PreAP Physics Final Review

1. How many significant figures do each of the following numbers have?
   A. 6050 B. 20.13 C. −0.00130040 D. 1.0040×10^{6} E. 0.1500

2. Using the previous numbers, do the following math operations, giving your answers with the correct number of significant figures.
   I. B(C) = II. A/B =
   III. A + B = IV. B + C + E =

3. Convert the following numbers to standard units.
   A. 52 cm = _____ m C. 6.8 MHz = _____ Hz E. 3.2 km = _____ m
   B. 8.2 nL = _____ L D. 4.5 μC = _____ C F. 1 hr = _____ sec

4. Convert 350 m/s to cm/min.

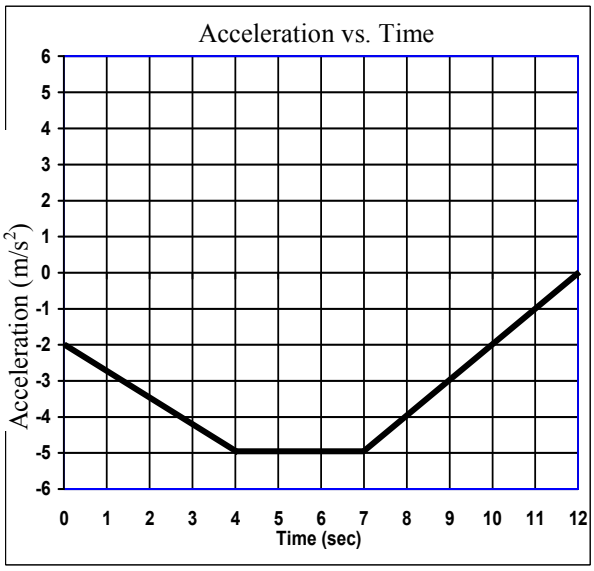
5. A car moving 25 m/s stops in 5 seconds.
   A. How far did it move before it stopped?

   B. Calculate the acceleration of the car.

   C. If the car is 850 kg, what force did the engine provide?

6. The same 850 kg car starts at rest. After moving 120 m it is moving 42 m/s to the right.
   A. How much time was necessary for the car to accelerate?

   B. Calculate the impulse on the car.



7. Use the graph at the left to answer the following.
   A. Calculate the change of velocity for the first 4 seconds.

   B. Calculate Δv between 4 and 7 seconds.

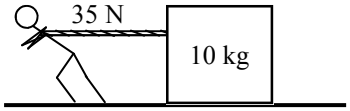
   C. Calculate Δv from 7 to 12 seconds.

   D. What is the total Δv of the object shown on the graph?

There are two kinds of forces: contact forces (when touching occurs) and field forces (forces at a distance). When using Newton's 3rd Law: contact forces oppose contact forces; field forces oppose field forces.

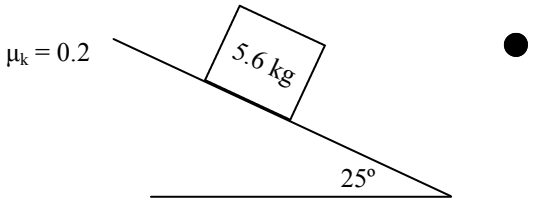
8. Contact or Field force?
   A. _____Tension C. _____Can cause accelerations E. _____Electrostatic force (*like a balloon rubbed on hair*)
   B. _____Normal force D. _____Gravity

9. A box is sitting on a table.
   A. What force opposes the normal force of the table pushing up on the box?
   B. What force opposes the force of weight pulling down on the box?



10. Slim Jim pulls with 35 N on a 10 kg box across the floor at constant speed.
    A. Draw all of the forces acting on the box.
    B. Write Newton's Second Law for both the x and y directions for the box.

    C. Calculate the force of friction on the box.



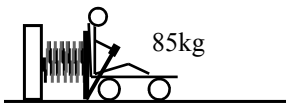
11. A. On the dot, draw a force diagram for the mass.
    B. Write Newton's Second Law for the mass in both the x and y directions.

