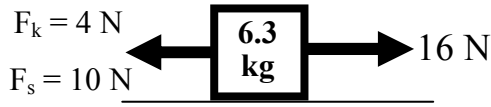
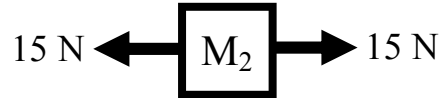
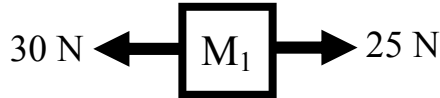


## Forces Review

1. A gun shoots a bullet. Which is greater: the force of the gun on the bullet; the force of the bullet on the gun?



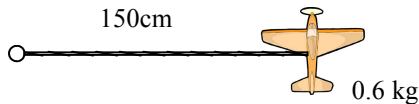
2. Use the mass at the left to answer the following.
- Draw a force diagram below the object.
  - How much force is necessary to start the object moving?
  - How much force is necessary to keep it moving?
  - What is the normal force on the object?
  - If the object starts at rest, does it start to slide?
  - If it was already moving, calculate its acceleration.



3. Which of the two above objects applies:  $M_1$ ,  $M_2$ , both, or neither?

- |  |   |
|--|---|
| A. <input type="checkbox"/> Could be at rest.            | F. <input type="checkbox"/> Could be moving.                    |
| B. <input type="checkbox"/> Could be accelerating.       | G. <input type="checkbox"/> Could be accelerating to the right. |
| C. <input type="checkbox"/> Could be moving to the left. | H. <input type="checkbox"/> Could be moving up.                 |
| D. <input type="checkbox"/> Has a net force.             | I. <input type="checkbox"/> Could have a velocity = 0m/s.       |
| E. <input type="checkbox"/> Is at constant speed.        | J. <input type="checkbox"/> Has no net force.                   |

4. A toy plane is attached to a rope, as shown at the left.

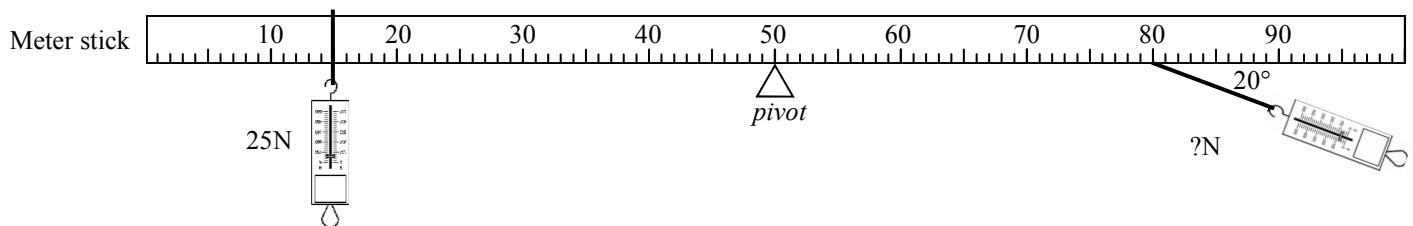


- Convert all number to standard units.
- Draw the path of the plane.
- Label the direction of the acceleration and velocity.
- What do we call this kind of acceleration.
- If the rope is breaks, which way does the plane go?
- If the plane is moving 2m/s, calculate the plane's acceleration.

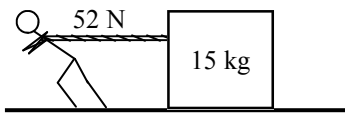
- G. Calculate the force of tension holding onto the plane.

5. A 120 kg object is on Pluto, which is still quite depressed by its recent astronomical demotion.

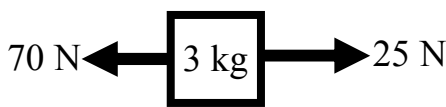
- What is the mass of the object on the earth?
- What is the weight of the object in space?
- What is the weight of the object on the earth?
- Given Pluto's information ( $m=1.31 \times 10^{22}$ kg;  $r = 1.161 \times 10^6$ ), calculate the weight of the object on Pluto.



- Calculate the torque provide by the 25N force.
- To increase its torque, what would you do?
- Which scale gives the greater torque?
- Calculate the force on the right of the pivot.  
(for regular physics pretend it is pulling straight down).

