Puzzle

Lines on a chessboard

Puzzles are great for developing mathematical logic skills, as well as training us to be resilient if a solution proves tricky to find…!

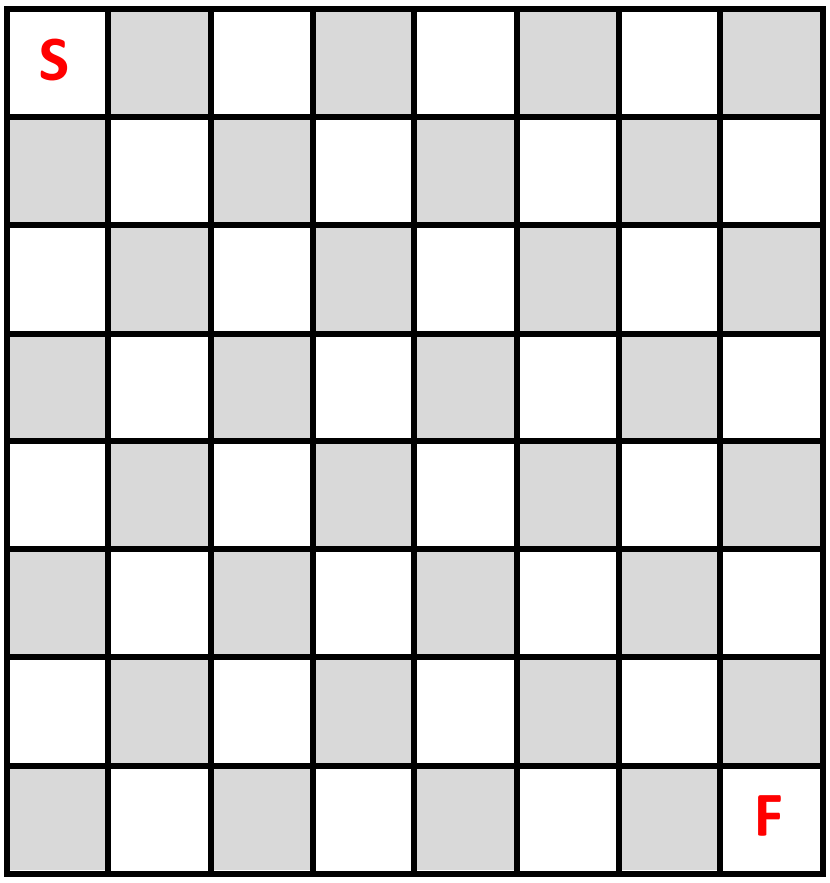
AIMS: Use logical reasoning to solve a spatial puzzle

> *"Begin at the beginning," the King said gravely,*
> *"and go on until you come to the end; then stop."*
>
> Lewis Carroll, *Alice's Adventures in Wonderland.*

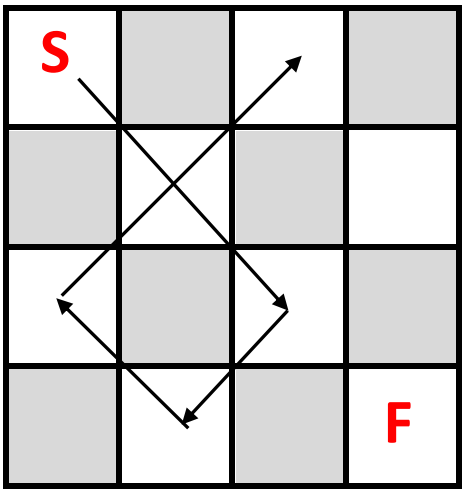
You will need: a pencil, paper, grids (*see resources*)

In this puzzle, we investigate how to use **straight lines** to go from start **'S'** to finish **'F'**, passing through every white square on a grid of grey and white squares – like a chessboard. Just like a bishop in chess, we will use **diagonal lines** to avoid crossing any grey squares.

YOU MAY NOT LIFT YOUR PENCIL FROM THE PAPER!



