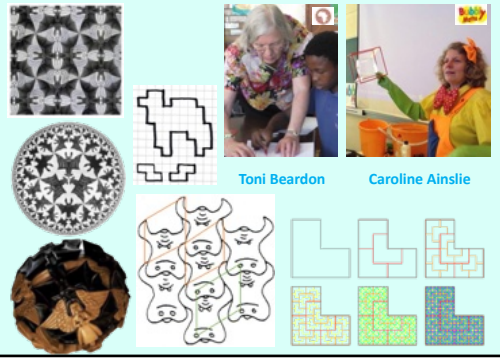
Global Teacher Empowerment Network GTEN

Saturday 20 July 2024 16:00 – 18:00 London Time

TESSELLATION REPTILES AND FRACTALS



Toni Beardon Caroline Ainslie

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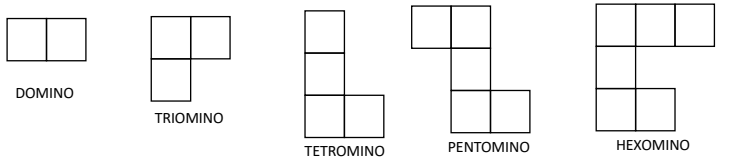
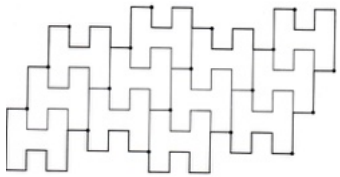
PART 2 POLYOMINOES

Polyominoes are shapes made up of squares. Here are some examples.





TESSELLATION OF SEPTOMINOES

The table shows the total number of each type.

Can you find them all?

Which pentominoes tessellate?

Which pentominoes are reptiles?

Name	Number of variations
	1
Domino	1
Triomino	2
Tetromino	5
Pentomino	12
Hexomino	35

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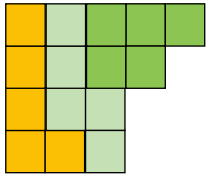
PENTOMINO PUZZLE

Make all 12 pentominoes and use them to make a rectangle.



Start with 3 pentominoes and complete the rectangle. Each piece of the jig-saw is a different shape.

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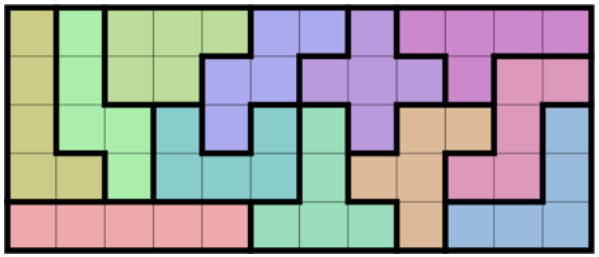
Pentomino Puzzle

The solution to the pentomino puzzle.
Cut out the pieces, mix them, then solve the puzzle.



Which of these pentominoes are reptiles?

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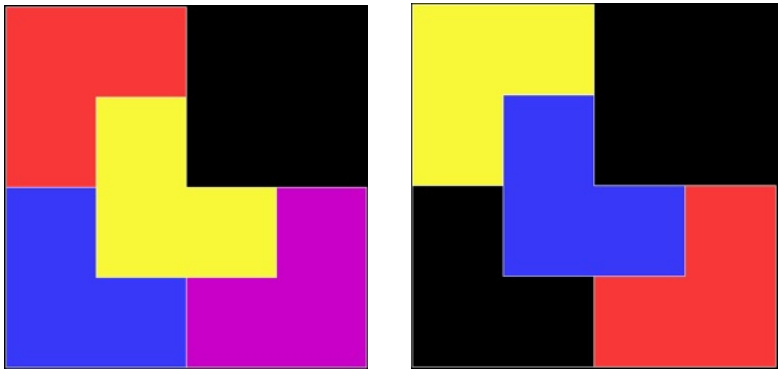
Two Reptile Fractals * Triomino or Trisquare



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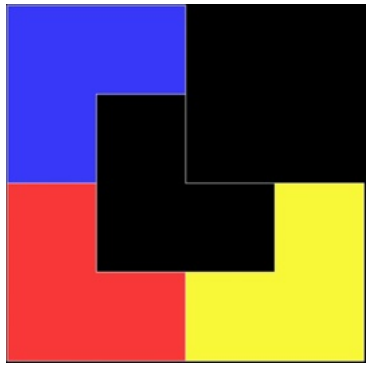
Third Reptile Fractal * Triomino or Trisquare



Notice how this fractal iteration produces a white pattern. This occurs through mixing primary colours.