    C. Solve for the acceleration of the mass down the ramp.

12. Calculate the gravitational force between a 12 kg mass and a 50 kg mass that are 3 m apart.

13. Are the following physical quantities vectors or scalars?

A. ____ Mass in kg	C. ____ Speed in m/s	E. ____ Acceleration in m/s^2
B. ____ Force in N	D. ____ Velocity in m/s	F. ____ Time in seconds



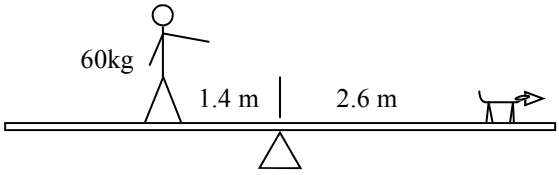
14. Slim Jim's "Spring Rocket" pushes him to 12 m/s in 0.8 seconds. Combined, Slim Jim and the rocket are 85 kg.
    A. Calculate his average acceleration.

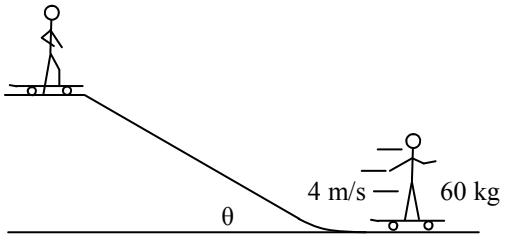
    B. Calculate the average force of the spring.

    C. Calculate the impulse given to the rocket.

15. Slim Jim and Bim end up at the park and balance on the see-saw. Jim is 60 kg, of course.
    A. If the see-saw stays balanced, who is giving more torque?

    B. Calculate Bim's weight and mass.





16. A. Calculate the potential energy of Jim at the top of the ramp

    B. Calculate the height of the ramp.

PreAP Physics Final Review

1. How many significant figures do each of the following numbers have?

   A. 6050 3 SF B. 20.13 4 SF C. -0.00130040 6SF D. 1.0040×10^{6} 5 SF E. 0.1500 4 SF

2. Using the previously numbers, do the following math operations, giving your answers with the correct number of significant figures.

   I. B(C) = $-0.026177052 = -0.02618$ (round up) II. A/B = 300.5464481 = 301 (least # of SF, 3 SF)

   III. A + B = 6070.13 = 6070 (round to 1's place) IV. B + C + E = 20.2786996 = 20.28 (decimal farthest to right)

3. Convert the following numbers to standard units.

   A. 52 cm = ___.52_____ m C. 6.8 MHz = _6.8×10^{6}_____ Hz E. 3.2 km = _3.2×10^{3}_ = 3200 m

   B. 8.2 nL = _8.2×10^{-9}_____ L D. 4.5 μC = _4.5×10^{-6}_____ C F. 1 hr = 60 min = 3600 sec

4. Convert 350 m/s to cm/min.

   $\frac{350\text{ m}}{1\text{ sec}}\left(\frac{100\text{ cm}}{1\text{ m}}\right)\left(\frac{60\text{ sec}}{1\text{ min}}\right) = 2.1\times10^{6}\text{ cm/min}$

5. A car moving 25 m/s stops in 5 seconds. so is accel.

   A. How far did it move before it stopped?

   $v_i = 25$ m/s $\Delta x =$ ___ $\Delta x = \frac{1}{2}(v_f + v_i)t$

   $t = 5$ sec $\Delta x = \frac{1}{2}(25)(5) = 62.5$ m

   $v_f = 0$ m/s

   B. Calculate the acceleration of the car.

   $a = \frac{\Delta v}{t} = \frac{v_f - v_i}{t} = \frac{0-25}{5} = -5\text{ m/s}^2$

