

# Introduction to Complexity (Fall 2016)

## 9.7 Take Unit 9 Test » Unit 9 Test

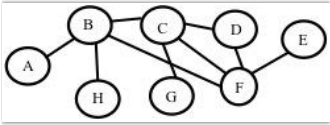
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### Instructions 1

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.

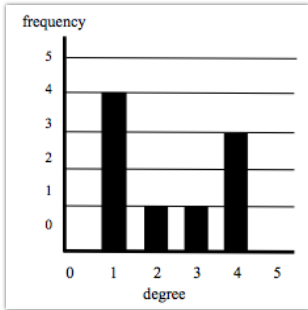
Question 2

Consider the following network.

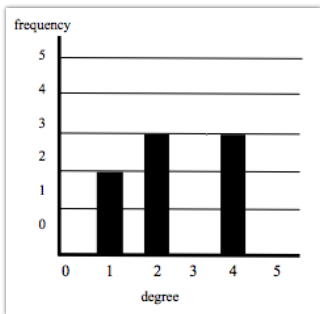


Which of the following is the correct degree distribution for this network?

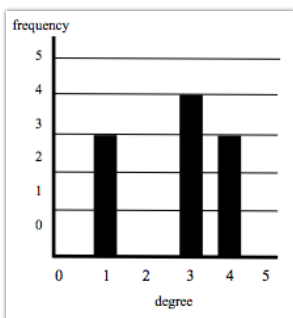
o A.



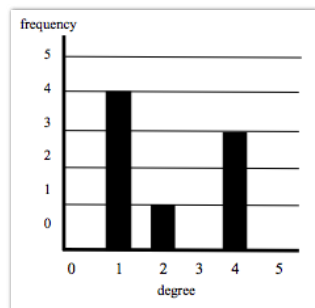
o B.



o C.



o D.



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**Question 3**

For the network given in Question 1, what is the clustering coefficient? [Hint: Find the clustering with respect to each of the 8 nodes take the average. Nodes with only one link coming into them have clustering 0.]

- A. 0.5
  - B. 0.67
  - C. 0.75
  - D. 0.23
  - E. 0.46
- 

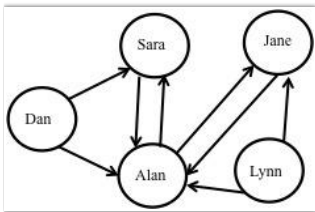
**Question 4**

For the network given in Question 1, how long is the shortest path between nodes A and E?

- A. 2 hops
  - B. 3 hops
  - C. 4 hops
  - D. 5 hops
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**Question 5**

Consider the network below:



What is Alan's in-degree?

- A. 2
  - B. 3
  - C. 4
  - D. 5
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**Question 6**

For the network given in Question 4, what is Alan's out-degree?

- A. 2
- B. 3
- C. 4
- D. 5

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**Question 7**

Consider the following statements about small-world networks:

- I. In a small-world network, every pair of nodes has at most six degrees of separation.
- II. In a small-world network, the median path-length between pairs of nodes is 5.
- III. In a small-world network, there are relatively few long-distance links, but most pairs of nodes are separated by short paths.
- IV. Small-world networks tend to have a lower clustering coefficient than random networks with the same number of nodes and link
- V. Small-world networks tend to have a higher clustering coefficient than random networks with the same number of nodes and link

Which of these statements is true?

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

Suppose you are presented with data from three different networks: Networks I, II, and III, all with the same number of nodes and link. You are told that one of them is a regular network, one is a small-world network, and one is a random network. For each network you calculate average path length and clustering coefficient, and get the following results:

| Network | L (average path length) | C (clustering coefficient) |
|---------|-------------------------|----------------------------|
| I       | 3.11                    | 0.01                       |
| II      | 4.35                    | 0.44                       |
| III     | 17                      | 0.6                        |

Which of the following should you conclude?

- A. Network I is the random network, II is the small-world network, and III is the regular network.
  - B. Network I is the small-world network, II is the random network, and III is the regular network.
  - C. Network I is the random network, II is the regular network, and III is the small-world network.
  - D. Network I is the small-world network, II is the regular network, and III is the random network.
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**Question 9**

Which of the following is true concerning scale-free networks?

- A. Any network with a "long-tailed" degree distribution is scale free.
- B. Any network that does not have a *normal* ("bell-curve") degree distribution is scale-free.
- C. Any network with a power-law degree distribution is scale free.
- D. Any network that has many hubs is scale-free

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**Question 10**

Which of the following is true concerning scale-free networks?

- A. Most nodes have high degree.
- B. The degree distribution has a "long tail".
- C. They are robust to hub node failure.
- D. They have normal (bell-curve-shaped) degree distributions.