LESSON MAKER PRO

One Walk Networks

Plan routes through connected graphs

HIGH SCHOOL · FM.N.A

FM.N.A "Complex problems can be modeled using vertex and edge graphs and characteristics of the different structures are used to find solutions."

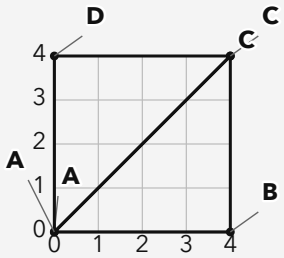
NAME _____ DATE _____

COUNT THE ODD VERTICES

A vertex's degree is the number of edges that meet there. In a connected graph, you can use every edge exactly once if zero or two vertices have odd degree. With zero, you can finish where you started. With two, you must start and finish at those vertices.

WORKED EXAMPLE

Each line is a path. Start at A and end at C. Can you use every path exactly once? Give a route.



1. A and C each have degree 3. B and D each have degree 2.
2. The two odd-degree vertices are the required start and finish.
3. Follow A → B → C → D → A → C.

Answer: Yes. A → B → C → D → A → C.

PRACTICE 4 problems

1 A graph has edges AB, BC, CD, and DE. Which vertices have odd degree?

ANSWER _____

2 A graph has edges AB, BC, CA, AD, DE, and EA. Give a route that uses every edge once and returns to its start.

ANSWER _____

3 A graph has edges AB, AC, AD, and AE. Can one route use every edge exactly once? Explain.

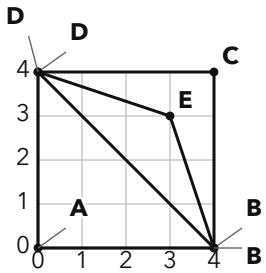
ANSWER _____

4 A graph has edges AB, BC, CA, CD, DE, EF, and FD. Give a route that uses every edge once.

ANSWER _____

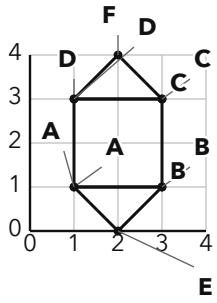
APPLY IT Show your work

1 At a music festival, letters mark stations and lines mark paths. Can a volunteer start at A, walk every path once, and return to A? Give a route.



ANSWER _____

2 At a school fair, letters mark booths and lines mark paths. Can you walk every path exactly once in one trip? Name the odd-degree booths.



ANSWER _____

CHALLENGE One step up

A graph has edges AB, BC, CD, DA, AC, CE, EF, and FC. You must start and finish at A and cover every edge. What is the fewest edges you must walk twice? Give a route.

WORK SPACE AND ANSWER

ANSWER KEY

One Walk Networks

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	A graph has edges AB, BC, CD, and DE. Which vertices have odd degree?	**A and E**
2	A graph has edges AB, BC, CA, AD, DE, and EA. Give a route that uses every edge once and returns to its start.	**A → B → C → A → D → E → A**
3	A graph has edges AB, AC, AD, and AE. Can one route use every edge exactly once? Explain.	**No. B, C, D, and E have odd degree, so there are four odd-degree vertices.**
4	A graph has edges AB, BC, CA, CD, DE, EF, and FD. Give a route that uses every edge once.	**C → A → B → C → D → E → F → D**

PART 2 · APPLY IT

1. **Yes. A → B → E → D → C → B → D → A.** Every station has even degree, so a route can end where it starts. The given route uses each path once.
2. **No. A, B, C, and D have odd degree.** Those four booths each meet three paths. A route using every path exactly once can have at most two odd-degree vertices.

CHALLENGE

One edge, AC. A → B → C → E → F → C → D → A → C → A.

Accept any valid route that meets the stated start and finish conditions. An edge shared by two shapes in a figure counts as one path.