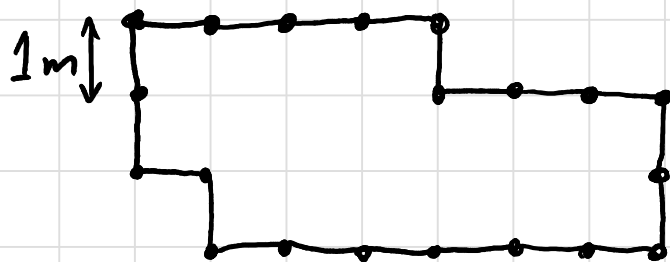
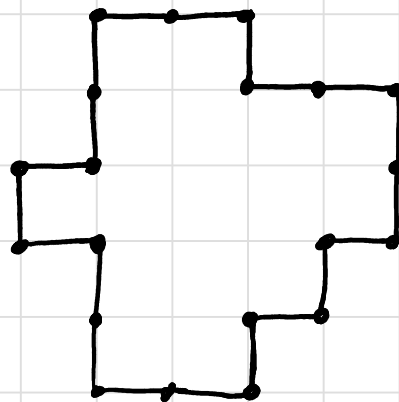


The Mathematics of Chicken Farming

view from above:



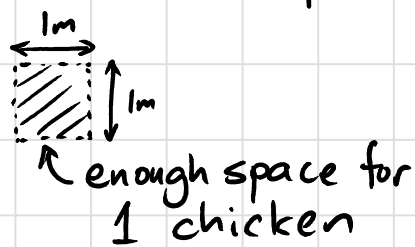
Farmer Sally's
chicken pen



Farmer Vijay's
chicken pen

The rules for chicken pens:

- ① Each piece of fence is 1 meter long and costs \$10.
- ② Each chicken needs as much space as a $1\text{m} \times 1\text{m}$ square

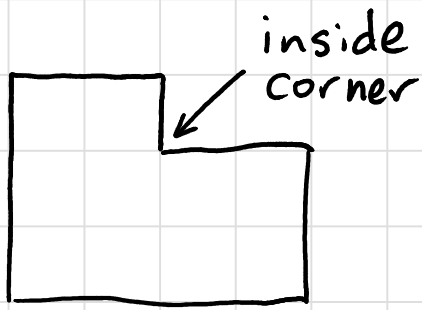


Questions:

- ① How much do farmer Sally and farmer Vijay's chicken pens cost?
- ② Whose pen holds more chickens?

③ Can you design a pen that holds more chickens than Sally and Vijay's but costs the same? Work in a group and draw your best designs below.

3a) Can you prove that the best possible shape cannot have any inside corners?



3b) If there are no inside corners, what are all the possible shapes the pen could be? Which has the biggest area?

④ Were your fence pieces arranged only along the grid lines? What if they don't have to be? If they weren't, what if they have to be?

⑤ What if the fence is flexible so it can take any shape you want? What's the largest number of chicken's you can hold with 20m of fence?

