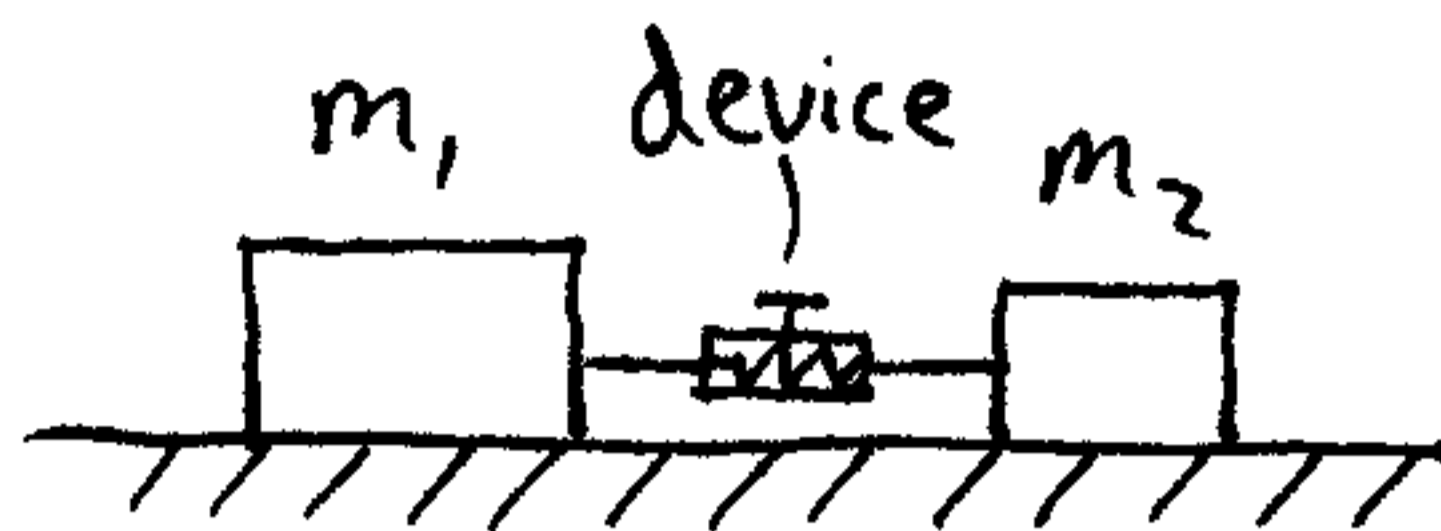
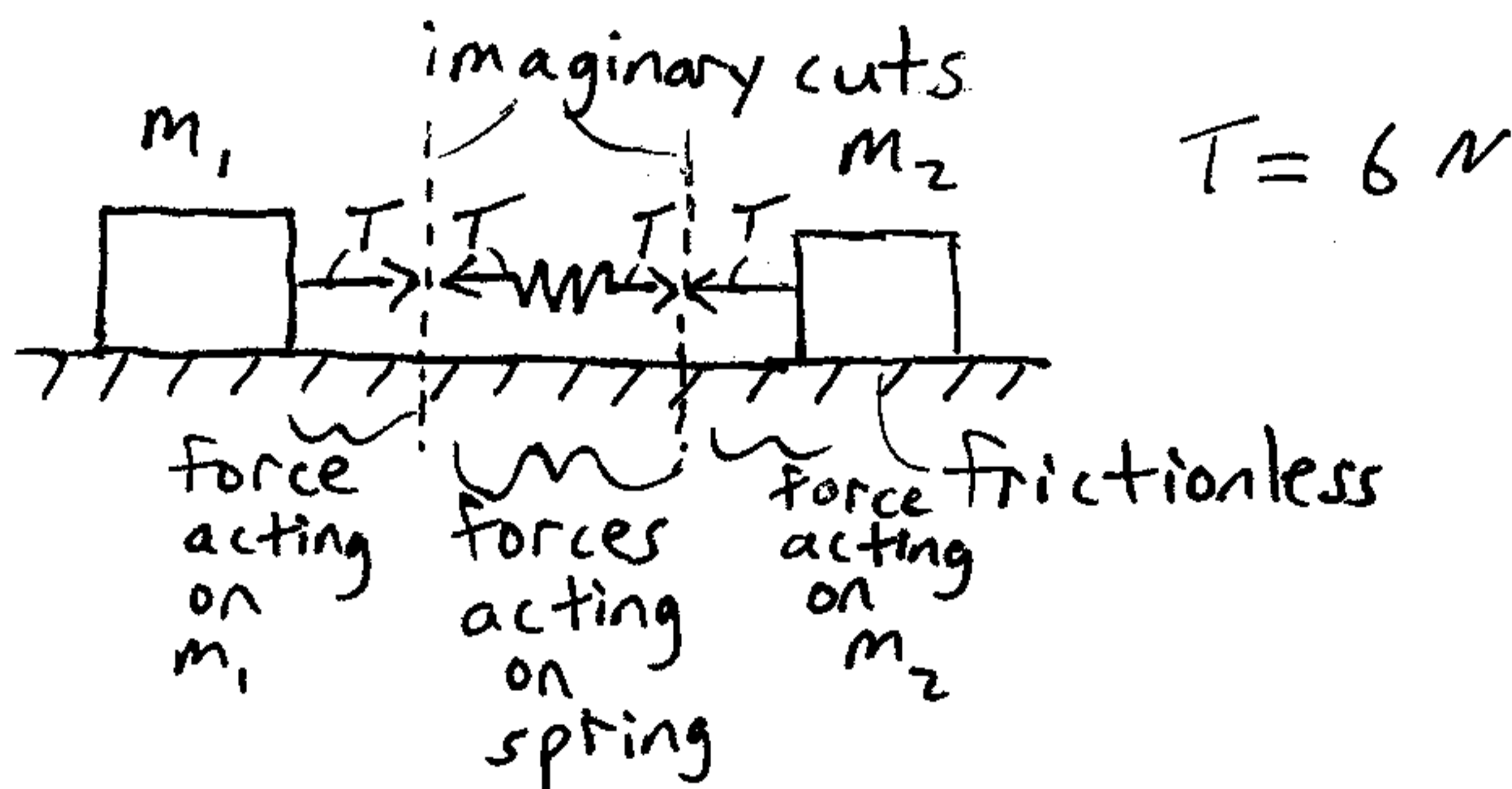


