

# **Teaching Abstraction in Computer Science to 7<sup>th</sup> grade students**

Department of Science Teaching

Weizmann Institute of Science

Copyright 2017 by David Statter, Michal Armoni.

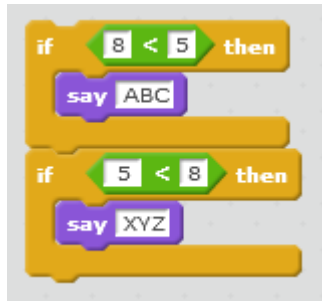
This work is licensed under the Creative Commons Attribution-NonCommercial-ShareAlike 3.0 Unported License. To view a copy of this license, visit <http://creativecommons.org/licenses/by-nc-sa/3.0/> or send a letter to Creative Commons, 444 Castro Street, Suite 900, Mountain View, California, 94041, USA.

Final test 2015

## Final test 2015

### Question 1

Look at the following script segment. What will the sprite say when this segment is executed?



1. ABC
2. XYZ
3. First, the sprite will say "ABC" and then, it will say "XYZ".
4. The sprite will say nothing.

### 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

Create an animation with three sprites: two flowers and a cat. The cat moves to the right until he reaches the end of the stage or bumps into one of the flowers. If the cat touches one of the flowers, then **both** flowers say, "Hello" and the cat says, "Oops...". 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 130 to -130. One flower is at position  $x: 100$   $y: 100$  and the other is 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 consideration you made and explain any decision you made while developing your solution and the appropriate scripts.

### Question 4

Create an animation in which four sprites participate: a dog that stands at position  $x: 200$   $y: 140$ , a flower that is located at position  $x: 100$   $y: 100$ , and another flower located at position  $x: 100$   $y: -100$ . Finally, a cat that looks to the right; He initially stands at the point where  $x=-100$  and  $y$  has a random value at the range between 130 and -130. The cat moves to the right until he reaches the end of the stage or bumps into one of the flowers. If the cat

touches one of the flowers, then both flowers will say "Hello" and the cat will say "Oops...". The cat will repeat this movement 12 times. After the 12 repetitions, the dog will say, "The cat bumped into the flowers X times", where X is the correct number of bumps between the cat and one of the flowers.

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 repeated execution*? Check the correct answer and explain your choice.

1. A few scripts that can be executed in parallel
2. The block *repeat until...*
3. A series of instructions that is executed as long as a certain condition is satisfied (a loop)
4. The block *forever*

### Question 6

You are requested to create a game in which the cat asks the user to select a direction by pressing one of the arrow keys (up, down, left or right), and then moves according to the direction indicated by that arrow, until he touches the edge of the stage. At this point the cat will say, "I walked T steps", where T stands for the number of steps that the cat has just walked. The cat starts while looking to the right, at position x: 50 y: 10, 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 your stages of thinking that led to the solution, including all the considerations and decisions you made.

### Question 7

A student created a script for the cat, whereby the cat behaves as 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, he 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?