Problem Set 5

Due: Tuesday, March 11, 2025 at 10am

Problem 5.1 [Tube Folding]. Ben Boxdiddle wants to fold a $1 \times 1 \times n$ box (Figure 1) from a square piece of paper. Ben can fold only along horizontal, vertical, and $45°$ diagonal lines, and only between points with integer or half-integer coordinates (an ancient tradition of the Boxdiddle family). He is considering several different approaches:

(a) Use the cube extrusion method from Lecture 7.

(b) Fold the paper into a width-1 rectangular strip and wrap it around the polycube.

(c) Do something else? Find the best method you can think of.

For each of these approaches, do the following:

- calculate the exact size of the smallest square that Ben needs; and

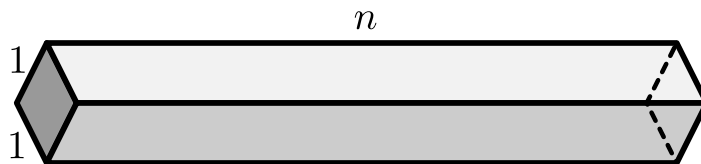- estimate the number of edges in the crease pattern (an answer like $\Theta(n^3)$ is sufficient).

Which approach should Ben use?

Figure 1: $1 \times 1 \times n$ box