1. A car headed west at 10 m/s rounds a curve in 10s so that it is now headed north at the same speed. Its average acceleration is

a) 0
b) 1 $m\,s^{-2}$
c) 1.4 $m\,s^{-2}$
d) 2 $m\,s^{-2}$
e) 4 $m\,s^{-2}$

$\Delta v_x = 10\,m s^{-1}$ $a_x = \frac{\Delta v_x}{\Delta t} = 1\,m s^{-2}$

$\Delta v_y = 10\,m s^{-1}$ $a_y = 1\,m s^{-2}$

$a = \sqrt{a_x^2 + a_y^2} = 1.4\,m s^{-2}$

2. In a naval battle a battleship simultaneously fires shells at enemy ships which are 1000m and 2000m away. In the trajectories shell 1 reaches a maximum height of 200m while shell 2 reaches a maximum height of 100m. The first shell to hit reaches its target in (Use $g = -10\,m\,s^{-2}$):

a) 4.5s
b) 6.3s
c) 10s
d) 20s
e) cannot answer w/o knowing the shells' velocities.

Shell w lower height hits first

$100\,m = \frac{1}{2} g t^2$

$t = \sqrt{\frac{2 \cdot 100\,m}{10\,m s^{-2}}} = 4.5\,s$

3. A box sits at rest on a table-top. Newton's third law force pairs are:

a) F(box-table) & Normal force of table on box, Weight of box & $F_g(box - earth)$
b) Weight of box & Normal force of table on box, only.
c) Weight of box & $F_g(box - earth)$, only
d) F(box-table) & Normal force of table on box, only.
e) Weight of box & Normal force of table on box, $F_g(earth - box)$ & $F_g(box - earth)$

4. An elephant and a field mouse collide in the African savannah. During the collision the force of the mouse on the elephant

a) is at all times less than the force of the elephant on the mouse.
b) is at all times equal to the force of the elephant on the mouse.
c) is at all times greater than the force of the elephant on the mouse.
d) is momentarily less than the force of the elephant on the mouse.
e) we need to know velocities to answer.

5) A freight train with a mass of $10^7 kg$ is pulled by a locomotive capable of exerting a force of $10^6 N$; how long will it take for the train to move 2 km, accelerating uniformly.

a) 100s
b) 141s
c) 200s
d) 2000s
e) 40,000s

$F = ma$ $a = \frac{10^6\,N}{10^7\,kg} = 0.1\,m s^{-2}$

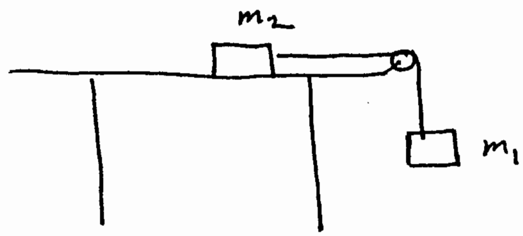
$x = \frac{1}{2} a_x t^2$

$t = \sqrt{\frac{2 \cdot 2000\,m}{0.1\,m s^{-2}}}$

6) You are running with a speed of 2 m/s while throwing a ball upward and catching it. If you throw the ball with a speed of 2 m/s, in order to catch it as it comes down you should: (neglect air resistance)

a) throw it at an angle of 45° and maintain the same speed.
b) throw it straight upward and slow down to catch it.
c) throw it straight upward and maintain the same speed.
d) stop and throw the ball straight upward then catch it 'cause you can't walk & throw at the same time.

Name________________________ ID # A____________________



7. $m_1 = 4kg$ is connected to $m_2 = 1kg$ as shown. m_1 is accelerating downward at [redacted]m/s. What is the coefficient of kinetic friction, μ_k between m_2 and the table top?

1pt each free body diagram

FBD's

m_2

m_1

m_1 (2pts m_1)

$$W_1 - T = m_1 a$$

$$m_1 g - T = m_1 a \qquad T = m_1(g-a)$$

m_2 (2pts m_2)

$$T - f_2 = m_2 a$$

$$T - \mu_k N = T - \mu_k m_2 g = m_2 a$$

$\mu_k =$ ________

(2pts μ_k) (2pts #'s) (1pt answer)

$$\mu_k = \frac{T - m_2 a}{m_2 g} = \frac{m_1(g-a) - m_2 a}{m_2 g}$$

$$= \frac{4kg(9.8ms^{-2} - [redacted]ms^{-2}) - 1kg\,[redacted]ms^{-2}}{1kg \cdot 9.8ms^{-2}}$$

$\mu_k = 0.94$

2kg 1kg $5ms^{-2}$ $\mu_k = 0.47$

kg 2kg $5ms^{-2}$ $\mu_k = 0.224$

kg 3kg $4ms^{-2}$ $\mu_k = 0.58$