41/41

Momentum 2006 B - out of order

9. Skater 1

$\Delta P = P_f - P_i$

$\Delta P = (75)(6) - (75)(10)$

$\Delta P = -300$

$\Delta P = F\Delta t$

$-300 = F(.200)$

$F = -1500\ N$

Skater 2

$\Delta P = P_f - P_i$

$\Delta P = (75)(6) - 75(0)$

+2

$\Delta P = 450 - 0$

$\Delta P = 450$

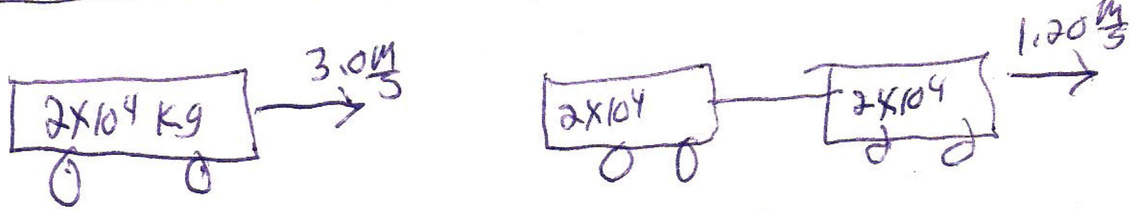
$F\Delta t = 450$

$F\ .200 = 450$

$F = 2,250\ N$

A) Both are O.K. Skater 2 is at a Higher Risk of Injury!

10.



$p_i = 6 \times 10^4$

$p_i = 4 \times 10^4 (1.20) = 4.8 \times 10^4$

+2

$P_i = P_f$

$6 \times 10^4 + 4.8 \times 10^4 = (6 \times 10^4)\ V_f$

A $V_f = 1.8\ \frac{m}{s}$

B) $\Delta KE = [.5(6 \times 10^4)(1.8)^2] - [.5(4 \times 10^4)(1.20)^2 - .5(2 \times 10^4)(3)^2] = -21600\ J$

11. $P_i = P_f$

$.030(200) + .15(0) = (.030 + .15)V$

$6 = V .18$

$V = 33.33$

$KE = PE$

$\frac{1}{2}mv^2 = mgh$

$\frac{1}{2}(33.33)^2 = 9.8(h)$

$h = 56.68\ m$

+1

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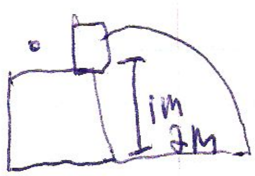
12. $P_i = P_f$

$.008V + .250(0) = .258V_f$

$.008V = .258(4.42)$



	x	y
s	2	0
x_i	0	1
v_i	4.42	0
v_f	$=v_i$	
a	0	-9.8
t	.452	.452

A) $V = 142.54\ m/s$

+1

$18 = \frac{1200(25) + 9000(20) + CR(20-25)(9000)}{10200}$

$KE_I = 1.8e6$

$KE_I\ 375{,}000$

2175000

$CR = .586$

$KE_f = 194\ 400$

$KE_F = 1971913$

2166313

13. $P_i = P_f$

$1200(25) + 9000(20) = 1200(18) + 9000V$

$210000 = 21600 + 9000V$

A) $V = 20.933$

B) $\Delta KE = \frac{1}{2}(1200)18^2 + \frac{1}{2}9000(20.933)^2 - [\frac{1}{2}(1200)(25)^2 + \frac{1}{2}9000(20)^2]$ -8742.80 J

+3 C) This is an InElastic collision so $\Delta KE \neq 0$. The "Lost Kinetic Energy shows up as mechanical, sound, and thermal energies. (CR=.586)

14. $P_i = P_f$

$4(5) + 10(3) + 3(-4) = (4+10+3)V_f$

+2 A) $V_f = 2.24\ \frac{m}{s}$

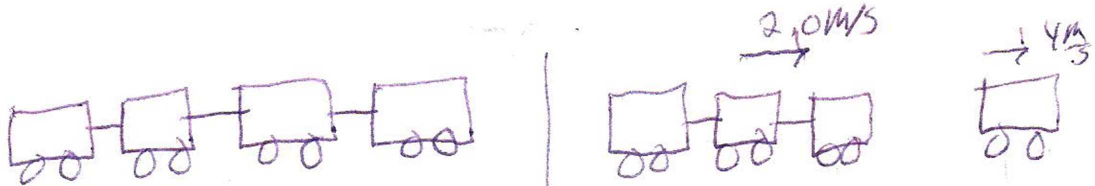
B) No, Momentum is Conserved no matter what type of collison is involved

15. .005 A → .20 m/s .010 kg B $V = 0$ m/s $CR = 1$ $V_{Bi} - V_{Ai}$ m/s

+2 $V_{fA} = \frac{.005(.2) + .010(0) + 1(0-.2)(.010)}{.015} = -.066\ \frac{m}{s} = -6.6\ \frac{cm}{s}$

$V_{fB} = \frac{.005(.2) + .010(0) + 1(.20-0)(.005)}{.015}$

$= .133\ \frac{m}{s} = 13.3\ \frac{cm}{s}$

16. 