A helpful problem-solving strategy is to try a **simpler problem first**, so learn how to start the problem with a **4 by 4 square.**



We could start by drawing a line directly from S to F, but we would then have to go back before we could travel to the other white squares. We definitely want to avoid this! So, instead follow these moves:

Move 1: Start by going down and right 2 squares.

Move 2: Turn and go down and left by 1 square.

Move 3: Turn and go up and left by 1 square.

Move 4: Turn and go up and right by 2 squares.

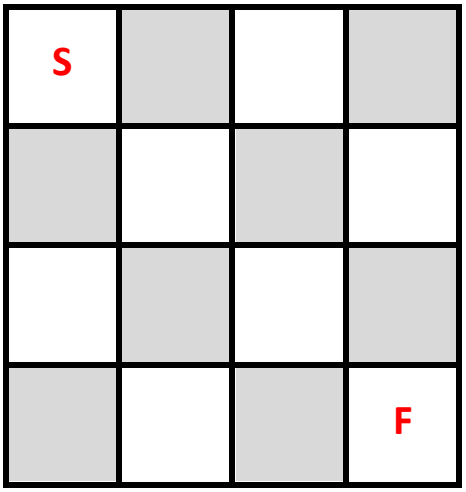
How many more moves to get to the **finish**? How many was that **in total**?

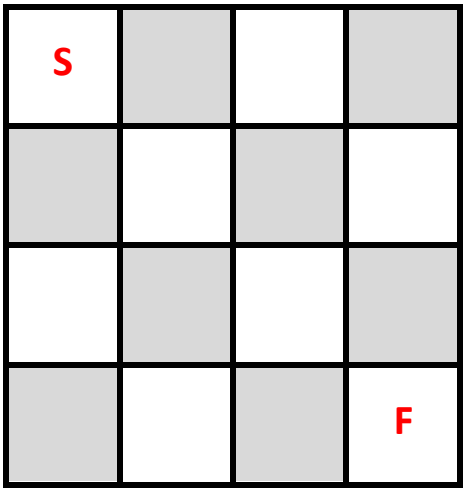
Do you think that you can beat that? Use the grids on the resource page to try out your ideas.

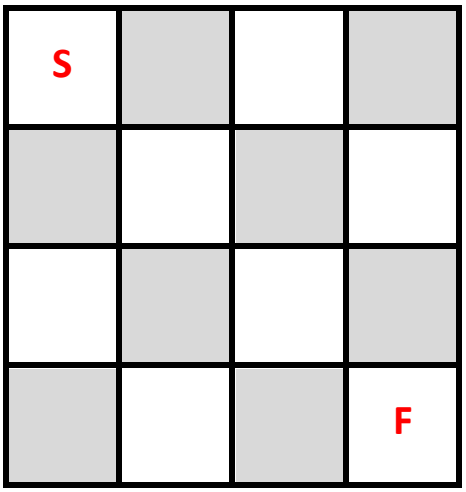
- Now try on the **5 by 5 grids.** What happens with these? UGH! You have to backtrack! There is no way to avoid this problem! Can you see why not?
- Now try on the **6 by 6 grids.**
- Now you are ready for the **chessboard challenge!**
  Look at your solutions for 4 by 4 and 6 by 6… Maybe you can use some of the patterns from those solutions to help?!
- If you get stuck, have a look at the solutions page and try and reproduce the examples before trying again.