   C. If the car is 850 kg, what force did the engine provide?

   $\Sigma F = ma = 850(-5) = -4250$ N

6. A car starts at rest and after moving 120 m is driving 42 m/s.

   A. How much time was necessary for the car to accelerate?

   $t =$ ___ $v_i = 0$ m/s $\Delta x = \frac{1}{2}(v_i + v_f)t$

   $\Delta x = 120$ m $v_f = 42$ m/s $120 = \frac{1}{2}(42)t$

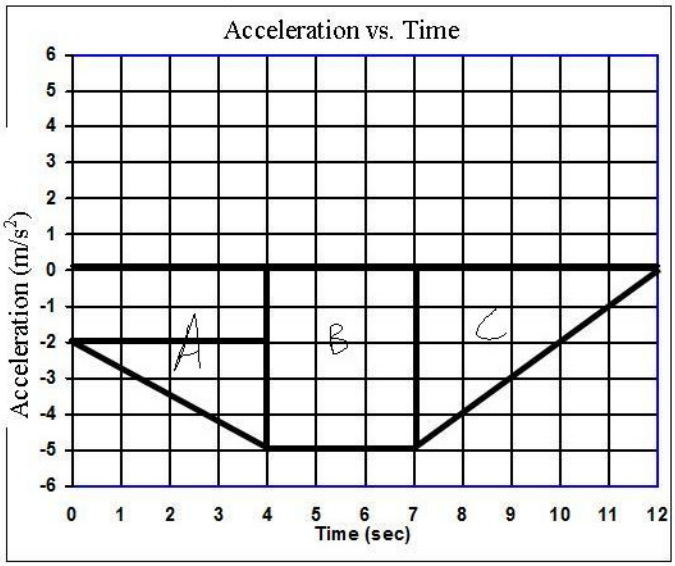
   $240 = 42t$

   $t = 5.7$ sec

   B. Calculate the impulse on the car. need force or mass, use same mass

   $I = \Delta p = p_f - p_i$

   $= 42(850) - 0 = 3.57\times10^{4}$ kg m/s



7. Use the graph at the left to answer the following.

   A. Calculate the change of velocity for the first 4 seconds.

   vel. is m/s $-2(4) + \frac{1}{2}(-3)(4) =$

   or $\frac{m}{s^2}$(sec) = area $-8 - 6 =$

   of graph -14 m/s

   B. Calculate Δv between 4 and 7 seconds.

   $3(-5) = -15$ m/s

   C. Calculate Δv from 7 to 12 seconds.

   $\frac{1}{2}(-5)(12-7) = \frac{1}{2}(-5)(5) =$

   -12.5 m/s

   D. What is the total Δv of the object shown on the graph?

   add em up: $-14 - 15 - 12.5 = -41.5$ m/s

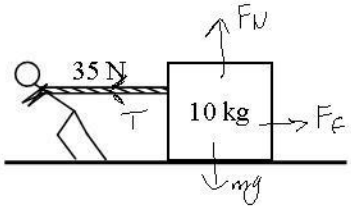
There are two major categories of forces: contact forces (when touching occurs) and field forces (forces at a distance).

8. Contact or Field force? (Newton's 3rd Law forces must be both contact or both field forces)

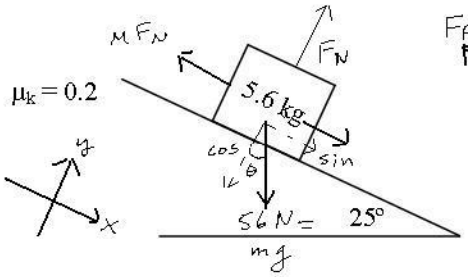
   A. C Tension C. both Can cause accelerations E. F Electrostatic force

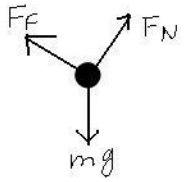
   B. C Normal force D. F Gravity (*like a balloon rubbed on hair*)

9. A box is sitting on a table.
   A. What force opposes the normal force pushing up on the box? box pushing down on table
   B. What force opposes the force of weight pulling down on the box? grav. of box pulling up on earth.



