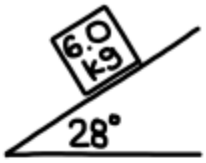
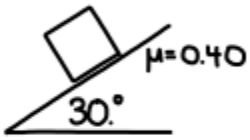
Forces at an angle

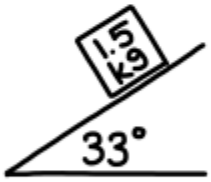
1. An 6.0 kg object is on a frictionless ramp as shown. What is the acceleration of the object?



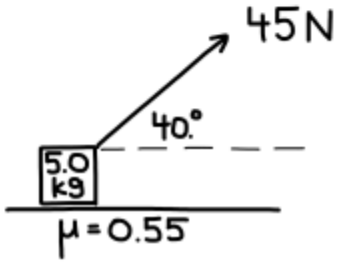
2. An object is on a ramp with a shown. If the coefficient of friction is 0.40, what is the acceleration of the object?



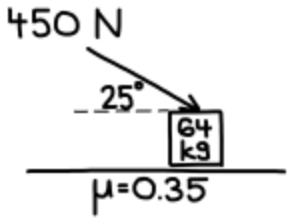
3. A 1.5 kg object is on a ramp as shown. If the object accelerates down the ramp at 3.0 m/s², what is the coefficient of friction between the object and the surface of the ramp?



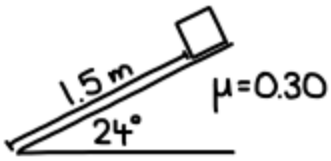
4. A 45 N force is applied to a 5.0 kg object as shown. If the coefficient of friction is 0.55, what is the acceleration of the object?



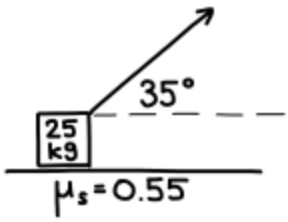
5. A 450 N force is applied to a 64 kg object as shown. If the coefficient of friction is 0.35, what is the acceleration of the object?



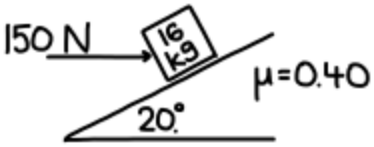
6. An object begins sliding down a ramp. If the object was initially at rest 1.5 m from the base of the ramp and the coefficient of friction is 0.30, how long does it take for the object to reach the bottom of the ramp?



7. The coefficient of static friction between a 25 kg object and a surface is 0.55. Determine the minimum force needed to move the object from rest if the force is applied at an angle of 35° above the horizontal.



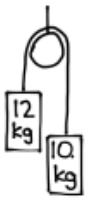
8. A 16 kg object is pushed up a ramp with a 150 N force applied parallel to the ground as shown. If the coefficient of friction is 0.40, what is the acceleration of the object?



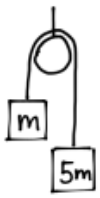
Multi-Body Systems

1. Determine the acceleration of the system and the tension of each rope.

a)

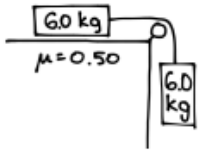


b)

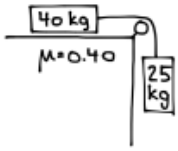


c)

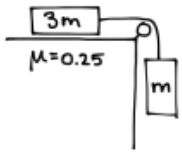
d)



e)

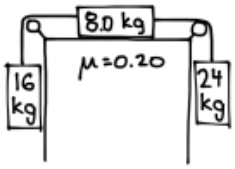


f)

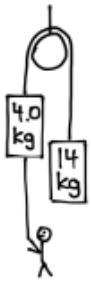


g)

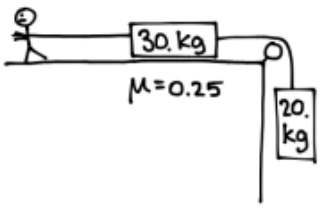
h)



2. The man pulls on a rope attached the 4.0 mass. What minimum force must he exert so the 14 kg mass does not hit his head? What would be the tension in the rope connecting the two masses?

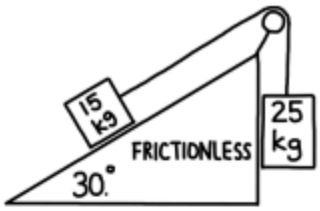


3. The man pulls on a rope attached to 30. kg mass. If he exerts a force of 500. N, determine the acceleration of the system and the tension in the rope connecting the two masses.

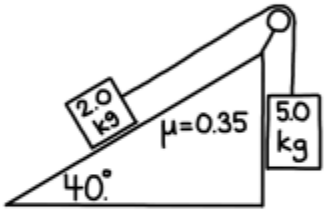


Multi body system II

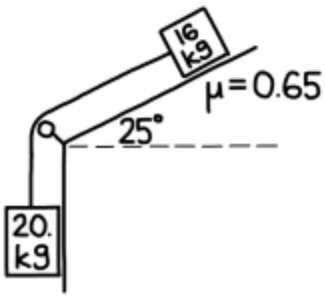
1. Determine the acceleration of the system and the tension of the rope.