This is a force and motion problem involving Newton's laws.



Two masses,  $m_1$  and  $m_2$ , are sitting on a flat frictionless surface. They are joined together by two ropes which are connected to a device containing a spring under tension. A pin is pulled which releases the spring causing it to contract with a force of  $6\text{ N}$ . If  $m_1 = 3\text{ kg}$  and  $m_2 = 1.4\text{ kg}$ , what is the acceleration of each mass?

Solution:



By Newton's 3<sup>rd</sup> law, the force acting on each mass is equal and opposite to the force acting on the spring, at the location of each imaginary cut.

Apply Newton's 2<sup>nd</sup> law to mass  $m_1$ :

$$\sum F = m_1 a$$

$$\Rightarrow T = m_1 a$$

$$\Rightarrow 6\text{ N} = (3\text{ kg}) a$$

$$\Rightarrow a = 2\text{ m/s}^2 \rightarrow \text{(answer)}$$

Apply Newton's 2<sup>nd</sup> law to mass  $m_2$ :

$$\sum F = m_2 a$$

$$\Rightarrow T = m_2 a$$

$$\Rightarrow 6\text{ N} = (1.4\text{ kg}) a$$

$$\Rightarrow a = 4.3\text{ m/s}^2 \leftarrow \text{(answer)}$$