最後修訂日期：2021-02-26

HKPSOI Competition Syllabus 比賽範圍

This syllabus serves as a guide only. If deemed appropriate, questions may involve contents that are out of scope.

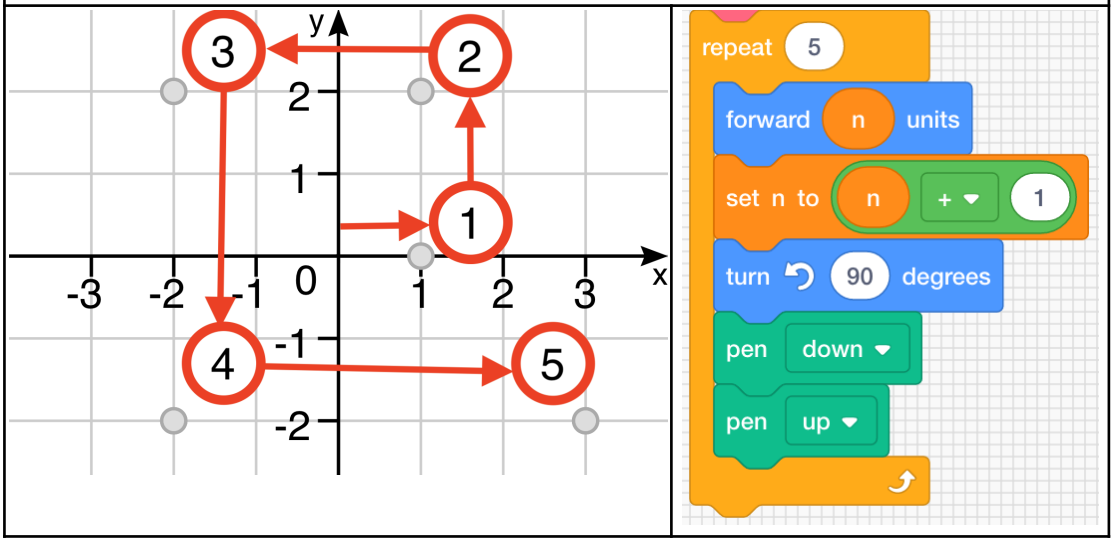
本文件只作參考之用。在適當情況下，題目可涉及範圍以外之內容。

1. Optimize drawing order 優化下筆次序

For the "Pen" questions, a set of seemingly irregular strokes can sometimes be efficiently drawn following a specific drawing order, greatly simplifying the program. In the following example, the five dots actually form a spiral.

對於「畫筆」類題目，一組看似無序的筆劃有時能依特定的下筆次序有效率地畫出，大幅簡化程序。以下例題中，無序的五點實際上構成一個螺旋圖案。

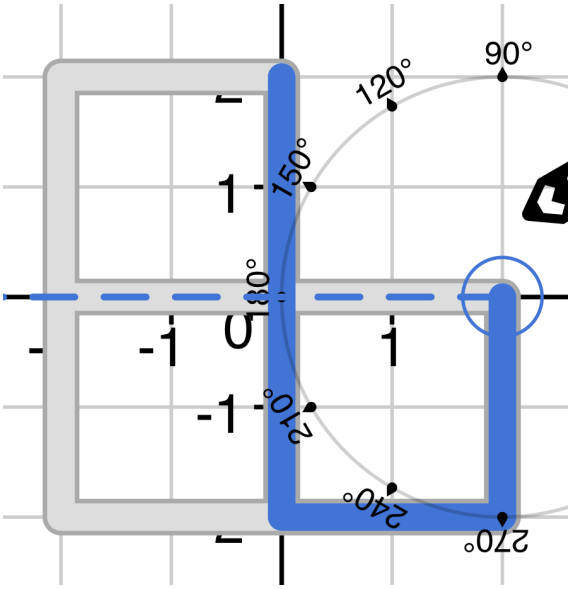
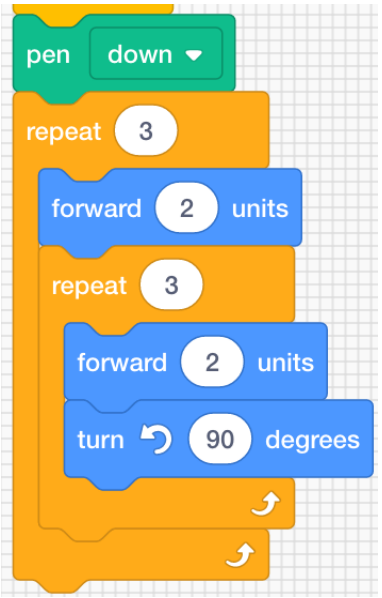
HKPSOI 2019/20 Final Event Question No. 10



