The Grinch's sleigh

Submission deadline:	**2022-10-23 23:59:59**
Late submission with malus:	**2023-02-01 23:59:59** (Late submission malus: 100.0000 %)
Evaluation:	**12.5000**
Max. assessment:	**2.0000** (Without bonus points)
Submissions:	7 / -
Advices:	0 / 0

> And THEN
> They'd do something
> He liked least of all!
> Every *Who* down in *Who*-ville, the tall and the small,
> Would stand close together, with Christmas bells ringing.
> They'd stand hand-in-hand. And the *Whos* would start singing!
>
> They'd sing! *And they'd sing!*
> AND they'd SING! SING! SING! SING!
> And the more the Grinch thought of this *Who*-Christmas-Sing,
> The more the Grinch thought, "I must stop this whole thing!
> "Why, for fifty-three years I've put up with it now!
> "I MUST stop this Chrsitmas fom coming!
> …But HOW?"
>
> Then he got an idea!
> *An awful idea!*
> THE GRINCH
> GOT A WONDERFUL, AWFUL IDEA!

The Grinch is the foulest creature you have ever seen. He is covered from head to toe with green hair that he never combs out of principle. He never takes a bath and he stinks to high heaven. His teeth are full of larvae and he resembles a grumpy crocodile. He is through and through evil and despises little kids. His heart is made of stone, he hates Christmas and the whole of Advent. Hence, he decided to steal Christmas this year.

But stealing Christmas is no easy business. One needs a proper plan! With that in mind, the Grinch climbed to the highest peak of the mountain rising above his cave. There he began scheming whilst launching avalanches toward Whoville. Oh yes, that's it. The gifts are what make Christmas special. All the gifts must be stolen. But how would one go about it?

Naturally, the Grinch cannot possibly carry all the gifts himself. And Whoville is too far away to make several trips in one night. At that moment, the Grinch heard a distant bark. Oh yes, you are right, Max! We need a sleigh to carry all the stolen gifts. And Max, the Grinch's only friend, shall pull them.

The Grinch immediately began carrying out his devilish plan. If one dared to enter his cave, they would hear plenty of thumping, hissing, welding, and swearing. Max himself rather receded into the darkest corner of the cave without as much as sticking out his nose.

Christmas is already peeking around the corner and the Grinch is running out of time. The sleigh is yet to be finished. Several important parts are missing, such as the bell, antlers for Max, and the largest bag Whoville has ever seen. These items must be assembled without any further delay. Thereby, the Grinch called Max and gave him a map and a list of parts that need to be gathered immediately. And if Max again goes to earth, as usual, the Grinch promised to cut off his tail.

I have yet to describe to you, dear reader, what the Grinch's cave truly looks like. Throughout the thirty-five years of his life, the beast has pierced the whole mountain with an abundance of passages and rooms in which he hoards his treasures. Or at least what he considers treasures. Thus, one can find there wildly scattered bones of animals that he ate or tortured, and various knick-knacks that he stole in the city, found in a rubbish dump or discovered while he was wandering in the hills.

Will you help Max save his skin and instruct him how to collect all the necessary items as quickly as possible?

Interface

Your task is to implement the function `std::list<Place> find_path(const Map &map)` which finds the shortest walk such that you obtain at least one item of each kind. The walk must begin at `map.start`, end at `map.end` and a connection must exists between every two consecutive rooms of the walk. If there is no such a walk, return an empty list. The structure `Map` contains the following:

- `places`: the total number of rooms,
- `start`, `end`: the first, resp. last, room of the walk,
- `connections`: a list of pairs of rooms describing the connections,
- `items`: a list of lists, `items[i]` is a list of rooms in which the `i`-th item is placed.

You can assume that the room numbers are always in the range 0 up to `places - 1` (including).

Classification Conditions

- To obtain 2 points, you must correctly decide wheter such a walk exists. If it does, just return any non-empty list, its contents will not be checked. The size of the instances is the same as for 5 points.
- To obtain 5 points, you must solve the task for instances with about 1000 rooms and up to 4 kinds of items. Each item can be in many rooms.
- To obtain 10 points, you must solve the task for instances with about 3000 rooms and up to 6 kinds of items. Each item can be in many rooms.
- **Bonus:** To obtain 13 points, you must solve the task for instances with about 10000 rooms and up to 12 kinds of items but each item is only in at most 5 rooms.

