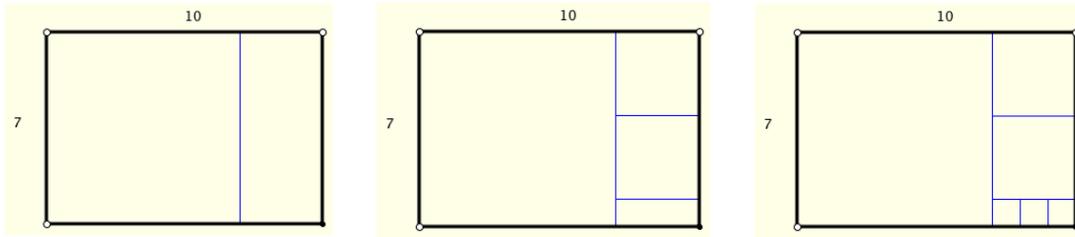


Square Removals & Square Developments

John Mason
MA 2016



Task SA: Square Developments

Read the diagrams from right to left as a process of starting with a rectangle made up of identical squares placed side by side, and then adding on a number of squares of appropriate size, alternating in direction.

Develop a narrative as a sequence of instructions making use of a sequence of positive integers $[r_1, r_2, \dots, r_n]$.

How might the proportions of the final rectangle be worked out arithmetically from the sequence of numbers?

Task SB: Square Removals

Read the diagrams from left to right as a process of starting with a rectangle and removing squares, keeping track of the number of squares removed of each size.

Develop a narrative as a sequence of instructions which results in a sequence of positive integers $[r_1, r_2, \dots, r_n]$.

How might the proportions of the original rectangle be worked out from the sequence of square-repetitions?

Task SC: Relationships

How are the processes arising from Task A and Task B related?

Explorations

What happens if the process never terminates?

What would the sequence of removals be if the original proportions were

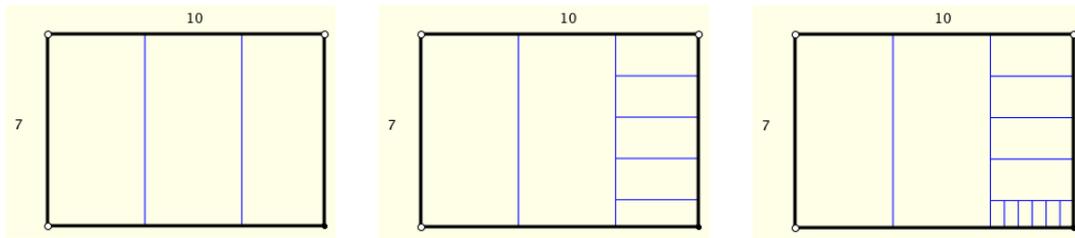
- (i) $\sqrt{2} + 1$ (ii) $\sqrt{3} + 1$ (iii) $(\sqrt{5} + 1)/2$

Reflection

What aspects of mathematical thinking might be called upon by students working on these tasks?

Rectangle Removals & Rectangle Developments

John Mason
MA 2016



Task RA: Rectangle Developments

Read the diagrams from right to left as a process of starting with a rectangle made up of rectangles with edges in the ratio 2 : 1 placed side by side, and then adding on rectangles again in the ratio 2 : 1 alternating in direction.

Develop a narrative as a sequence of instructions making use of a sequence of positive integers .

How might the proportions of the final rectangle be worked out arithmetically from the sequence of numbers given the ratio of the edges of the 'building' rectangles?

Task RB: Rectangle Removals

Read the diagrams from left to right as a process of starting with a rectangle and removing rectangles with edges in the ratio 2 : 1, keeping track of the number of rectangles removed of each size.

Develop a narrative as a sequence of instructions which results in a sequence of positive integers .

How might the proportions of the original rectangle be worked out from the sequence of rectangle-repetitions?

Task RC: Relationships

How are the processes arising from Task A and Task B related?

Explorations

For a given ratio $p : 1$ for the removal rectangle, what number is the equivalent of the golden ratio (the slowest converging continued fraction)?

Given the edge ratios of the original rectangle and the removal rectangle, what conditions determine whether the process terminates or continues indefinitely?

Reflection

What aspects of mathematical thinking have you drawn upon in working on these tasks?