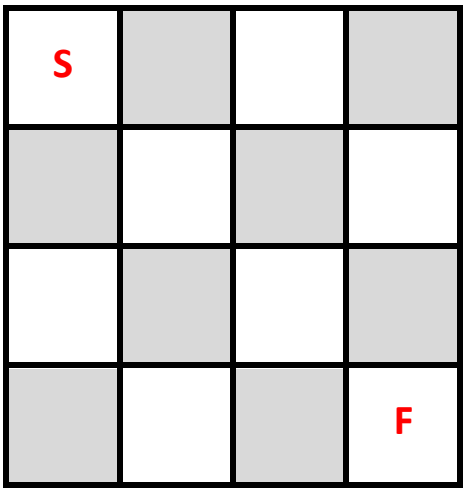
Resource

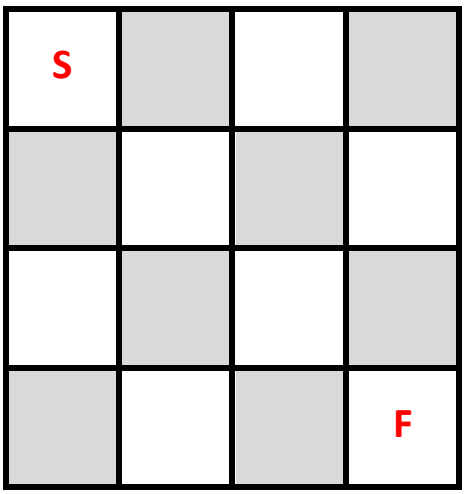
4 by 4 grids

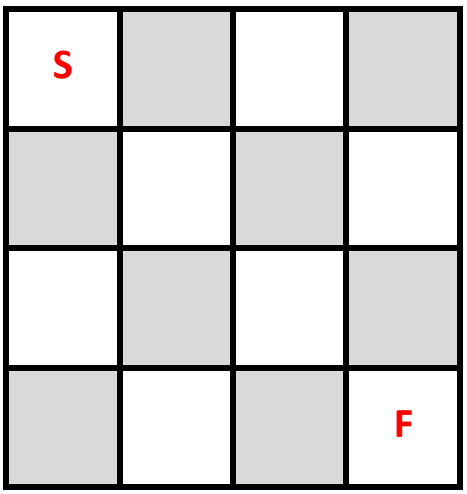






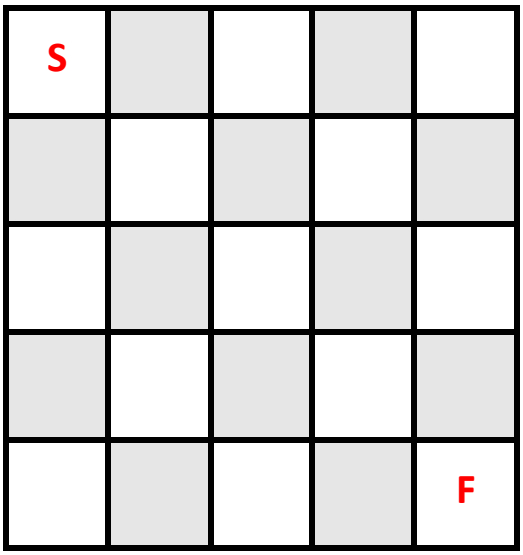


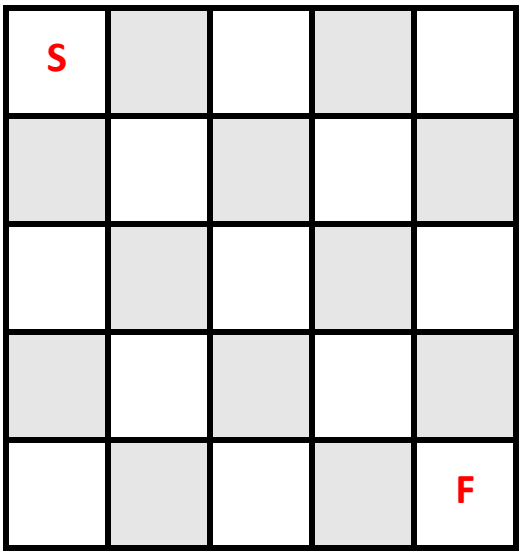


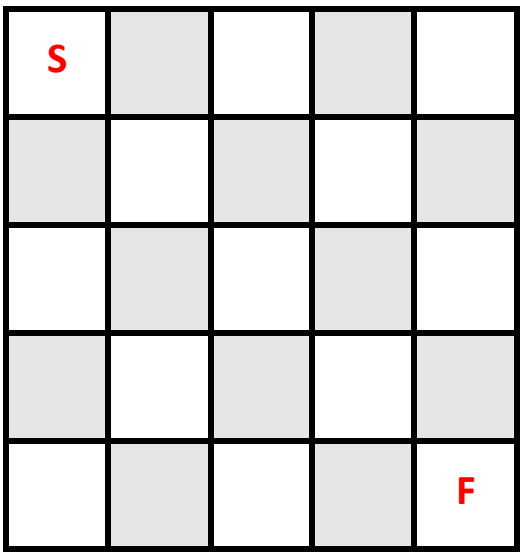


