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SPROUTS

Euro-sceptics may be relieved to know this idea has nothing to do with Brussels.

Sprouts is a game for two people requiring cooperation and provides opportunities for strategic thinking, problem-solving, careful counting, some pattern spotting, looking for a 'closed' generalization and a bit of fun.

The game is based upon a situation involving nodes, arcs and regions where:

- A node is a small blob (or a big dot).
- A region is an area bounded by at least two arcs.
- An arc is a line (curved or straight) joining two nodes.

The game is played as follows:

- Draw two, three or four nodes on a piece of paper.
- Players take turns to join pairs of nodes with arcs.
- As soon as an arc is drawn a new node is drawn on it (i.e. a new node 'sprouts' on the arc).

The game continues using the following rules:

1. Every time a pair of nodes is joined by an arc, a new node sprouts on the arc just drawn (this new node effectively splits the arc into two shorter arcs).
2. When a node has three arcs coming out from it the node becomes defunct, deceased, dead. It is crossed out and cannot be used again.
3. Players are not allowed to draw an arc to join two nodes by crossing over an existing arc.
4. The same pair of nodes can be joined by more than one arc.

The winner is the person who draws the final arc. Once a game is completed, count the nodes, regions and arcs for the resulting diagram. We also need to count an extra region around the outside (imaging drawing a frame around the diagram and this produces a further region).

Students can play several games and gather the required data to look for the connection between nodes, regions and arcs.

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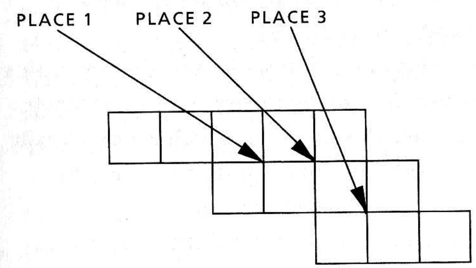
4-SQUARE MEETING POINT PROBLEM

The following idea is one I have used with Year 10 students in mixed-attainment groups. Because the problem can be both simplified and developed to varying degrees, all students can gain different levels of achievement.

The problem involves students drawing shapes from a given number of squares (n) joined by full edge to full edge. Information is then extracted from each diagram drawn; how many places four squares meet at different points (m), together with the perimeter of the shape (p).

For example, if the squares are joined as follows there are three places where four squares meet:



so $m = 3$ and $p = 20$.

If the squares are joined, say, in the shape of a 3-by-4 rectangle then $m = 6$ and $p = 14$. The idea is to form connections between n, m and p.

I have introduced the problem by inviting students to use 12 squares and gather a range of different sets of results. With this information students can explore patterns and connections between n, m and p.

Using smaller numbers of squares may help to simplify the problem, however, as explorers of mathematics, this is a decision students need to make for themselves.

Using equilateral triangles and regular hexagons can provide extensions to the problem.