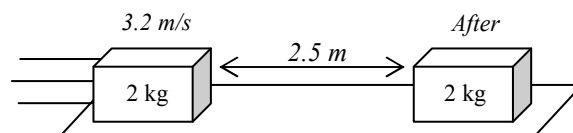


7. Slim Jim pulls with 52 N on a 15 kg box across the floor at constant speed. There is friction between the box and the floor.
- Since it is at constant speed, what is its acceleration?
  - Draw all of the forces on the box.
  - In the x-direction only, use  $\Sigma F = ma$  to find the force of friction on the box.
- D. Challenge: Find the coefficient of friction of the floor.

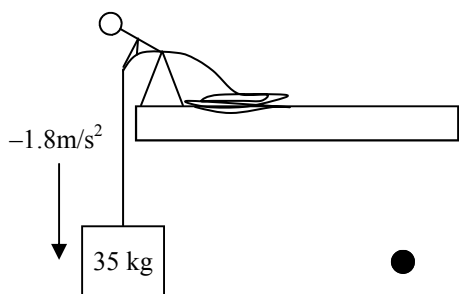


8. Find the acceleration of the object.

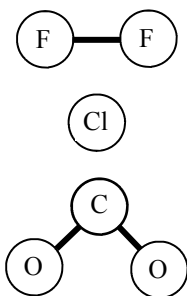
9. A box moving 3.2m/s stops in 2.5m.
- Use a kinematic equation to find the acceleration of the object.
  - Find the force of friction that stopped the object.



10. A 6kg mass has an acceleration of  $8.2\text{m/s}^2$ . What net force caused this?



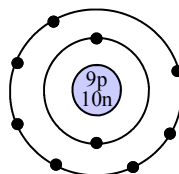
11. Slim Jim is lowering a 35kg mass with an acceleration of  $-1.8\text{ m/s}^2$ .
- On the dot, draw a force body diagram.
  - Find the tension in the rope.



**TAKS PREP**

12. In the diagrams at the left how many Atoms? Molecules? Compounds? Elements?

13. A. What element is shown?  
B. Is it a neutral atom?

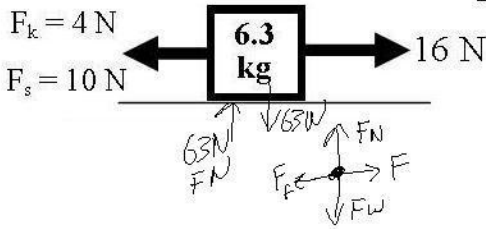


14. Protons, Neutrons, or Electrons?
- Are positive
  - Are in the nucleus
  - Are neutral
  - Are in the orbits
  - Attract electrons
  - Are negative
  - Tell you the element
  - Tell you the isotope
  - Cause bonding

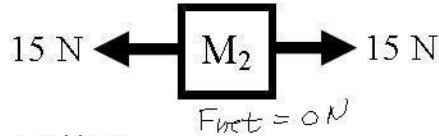
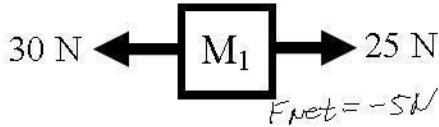
15. Element, Isotope, Ion?
- Changes when you change the number of neutrons.
  - Changes when you change the number of protons.
  - Changes when an atom gains or loses electrons.

# 2009 Forces Review

1. A gun shoots a bullet. Which is greater: the force of the gun on the bullet; the force of the bullet on the gun?  
*they are the same.*



2. Use the mass at the left to answer the following.
- Draw a force diagram below the object.
  - How much force is necessary to start the object moving? *10 N*
  - How much force is necessary to keep it moving? *4 N*
  - What is the normal force on the object? *63 N*
  - If the object starts at rest, does it start to slide? *yes 16 > 10*
  - If it was already moving, calculate its acceleration.  
 $\Sigma F = ma$        $12 = 6.3a$   
 $16 - 4 = 6.3a$        $a = 12/6.3 = 1.9 \text{ m/s}^2$

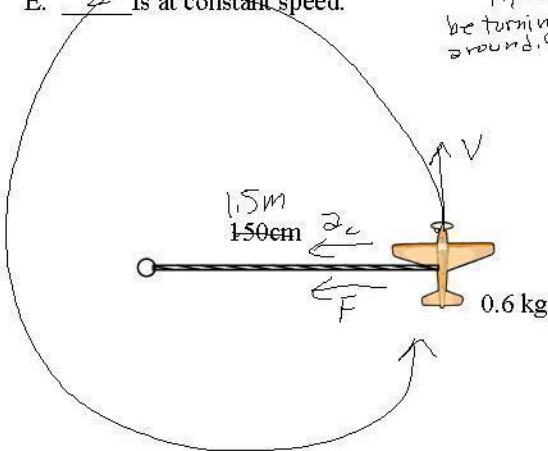


3. Which of the two above objects applies: M<sub>1</sub>, M<sub>2</sub>, both, or neither?

- 2* Could be at rest.
- 1* Could be accelerating.
- both* Could be moving to the left.
- 1* Has a net force.
- 2* Is at constant speed.

