Age 11+ Level ★★
Worksheet 1

1. Sliding Robot

A robot moves along the number line.
It starts at 0, slides forward one unit (to 1), slides backwards 2 units (to -1), then forward 3, back 4, and so on.
It slides alternately forward and backwards, with each slide one unit longer than the previous one.

Where is the robot after 2011 slides?

2. Knockdown

Pegs numbered 1 to 50 are placed in order in a line, with number 1 on the left. They are then knocked over, one at a time, following these rules:

- Starting with the first standing peg on the left, alternate pegs are knocked down, until the end of the row is reached.
- Each time the end of the row is reached, repeat the previous rule.

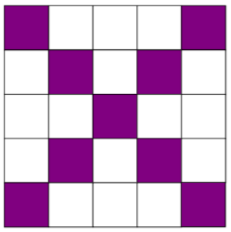
What is the number of the last peg to be knocked down?

3. Square Grid

A square is split into a 100 by 100 square grid.
100 squares in the first row are shaded, 99 in the second row, 98 in the third row, and so on.
What fraction of the whole square is shaded?

4. Tiled Floor

In Andrea's house, all floors are square, and covered with square tiles.
Tiles along the diagonal are purple, and the other tiles are white, as shown in the diagram.

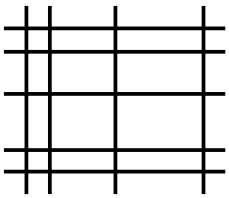


There are 109 purple tiles on the square bathroom floor.
How many tiles are there altogether on the bathroom floor?

These problems are adapted from UKMT (ukmt.org.uk) and SEAMC (seamc.asia) problems.

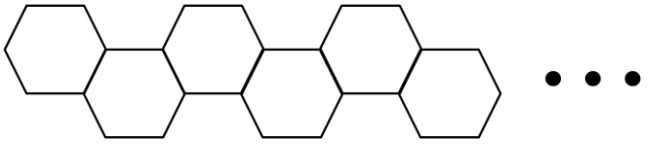
Age 11+ Level ★★
Worksheet 2

1. How many Rectangles?



By drawing 9 lines, 5 horizontal and 4 vertical, one can form 12 small rectangles, as shown on the right.
What is the greatest possible number of small rectangles that one can form by drawing 15 lines, either horizontal or vertical?

2. Hexagon Line

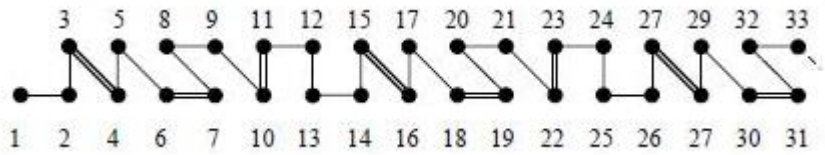


A shape consisting of a number of regular hexagons is made by continuing the pattern shown in the diagram, with each extra hexagon sharing one side with the preceding one.
Each hexagon has a side length of 1cm.

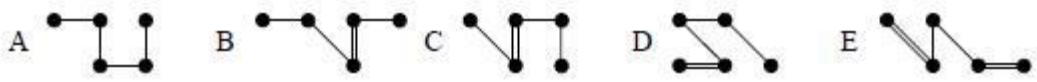
How many hexagons are required for the perimeter of the whole shape to have length 1002cm?

3. Pattern Snake

The diagram below shows a pattern which repeats every 12 dots.



What does the piece between 2007 and 2011 look like?



4. Night Watchmen

Granny's watch gains 30 minutes every hour, whilst Grandpa's watch loses 30 minutes every hour. At midnight, they both set their watches to the correct time of 12 o'clock.
What is the correct time when their two watches next agree?

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