

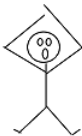
## I-137

Tired of walking up the stairs, an engineering student of mass  $m$  designs an ingenious device for reaching his third floor dorm room. A block of mass  $M$  is attached to a rope that passes over a pulley. The student holds the other end of the rope. When the block is released, the student is pulled up to his dorm room in a time  $T$ . Determine the velocity of the student ( $v$ ) when he reaches his room as a function of  $m$ ,  $M$ ,  $T$  and  $g$ .

### Free-Body Diagrams

#### Mathematical Analysis

student



block



Event 1:

Event 2:

### Questions

If  $g = 0 \text{ m/s}^2$ , what should  $v$  equal? Does your function agree with this observation?

If  $m = M$ , what should  $v$  equal? Does your function agree with this observation?

If  $M = \infty$ , what should  $v$  equal? Does your function agree with this observation?

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