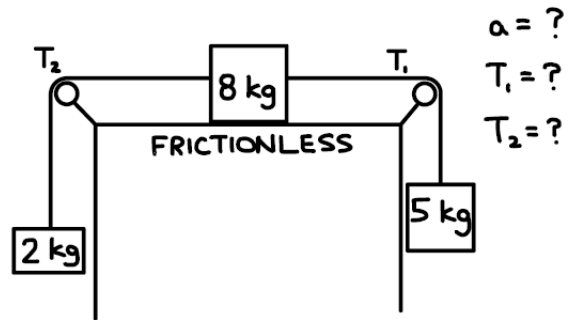


More Three-Body Systems

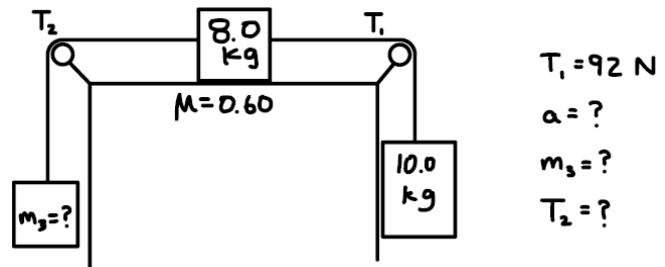
1. Three masses are connected by **light, inextensible ropes** and **two frictionless pulleys**, as shown. A **2 kg** mass hangs on the left, connected by a rope over a pulley to an **8 kg block** that rests on a **frictionless horizontal surface**. The 8 kg block is connected by a second rope over another pulley to a **5 kg** mass hanging on the right. Because the ropes are independent, the **tensions in each rope are not necessarily equal**.

- a. Determine the **acceleration of the system**.
- b. Determine the **tension T_1** in the rope connecting the **8 kg and 5 kg** masses.
- c. Determine the **tension T_2** in the rope connecting the **8 kg and 2 kg** masses.



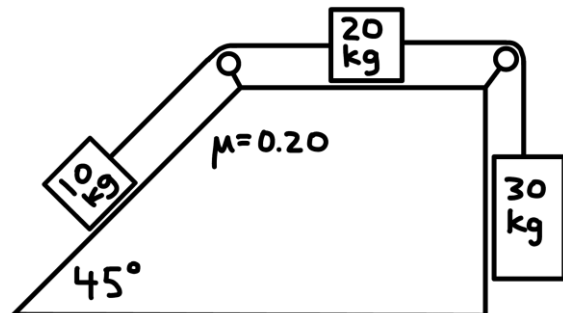
2. Three masses are connected by **light, inextensible ropes** and **two frictionless pulleys**, as shown. An **8.0 kg block** rests on a **horizontal surface** where the **coefficient of kinetic friction is $\mu = 0.60$** . A rope on the right connects the 8.0 kg block to a **10.0 kg hanging mass**; the tension in this rope is labeled T_1 . A second rope on the left connects the 8.0 kg block to an **unknown hanging mass m_3** ; the tension in this rope is labeled T_2 . It is known that the **tension in the right rope is $T_1 = 92$ N**.

- a. Determine the **acceleration of the system**.
- b. Determine the **value of the unknown mass m_3** .
- c. Determine the **tension T_2** in the left rope.



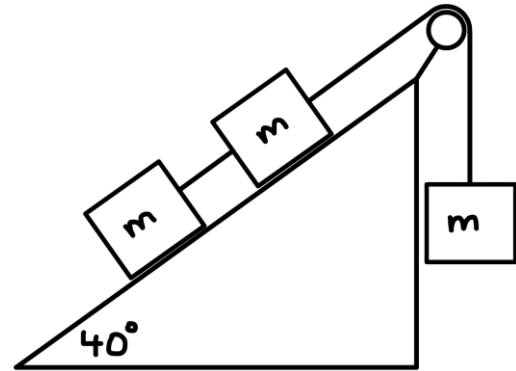
3. Three blocks are connected by **light, inextensible ropes** and **two frictionless pulleys**, as shown. A **10 kg block** rests on a **45° incline** and is connected by a rope over a pulley to a **20 kg block** on a **horizontal surface** with **coefficient of kinetic friction $\mu = 0.20$** . The 20 kg block is connected by a second rope over another pulley to a **30 kg hanging block**. The system is released from rest.

- a. Determine the **acceleration of the system**.
- b. Determine the **tension in the rope connecting the 10 kg and 20 kg blocks**.
- c. Determine the **tension in the rope connecting the 20 kg and 30 kg blocks**.



4. Three identical blocks, each of mass m , are connected by **light, inextensible cords** over a **frictionless pulley**, as shown. Two of the blocks lie on a **40° incline**, and the fourth block hangs vertically on the other side of the pulley. The system is released from rest. For each case below, **determine the acceleration of the system** (magnitude and the direction of motion of each block):

- The incline is **frictionless**.
- The incline has a **coefficient of kinetic friction** $\mu = 0.10$.
- The incline has a **coefficient of kinetic friction** $\mu = 0.30$.



5. Three identical blocks, each of mass m , are connected by **light, inextensible cords** and are arranged as shown. One block rests on a **30° incline** with a **coefficient of kinetic friction** $\mu = 0.45$. The rope passes over two **frictionless pulleys**, connecting the block on the incline to a **hanging block on the left** and another **hanging block on the right**. The system is released from rest.

- Determine the **acceleration of the system** (magnitude and the direction of motion of each block).
- Determine the **tension in each cord**. (There are *two* cords and therefore *two different* tensions.)

