LESSON MAKER PRO

Ship It Shortest

Find the lowest-cost route through a shipping network.

HIGH SCHOOL · FM.N.A.18.a

FM.N.A.18.a "Use shortest path techniques to find optimal shipping routes."

NAME _____ DATE _____

FOLLOW THE LOWEST TOTAL

Each link has a shipping cost, and a route's cost is the sum of its links. Start at the depot and record the lowest known cost to each stop. Visit the unvisited stop with the lowest total, then check whether going through it lowers the cost to another stop.

WORKED EXAMPLE

Links work in both directions. Find the cheapest route from S to T.

SHIPPING COSTS

Link	Cost ($)
S-A	19
S-B	29
A-B	7
A-T	31
B-T	41

1. From S, the known costs are A = 19 and B = 29.
2. Visit A: lower B to 19 + 7 = 26; reach T for 19 + 31 = 50.
3. Visit B: its route to T costs 26 + 41 = 67, so T stays at 50.

Answer: S-A-T, $50

PRACTICE 4 problems

1 Links work both ways. Costs: S-A 4, S-B 8, A-B 3, A-T 12, B-T 5. Find the cheapest S-to-T route and its cost.

ANSWER _____

2 Links work both ways. Costs: S-A 6, S-B 12, A-B 4, A-T 15, B-T 5. Find the cheapest S-to-T route and its cost.

ANSWER _____

3 Links work both ways. Costs: S-A 5, S-B 6, A-B 4, A-T 10, B-T 8. Find the cheapest S-to-T route and its cost.

ANSWER _____

4 Links work both ways. Costs: S-A 4, S-B 6, A-C 5, B-C 5, A-T 15, C-T 8, B-T 14. Find the cheapest S-to-T route and its cost.

ANSWER _____

APPLY IT Show your work

1 Your club is shipping stickers from warehouse W to school H. Each link works both ways. Which route costs the least, and how much does it cost?

STICKER SHIPPING

Link	Cost ($)
W-P	6
W-Q	12
P-Q	4
P-H	15
Q-H	5

ANSWER _____

2 An esports team ships its equipment from warehouse W to venue V. Each link works both ways. Which route costs the least, and how much does it cost?

EQUIPMENT SHIPPING

Link	Cost ($)
W-A	10
W-B	6
A-B	3
A-V	8
B-V	15

ANSWER _____

CHALLENGE One step up

A depot D ships team shirts to T. Links work both ways. Find the cheapest route before and after A-B closes. Explain why the new route is cheapest.

SHIRT SHIPPING

Link	Cost ($)
D-A	4
D-B	10
A-B	3
A-T	12
B-T	5
D-T	18

WORK SPACE AND ANSWER

Ship It Shortest

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Links work both ways. Costs: S-A 4, S-B 8, A-B 3, A-T 12, B-T 5. Find the cheapest S-to-T route and its cost.	**S-A-B-T, $12**
2	Links work both ways. Costs: S-A 6, S-B 12, A-B 4, A-T 15, B-T 5. Find the cheapest S-to-T route and its cost.	**S-A-B-T, $15**
3	Links work both ways. Costs: S-A 5, S-B 6, A-B 4, A-T 10, B-T 8. Find the cheapest S-to-T route and its cost.	**S-B-T, $14**
4	Links work both ways. Costs: S-A 4, S-B 6, A-C 5, B-C 5, A-T 15, C-T 8, B-T 14. Find the cheapest S-to-T route and its cost.	**S-A-C-T, $17**

PART 2 · APPLY IT

1. **W-P-Q-H, $15** Through P and Q, the cost is 6 + 4 + 5 = 15. The routes through only Q or only P cost $17 and $21.
2. **W-B-A-V, $17** The route through B and A costs 6 + 3 + 8 = 17, less than W-A-V at $18 or W-B-V at $21.

CHALLENGE

Before: D-A-B-T, $12. After: D-B-T, $15. With A-B closed, D-A-T costs $16 and D-T costs $18, so neither beats $15.

Route letters must appear in travel order. Costs include every link used in the route.