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

S
F
S
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Resource
5 by 5 grids
Resource
6 by 6 grids

S

F

S

F

S

F

S

F

S

F

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Resource
8 by 8 grids

S

F

S

F
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.