Maths Week Ireland

1. Discovering the Polyominoes (Junior Cycle)
2. Pentominoes– area and perimeter

Resources: Squares(p.3)- 5 per student. Pentominoes (page 3) one sheet per student. Print the tetrominoes template on the 160 gsm paper. Scissors.

Strands: Transformations, perimeter, area.

Time: 80 minutes

Teacher's note: A polyomino is a plane geometric figure formed by joining one or more equal squares edge to edge. Polyominoes have connections with various themes in geometry- symmetry, tiling, perimeter, and area.

Solomon Golomb (1932 – 2016) was an American mathematician and engineer who first defined pentominoes. They were made famous by the American maths populariser, Martin Gardner.

Activity I: Discuss how many shapes can be made with one (MONOMINO– just one shape) or two (DOMINO– one shape) squares. How many with three merged squares (TROMINOES- two shapes)? How many with four (five shapes called TETROMINOES)? How many with five squares? (12 shapes called PENTOMINOES) Give the students loose squares so they can create shapes themselves. Then replace them with the ones cut out of the template.

Questions:

- Pentominoes are sometimes called after letters that they (kind of) look like: F, I, L,N, P, T, U, V, W, X, Y, Z. Assign shapes to the letters.

- What form of symmetry can you find in PENTOMINOES and in which shapes? (axial, line symmetry)
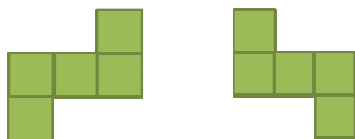
For instance:

 Are these the same shape?

It is easy to see that they are the same shape rotated by 90 degrees.

We can also look at re-   flections- where one shape is
the mirror image of an-   other:

- How many ways can we make a shape that looks different by rotating or flipping a pentomino?(We only consider rotations through 90 degrees (you can rotate 1, 2, 3 times). Rotating 4 times through 90 degrees brings us back to the start. And also flipping horizontally or vertically. Flipping the shape gives us the mirror image.)

- Is there a pentomino that is more symmetrical? In other words that wont look different no matter how you turn it (through 90, 180 or 270 degrees) or flip it. (answer: X– shape pentomino)

- What pentominos have the most orientations? (answer: the F– shape pentomono; There are 8 ways that the F-pentomino can be turned and flipped to make to look different)

Reflection through a vertical mirror (flipping horizontally) and its 3 rotations right 90^0,
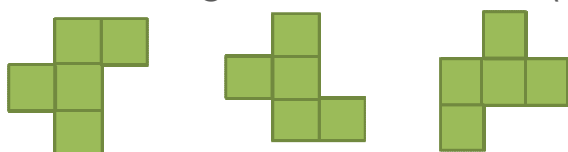
Reflection through a horizontal mirror (flipping vertically) and its rotation right 90^0.

Activity II: Ask the student to cut out the pentominoes from the given template. Let's analyse their area and perimeter.

Questions:

- Do all the pentominoes have the same area?

- Do all the pentominoes have the same perimeter?

- Can the12 pentominoes be assembled into a rectangle?

- What is the area of the rectangle?

- What are all of the possible perimeters of a rectangle with an area of 60 square units?

- Is it possible for the 12 pentominoes to assembled into a square?

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