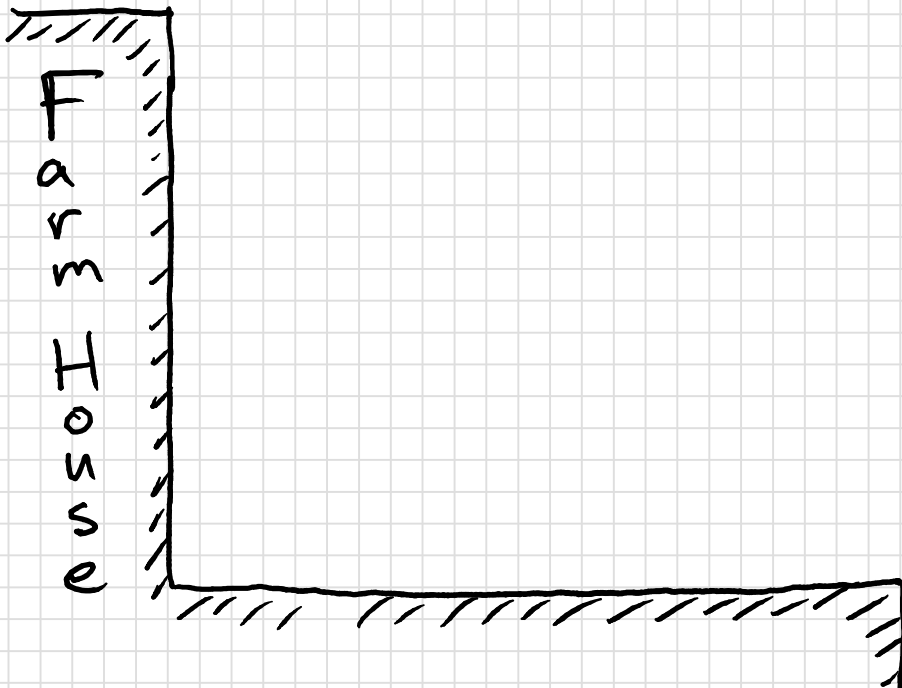
⑥

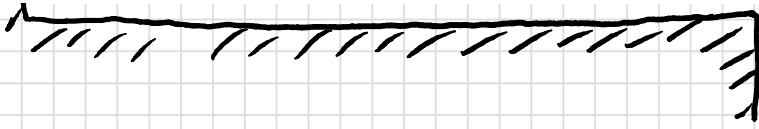


What's the most number of chickens you could hold with 20m of fence if you are allowed to use the side of the barn as one wall?

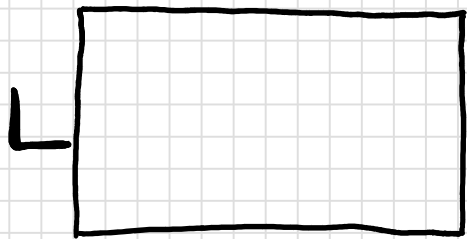
Find the answer if the pen has to be rectangular, and if the pen can be any shape.

⑦ What if you are allowed to use the corner of the farm house?



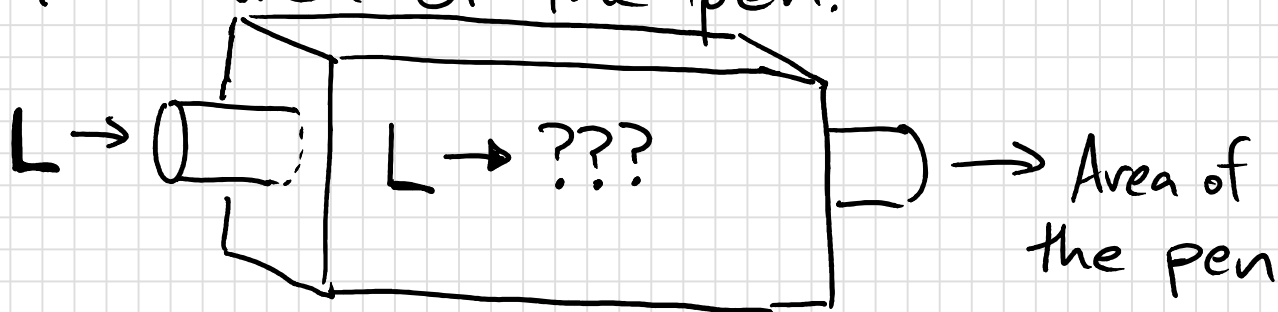


⑧ Some algebra:



a) Call the length of one side of a rectangular pen L .
If the perimeter of

the pen is 20, find a formula for the area of the pen.



b) Does your formula give the same answers as

$$L \rightarrow 25 - (L-5) \times (L-5) \quad ?$$

Can you prove it?

c) Using the new formula, can you prove that a square pen is the rectangular pen that holds the most chickens?