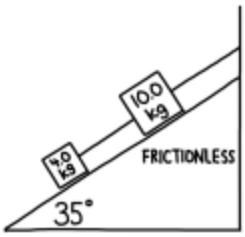
2. Determine the acceleration of the system and the tension of the rope.



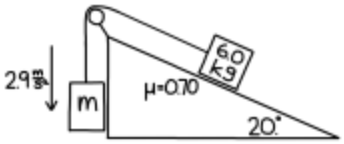
3. Determine the acceleration of the system and the tension of the rope.



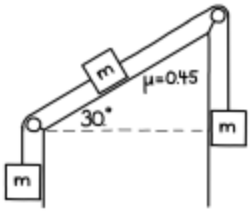
4. Two masses on a 35° frictionless incline are connected together by a cord. The 10.0 kg mass is connected to a wall. Determine the tension in each cord.



5. The system below is accelerating at 2.9 m/s² as shown. Determine the mass *m*.



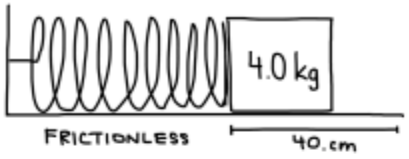
6. Three objects of equal mass are connected as shown. Determine the acceleration of the system.



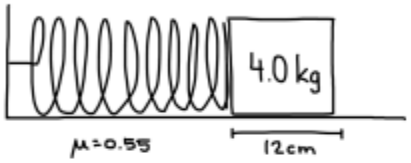
Hooke spring Law

1. What force is required to compress a spring (spring constant of 240 N/m) by 5.0 cm?

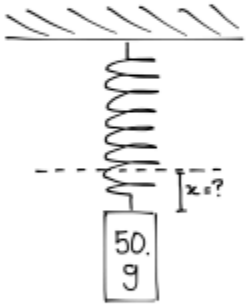
2. A 4.0 kg mass is on a horizontal frictionless surface. It is pressed against a spring (spring constant 320 N/m) so that it is 40. cm from its equilibrium position as shown. What is its acceleration immediately after it is released?



3. A 4.0 kg mass is on a horizontal surface with a coefficient of 0.55. It is pressed against a spring (spring constant 440 N/m) so that it is 12 cm from its equilibrium position as shown. What is its acceleration immediately after it is released?

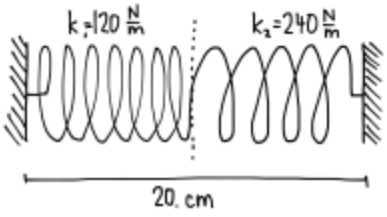


4. A 50. g mass is hanging from a spring with a spring constant of 140 N/m. How far is the spring displaced from its equilibrium position?



5. A spring is 20 cm long when a load of 10 N is hanging from it, and 30 cm long when a load of 20 N is hanging from it. Determine its spring constant and equilibrium position.

6. The ends of two springs are attached and pressed towards each other so they are 20. cm apart as shown. One spring has a spring constant of 120 N/m and an equilibrium position of 16 cm. The other has a spring constant of 240 N/m and an equilibrium position of 12 cm. Determine how much each spring is compressed.



Universal Gravitiation

1. An 8.0 kg ball is separated from a 6.0 kg ball by 2.0 m. What is the gravitational force of attraction between them?

2. Two satellites of equal mass are put 30.0 m apart. A gravitational force of 2.0×10^{-7} N acts between them.
What is the mass of each satellite?

3. The force of gravity on the average person is about 700 N at the Earth's surface.
Calculate the gravity on a person 10 times that distance from the centre of the Earth.

4. Calculate the force of gravity on a 1.0×10^{5} kg space station situated at each of the following locations.
($R_{Earth} = 6.38 \times 10^{6}$ m ; $M_{Earth} = 5.98 \times 10^{24}$ kg)
a) on the Earth's surface
b) 128 000 km from the centre of the Earth
c) 384 000 km from the centre of the Earth (about the distance to the moon)
d) 1.5×10^{8} km from the centre of the Earth (about the distance to the sun)

5. The distance from the centre of the Earth to the North Pole is 6 356 km and the distance from the centre of the Earth to the equator is 6 378 km.
a) What is your weight if you are at the North Pole?
b) What is your weight if you are on the equator?
c) What is the percent difference between your weight on the equator and your weight at the North Pole?
d) What is the percent difference between your mass on the equator and your weight at the North Pole?

6. Mars has a radius of 3 390 km and a mass of 6.39×10^{23} kg.
a) What is the gravitational field strength on Mars?
b) How much would you weigh on Mars?

7. A space rock is dropped near the surface of a planet the same size as Earth but of a different mass. It reaches a speed of 15 m/s in 5.0 s.
What is the mass of the planet?

8. A man jumps on the surface of the moon with an initial velocity of 3.2 m/s upwards.
How high does he jump? ($R_{Moon} = 1.74 \times 10^{6}$ m ; $M_{Moon} = 7.35 \times 10^{22}$ kg)