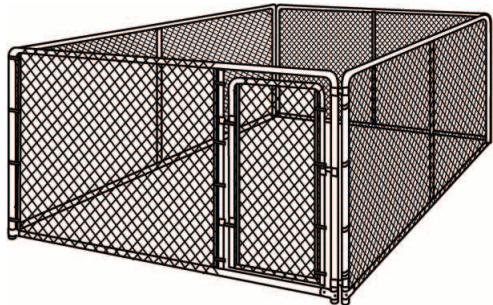


**Problem**

- a) Part of Jan's yard is fenced to make a pen for her dog. The pen measures 10 metres wide by 20 metres long. She wants to enlarge the pen as she has adopted a second dog. She plans to move one side of the pen outward to increase the area by 40 square metres. What is the least number of metres of additional fencing Jan will need to enclose the enlarged pen if she re-uses all the existing fencing?
- b) Suppose Jan has 10 metres of fencing stored in the garage. If she uses this instead to enlarge the pen (keeping it rectangular), what is the greatest number of square metres of area she can add to the pen, assuming she re-uses all existing fencing?

**Hints****Part a)**

**Hint 1** - In how many different places could the extra area be added?

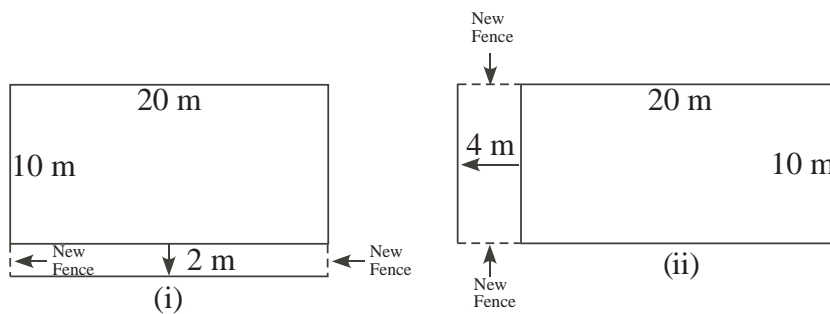
**Hint 2** - Remember, she will re-use the old fencing.

**Part b)**

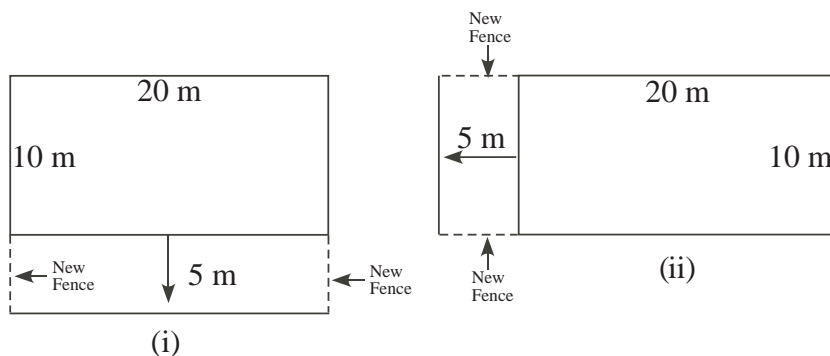
**Hint 1** - What is the greatest amount of overlap possible? What is the least?

**Solution**

a) There are two ways Jan can move one side of the pen outwards to create the additional area of 40 square metres. They are both shown at the right. Clearly choice (i) uses only 4 metres of new fence, while (ii) uses 8 metres.



b) Jan could use the 10 metres of stored fencing in the same ways as in a), giving areas (i)  $15 \times 20 = 300$  square metres, or (ii)  $25 \times 10 = 250$  square metres.



But there is a third alternative, which is to use all the fencing,  $20 + 20 + 10 + 10 + 10 = 70$  metres to form a square with sides of 17.5 metres and area  $17.5 \times 17.5 = 306.25$  square metres. This gives the largest possible area for the pen.