*M<sub>1</sub> would turn to left*  
*M<sub>1</sub> could be turning around.*  
*M<sub>2</sub> could be at const. speed*

- both* Could be moving.
- none* Could be accelerating to the right.
- both* Could be moving up.
- both* Could have a velocity = 0 m/s.
- 2* Has no net force.



4. A toy plane is attached to a rope, as shown at the left.

- Convert all number to standard units.
- Draw the path of the plane.
- Label the direction of the acceleration and velocity.
- What do we call this kind of acceleration. *centripetal*
- If the rope is breaks, which way does the plane go? *straight*
- If the plane is moving 2m/s, calculate the plane's acceleration.

$$a = \frac{(v_t)^2}{r} = \frac{2^2}{1.5} = 2.66 \text{ m/s}^2$$

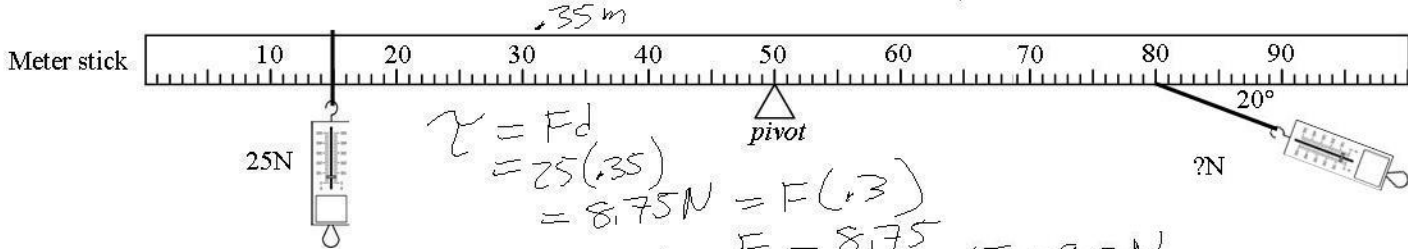
G. Calculate the force of tension holding onto the plane.

$$F = ma = .6(2.66) = 1.6 \text{ N}$$

5. A 120 kg object is on Pluto, which is still quite depressed by its recent astronomical demotion.

- What is the mass of the object on the earth? *120 kg*
- What is the weight of the object in space? *0 N*
- What is the weight of the object on the earth? *1200 N*
- Given Pluto's information ( $m = 1.31 \times 10^{22} \text{ kg}$ ,  $r = 1.161 \times 10^6$ ), calculate the weight of the object on Pluto.

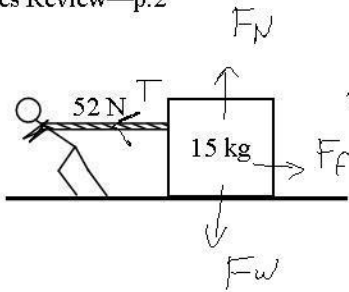
$$F_g = G \frac{m_1 m_2}{r^2} = 6.673 \times 10^{-11} \times 120 \times 1.31 \times 10^{22} / (1.161 \times 10^6)^2 = 77.8 \text{ N}$$



- Calculate the torque provide by the 25N force. *8.75 N*
- To increase its torque, what would you do? *more F, more D*
- Which scale gives the greater torque? *same*
- Calculate the force on the right of the pivot. (for regular physics pretend it is pulling straight down).

Honors only:  $\tau = \tau_R$   
 $25(.35) = F(.3) \sin 20^\circ$   
 $F = 85.3 \text{ N}$

Looking at the angle you see that most of the right force pulls parallel and provides no torque at all. This is why F has to be so big



7. Slim Jim pulls with 52 N on a 15 kg box across the floor at constant speed. There is friction between the box and the floor.

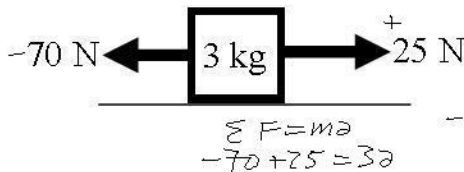
- A. Since it is at constant speed, what is its acceleration?  $0\text{ m/s}^2$
- B. Draw all of the forces on the box.
- C. In the x-direction only, use  $\Sigma F = ma$  to find the force of friction on the box.

