# Netwon's Law Problem #1

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1. For the first part of this problem, this is the situation: You have $N$ identical blocks of mass $m$ lying on a frictionless surface. Consecutive blocks are connected by identical, massless, unstretchable strings of length $L$. Someone pulls the leading block with a constant force $F$.

   (a) What is the tension in the string connecting the $i^{th}$ block to the $i + 1^{th}$ block? Express your answer in terms of any/all of the following: $i$, $N$, $m$, $F$, and $L$.

   (b) Okay, I lied. The blocks are not identical. Each successive block has a greater mass than the previous block by some small amount $\delta$, and the leading block still has mass $m$. Now, what's the tension in the string connecting the $i^{th}$ block to the $i + 1^{th}$ block? Express your answer in terms of any/all of the following: $i$, $N$, $m$, $F$, $L$, and $\delta$.

2. Now we consider a similar but slightly different situation. $N$ point particles, each of mass $m$, are lying stationary on a frictionless vertical circular track of radius $R$. Successive particles are connected by identical massless, unstretchable strings of length $L$. Initially, this system of $N$ particles is in an equilibrium position on the track. Then, a force $F$ is applied to the leading block in the direction of its expected motion around the circle.

   (a) For $N$ odd, what is tension between the $i^{th}$ block and the $i + 1^{th}$ block immediately after the force is applied? Express your answer in terms of $g$, $m$, $N$, $i$, $R$, $L$, $F$, and the tension between the $i - 1^{th}$ block and the $i^{th}$ block, which we'll call $T_{i-1}$?

   (b) For $N$ even, what is the tension (ditto parameters above)? This is not a trick question; the answers are different because the equilibrium geometries for even and odd $N$ are different.