Topple Blocks Puzzle

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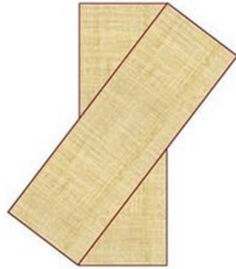
Topple blocks (aka jenga blocks) are designed to fit on top of one another in sets of 3 as shown, ie. 3 blocks form one layer.	**Two blocks are stacked on top of each other with the corners aligning as shown.**	**This pattern is continued …**	**It appears as if this creates a repeating pattern of every five blocks (e.g. blocks 1 & 6 are precisely aligned.) Prove this is not the case.**

This is another imaginative puzzle from MEI's MathsMonday.[1] I didn't know what topple blocks were at first, but a previous MathsMonday puzzle[2] defined them as shown in the first frame. Apparently they derive from the game of Jenga created by Leslie Scott and launched in 1983.[3]

Solution

If the topple blocks repeated the pattern after 6 blocks, then a top view of the stack would look like that in Figure 1. This makes a regular octagon with central angles for each side of 360º/10 = 36º, as shown in Figure 2. That would mean the diagonal of the block would make an 18º angle with the vertical edge and thus have a tangent of tan 18º = .3249 to four decimal places. But by definition, the topple block diagonal angle has a tangent of tan θ = 1/3 = .3333 to four decimal places, which is a tad

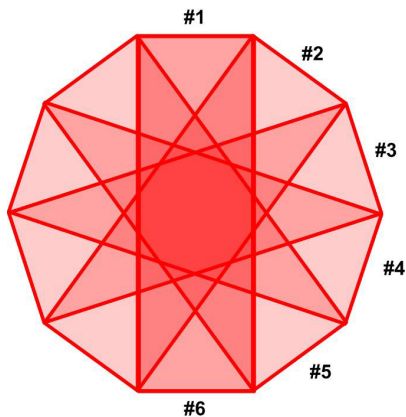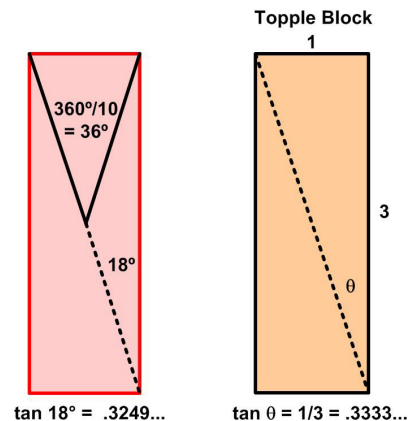**Figure 1**

Figure 2

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[1] https://twitter.com/MEIMaths/status/1411973124619337735 5 July 2021
[2] https://twitter.com/MEIMaths/status/1404362986295336962 14 June 2021
[3] https://en.wikipedia.org/wiki/Jenga

larger. This means the topple blocks do not line up exactly and overshoot coinciding. As the spiral of stacked blocks proceeds, each layer of blocks appears to precess in the clockwise direction relative to the preceding layer.

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