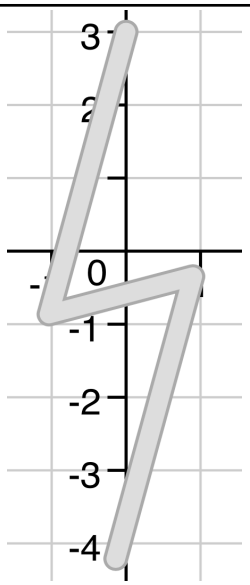
2. Recognize repeating subpattern 辨認重複子圖案

For the "Pen" questions, a complex pattern can sometimes be decomposed into several simpler repeating subpatterns, allowing us to simplify the program using the "repeat" block. In the following example, the L-shaped pattern can be decomposed into 3 repeating squares, as well as 3 repeating hooks as illustrated. The latter one requires a program with fewer blocks.

對於「畫筆」類題目，一個複雜的圖案有時可分拆成數個重複的簡單圖案，讓我們能用「重複」Blockly 積木簡化程序。以下例題中的「L」形圖案，可以分拆成 3 個正方形，或者 3 個勾形（如圖），而後者的程序需要較少積木。

HKPSOI 2018/19 Final Event Question No. 10	
	

3. Trial and error 試錯法

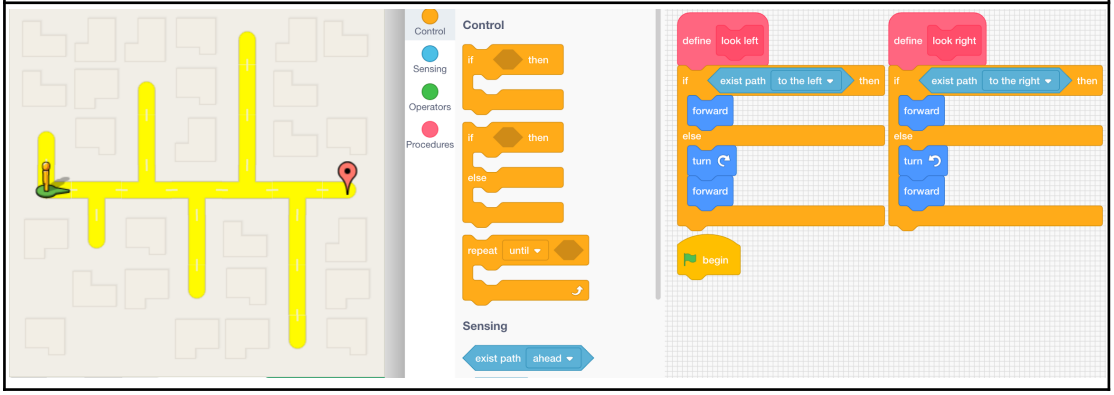
For the "Pen" questions, common angles like 90 degrees in a square or 60 degrees in a triangle are relatively easier to recognize. Other uncommon angles can be found out using trial-and-error. At first, guess the angle and try it out. Then, observe the result and fine tune the value. 對於「畫筆」類題目，常見的角度如正方形的 90 度及三角形的 60 度是比較容易辨認的。其他不容易辨認的角度，需要使用試錯法找出。首先估算角度值，執行後觀察誤差，再作調整。	

4. Restricted movements 受限制的移動

For the "Maze" or "Star collector" questions, normally we can control all sorts of movements of the character. However, some questions deliberately disable movement blocks and provide new movement procedures forming specific paths. Contestants must learn to use the new movement procedures to solve the question.

對於「迷宮」及「摘星星」類題目，正常情況下我們可以控制角色所有移動，但有些題目特地禁用了移動角色的積木，而另外提供組成特定路徑的新移動程序。參賽者需要即時學習使用那些新的程序以完成題目。

HKPSOI 2019/20 Final Event Question No. 9



5. Wall follower 跟牆行

Certain "Maze" or "Star collector" problems can be solved by the well-known "wall follower" algorithm, in which the character keeps "touching" the wall on its left (or its right) while walking. Contestants should be able to:

1. Identify if a problem can be solved using this method
2. Determine if it should follow the left wall or the right wall
3. Calculate the number of repetitions required for the algorithm
4. Add extra blocks before or after the main algorithm to solve advanced questions

