

Tan Graph Transformations – a Practical Application

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The counter top in Dr Lee's office, along with certain dimensions, is illustrated in Figure 1. Determine the length of y . Readers are encouraged to solve this problem before reading on.

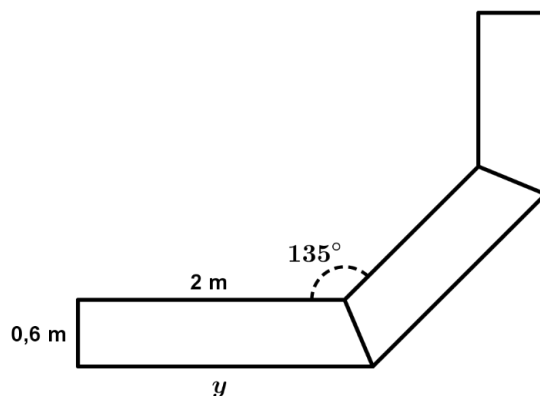


FIGURE 1: The counter top in Dr Lee's office.

With reference to Figure 2, by constructing perpendiculars AB and AD we see that the two triangles ABC and ADC are congruent (90°HS). From this it follows that $\theta = 22,5^\circ$, and hence $t = 0,6 \tan(22,5^\circ)$. We thus have $y = 2 + 0,6 \tan(22,5^\circ)$ which is approximately 2,25 m. If the original angle of turn (135°) is x , then we have the following relationship: $y = 2 + 0,6 \tan[(180^\circ - x)/2]$. This can be interpreted graphically as the graph of $y = \tan x$ having undergone a number of successive transformations (Figure 3).

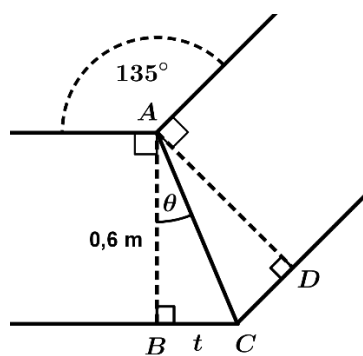


FIGURE 2

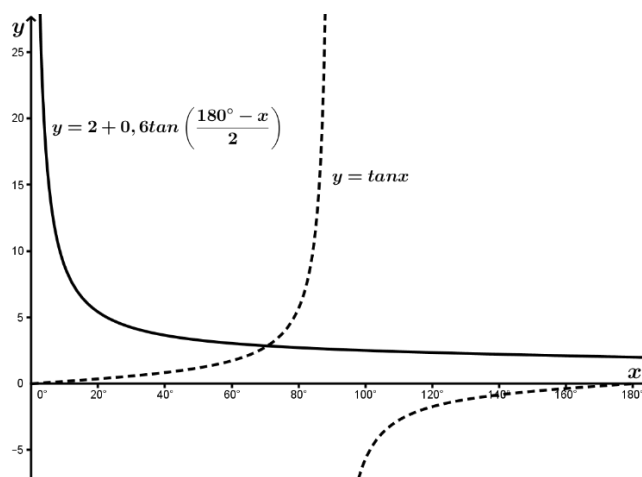


FIGURE 3

In general, if the width of the counter top is w , the shorter horizontal length is v , the angle of turn is x , and the longer horizontal length is y , then $y = v + w \tan[(180^\circ - x)/2]$. It is left to the interested reader to explore this further.