LESSON MAKER PRO

Best Route Wins

Find the lowest-cost path through a network.

HIGH SCHOOL · FM.N.A.17.a

FM.N.A.17.a "Develop optimal solutions of application-based problems using existing and student-created algorithms."

NAME _____ DATE _____

COMPARE ROUTE TOTALS

Each link in a network has a cost. Add the costs along each route from start to finish, then choose the route with the smallest total.

WORKED EXAMPLE

Find the lowest-cost route from A to D.

LINK COSTS

Link	Cost
A-B	12
B-D	15
A-C	17
C-D	6

1. A-B-D costs 12 + 15 = 27.
2. A-C-D costs 17 + 6 = 23.
3. 23 is less than 27.

Answer: A-C-D, cost 23

PRACTICE 4 problems

1 Links: A-B 2, B-D 5, A-C 4, C-D 1. Find the lowest-cost route from A to D and its cost.

ANSWER _____

2 Links: A-B 4, B-D 5, A-C 3, C-D 9, A-D 10. Find the lowest-cost route from A to D and its cost.

ANSWER _____

3 Links: A-B 3, B-D 8, A-C 5, C-D 4, B-C 1. Find the lowest-cost route from A to D and its cost.

ANSWER _____

4 Links: A-B 5, B-D 4, A-C 2, C-D 9. Add link B-C with cost 1. Find the new lowest-cost route from A to D and its cost.

ANSWER _____

APPLY IT Show your work

1 A shuttle runs from school (A) to an arena (D). Find the fastest route and its time.

SHUTTLE LINKS

Link	Minutes
A-B	9
B-D	3
A-C	5
C-D	4

ANSWER _____

2 A game sends data from A to D. Link delays (ms): A-B 2, B-D 9, A-C 4, C-D 5, B-C 1. Find the quickest route and its total delay.

WORK SPACE

ANSWER _____

CHALLENGE One step up

Find the lowest-cost route from A to D. Explain a method that proves no other route costs less.

LINK COSTS

Link	Cost
A-B	4
B-D	8
A-C	7
C-D	3
B-C	1
A-D	11

WORK SPACE AND ANSWER

Best Route Wins

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Links: A-B 2, B-D 5, A-C 4, C-D 1. Find the lowest-cost route from A to D and its cost.	**A-C-D, cost 5**
2	Links: A-B 4, B-D 5, A-C 3, C-D 9, A-D 10. Find the lowest-cost route from A to D and its cost.	**A-B-D, cost 9**
3	Links: A-B 3, B-D 8, A-C 5, C-D 4, B-C 1. Find the lowest-cost route from A to D and its cost.	**A-B-C-D, cost 8**
4	Links: A-B 5, B-D 4, A-C 2, C-D 9. Add link B-C with cost 1. Find the new lowest-cost route from A to D and its cost.	**A-C-B-D, cost 7**

PART 2 · APPLY IT

1. **A-C-D, 9 minutes** A-C-D takes 5 + 4 = 9 minutes. A-B-D takes 9 + 3 = 12 minutes.
2. **A-B-C-D, 8 ms** A-B-C-D takes 2 + 1 + 5 = 8 ms. Every other route takes at least 9 ms.

CHALLENGE

A-B-C-D, cost 8. Check all routes without repeated stops: A-B-C-D costs 8, A-C-D costs 10, A-D costs 11, A-B-D costs 12, and A-C-B-D costs 16. Thus 8 is the lowest cost.

Accept routes written with arrows instead of hyphens. In the challenge, accept any valid method that rules out a route costing less than 8.