Primary colour mix rainbow wheel. Johannes Itten 1961

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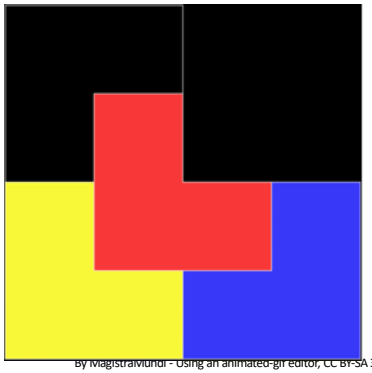
Reptile Fractals * Triomino or Trisquare



ANOTHER ITERATION PATTERN WITH THE TRIOMINO TILE.

This iteration produces a Sierpinski triangle pattern.

The fractal repetition gives a white pattern because it produces small areas of the primary colours red, blue and yellow. Finally the eye sees white because it can only detect a mix of the 3 colours.

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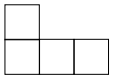
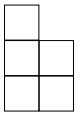
Polyomino Reptile Fractals



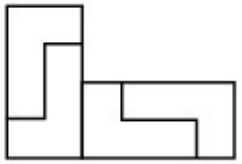
A tetromino

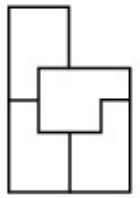
Put 4 copies of these shapes together to make enlarged copies of the same shape.



A pentomino

This can be repeated again and again, infinitely often to produce a fractal.





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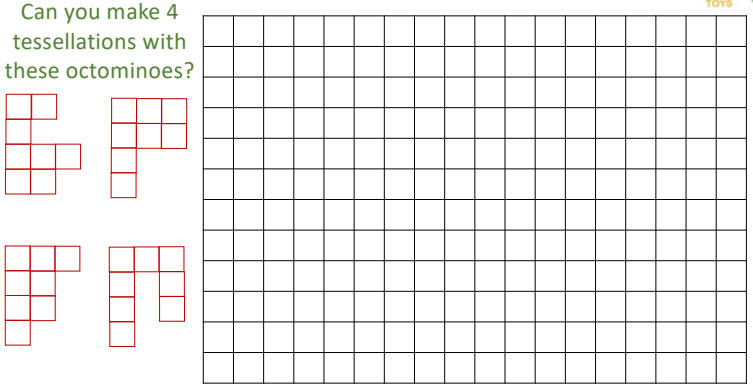
Four different Octomino Reptiles

Can you make 4 tessellations with these octominoes?



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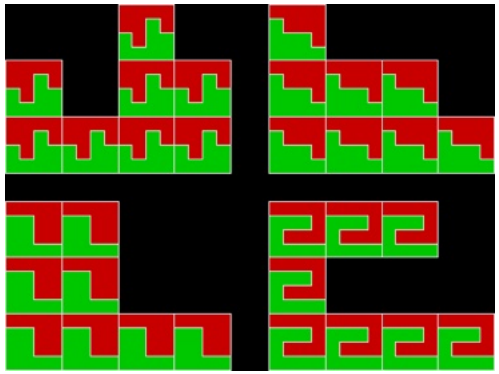
Four different Octomino Reptiles

In each case 2 octominoes tile a square.

The squares tessellate the plane.

Each square can be replaced by 4 smaller copies over and over again infinitely often to produce a fractal.



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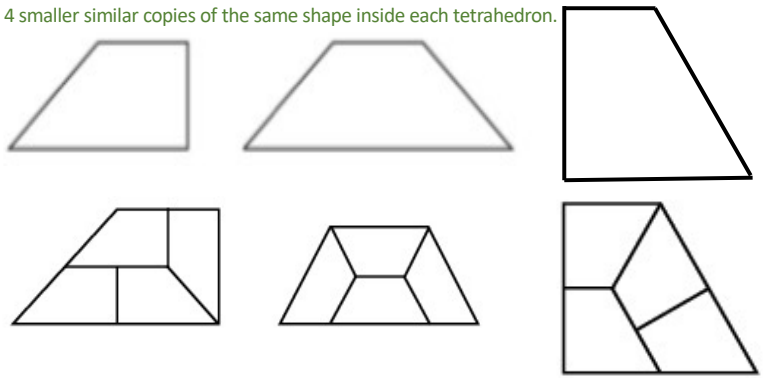
Reptile Trapezia * all rep-4s

Fill in 4 smaller similar copies of the same shape inside each tetrahedron.



