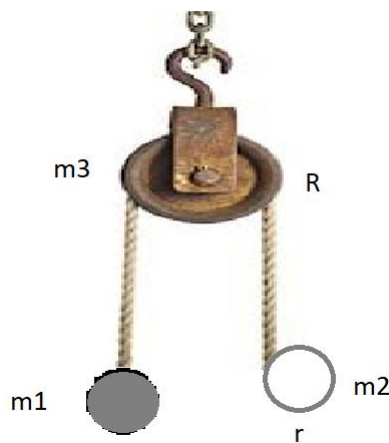


## Physics Prize Puzzle 2020

The person who submits the earliest and best solution to all the questions below will win eternal glory plus a cash prize. Only individual (rather than group) solutions are allowed. Email your solution to [cschulz@knox.edu](mailto:cschulz@knox.edu) on or before May 15, 2020.



An Atwood machine is constructed of a solid-disk frictionless pulley of mass  $m_3$  and radius  $R$ . On the left side is hung a mass  $m_1$ , and on the right the string is wound around a hollow cylinder of mass  $m_2$  and radius  $r$  (like a yoyo.)

- 1) For what mass ratio  $m_2/m_1$  will mass  $m_1$  remain stationary, and what will the acceleration of mass  $m_2$  be?
- 2) Suppose  $m_2 = 2*m_1$ . For what mass  $m_3$  will the masses  $m_1$  and  $m_2$  have the same downward acceleration, and what will that acceleration be?