$m = 1E5\ kg$
$V =$
$p_i = 1E5V$

$M = 7.5 \times 10^4$
$V = 2$
$p_f = 150000$

$M = 2.5 \times 10^4$
$V\ 4$
$p_f = 100,000$

$p_i = p_f$

$\frac{1E5V}{1E5} = \frac{250000}{1E5}$

$\boxed{V = 2.5 \frac{m}{s}}$

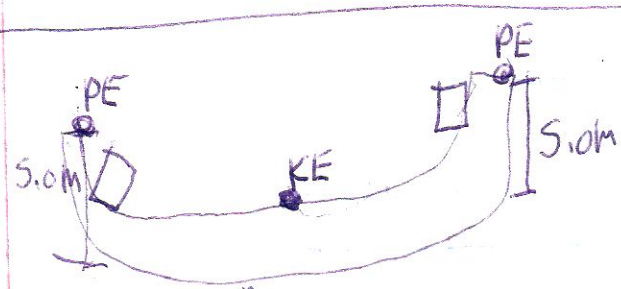
+2

$\Delta KE = KE_F - KE_I = work$

B ΔKE $.5(7.5 \times 10^4)(2)^2 + .5(2.5 \times 10^4)(4)^2 - .5(1E5)(2.5)^2 =$ ~~1,387,500 J~~

$\boxed{37,500 J}$

$= 8.97 Cal.$

17. 

+1

$KE = PE$

$\frac{1}{2}mv^2 = mgh$

$\frac{1}{2}v^2 = 9.8(5)$

A) $\boxed{V = 9.90 m/s \text{ for both Blocks}}$ toward center

$P_i = P_f$

$2(9.90) + 4(-9.90) = 6V$

$$\frac{-19.8}{6} = \frac{6V}{6}$$

B) $V = -3.30$ m/s toward Left

+2

C) $KE = PE$

$\frac{1}{2}mv^2 = mgh$

$\frac{1}{2}V^2 = 9.8h$

$\frac{1}{2}(-3.30)^2 = 9.8h$

$h = .56m$ up Left Ramp

---

18. Billard Balls are undergoing an elastic Collison. CR=1 In an Elastic Collision When masses are the same (Equal) velocities Exchange.

a) ① 1.50 → ② 0 m/s | ① 0 m/s ②→ 1.50 m/s

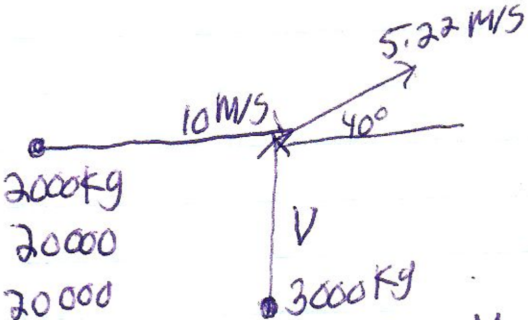
+3

b) ①→ 1.50 m/s ←② -1 m/s | ←① -1 m/s ②→ 1.50 m/s

c) ①→ 1.50 m/s ②→ 1 m/s | ①→ 1 m/s ②→ 1.50 m/s

$P_{ix} = P_{fx}$ $P_{iy} = P_{yf}$

19.



$P_i = 20000$
P_x 20000
$P_y = 0$

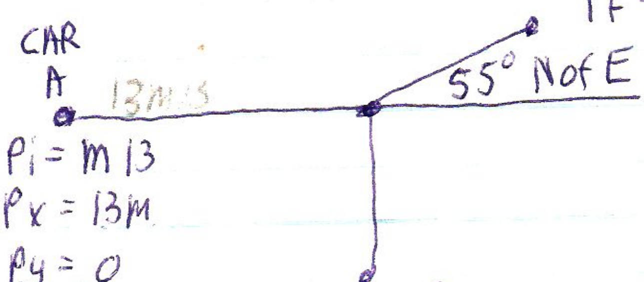
$P_i = 3000V$
$P_x = 0$
$P_y = 3000V$

$M = 5000$
$P_f = 5000V = 5000(5.22) = 26100$
$P_x = 26100 \cos 40 \approx 19994$
$P_y = 26100 \sin 40 = 16776.76$

+1

$P_{iy} = P_{fy}$
$3000 V_{iy} = 16776.76$
$\boxed{V_{iy} = 5.60 \text{ M/S}} \approx 12.52 \text{ mph}$

20.



