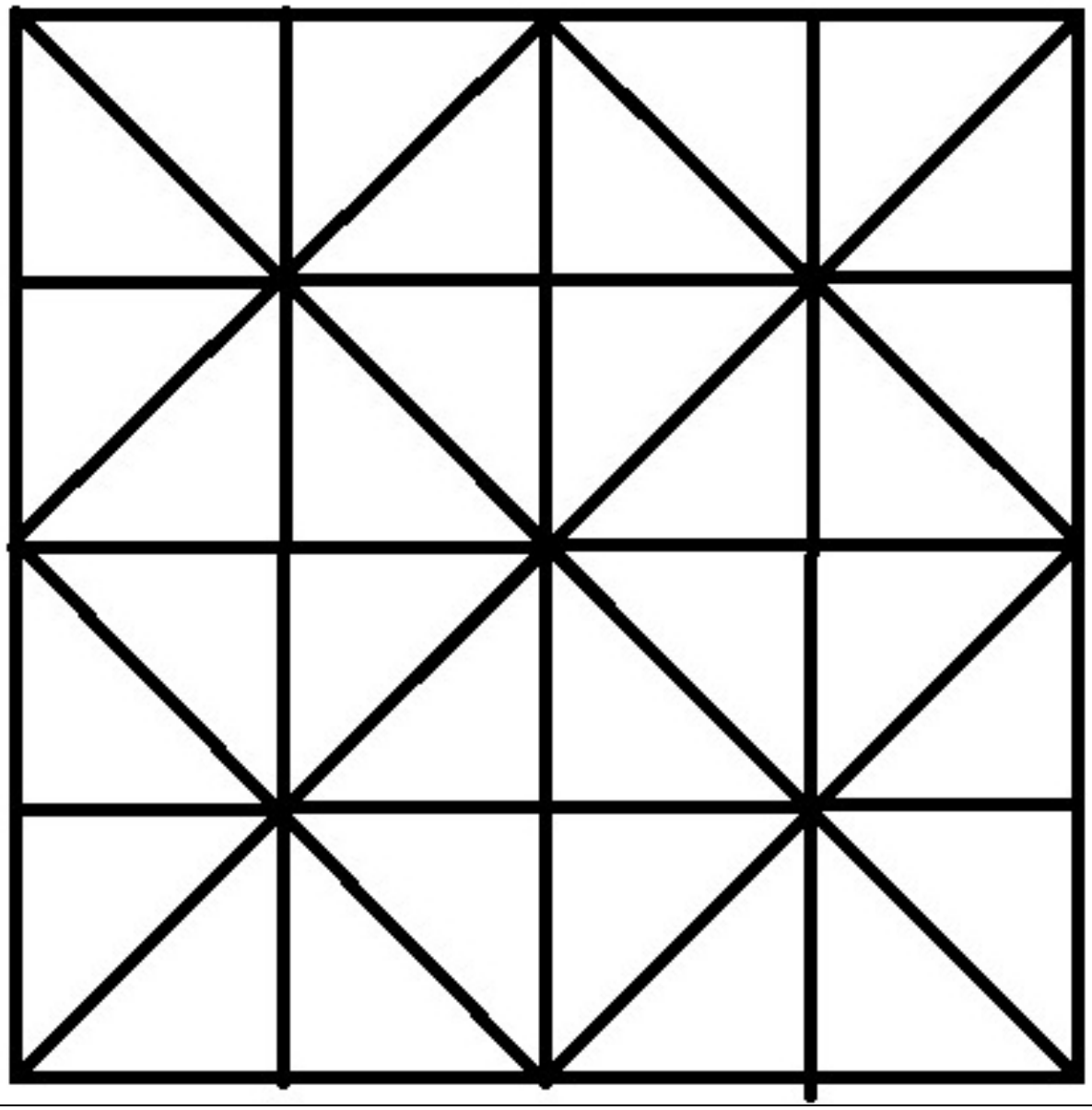
FIVE IN A LINE GAME

This is a game for two players. It requires a lot of thinking and strategic play.

Each player has 5 stones, counters, bottle tops or buttons that look different from the counters used by the other player.

