LESSON MAKER PRO

Networks and Nodes

Read graphs, count connections, and test paths.

HIGH SCHOOL · MA.912.LT.2.1

MA.912.LT.2.1 "Define and explain the basic concepts of Graph Theory."

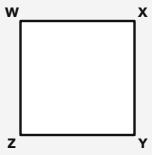
NAME _____ DATE _____

GRAPH BASICS

A graph has vertices, which are points, and edges, which connect pairs of vertices. A vertex's degree is its number of connected edges. A simple path follows edges without repeating a vertex, and the sum of all degrees is twice the number of edges.

WORKED EXAMPLE

In the graph shown, how many vertices and edges are there?



1. Count the labeled corners: 4 vertices.
2. Count the sides: 4 edges.

Answer: 4 vertices and 4 edges

PRACTICE 4 problems

1 A graph has edges AB, AC, BC, CD, and EF. What is the degree of C?

ANSWER _____

2 A graph has edges AB, AC, CD, DE, and EF. Is A-C-D-F a path? Explain.

ANSWER _____

3 The vertex degrees in a graph are 3, 3, 2, 2, 2, and 2. How many edges are in the graph?

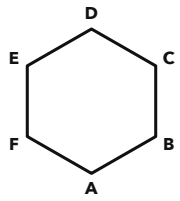
ANSWER _____

4 A connected graph has 7 vertices and 6 edges. Is it a tree?

ANSWER _____

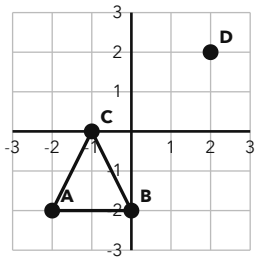
APPLY IT Show your work

1 The stage-crew communication graph is shown. Write one simple route for a message from A to D.



ANSWER _____

2 Each point in the club network is a club, and each drawn segment is a contact link. Is the network connected? Explain.



ANSWER _____

CHALLENGE One step up

A simple graph has 6 vertices. Five vertex degrees are 3, 3, 2, 2, and 2. A student says the last degree can be 5. Is that possible? Explain.

WORK SPACE AND ANSWER

ANSWER KEY

Networks and Nodes

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	A graph has edges AB, AC, BC, CD, and EF. What is the degree of C?	**3**
2	A graph has edges AB, AC, CD, DE, and EF. Is A-C-D-F a path? Explain.	**No. There is no edge from D to F.**
3	The vertex degrees in a graph are 3, 3, 2, 2, 2, and 2. How many edges are in the graph?	**7**
4	A connected graph has 7 vertices and 6 edges. Is it a tree?	**Yes**

PART 2 · APPLY IT

1. **A-B-C-D** Follow connected sides from A to D without visiting a crew twice. A-F-E-D is also valid.
2. **No. D is isolated, so it cannot be reached from the other clubs.** The triangle connects A, B, and C. Vertex D has no edge, so the graph is not connected.

CHALLENGE

No. The total would be 17, but the sum of vertex degrees must be even.

Accept any valid simple route from A to D in the stage-crew graph. For the tree item, accept "yes" with the reason that a connected graph with one fewer edge than vertices is a tree.