Teaching Abstraction in Computer Science to 7th grade students

Department of Science Teaching

Weizmann Institute of Science

Final test 2016

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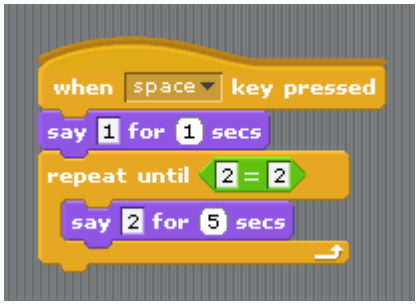
Question 1

Look at the following script segment. The user presses the space key. What will the sprite say five minutes later?



1. 1
2. 2
3. 12
4. The sprite will say nothing at that time.

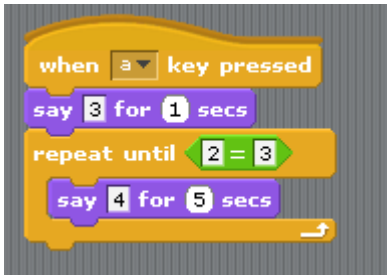
Question 2

Create another script segment, preferably shorter than the one in Question 1, which has the same functionality as the script segment in Question 1. In other words, any viewer who sees only the behavior of the sprite on the stage, and not the script segments, will not be able to distinguish between the two.

Describe all stages of your solution. That is, write down each consideration you made and each step of the solution process. Explain your answer in detail, and explain why the new script segment produces the same result.

Question 3

Look at the following script segment. The user presses the 'a' key. What will the sprite say five minutes later?



1. 3
2. 4
3. 34
4. The sprite will say nothing at that time

Question 4

Create a game with two sprites: a dog and a cat. Both move across the stage and when the dog touches the cat, he says, "I caught you." The cat moves three steps per second in a

random direction. The dog moves five steps every time the user presses one of the arrow keys (up, down, left or right) according to the direction indicated by that arrow. The cat starts while looking to the right, from the point where x =-100 and the value of y is randomly selected from the range of 200 to -200. The dog starts while looking to the right, at position x: 100 y: 100.

Describe every stage of your solution, each step of all the animation scripts from start to finish. Include any considerations you made and explain any decision you made while developing your solution and the appropriate scripts.

Question 5

What is a *conditional execution*? Check the correct answer and explain your choice.

1. A loop
2. The block *if…*
3. A series of instructions that is executed if a certain condition is satisfied
4. The block *forever*

Question 6

You are requested to create a game in which the cat asks the user to select a number from 1 to 8 by pressing the space bar, and then counts the number of times the bar was pressed. If the user presses the space bar more than 8 times, it is considered as if the bar was pressed exactly 8 times. The user will then press the enter key to signal the cat that he has finished pressing the space bar. At this point the cat will walk 10 steps for each press, and then will say, "you pressed the space bar x times ", where x stands for the number of presses. The cat starts at the center of the stage, looks to the right, and advances at a steady pace of 10 steps per second.

Describe how you would create such a game (if the description of the solution is clear enough, there is no need to provide a Scratch script).

Explain the correctness of your solution and describe all the stages of thinking that led to the solution, including all the considerations and decisions you took.

Question 7

A student created a script for the cat, whereby the cat behaves in the follows: When the cat gets a message "check the number", he checks whether the value of the number he holds in his memory is divisible by 14 (that is, whether the number that the cat remembers can be divided by 14 without a remainder). If the number is indeed divisible by 14, the cat calls out "yes". If the number is not divisible by 14, he calls out "no". The cat remembers the number in a variable called *test number*.

You are requested to create an animation in which the dog asks the user to type a number. Then the dog tells the user whether this number is divisible by 7.

For example: the cat will say "yes" for the number 14 and "no" for 21, whereas the dog will say "yes" for the numbers 7 and 14 but "no" for 20.

A. Describe a way to solve this question (that is, describe how the dog should behave) without using the *mod* block.

B. Does the cat's script help you in any way?

C. Can you use the cat's script even if you cannot change it or even see it?