

# Introduction to Complexity (Fall 2016)

## 7.9 Take Unit 7 Test » Unit 7 Test

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### Instructions 1

You may use any course materials, websites, Netlogo models, calculators, etc. for this test. Just don't ask another person for the answer and don't share your answers with other people.

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### Question 2

According to the definition given in the lecture, self-organization refers to which of the following?

- A. Organized patterns across an entire system that result from interactions within the system itself.
  - B. Organized patterns across an entire system that result from the selfish choices made by individuals in the system.
  - C. The ability of biological organisms to organize their environments.
  - D. The emergence of self-consciousness in complex systems.
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### Question 3

In the description of the NetLogo flocking model, three rules were given for flocking: align, cohere, separate. Which one is applied first?

- A. Cohere
  - B. Separate
  - C. Align
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### Question 4

Consider the following statements about the NetLogo Fireflies model described in the lectures:

- I. The model assumes there is no leader
- II. All fireflies have the same cycle length
- III. When the simulation begins, all fireflies synchronize their clocks to zero.
- IV. At each timestep, fireflies are able to perceive the flashes of neighboring fireflies (within a radius of one patch).

Which of these statements are true statements about the model?

- A. All of them (statements I – IV).
  - B. All but statement I.
  - C. All but statement II.
  - D. All but statement III.
  - E. All but statement IV.
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### Question 5

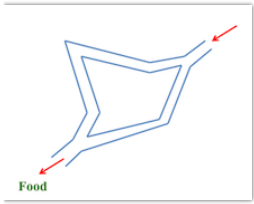
The lectures demonstrated the NetLogo Fireflies model. Which of the following is a true statement about this model?

- A. A firefly will never flash at a given time step if it has flashed within the last 5 time steps (ticks).
- B. Under the phase delay strategy, a firefly will never flash if all the other fireflies in its neighborhood are flashing.
- C. Under the phase advance strategy, a firefly will reset its clock to zero if it sees enough of its neighbors flashing.

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**Question 6**

Consider the experiment discussed in Video 7.4 in which ants can choose two possible paths through a structure like this one:



It was observed that the vast majority of ants end up taking the shorter path to the food source. This is because:

- A. Ants can see far enough to determine which path is shorter.
  - B. Pheromone concentration along the shorter path ends up being stronger.
  - C. The smell of food is stronger along the shorter path.
  - D. Ants dislike having to turn right and left multiple times.
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**Question 7**

Consider the following possible explanations for how an ant chooses a task to perform (for example, foraging or nest maintenance)

- I. An ant performs the task it was assigned at birth
- II. An ant typically chooses a task that it has done successfully in the past
- III. An ant chooses a task that depends on how many other ants it currently perceives to be performing that task
- IV. An ant chooses a task based on current environmental conditions
- V. An ant chooses a task based on the Queen ant's directions

Which of these are actual explanations, as described in Video 7.4? (Note that more than one of these can be true.)

- A. I and II
  - B. II and III
  - C. III and IV
  - D. IV and V
  - E. I, II, III, and IV
  - F. V
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**Question 8**

In Video 7.5 it was stated that self-organizing biological systems are different from traditional computers in the way they process information.

Which of the following is an example of a difference that was discussed in that video?

- A. Biological systems are made of cells, which have very different properties from computer chips made of silicon.
- B. Traditional computer programs use deterministic rules whereas biological systems use rules that have some random elements.
- C. Traditional computers can be programmed by humans whereas biological systems cannot.