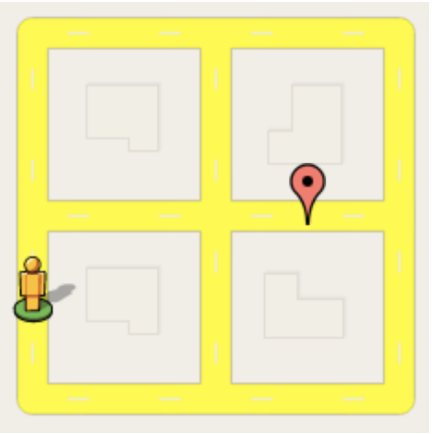
有一些「迷宮」及「摘星星」類題目可用著名的「跟牆行」方法解決。這方法是控制角色向前移動時，時刻「摸著」左邊（或右邊）的牆。參賽者應懂得：

1. 辨認一條題目是否能用「跟牆行」解決
2. 判斷跟左牆還是跟右牆較好
3. 計算主程序需要重複執行的次數
4. 在主程序前後添加積木，以解決進階題目

HKPSOI 2018/19 Final Event Question 7

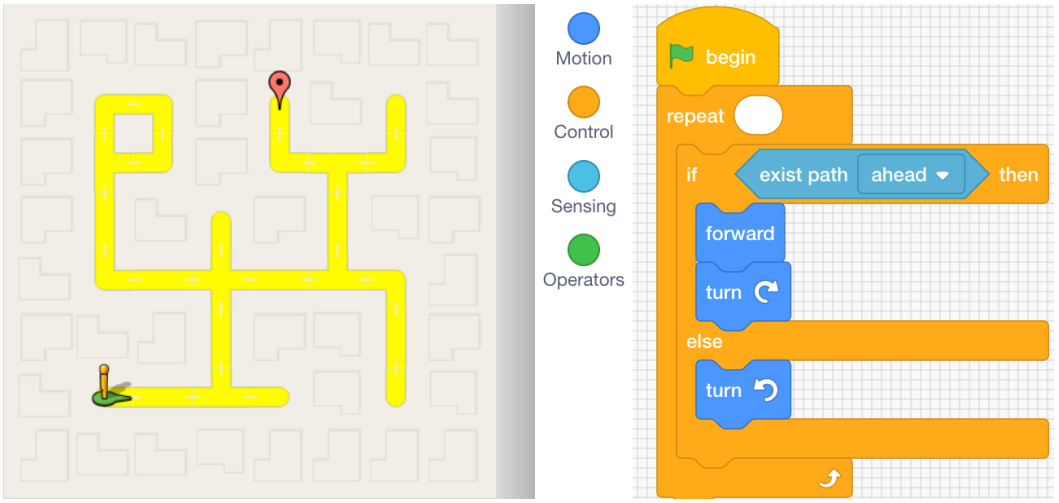
This maze **cannot** be solved using the "wall follower" algorithm.

