LESSON MAKER PRO

Route Quest

Find efficient paths through graphs.

HIGH SCHOOL · MA.912.LT.2.2

MA.912.LT.2.2 "Solve problems involving paths in graphs."

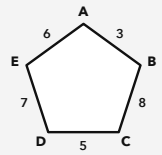
NAME _____ DATE _____

SHORTEST PATHS

A path follows connected edges from one vertex to another. Add the edge weights on each possible path, then choose the path with the least total weight. Do not repeat a vertex unless the problem asks for a route that returns.

WORKED EXAMPLE

Use the weighted graph to find the shortest path from A to D.



1. A-B-C-D has weight 3 + 8 + 5 = 16.
2. A-E-D has weight 6 + 7 = 13.
3. Since 13 is less than 16, choose A-E-D.

Answer: A-E-D, with total weight 13.

PRACTICE 4 problems

1 A graph has edges AB = 4, AC = 9, BC = 2, BD = 10, and CD = 4. Find the shortest path from A to D. Give the path and its total weight.

ANSWER _____

2 A graph has edges PQ = 11, QR = 12, RS = 13, PS = 17, and PR = 14. What is the total weight of path P-Q-R-S?

ANSWER _____

3 An unweighted graph has edges LM, LN, MO, NO, NP, and OP. How many simple paths lead from L to P?

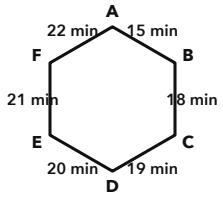
ANSWER _____

4 An unweighted graph has edges JK, JL, KM, LM, MN, and KN. Find a shortest path from J to N. Give the path and its number of edges.

ANSWER _____

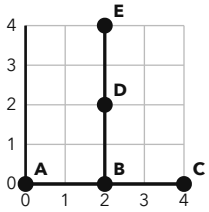
APPLY IT Show your work

1 The figure shows a loop of activity stations. Each side label gives walking time in minutes. Find the fastest route from A to D.



ANSWER _____

2 The grid shows a campus shuttle graph. Each segment between neighboring stations on a drawn route takes 1 minute. Find the shortest path from C to D.



ANSWER _____

CHALLENGE One step up

A weighted graph has edges RS = 11, RT = 12, RU = 10, ST = 4, SV = 14, TV = 13, and UV = 20. Find every shortest path from R to V. Explain why both paths have the same least weight.

WORK SPACE AND ANSWER

Route Quest

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	A graph has edges AB = 4, AC = 9, BC = 2, BD = 10, and CD = 4. Find the shortest path from A to D. Give the path and its total weight.	**A-B-C-D, total weight 10**
2	A graph has edges PQ = 11, QR = 12, RS = 13, PS = 17, and PR = 14. What is the total weight of path P-Q-R-S?	**36**
3	An unweighted graph has edges LM, LN, MO, NO, NP, and OP. How many simple paths lead from L to P?	**4**
4	An unweighted graph has edges JK, JL, KM, LM, MN, and KN. Find a shortest path from J to N. Give the path and its number of edges.	**J-K-N, 2 edges**

PART 2 · APPLY IT

1. **A-B-C-D, 52 minutes** A-B-C-D takes 15 + 18 + 19 = 52 minutes. The route through F and E takes 22 + 21 + 20 = 63 minutes.
2. **C-B-D, 2 minutes** Travel from C to B, then from B to D. This uses 2 connected segments.

CHALLENGE

R-S-V and R-T-V. Each has weight 25: 11 + 14 = 25 and 12 + 13 = 25. Every other simple path has weight at least 28.

Accept paths written with arrows instead of hyphens. For shortest-path items, require both a valid path and the correct total when the prompt asks for both.