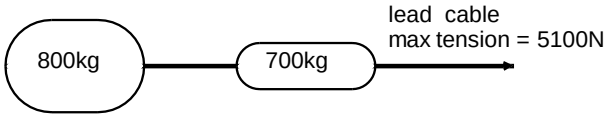
## ***4U Physics : Review Problems - Part 3 (even more problems ☺)***

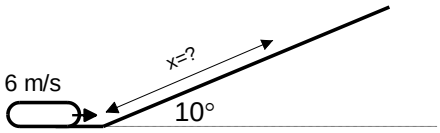
1. A 60.0 kg person is accelerating upwards in an elevator at a rate of 2.0m/s$^2$. Letting up be positive, what is the force the elevator is applying to the passenger?
2. Two gliders are being towed in line along a flat runway by one plane.




The mass of the first glider is 700 kg and the mass of the second glider is 800 kg. Assume that when they are being towed, each glider experiences an air resistance of 300N. The maximum force that the lead tow cable can withstand is 5100N and the takeoff velocity required is 36.7 m/s.

   a. Calculate the minimum length that the runway can be so that the plane does not accelerate more than the lead cable will safely allow.
   b. What tension will be on the second cable while accelerating?

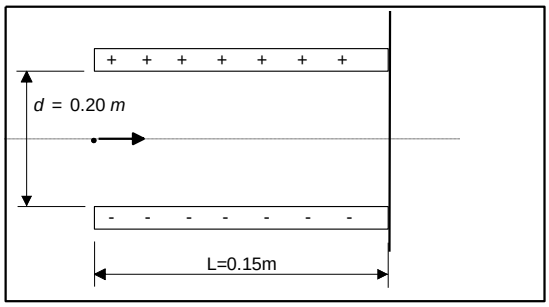
3. We push the spring of a 42g popper down 3.0cm to lock the suction cup down. When it pops up, it goes straight up to its' maximum height of 38cm. Calculate the *k* value of the spring (express your answer in units N/m).
4. A slider approaches a ramp that is sloped up at an angle of 10.0° at a velocity of 6.0 m/s. The coefficient of friction between the slider and the ramp's surface is 0.2. How far up the ramp does the slider slide?




5. Poor planet Pluto has been bullied out of the club of the Solar System Planets because he is a little on the small side. So in the spirit of WAPVE (working against planet violence everywhere), Pluto deserves some attention and a planet worthy question. Pluto has a small moon orbiting it that has a radius of orbit of 2.54x10$^6$m and a period of orbit of 1 hour and 7 minutes. Calculate the mass of Pluto. *(note : this is a made up problem – don't try to look up the mass of Pluto and compare to your answer …..)*
6. The moon takes 2.36x10$^6$ s to make on complete orbit of the earth. The moon's centre is 3.8x10$^8$m away the centre of the earth. Using this information calculate the radius of orbit of a satellite around earth that would take 1 day to complete its' orbit. What is this type of orbit called?
7. A rocket is travelling at a velocity of 3.0x10$^7$m/s relative to the earth. If an observer on earth records that the rocket has been away from the earth for 5 years, how long do the occupants of the rocket think they have been gone?
8. If a rocket powered car is travelling at 3,600 km/hr (relative to the earth), shines a laser beam of wavelength 632.8nm out the front of the rocket, what is the speed of the laser beam relative to an observer on earth?
9. Which of the following wavelengths of light would generate a standing wave in an optical cavity of length 5.2cm?

   a. Red λ=650nm  b. Green λ=550nm  c. Blue λ=450nm  d. Violet λ=350nm

10. A +2 charged particle ($+3.2 \times 10^{-19}$C) is placed $4.0 \times 10^{-8}$m to the left of a +1 charged ($+1.6 \times 10^{-19}$C) particle. What is the net Electric Field at the midpoint between the two particles?
11. A pair of charged parallel plates are set up as shown in the diagram below with a 120V potential applied across the plates.




If an electron travelling at $3.5 \times 10^{6}$m/s (charge = $1.602 \times 10^{-19}$C, mass = $9.11 \times 10^{-31}$kg) enters the electric field as shown, will it escape the parallel plates and if so at what angle?

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***ANSWERS :***

1. F=708N
2. a. 225m, b. 2700N
3. 348 N/m
4. 5.0m
5. $6.0 \times 10^{23}$ kg
6. $4.19 \times 10^{7}$m, geosynchronous or geostationary
7. 4.97 years
8. $3.0 \times 10^{8}$ m/s
9. red λ=650nm
10. $3.6 \times 10^{6}$ N/C [right]
11. yes (at a height of 0.097m), angle = 52° (find vertical and horizontal velocities and resultant angle)