Sample data: **Download**

Reference

- **Evaluator: computer**
  - Program compiled
  - Test 'Test existence cesty (s mem-debuggerem)': success
    - result: 100.00 %, required: 100.00 %
    - Total run time: 0.032 s (limit: 10.000 s)
    - Mandatory test success, evaluation: 100.00 %
  - Test 'Malý test': success
    - result: 100.00 %, required: 100.00 %
    - Total run time: 0.084 s (limit: 10.000 s)
    - Bonus test - success, evaluation: 250.00 %
  - Test 'Velký test': success
    - result: 100.00 %, required: 100.00 %
    - Total run time: 0.440 s (limit: 10.000 s)
    - Bonus test - success, evaluation: 200.00 %
  - Test 'Bonus test': success
    - result: 100.00 %, required: 100.00 %
    - Total run time: 0.745 s (limit: 10.000 s)
    - Bonus test - success, evaluation: 130.00 %
  - Overall ratio: 650.00 % (= 1.00 * 2.50 * 2.00 * 1.30)
- Total percent: 650.00 %
- Early submission bonus: 0.50
- Total points: 6.50 * (2.00 + 0.50) = 16.25

SW metrics:

	Total	Average	Maximum	Function name
Functions:	**9**	--	--	--
Lines of code:	**149**	**16.56 ± 29.28**	**96**	`find_path_bonus`
Cyclomatic complexity:	**42**	**4.67 ± 7.07**	**24**	`find_path_bonus`

7 **2022-10-16 22:44:08** **Download**

Submission status: Evaluated
Evaluation: 12.5000

- **Evaluator: computer**
  - Program compiled
  - Test 'Path existence test (with mem-debugger)': success
    - result: 100.00 %, required: 100.00 %
    - Total run time: 0.078 s (limit: 10.000 s)
    - Mandatory test success, evaluation: 100.00 %
  - Test 'Small test': success
    - result: 100.00 %, required: 100.00 %
    - Total run time: 0.290 s (limit: 10.000 s)
    - Bonus test - success, evaluation: 250.00 %
  - Test 'Big test': success
    - result: 100.00 %, required: 100.00 %
    - Total run time: 1.867 s (limit: 10.000 s)
    - Bonus test - success, evaluation: 200.00 %
  - Test 'Bonus test': Abnormal program termination (Time limit exceeded)
    - Cumulative test time exceeded, killed after:: 10.012 s (limit: 10.000 s)
    - Bonus test - failed, evaluation: No bonus awarded
  - Overall ratio: 500.00 % (= 1.00 * 2.50 * 2.00)
- Total percent: 500.00 %
- Early submission bonus: 0.50

- Total points: 5.00 * (2.00 + 0.50) = 12.50

SW metrics:

	Total	Average	Maximum	Function name
Functions:	**8**	--	--	--
Lines of code:	**83**	**10.38 ± 8.09**	**30**	`BFS`
Cyclomatic complexity:	**31**	**3.88 ± 2.62**	**10**	`BFS`

6 **2022-10-16 18:00:11** **Download**

Submission status: Evaluated
Evaluation: 0.0000

- **Evaluator: computer**
  - Program compiled
  - Test 'Path existence test (with mem-debugger)': Abnormal program termination (Segmentation fault/Bus error/Memory limit exceeded/Stack limit exceeded)
    - Total run time: 0.064 s (limit: 10.000 s)
    - Mandatory test failed, evaluation: 0.00 %
  - Overall ratio: 0.00 %
- Total percent: 0.00 %
- Early submission bonus: 0.50
- Total points: 0.00 * (2.00 + 0.50) = 0.00

SW metrics:

	Total	Average	Maximum	Function name
Functions:	**4**	--	--	--
Lines of code:	**67**	**16.75 ± 16.32**	**44**	`BFS`
Cyclomatic complexity:	**24**	**6.00 ± 5.34**	**15**	`BFS`