這個迷宮不能用「跟牆行」解決。



HKPSOI 2017/18 Practice Contest Question 14

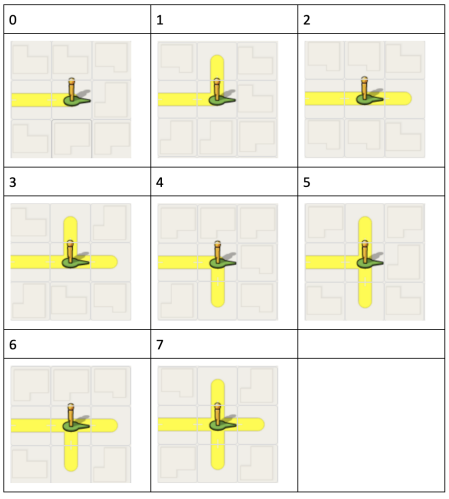
An example of "wall follower"「跟牆行」示例

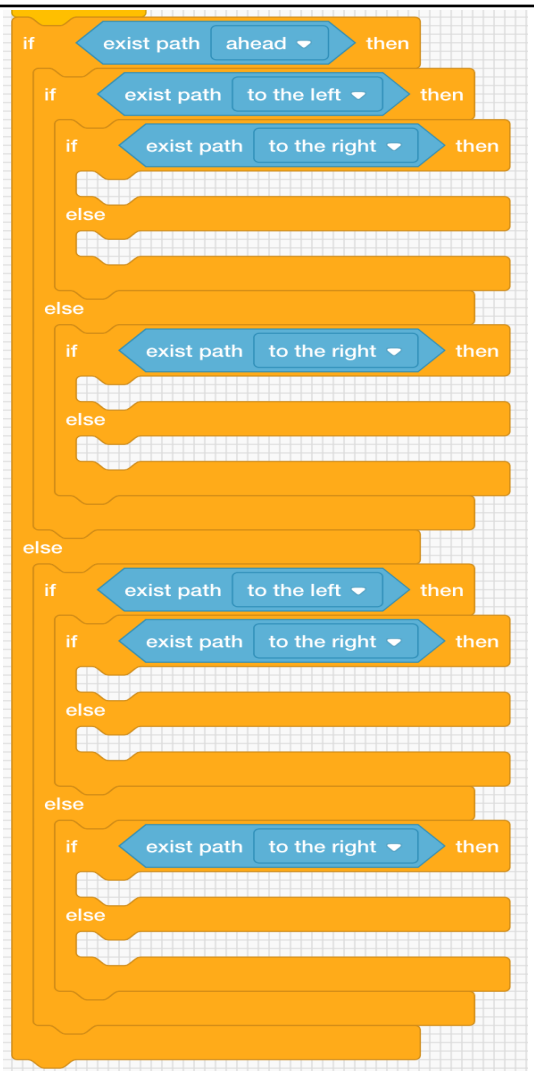


6. Finite state machine 有限狀態機

The finite state machine method applies to the "Maze" and "Star collector" questions. Without using variables, the character will only encounter 8 states. Note that the character cannot detect if there exists a path going backward.

有限狀態機適用於「迷宮」及「摘星星」類題目。在沒有使用變數的情況下，角色只可能遇上 8 種情況。留意，角色無法檢查後方是否有路。

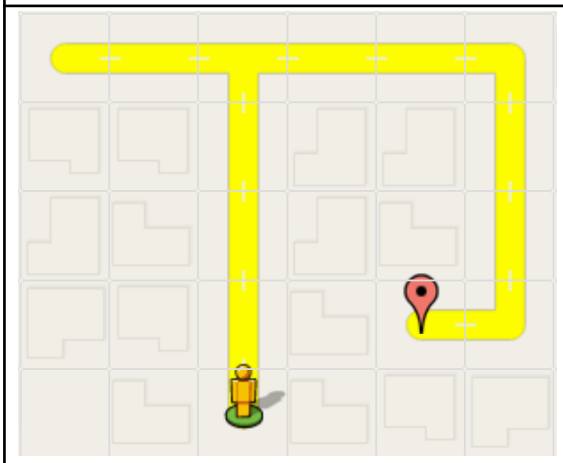


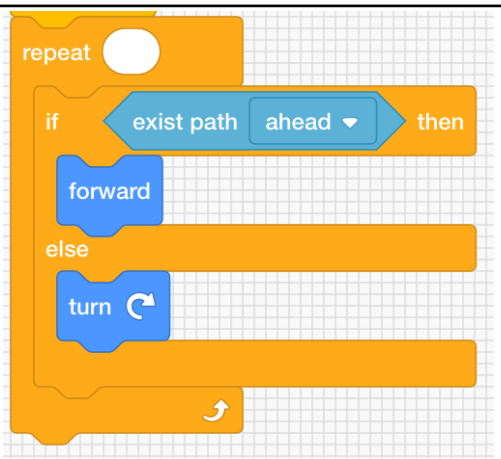


When the movement of the character can be determined merely by the shape of the intersection, we can construct a finite state machine. In the worst case, we have to write a 3-layer nested if-else to catch all 8 states. Fortunately, most of the time we can omit some branches. Take the following question as an example. We first draw a table listing all possible intersections and the corresponding actions. It can then be observed that all actions depend merely on whether there exists a path ahead.

若角色的行動只取決於路口的形狀，我們就可使用有限狀態機。在最壞情況下我們需要編寫三層「如果……否則……」，以捕捉所有的 8 個狀態。不過，很多時候我們都能省略一些枝節。對於以下例題，我們可先列出所有路口狀態及相應的行動，然後就能看出所有的行動只取決於前方是否有路。

HKPSOI 2019/20 Final Event Question No. 1





Intersection 路口				Action 行動
0				N/A
1	to the left			N/A
2		ahead		move forward
3	to the left	ahead		N/A
4			to the right	turn right
5	to the left		to the right	turn right
6		ahead	to the right	move forward
7	to the left	ahead	to the right	N/A