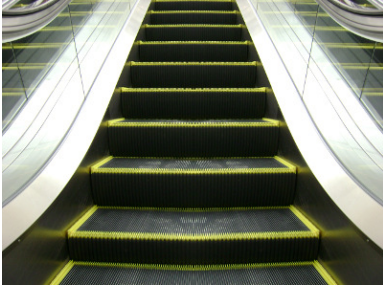


# Moving Up

22 April 2021

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Here is a simple problem from an old *Futility Closet* posting ([1]).

My wife and I walk up an ascending escalator. I climb 20 steps and reach the top in 60 seconds. My wife climbs 16 steps and reaches the top in 72 seconds. If the escalator broke tomorrow, how many steps would we have to climb?

## My Solution

Let  $s$  be the number of steps visible in the escalator and let  $r$  be the rate of the escalator measured in number of steps that disappear at the top per second. Then from my climbing and my wife's we get

$$s = 20 \text{ steps} + r (60 \text{ sec})$$

$$s = 16 \text{ steps} + r (72 \text{ sec})$$

Subtracting, we get  $r = 1/3$  steps per sec and so  $s = 40$  steps.

## *Futility Closet* Solution

Let  $x$  be the number of steps on the escalator. I climb  $x - 20$  steps in 60 seconds, and my wife climbs  $x - 16$  steps in 72 seconds. This means the escalator ascends at a rate of 4 steps every 12 seconds, or 20 steps in 60 seconds. Its length is the sum of these 20 steps and the 20 steps I climb, or 40 steps.

**Comment.** It struck me again how often puzzle books present solutions to mathematics problems verbally rather than resort directly to math, in particular algebra. It is almost a throw-back to the pre-symbolic algebra days of the Middle Ages or before. But is a verbal solution clearer than an algebraic one? Is there something off-putting about a solution that falls out of algebraic manipulations rather than mental verbal reasoning? (For me the opposite is true.) Interesting. Curious.

## References

[1] "Moving Up" *Futility Closet*, 28 June 2014 (<http://www.futilitycloset.com/2014/06/28/moving-up/>)

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