## Why Floyd's tortoise and hare algorithmworks?

 $L_1$ : The distance between the head and the entry point.

 $L_2$ : The distance between the entry point and the meeting point.

C: The length of the cycle.

m: The number of cycles have traverses.

n: The number of cycles tortoise traverses.

*Proof.* Since the speed of the hare is twice the speed of the tortoise, the distance hare traverses is twice the distance tortoise traverses. Then  $L_1 + mC + L_2 = 2(L_1 + nC + L_2)$ , i.e.,  $(n-2m)C = L_1 + L_2$ . Therefore,  $L_1 + L_2$  is a multiple of the length of the cycle.

Starting from the meeting point, the tortoise traversed  $L_2$  distance, then it traversed  $L_1$  distance to go back to the entry point. Starting from the head, the hare traversed  $L_1$  distance to go to the entry point.