To win, the player must be the first to get his or her 5 counters in a line. Each player has to stop the other player making a line.

The players take it in turns to place their counters on one of the lattice points on the board. When 10 counters have been placed, players take turns to move one counter at a time to an adjacent empty place along any of the marked lines. Players must move when it is their turn.



Alternative version

No stones are moved. Instead, both players place their stones until one makes a line of 5. If neither player can make a line of 5 then the game ends in a draw.

HELP

It is possible to make a line of 5 of your counters on 10 vertical, 10 horizontal and 2 diagonal lines. You need to keep watching your opponents moves to stop him or her getting a line before you do. Plan your strategy according to what your opponent does.

NEXT

You could try Gomoku which is the same game played using a15×15 board or a 19×19 board. This is more challenging than the simple game on a 5×5 board

Gomoku, also called *Five in a Row*, is an abstract strategy board game. It is traditionally played with Go pieces (black and white stones) on a Go board. Because pieces are typically not moved or removed from the board, Gomoku may also be played as a paper-and-pencil game. The game is known in several countries under different names.

Players alternate turns placing a stone of their color on an empty intersection. The winner is the first player to form an unbroken chain of five stones horizontally, vertically, or diagonally.

For an example game won by black in 37 moves see https://en.wikipedia.org/wiki/Gomoku

NOTES FOR TEACHERS

Why do this activity?

Games like this teach children to reason logically. They must be able to visualise the board several moves ahead with different possible sequences of play, and choose their best next move. Playing such games with concentration helps learners to develop their thinking skills.

Learning objectives

In doing this activity students will have an opportunity to develop their mathematical thinking and visualization skills.

Generic competences

In doing this activity students will have an opportunity to:

- analyze, **make hypotheses** (if I did this and he did that …) and to reason logically;
- play games competitively with **consideration and respect for others.**

Suggestions for teaching

Let everyone play the game, and encourage concentration and perseverance. After several days when people have had the opportunity to play the game, you could organise a competition in which everyone gets to play everyone else.

One way to run this competition is to start by everyone playing in pairs. After each game, the winner moves to the next place in the order and the loser on the first table plays the winner on the last table in the cycle. After a while a ranking will emerge. You might stop the cyclic play and just let players practise. Invite anyone to challenge the 'champion' to a contest of 5 games. If the challenger wins then he or she becomes the new champion.

Key questions

- Has your opponent got 3 stones anywhere on the same line?
  How can you stop your opponent getting 5 in a line?
- If you go there, what would be the best move for your opponent? What would you do then?
- What would be a good next move for your opponent? What would you do then? If you did that what would your opponent do?

Follow up

Tell the class about Gomoku (see the Next box on page 1). They might like to try it in the Maths Club or at home. In Korea this game is played very seriously by young children as an introduction to the game of Go which is simpler to learn than chess but more challenging to play with skill.

For the story of the victory for Artificial Intelligence over the best champion plays see https://en.wikipedia.org/wiki/AlphaGo_versus_Lee_Sedol

Note: The Grades or School Years specified on the AIMING HIGH Website correspond to Grades 4 to 12 in South Africa and the USA, to Years 4 to 12 in the UK and up to Secondary 5 in East Africa. New material will be added for Secondary 6.
For resources for teaching A level mathematics see https://nrich.maths.org/12339
Note: The mathematics taught in Year 13 (UK) and Secondary 6 (East Africa) is beyond the school curriculum for Grade 12 SA.

	Lower Primary or Foundation Phase Age 5 to 9	Upper Primary Age 9 to 11	Lower Secondary Age 11 to 14	Upper Secondary Age 15+
South Africa	Grades R and 1 to 3	Grades 4 to 6	Grades 7 to 9	Grades 10 to 12
USA	Kindergarten and G1 to 3	Grades 4 to 6	Grades 7 to 9	Grades 10 to 12
UK	Reception and Years 1 to 3	Years 4 to 6	Years 7 to 9	Years 10 to 13
East Africa	Nursery and Primary 1 to 3	Primary 4 to 6	Secondary 1 to 3	Secondary 4 to 6