A-Day: Due Wed., Nov 4
B-Day: Due Thurs., Nov 5


## 2009 Forces 6

1. Slim Jim makes a giant slingshot that can provide 60 N of force. He launches three objects: $1 \mathrm{~kg} ; 2 \mathrm{~kg} ; 4 \mathrm{~kg}$.
A. Calculate the acceleration for each mass. $1 \mathrm{~kg} \quad 2 \mathrm{~kg} \quad 4 \mathrm{~kg}$
B. Which mass has the smallest acceleration?
C. Which mass has the largest acceleration?
2. Slim Jim is also a cave explorer (known as a spelunker). A mining company asks our famous spelunker to explore part of their gold mine. Slim Jim is a slim 60 kg and the bucket is a hefty 980 kg .
A. On the dot at the left, draw all of the forces acting on the bucket.
B. What is the total mass of Jim and the bucket?
C. What is the total weight of Jim and the bucket?
D. Calculate the tension in the rope when he begins to accelerate downward at $-1.5 \mathrm{~m} / \mathrm{s}^{2}$.
$\mu_{\mathrm{s}}=0.22$
$\mu_{\mathrm{k}}=0.16$


From the "Surface Friction" notes:
3. A. What is the weight of the 3 kg mass?
B. What is the normal force pushing up on the mass?
C. Calculate the forces of static and kinetic friction acting on the mass.
D. If the object starts at rest, is the 25 N force enough to start it moving?
E. If it is moving, calculate the acceleration of the object.
4. A 2 kg box slides to a stop in 0.65 seconds.
A. Use a kinematic equation to calculate the acceleration of the object.
B. Calculate the force of friction that stopped the object.
C. Since it was sliding, was this kinetic or static friction?
D. What is the normal force acting on the object?
E. Calculate the coefficient of friction of the surface.
5. (Using "Gravity Notes" and the table on the last homework.) A 14 kg object is moved from the Earth to Mars.
A. What is its weight on the Earth?
B. What is the mass of the object on Mars?
C. If the mass of Mars is $6.4 \times 10^{23} \mathrm{~kg}$ and the radius of Mars is $3.39 \times 10^{6} \mathrm{~m}$ calculate the force of gravity of the 14 kg object on Mars.
D. If the object's mass were doubled, how would the force of gravity change?
E. If the distance to the center of Mars was doubled, how would Fg change?
6. A 280 kg go-cart is moving $12 \mathrm{~m} / \mathrm{s}$ as it moves around a circular track that has a radius of 35 m .
A. Which way does the centripetal acceleration point?
B. What force provides the centripetal force that keeps the cart moving in the circle?
C. Calculate the centripetal acceleration of the cart.
D. Calculate the force keeping the cart in the circle.


7. A 15 N force is hanging at 15 cm on a meter stick.
A. How far is the mass from the pivot point (in meters)?
B. Calculate the torque caused by the 15 N force.
C. Where would you need to put a 25 N force to make the meter stick balanced?
8. How many protons does carbon have?
9. How many protons does chlorine have?

10 . What is the atomic number of Silicon?
11. If I take away 1 proton from Oxygen, what element do I create?
12. If I add 1 neutron to carbon, what element do I have?

| 6 | 7 | 8 |  |
| :---: | :---: | :---: | :---: |
| $\mathbf{C}$ | $\mathbf{N}$ | $\mathbf{O}$ | $\overline{\mathbf{F}}$ |
| 12.011 <br> Carbon | 14.007 <br> Nitrogen | 15.999 <br> Oxygen | 18.998 <br> Fluorine |
| $\mathbf{1 4}$ | $\mathbf{1 5}$ | $\mathbf{1 6}$ |  |
| $\mathbf{S i}$ | $\mathbf{P}$ | $\mathbf{S}$ | $\mathbf{\mathbf { C l }}$ |
| 28.086 | 30.974 | 32.066 | 35.453 |
| Silicon | Phosphorus | Sulfur | Chlorine |

13. If two atoms have the same number of protons, but different number of neutrons, what do we call them?
14. If you add electrons to a neutral atom, it becomes a negative $\qquad$ .
15. Is this atom neutral, positive, or negative?

