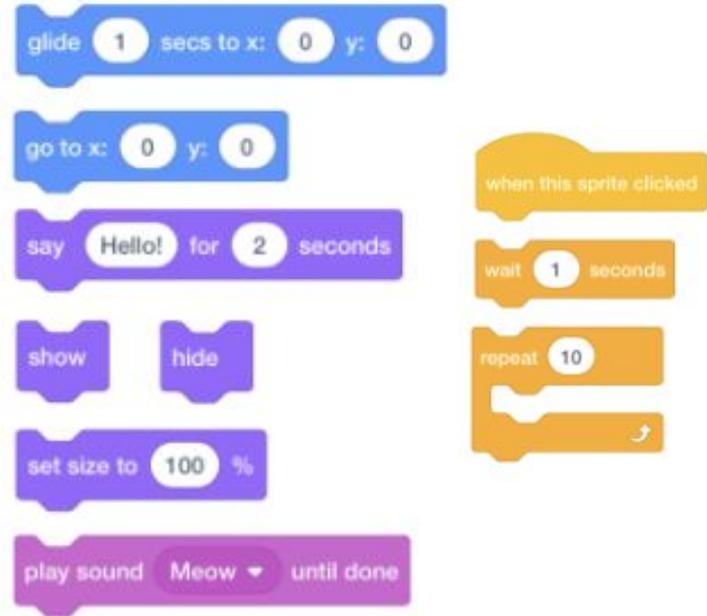
Getting Started: What can you make with these 10 blocks?

Create a project using only these 10 blocks.

Use them once, twice, or multiple times, but use each block at least once.

START HERE

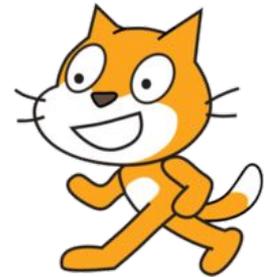
- Test ideas by experimenting with each block
- Mix and match blocks in various ways
- Repeat!



Scratch Resources

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- » MIT [Scratch website](#)
 - » Create an account
 - » [Registering for a Teacher's Account](#) (takes a few days)
 - » [Teacher Account Guide](#)
- » [CS First](#)
- » Split screen



Write Code

For the equation of the line $y = 2x + 5$, determine whether or not an entered coordinate is located on the line.

C1.2 create algebraic expressions to generalize relationships expressed in words, numbers, and visual representations, in various contexts

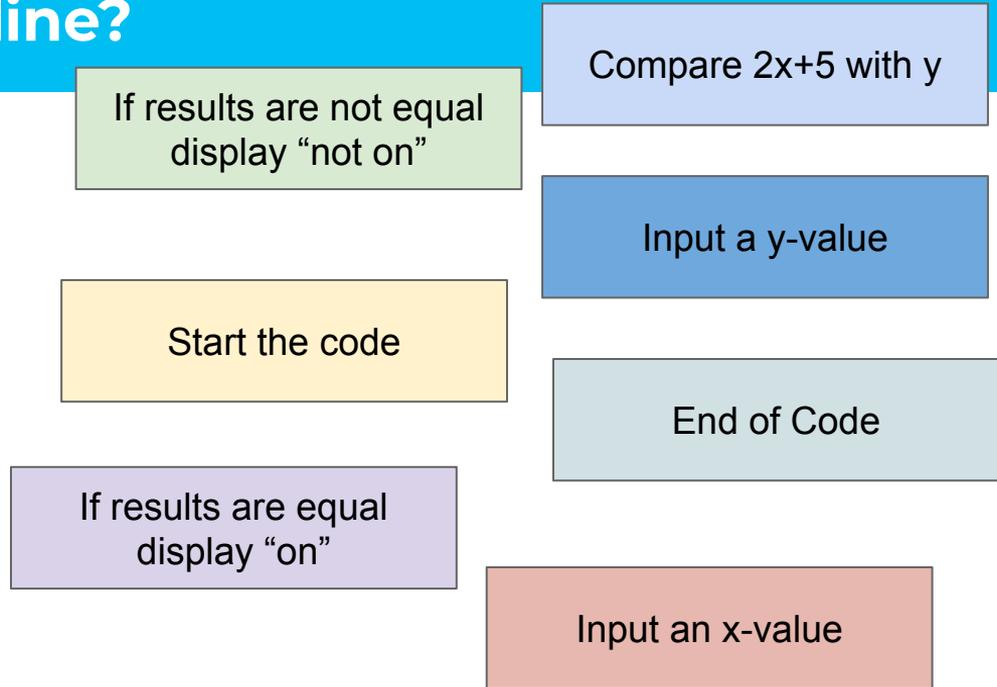
Write Code

For the equation of the line $y = 2x + 5$, determine whether or not an entered coordinate is located on the line.

C2.2 create code by **decomposing situations** into computational steps in order to represent mathematical concepts and **relationships**, and to **solve problems**

Is the point on the line?

Think about how to sequence the steps in order to solve the problem.



Write Code

For the equation of the line $y = 2x + 5$, determine whether or not an entered coordinate is located on the line.