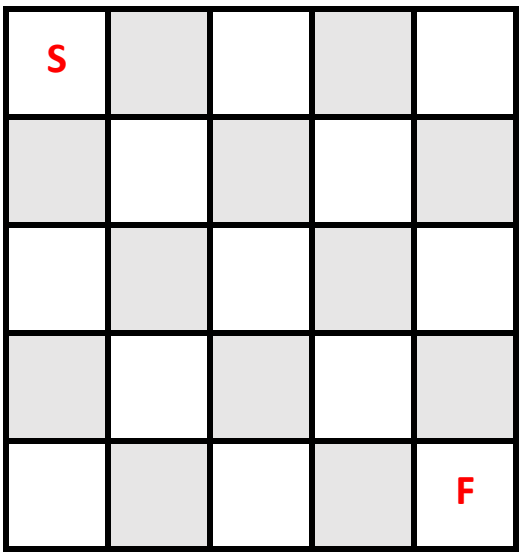
Resource

5 by 5 grids



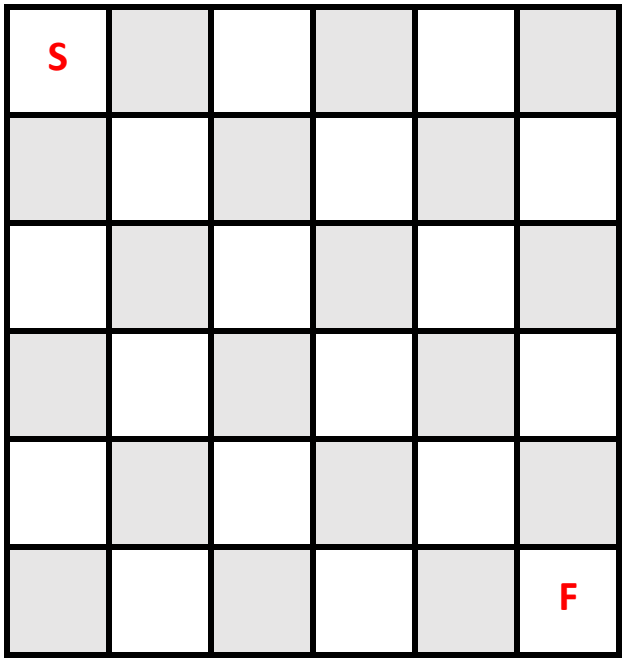


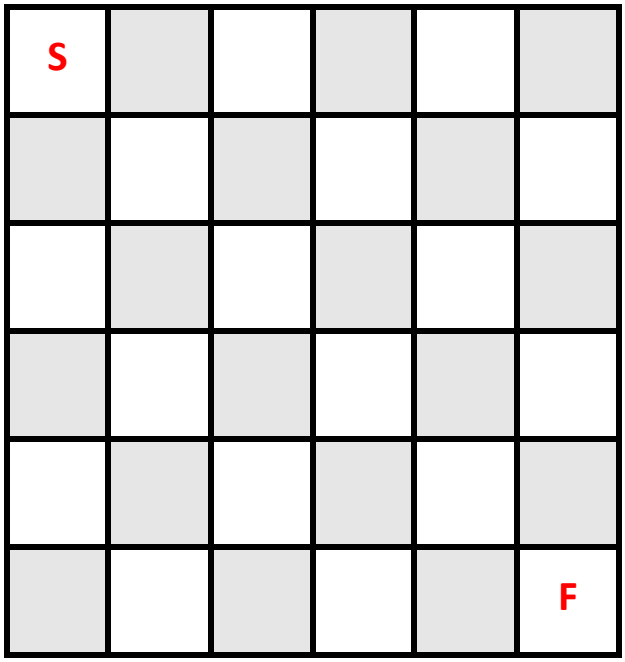


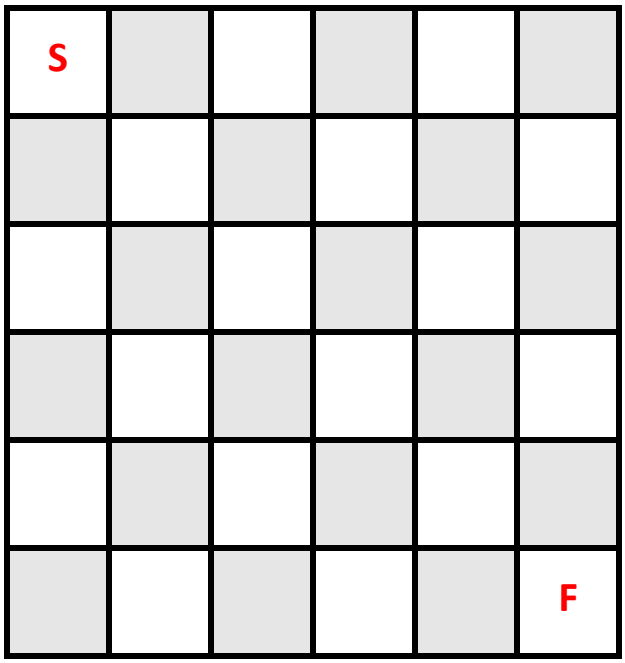


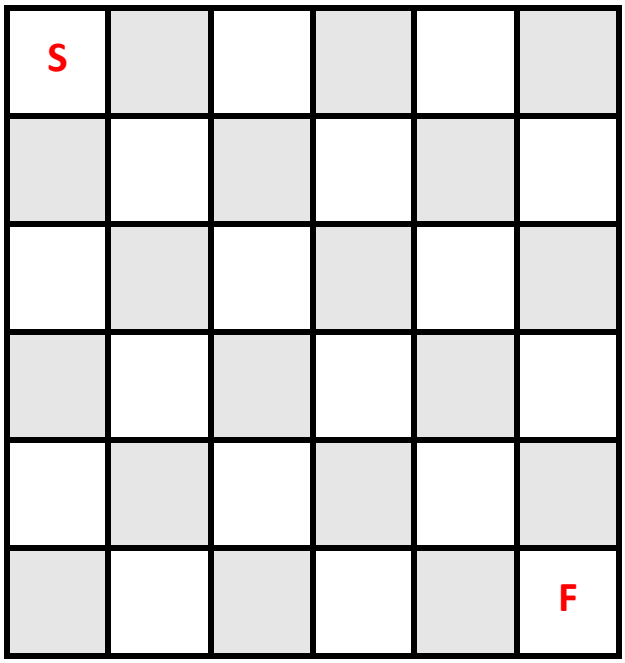
Resource

6 by 6 grids



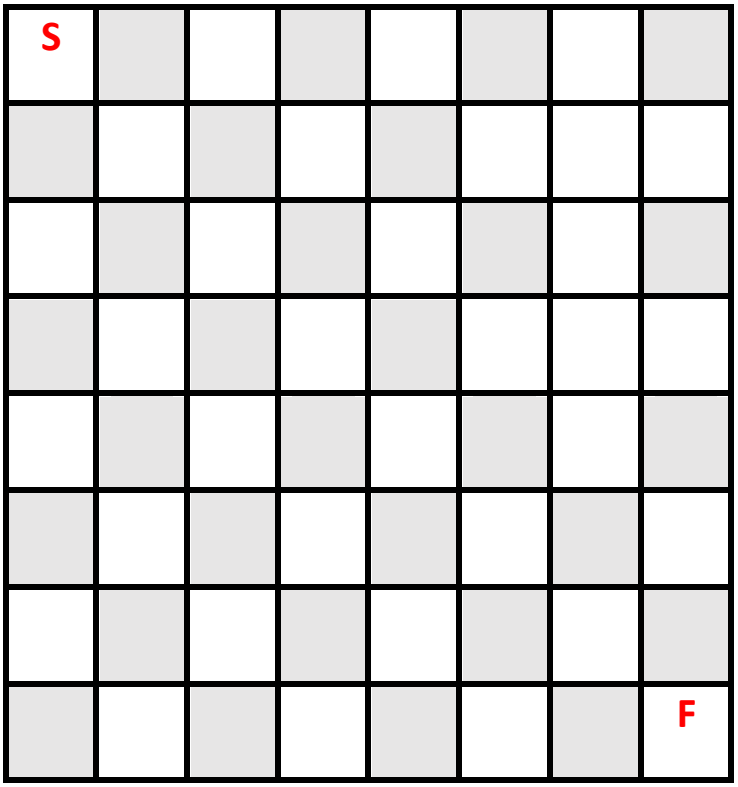