$P_f = 2mV_f$
$P_x = 2mV_f \cos 55$
$P_y = 2mV_f \sin 55$

Car A:
$P_i = m13$
$P_x = 13m$
$P_y = 0$

Car B:
$P_i = mV$
$P_x = 0$
$P_y = mV$

+1

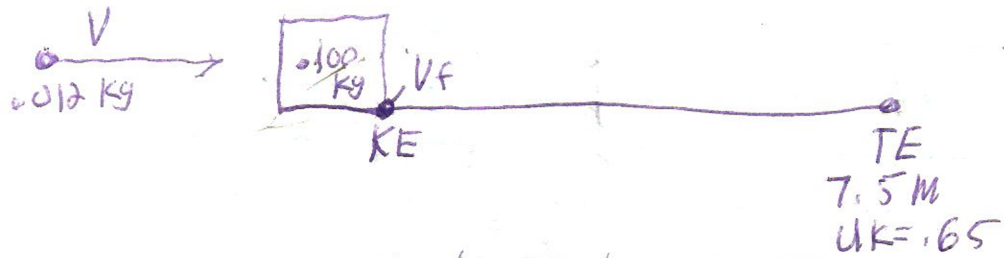
$P_{ix} = P_{fx}$
$13m + 0 = 2mV_f \cos 55$
$V_f = 11.332 \frac{m}{s}$

$P_{iy} = P_{fy}$
$0 + mV = 2mV_f \sin 55$
$V = 2(11.332) \sin 55$

$V = 18.56 \frac{m}{s} = 41.57 \text{ mph}$

Illegal! LIAR! →

21.



$\frac{1}{2}mv^2 = mg\mu_k d$

$\frac{1}{2}V^2 = 9.8(.65)(7.5)$

$V_f = 9.77$ m/s

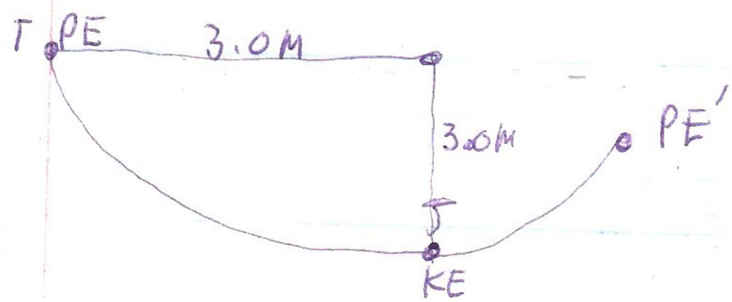
+1

$P_i = P_f$

$.012V + .100(0) = .112(9.77\ \frac{m}{s})$

$\boxed{V = 91.23\ m/s}$

22.



+1

PE = KE

$mgh = \frac{1}{2}mv^2$

$9.8(3) = \frac{1}{2}v^2$

$V = 7.67\ \frac{m}{s}$

$P_i = P_f$

$80(7.67) + 60(0) = 140V_f$

$V_f = 4.38$

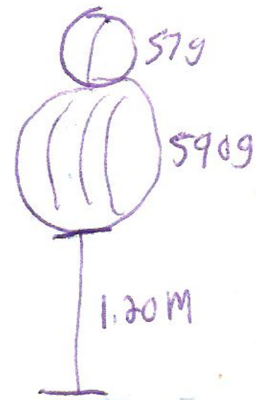
KE = PE'

$\frac{1}{2}mV_f^2 = mgh$

$\frac{1}{2}(4.38)^2\ 9.8h$

$h = .978$ M

23.