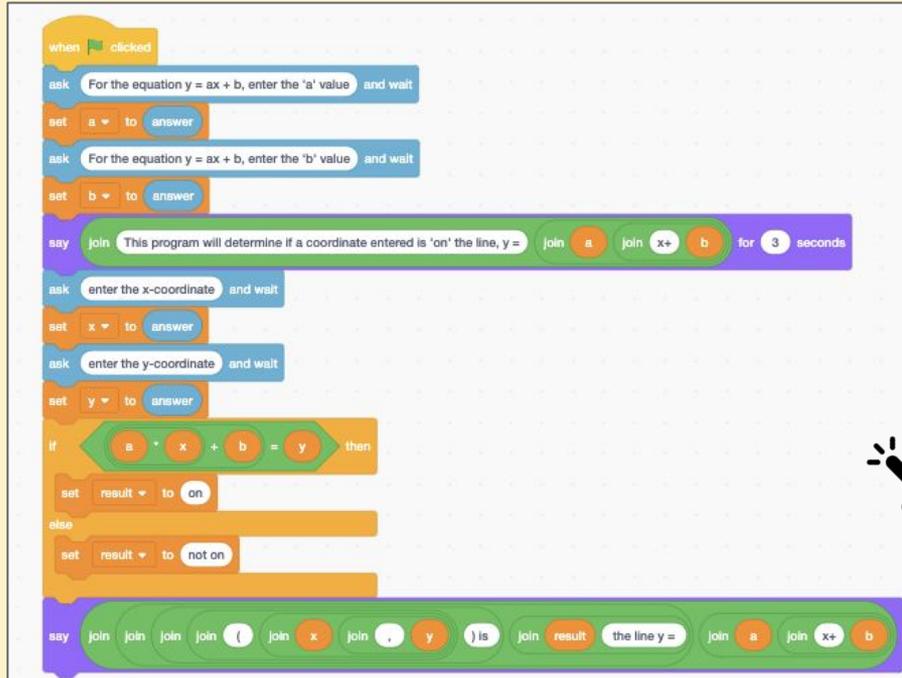
C2.1 use coding to demonstrate an understanding of algebraic concepts including **variables**, parameters, **equations**, and **inequalities**

Is the point on the line ?

Problem: For any equation of a line in the form $y = ax + b$, determine whether or not an entered coordinate is on that line

Use **pseudocode** to detail the plan that could be used to code this problem.

Read the code shown and describe its function.



```
when clicked
ask For the equation y = ax + b, enter the 'a' value and wait
set a to answer
ask For the equation y = ax + b, enter the 'b' value and wait
set b to answer
say join This program will determine if a coordinate entered is 'on' the line, y = join a join x+ join b for 3 seconds
ask enter the x-coordinate and wait
set x to answer
ask enter the y-coordinate and wait
set y to answer
if a * x + b = y then
set result to on
else
set result to not on
say join join join join { join x join , join y } is join result the line y = join a join x+ join b
```



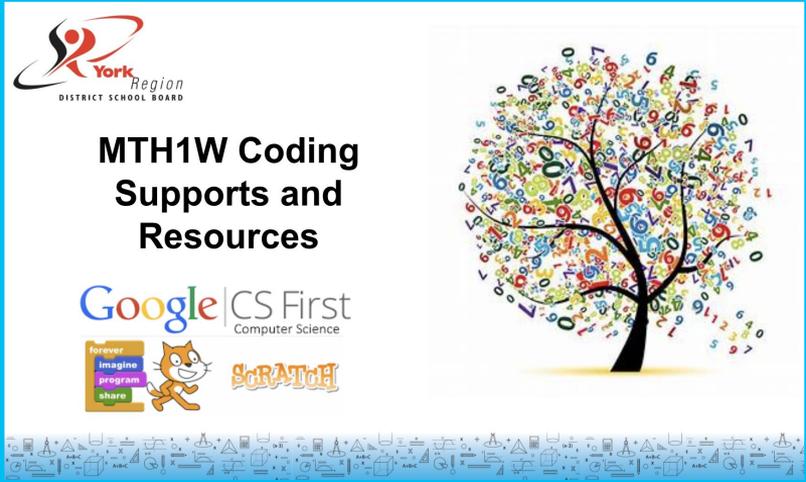
Modify the code shown below to determine if the coordinate is on, above or below the line.

Write the complete code for the above problem.

MTH1W Coding Resources

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- » [MTH1W task bank](#) linked to expectations and individually organized by -
 - » Pseudocode
 - » Read Code
 - » Alter Code
 - » Write Code
 - » Other Resources
 - » [Intro to Scratch](#) (grades 1 to 8)
 - » [Sample Programs](#)
 - » [Coding and Spreadsheet Ideas](#)
- <https://bit.ly/YRDSBcoding9W>



York Region
DISTRICT SCHOOL BOARD

**MTH1W Coding
Supports and
Resources**

Google | CS First
Computer Science

forever
imagine
program
share

Scratch

Questions?





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