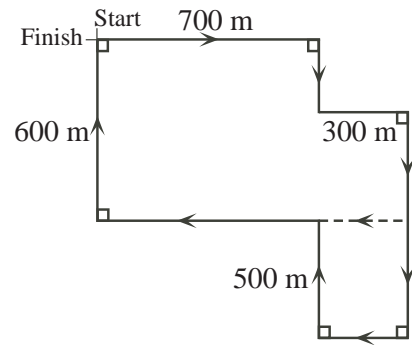


**Problem**

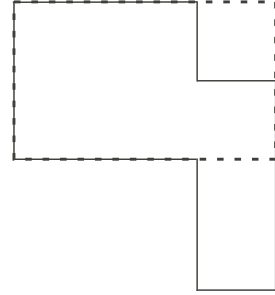
Sabrina is running a cross-country race on the course sketched at right. The race consists of three laps: on the first lap, the runners must complete the entire course (solid line), but on the next two laps, they take the shortcut (dotted line). How far will Sabrina run altogether?



## Hints

**Hint 1** - What missing distances can you fill in?

*Suggestion:* For laps 2 and 3, it may help students to visualize the run length as the perimeter of an equivalent rectangle.



**Solution**

We can fill in the following distances:

$$IH = AB = 700 \text{ metres}$$

$$HE = GF = CD = 300 \text{ metres}$$

$$EF = HG = 500 \text{ metres}$$

Thus on the first lap, Sabrina runs

$$700 + BC + 300 + DE + 500 + 300 + 500 + 700 + 600 = 3600 + BC + DE \text{ metres.}$$

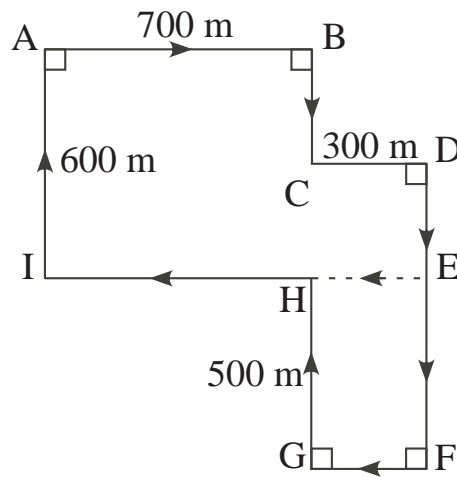
But,  $BC + DE = AI = 600$  metres.

Thus Sabrina runs  $3600 + 600 = 4200$  metres.

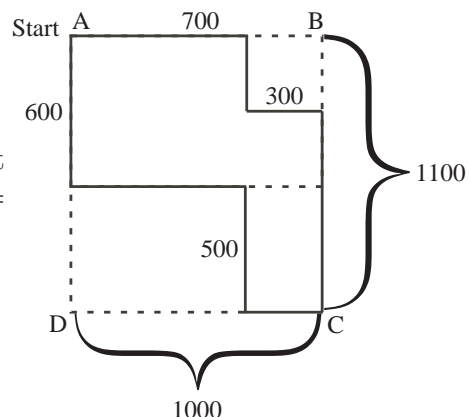
On the second lap, she does not cover the distance

$EF + FG + GH = 1300$  metres, but does cover  $HE = 300$  metres. Thus she only runs  $4200 - 1000 = 3200$  metres.

So all together, Sabrina runs  $4200 + 3200 + 3200 = 10600$  metres or 10.6 km.



An alternate solution for the first lap is to note that it is equivalent to the rectangle  $ABCD$ , which has perimeter  $2 \times (1000 + 1100) = 2 \times 2100 = 4200$  metres.



*Suggestion:* Discuss with the class whether the answer would change if Sabrina started somewhere else. (e.g., at  $I$ , or at  $F$ ).