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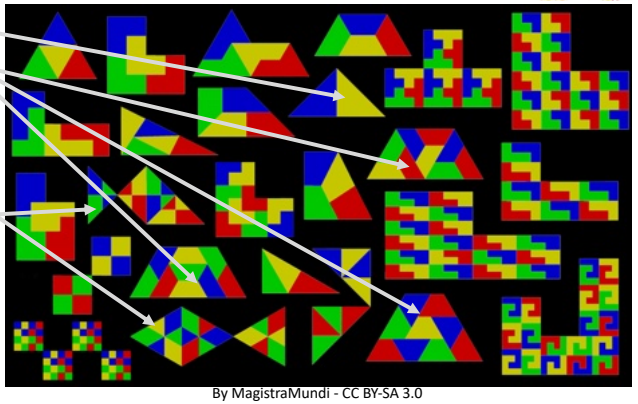
Selection of Reptiles

Can you spot a rep-2?

And some rep-9s?

How would you classify the other reptiles?

In some tilings (e.g. the 2 fish) the shapes intersect but still fill the plane without gaps or overlapping.



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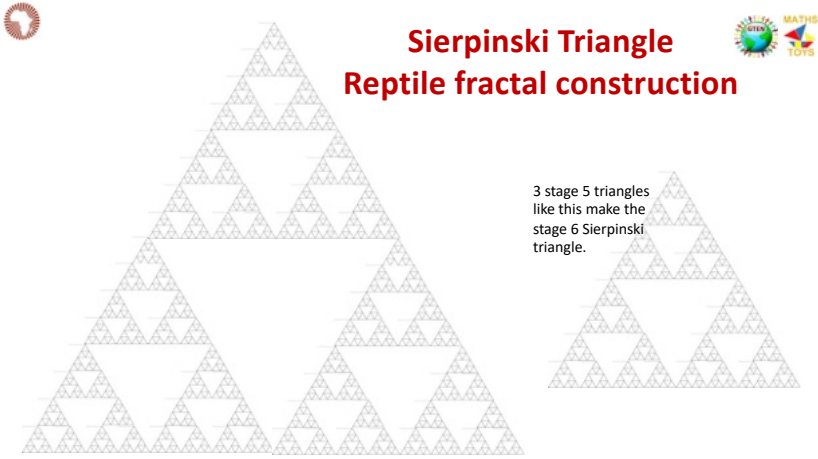
Sierpinski Triangle
Reptile fractal construction



3 stage 5 triangles like this make the stage 6 Sierpinski triangle.

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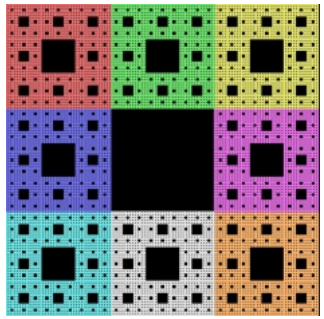
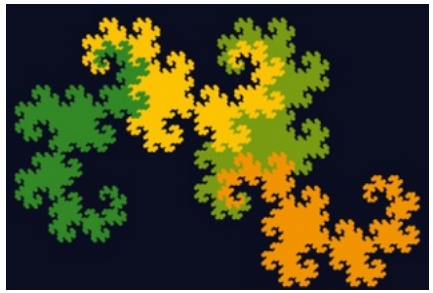
Fractal Reptiles



Sierpinski carpet made up of 8 copies of itself



A dragon curve made up of 4 smaller copies of itself.

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Create your own Escher type tilings

Cut a piece from one edge of a square (or parallelogram) and attach it to the opposite edge. This can be done on both pairs of opposite edges.
If you do this on card then you can use it as a template and draw around it to create a tessellation.

Be creative with your design. Perhaps turn the shape into a cat or fish or …

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Watch recordings of GTEN workshops on the AIMSSEC YouTube channel
https://youtube.com/c/mathstoys

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REPTILES & FRACTALS RESOURCES ON THE AIMING HIGH TEACHER NETWORK

Fractals Collection	https://aiminghigh.aimssec.ac.za/30-minute-fractals.../
Trisquares	https://aiminghigh.aimssec.ac.za/trisquares/
Enlargement	https://aiminghigh.aimssec.ac.za/enlargement/
Tessellating Triangles	https://aiminghigh.aimssec.ac.za/tessellating-triangles/
Tessellating Quadrilaterals	https://aiminghigh.aimssec.ac.za/tessellating-quadrilaterals/
Tessellation and Tiling	https://aiminghigh.aimssec.ac.za/tessellation-and-tiling/

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LET'S PLAY MATHEMATICALLY AND LEARN

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Play Mathematically

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- to unlock knowledge
- to improve numeracy and visualisation skills
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AIMS African Institute for Mathematical Sciences SCHOOLS ENRICHMENT CENTRE

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Caroline Ainslie caroline@bubblymaths.co.uk

Enquire about signing up for an AIMSSEC course as a self-funding student admin@aimssec.ac.za

Thanks for coming to this workshop.

Use the AIMSSEC ideas on AIMING HIGH and add comments.

Share what you have learned with other teachers.

Try to help all your learners to have a

'YES I CAN'

attitude to mathematics.

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