

# Introduction to Complexity (Fall, 2014)

## 9.7 Take Unit 9 Test » Unit 9 Test

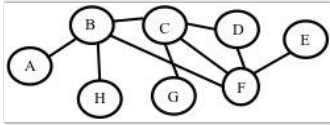
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### Instructions 1

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.

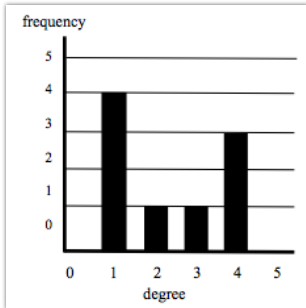
## Question 2

Consider the following network.

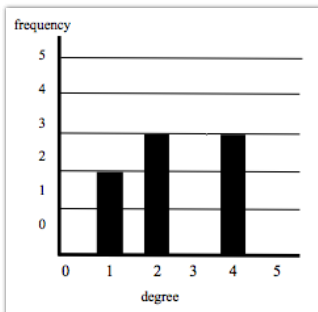


Which of the following is the correct degree distribution for this network?

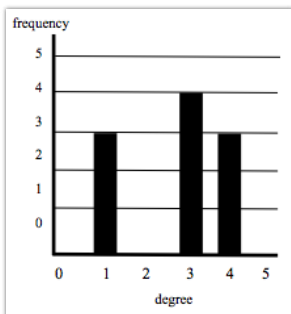
◦ A.



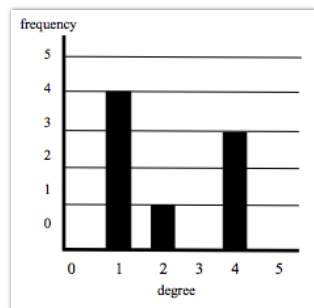
◦ B.



◦ C.



◦ 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
- 

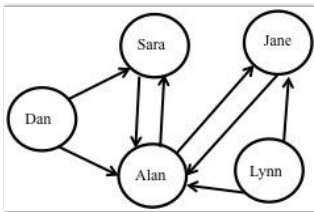
**Question 4**

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 the 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.