5 **2022-10-16 17:56:45** **Download**

Submission status: Evaluated
Evaluation: 0.0000

- **Evaluator: computer**
  - Program compiled
  - Test 'Path existence test (with mem-debugger)': Abnormal program termination (Segmentation fault/Bus error/Memory limit exceeded/Stack limit exceeded)
    - Total run time: 0.064 s (limit: 10.000 s)
    - Mandatory test failed, evaluation: 0.00 %
  - Overall ratio: 0.00 %
- Total percent: 0.00 %
- Early submission bonus: 0.50
- Total points: 0.00 * (2.00 + 0.50) = 0.00

SW metrics:

	Total	Average	Maximum	Function name
Functions:	**4**	--	--	--
Lines of code:	**70**	**17.50 ± 17.57**	**47**	`BFS`
Cyclomatic complexity:	**23**	**5.75 ± 4.92**	**14**	`BFS`

4 **2022-10-16 17:50:58** **Download**

Submission status: Evaluated
Evaluation: 0.0000

- **Evaluator: computer**
  - Program compiled
  - Test 'Path existence test (with mem-debugger)': Abnormal program termination (Segmentation fault/Bus error/Memory limit exceeded/Stack limit exceeded)
    - Total run time: 0.045 s (limit: 10.000 s)
    - Mandatory test failed, evaluation: 0.00 %
  - Overall ratio: 0.00 %
- Total percent: 0.00 %
- Early submission bonus: 0.50
- Total points: 0.00 * (2.00 + 0.50) = 0.00

SW metrics:

	Total	Average	Maximum	Function name
Functions:	**4**	--	--	--

	Lines of code:	**67**	**16.75 ± 16.32**	**44**	BFS
	Cyclomatic complexity:	**21**	**5.25 ± 4.09**	**12**	BFS

3	**2022-10-16 17:49:28**	**Download**
Submission status:	Evaluated	
Evaluation:	0.0000	

- **Evaluator: computer**
  - Program compiled
  - Test 'Path existence test (with mem-debugger)': Abnormal program termination (Segmentation fault/Bus error/Memory limit exceeded/Stack limit exceeded)
    - Total run time: 0.039 s (limit: 10.000 s)
    - Mandatory test failed, evaluation: 0.00 %
  - Overall ratio: 0.00 %
- Total percent: 0.00 %
- Early submission bonus: 0.50
- Total points: 0.00 * (2.00 + 0.50) = 0.00

SW metrics:		Total	Average	Maximum	Function name
	Functions:	**4**	--	--	--
	Lines of code:	**67**	**16.75 ± 16.32**	**44**	BFS
	Cyclomatic complexity:	**21**	**5.25 ± 4.09**	**12**	BFS

2	**2022-10-16 17:44:48**	**Download**
Submission status:	Evaluated	
Evaluation:	0.0000	

- **Evaluator: computer**
  - Program compiled
  - Test 'Path existence test (with mem-debugger)': Abnormal program termination (Segmentation fault/Bus error/Memory limit exceeded/Stack limit exceeded)
    - Total run time: 0.065 s (limit: 10.000 s)
    - Mandatory test failed, evaluation: 0.00 %
  - Overall ratio: 0.00 %
- Total percent: 0.00 %
- Early submission bonus: 0.50
- Total points: 0.00 * (2.00 + 0.50) = 0.00

SW metrics:		Total	Average	Maximum	Function name
	Functions:	**5**	--	--	--
	Lines of code:	**75**	**15.00 ± 15.01**	**44**	BFS
	Cyclomatic complexity:	**24**	**4.80 ± 3.76**	**12**	BFS

1	**2022-10-16 17:32:49**	**Download**
Submission status:	Evaluated	
Evaluation:	0.0000	

- **Evaluator: computer**
  - Compile in 'pedantic' mode failed (10 % penalty).
  - Test 'Path existence test (with mem-debugger)': Abnormal program termination (Segmentation fault/Bus error/Memory limit exceeded/Stack limit exceeded)
    - Total run time: 0.074 s (limit: 10.000 s)
    - Mandatory test failed, evaluation: 0.00 %
  - Overall ratio: 0.00 %
- Total percent: 0.00 %
- Early submission bonus: 0.50
- Total points: 0.00 * (2.00 + 0.50) = 0.00

SW metrics:		Total	Average	Maximum	Function name
	Functions:	**5**	--	--	--
	Lines of code:	**75**	**15.00 ± 15.01**	**44**	BFS
	Cyclomatic complexity:	**24**	**4.80 ± 3.76**	**12**	BFS