55. When the escalator is stalled the speed of the person is \( v_p = \frac{\ell}{t} \), where \( \ell \) is the length of the escalator and \( t \) is the time the person takes to walk up it. This is \( v_p = \frac{(15 \text{ m})}{(90 \text{ s})} = 0.167 \text{ m/s} \). The escalator moves at \( v_e = \frac{(15 \text{ m})}{(60 \text{ s})} = 0.250 \text{ m/s} \). The speed of the person walking up the moving escalator is 

\[ v = v_p + v_e = 0.167 \text{ m/s} + 0.250 \text{ m/s} = 0.417 \text{ m/s} \]

and the time taken to move the length of the escalator is

\[ t = \frac{\ell}{v} = \frac{(15 \text{ m})}{(0.417 \text{ m/s})} = 36 \text{ s} \text{.} \]

If the various times given are independent of the escalator length, then the answer does not depend on that length either. In terms of \( \ell \) (in meters) the speed (in meters per second) of the person walking on the stalled escalator is \( \frac{\ell}{90} \), the speed of the moving escalator is \( \frac{\ell}{60} \), and the speed of the person walking on the moving escalator is 

\[ v = \frac{\ell}{90} + \frac{\ell}{60} = 0.0278 \ell \text{.} \]

The time taken is 

\[ t = \frac{\ell}{v} = \frac{\ell}{0.0278 \ell} = 36 \text{ s} \text{ and is independent of } \ell \text{.} \]