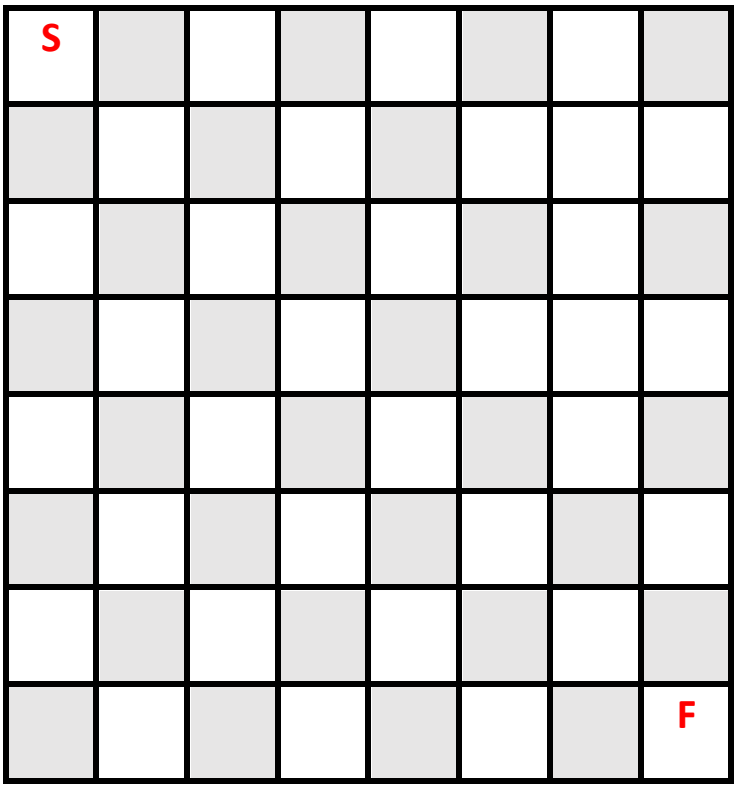




Resource

8 by 8 grids

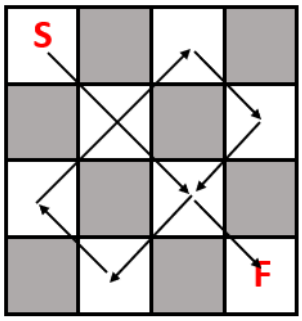


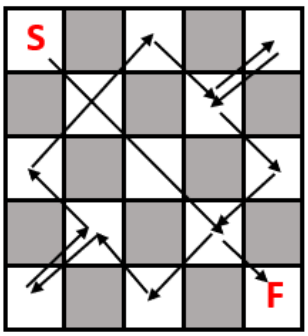


Solutions

Note – there are many different solutions - you may have a different one.

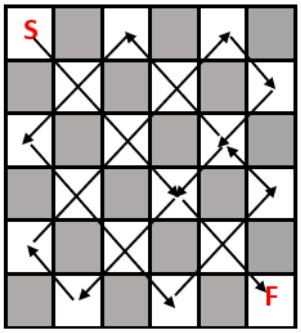
4 by 4: This solution has 7 lines.





5 by 5: This solution has 13 lines. With an odd number, it is impossible to avoid going back over a line since the white corner squares have only one route in and out.

6 by 6: This solution has 13 lines.



8 by 8: This solution has 17 lines.