10. Slim Jim pulls with 35 N on a 10 kg box across the floor at constant speed.
    A. Draw all of the forces acting on the box.
    B. Write Newton's Second Law for the
    $\Sigma F_x = F_f - T = m(0)$ $\Sigma F_y = F_N - mg = m(0)$
    C. Calculate the force of friction on the box.
    $F_f - T = 0$ $T = F_f = 35N$



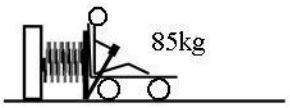


11. A. On the dot, draw a force diagram for the mass.
    B. Write Newton's Second Law for the mass in both the x and y directions.
    $\Sigma F_x = mg\sin\theta - \mu F_N = ma$
    $\Sigma F_y = F_N - mg\cos\theta = m(0)$
    $F_N = mg\cos\theta = 50.8\,N$
    C. Solve for the acceleration of the mass down the ramp.
    $mg\sin\theta - \mu F_N = ma$
    $56(\sin\theta) - .2(50.8) = 5.6a$
    $a = 2.41\ m/s^2$

12. Calculate the gravitational force between a 12 kg mass and a 50 kg mass that are 3 m apart.
    $F_g = G\frac{m_1 m_2}{r^2} = 6.673\times10^{-11}(12)(50)/3^2 = 4.45\times10^{-9}\,N$

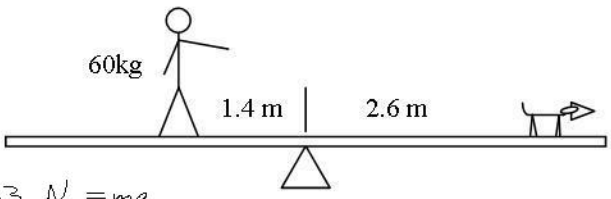
13. Are the following physical quantities vectors (magnitude and direction) or scalars (just magnitude)?

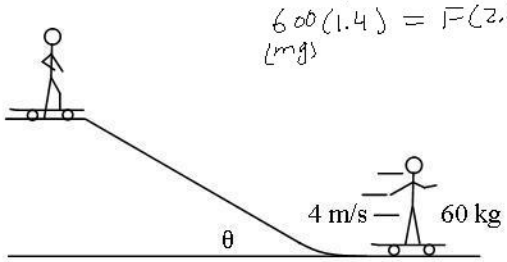
A.	S	Mass in kg	C.	S	Speed in m/s	E.	V	Acceleration in m/s^2
B.	V	Force in N	D.	V	Velocity in m/s	F.	S	Time in seconds



14. Slim Jim's "Spring Rocket" pushes him to 12 m/s in 0.8 seconds. Slim Jim in the rocket is 85 kg.
    A. Calculate his average acceleration.
    $a = \frac{\Delta v}{t} = \frac{v_f - v_i}{t} = \frac{12-0}{.8} = 15\ m/s^2$
    B. Calculate the average force of the spring.
    $F = ma = 85(15) = 1275\,N$
    C. Calculate the impulse given to the rocket.
    $I = \Delta p = p_f - p_i = 85(12) - 0 = 1020\ kg\,m/s$

15. Slim Jim and Bim end up at the park and balance on the see-saw. Jim is 60 kg, of course.
    A. If the see-saw stays balanced, who is giving more torque?
    Same: one with more mass has less distance (Jim)
    B. Calculate Bim's weight and mass.
    $\Sigma\tau = 0$ so $\tau_{jim} = \tau_{Bim}$
    $Fd_J = Fd_B$
    $600(1.4) = F(2.6)$
    (mg)
    $F = 323\ N = mg$
    $m = 32.3\ kg$





16. A. Calculate the potential energy of Jim at the top of the ramp
    $PE_{top} = KE_{Bottom} = \frac{1}{2}mv^2$
    $= \frac{1}{2}(60)16 = 480\,J$
    B. Calculate the height of the ramp.
    $mgh = 480\,J$
    $60(10)h = 480$
    $h = .8\,m$