$F_f - T = 15a$   
 $F_f - 52 = 15(0)$   
 $F_f = 52\text{ N}$

Any time an object has no acceleration, the forces must be balanced. If only 2 forces, they are equal.

D. Challenge: Find the coefficient of friction of the floor.

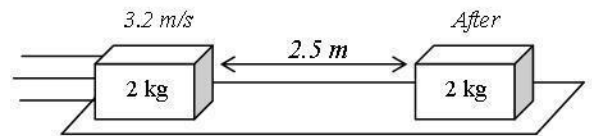
$F_f = \mu F_N$     $F_f = 52\text{ N}$     $F_N = 150\text{ N}$   
 $52 = \mu(150)$   
 $\mu = \frac{52}{150} = .35$



$\Sigma F = ma$   
 $-70 + 25 = 3a$   
 $-45 = 3a$   
 $a = -15\text{ m/s}^2$

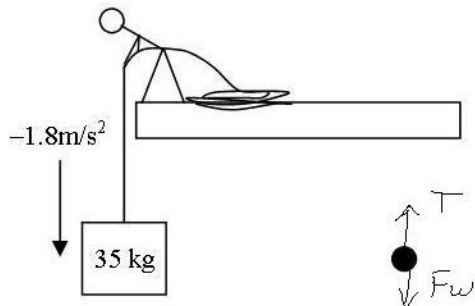
- 8. Find the acceleration of the object. *above*
- 9. A box moving 3.2 m/s stops in 2.5 m.

A. Use a kinematic equation to find the acceleration of the object.  
 $v_i = 3.2\text{ m/s}$     $\Delta x = 2.5\text{ m}$     $v_f^2 = v_i^2 + 2a\Delta x$   
 $v_f = 0\text{ m/s}$    *this not used*  
 $0 = 3.2^2 + 2a(2.5)$



$0 = 10.24 + 5a$   
 $-10.24 = 5a$   
 $\frac{-10.24}{5} = a$   
 $a = -2.05\text{ m/s}^2$

- B. Find the force of friction that stopped the object.
- $\Sigma F = ma$   
 $-F_f = 2(-2.05)$   
 $F_f = 4.10\text{ N}$



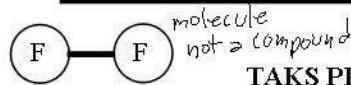
- 10. A 6kg mass has an acceleration of  $8.2\text{ m/s}^2$ . What net force caused this?
- 11. Slim Jim is lowering a 35kg mass with an acceleration of  $-1.8\text{ m/s}^2$ .

- A. On the dot, draw a force body diagram.
- B. Find the tension in the rope.

$T - F_w = 35(-1.8)$   
 $T - 350 = -63$   
 $T = 350 - 63 = 287\text{ N}$

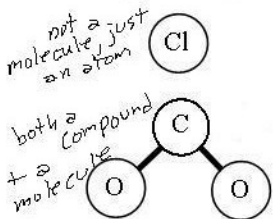
If the object was just hanging (at rest), then  $T = F_w = 350\text{ N}$ . If Jim accel it up ( $a$  is +), then  $T > F_w$ . If at constant velocity, then  $a = 0$  and  $T = F_w$ . Since it is accelerating down ( $-a$ ),  $T < F_w$ . If it is in freefall, then  $a = -9.8$  and  $T = 0$ .

$6(8.2) = 49.2\text{ N}$

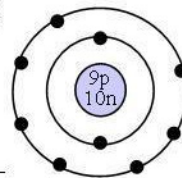


**TAKS PREP**

12. In the diagrams at the left how many Atoms? Molecules? Compounds? Elements?
- Atoms: 3  
 Molecules: 1  
 Compounds: 4  
 Elements: (F, Cl, C, O)



13. A. What element is shown? Fluorine  
 B. Is it a neutral atom? yes # of p = # of e



14. Protons, Neutrons, or Electrons?

- A. P Are positive
- B. P, N Are in the nucleus
- C. N Are neutral
- D. E Are in the orbits
- E. P Attract electrons
- F. E Are negative
- G. P Tell you the element
- H. N Tell you the isotope
- I. E Cause bonding

15. Element, Isotope, Ion?

- A. Changes when you change the number of neutrons. *Isotope*
- B. Changes when you change the number of protons. *element*
- C. Changes when an atom gains or loses electrons. *ion*