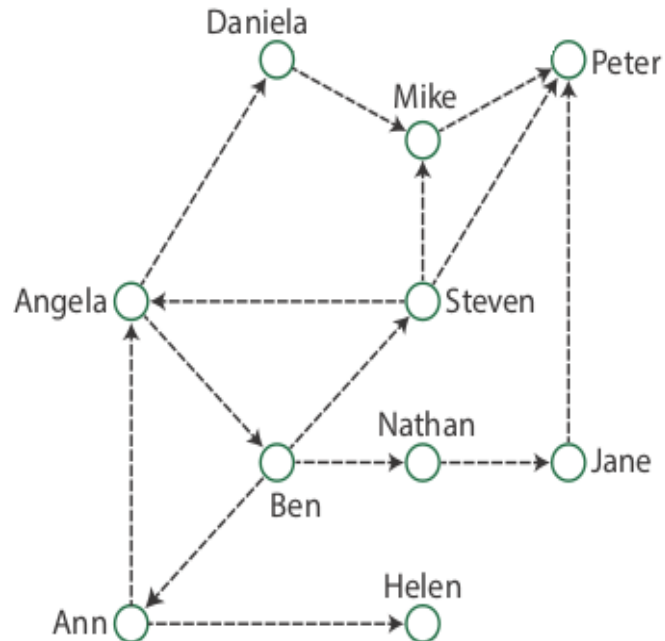


Gossiping



Friends in a primary school enjoy spreading gossip. The arrows in the figure below show who a person tells news to. For instance, Steven tells everything to Peter, Mike, and Angela.



Today, Ann brought in some interesting news that spread quickly to others. After school, Helen, Peter, Steven, and Jane met together and discovered that Helen and Peter had heard the news, while Steven and Jane had not. Somebody was absent from school today which prevented the normal spreading of news.

QUESTION

Who was absent today?

- A. Nathan
- B. Ben
- C. Angela
- D. Mike



Answer

The correct answer is B. Ben.

Explanation of the answer

We can break this problem down into smaller problems. For each person in the school, we can ask if they were the person missing.

We can assume that Helen, Peter, Steven, and Jane were present since they met after school. Ann was present since she brought the news in.

From the problem description, we know we can check each remaining person to see if they were missing by answering two questions:

"If they were missing, did the news still reach Helen and Peter?", and

"If they were missing, did the news no longer reach Steven and Jane?".

Was **A.** Nathan missing? The news would still reach Helen and Peter if Nathan was missing. The news could have spread from Ann to Peter by following the path Ann -> Angela -> Ben -> Steven -> Peter. The news still reaches Steven even if Nathan was missing, so Nathan was not absent.

Was **B.** Ben missing? The news would still reach Helen and Peter if Ben was missing (Ann -> Angela -> Daniela -> Mike -> Peter). The news would not reach Steven or Jane if Ben was missing. All news that reaches Steven must go through Ben. All news that reaches Jane must go through Nathan, and all news to Nathan must go through Ben. B. Therefore, Ben was absent.

Was **C.** Angela missing? The news would not reach Peter if Angela was missing. All the paths from Ann to Peter go through Angela. Ann only directly tells two people news: Helen and Angela. Helen doesn't tell anyone news. So, if Angela was missing, the news would not spread to anyone else in the school. Angela was not absent.

Was **D.** Mike missing? The news would still reach Helen and Peter. The news still reaches Steven and Jane even if Mike was missing, so Mike was not absent.

Was Daniela missing? The news would still reach Helen and Peter if Daniela was missing. The news still reaches Steven and Jane even if Daniela was missing, so Daniela was not absent.

In conclusion, Ben is the only friend who was absent.

Connection to computational thinking

Decomposition: This task is an example of *breaking into parts*. The question "Was X missing?" is a useful decomposition as it can be answered one at a time for each person. By answering the question for each person, we can get an answer to the original problem. This task also shows how we might further decompose each question into two smaller questions that are more manageable.