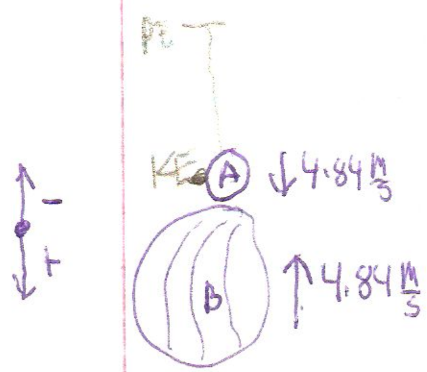


PE = KE

$mgh = \frac{1}{2}mv^2$

$9.8(1.20) = \frac{1}{2}v^2$

$V = 4.84\ m/s$



CR = 1

+1

$V_{fA} = \dfrac{.057(4.84) + .590(-4.84) + 1(-4.84-4.84).590}{.590 + .057}$

−12.81

= [redacted] m/s

KE = PE

$\frac{1}{2}mv^2 = mgh$

$\frac{1}{2}(-12.81)^2 = 9.8h$

$h = 8.37\ m$

1. $PE = KE$

$mgh = \frac{1}{2}mv^2$

$9.8(2.25) = \frac{1}{2}v^2$

$V_i = 6.64 \frac{m}{s}$

$KE = PE$

$\frac{1}{2}mv^2 = mgh$

$\frac{1}{2}v^2 = 9.8(.95)$

$V_f = -4.32 \frac{m}{s}$

+1

$\Delta P = P_f - P_i$

$\Delta P = .25(-4.32) - .25(6.64)$

$= -2.74$ kg m/s

---

2. $KE = PE$

$\frac{1}{2}mv^2 = mgh$

$\frac{1}{2}(25)^2 = 9.8h$

$h = 31.89$

A) $P = mv$

$P = .20(0)$

$P = 0$ kgm/s

+2

$KE = KE + PE$

$\frac{1}{2}(25)^2 = \frac{1}{2}v^2 + 9.8\left(\frac{31.89}{2}\right)$

$V = 17.677$ m/s

$P = mv$

$= .20(17.677) = 3.535 \frac{kg\,m}{s}$

---

3. A) $P_{bullet} = P_{ball}$

$.003(1.50 \times 10^3) = .145 V_f$

+3

$V_f = 31.03 \frac{m}{s}$ = 69.5 mph

B) $KE_{ball} = \frac{1}{2}(.145)(31.03)^2 = 69.80$ J

$KE_{bullet} = \frac{1}{2}(.003)(1.50 \times 10^3)^2 = 3,375$ J

$p = mv$

4\. [redacted]

$PE = KE$

$mgh = \frac{1}{2}mv^2$

$9.8(20) = \frac{1}{2}v^2$

$V = 19.80$ m/s

$\Delta P = P_f - P_i$

$\Delta P = 0 - 19.80(75)$

$\Delta P = F \cdot \Delta t$

$-1484.92 = F \cdot \Delta t$

$-1484.92 = F \, .0202$

$F = -73,479$

$S = 2.0$ m

$x_i = 0$ m

$v_i = 19.80$ m/s

$v_f = 0$ m/s

$a = \frac{0 - 19.80}{t}$ m/s²

$t = .202$ sec

$F =$

$m = 75.0$ kg

$2.0 = 19.80t + \frac{1}{2}\frac{-19.80}{t}t^2$

$\frac{2.0}{9.9} = \frac{9.9t}{9.9}$

$t = .202$ sec

$a = \frac{-19.80}{.202} = -98.02 \frac{m}{s^2}$

$F = ma$

$F = 75(-98.02)$

$F = -7351.5$ N

+1

5\.

$S = 1.20$ m

$x_i = 0$ m

$v_i = 25$ m/s

$v_f = 0$ m/s

$1.20 = 25t + \frac{1}{2}\frac{-25}{t}t^2$

$\frac{1.20}{12.5} = \frac{12.5t}{12.5}$ [redacted]

$t = .096$

C) $a = \frac{-25}{t} = -260.41 = -26.57g$

A) $t = .096$

+3

B) $F = ma$

$= 1400(-260.41)$

$= -364,574$ N

$\Delta P = Ft$

$-35000 = F(.096)$

6. $730N \rightarrow \underline{74.49}\ kg$

$P_i = P_f$

$0 = 74.49V + 1.2(5)$ $\quad \frac{-6}{74.49} = \frac{74.49V}{74.49}$

$V = .0805\ m/s$

+1

$S = x_i t + V_i t + \frac{1}{2}at^2$

$S = 0 + .0805t + \cancel{\frac{1}{2}a}t^2$

$t = 62.1\ sec \approx 1\ min$

7. $30N \rightarrow 3.06\ kg$

$700N \rightarrow 71.43\ kg$

A) $P_i = P_f$

$0 = 3.06V + (.005)(300)$

$-1.5 = 3.06V$

$V = -.49\ m/s$

+2

B $P_i = P_f$

$0 = 74.49V + .005(300)$

$V = -.02\ m/s$

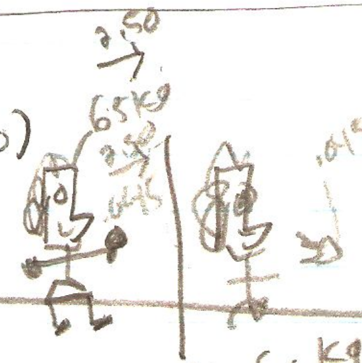
$65(2.50) = 65V + .045(32.5)$

8. $P_i = P_f$

$65(2.50) + .045(0) = 65V + .045(30)$

$162.5 = 65V + 1.35$

$V = 2.48\ m/s$



+2

$P_i = P_f$

$(.045)(30) + 60(0) = 60.045V$

$V = .022\ m/s$