Task #1

Consider a 1400-kg car that experiences 900 N of friction and 1300 N of air drag. How much force must the car's engine exert in order to maintain a constant speed of 45 m/s?

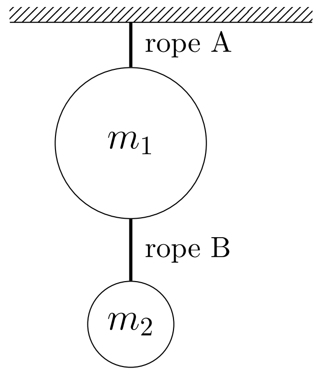
Solution: 2200 N

Task #2

Two masses are suspended at rest. Assume that $m_1 = 5.2$ kg and $m_2 = 1.7$ kg.

(a) Draw a free-body diagram for each mass.

(b) Calculate the tension on each rope.



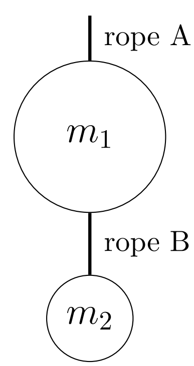
Solution: $T_A = 67.62$ N; $T_B = 16.66$ N

Task #3

Now you've detached rope A and are accelerating the system upward at a rate of $0.5\,\mathrm{m/s^2}$, what would be the tensions on both ropes?

(a) Draw a free-body diagram for each mass.

(b) Calculate the tension on each rope.



Solution: $T_A = 71.07$ N; $T_B = 17.51$ N

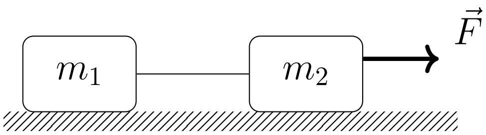
Task #4

Two boxes have masses $m_1 = 20$ kg and $m_2 = 10$ kg and are sitting on a frictionless surface connected by a massless cord. They are pulled with an applied force of $F = 50$ N.

(a) Draw a free-body diagram for each mass.

(b) Calculate the acceleration of the system.

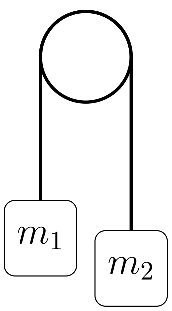
(c) Calculate the tension in the cord connecting them.



Solution: 1.67 m/s^2; 16.7 N

Task #5

Two masses $m_1 = 4$ kg and $m_2 = 2$ kg are attached by a string that hangs over a frictionless pulley. What is (a) the tension on the string and (b) the acceleration of the masses? (This is known as an *Atwood Machine*)

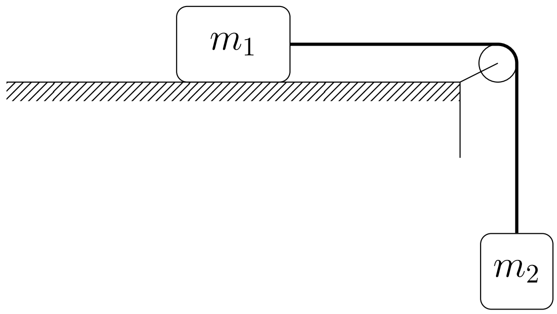


Solution: 26.14 N; 3.27 m/s^2

Extension: How much downward force would need to be applied on m_2 in order to keep the system from moving? (19.6 N)

Task #6

We now have what is called a *Modified Atwood Machine* with $m_1 = 4$ kg and $m_2 = 3$ kg. What is (a) the tension on the string and (b) the acceleration of the masses? Again, the surface is frictionless.



Solution: