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Motion Review Worksheet 2012 Name Key Hr.______

1. List the units for the following quantities.

+3 a) acceleration m/s^2 b) volume m^3 c) velocity m/s

2. Find the SI units for each of the following

a) P= mass* acceleration * velocity → $\frac{kg}{1} \cdot \frac{m}{s^2} \cdot \frac{m}{s} = \frac{kg\,m^2}{s^3}$

+3 b) Ff=mass*Acceleration due to gravity*.06 → $\frac{kg\,m}{s^2}$

c) momentum = mass * velocity → $\frac{kg\,m}{s}$

3. For each of the graphs state what ~~each~~ item represents be as specific as possible with units.

$\frac{m}{s^2} \cdot \frac{1}{s^2} = \frac{m}{s^4}$ $\frac{m}{s} \cdot \frac{s}{1} = m$

type	x-axis	y-axis	slope (Δy/Δx)	area (y·x)
Acceleration-time^2	s^2	m/s^2	m/s^4	m
Ff-Speed	m/s	$kg\,m/s^2$	kg/s	$\frac{kg\,m^2}{s^3}$
+4 Work-time	s	$kg\,m^2/s^2$	$kg\,m^2/s^3$	$kg\,m^2/s$
time-current	A	s	s/A	s·A

~~Z-light~~

Directions: Solve The following

+1 1. A gun fires a bullet at 835 m/s at a playing card 20m away. If we wish to photograph the card being split by the bullet at what time must the camera's shutter be opened? **t = .024 sec**

+1 2. A baseball is thrown upward at 80 mi/hr. What is the maximum height that the ball will raise into ~~the air? Hint~~ Velocity at the top of the flight is zero. **65.21 m**

+1 3. A rock it thrown **Upward** from a cliff which is 600m high at a speed of 12 m/s. How long will it take for the rock to hit the ground? What is the rock's speed on impact? **t = 12.36 sec V_f = +109.28 m/s toward ground**

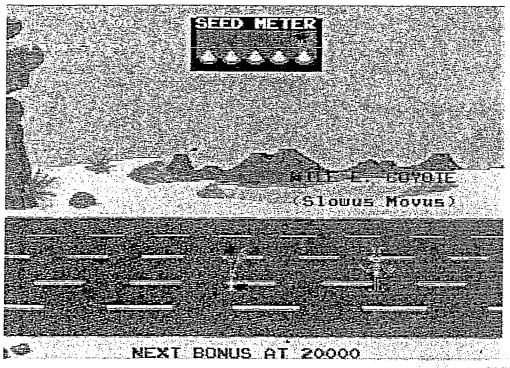
+1 4. A model-T ford is driving down the road at 9.0 m/s and is accelerating at .53 m/s^2. The car will stop accelerating when it reaches its maximum speed of 12.3 m/s. A police car is 3500 m behind the car and is chasing the driver at ~~15.0 m~~/s. How long will it be before the police car catches up to the model-T? **t = 1292.49 sec ≈ 21.54 min**

+3 5. A star fighter is approaching the planet Giridian of the Techkarian Empire at a speed of 15,000.0 m/s. When the fighter is 1.8 x10 8. km from the planet a nuclear tipped missile is fired from the surface ~~at~~ of the ~~fighter~~ planet. The missile is moving at 65,000.0 m/s and accelerating at 48.0 m/s^2. In response the fighter fires its breaking thrusters to slow down and reverse speed. The fighter's braking thrusters provide an acceleration of 32.8 m/s^2. a) How long will it take the missile to reach the fighter? b) What is the velocity of the fighter on impact? c) How much extra time did the fighter gain by firing its braking thrusters? d*) The fighter pilot realizing that he is in trouble plans to fire at the missile using a 5 MW anti-proton beam when the missile is 100,000,000 km from his ship. At what time should the particle beam be fired?

$|S_F - S_M| = 1E^{11}$

A) t = 148,723.57 sec ≈ 1.72 days B) 4.86E6 m/s away from the planet

C) 63771.6 sec ≈ 17.7 hr. D) 97,469.58 sec ≈ 27.07 Hrs

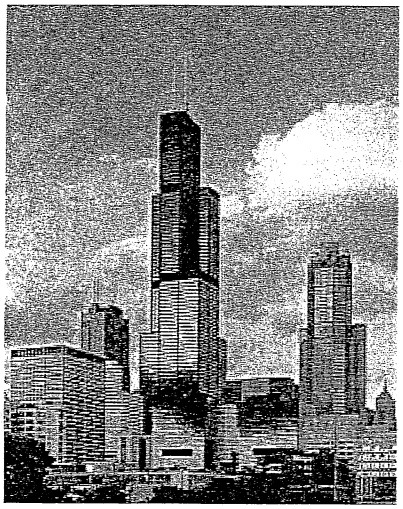


6, The Road Runner is 50m in front of Wile E. Coyote. The Coyote is hungry so he is moving faster than usual at 5m/s and is accelerating at .2 m/s^2. It has been a cold winter in the desert and the Road Runner is not up to par. The Road Runner is moving at 15 m/s and is decelerating at .3 m/s^2 a) How long will it be before the Coyote catches the Road Runner ? b) What will be the Coyote's speed at that time? C) What will be the Road Runner's speed at that time? D) What distance will they have traveled during that chase?

+4

A) 44.49sec B) 1.65 $\frac{m}{s}$ C) 13.90 $\frac{m}{s}$ D) 420.4m

7, A group of Physics students bored with the dart game in previous worksheets developed a new game. In this game a basketball is thrown to the ground at 20 m/s from the top of the building. At the same time a 2nd ball is thrown upward at 50 m/s from the ground. The basket balls pass each other at 6.32 sec. What is the height of the building?



+1

$X_i = 442.4\,m$

8. A car sliding down a straight and flat oil covered road comes to a rest after traveling 252.2 m. If its initial velocity was 15.1 m/s a) What is its acceleration? b) How long does it take the car to come to rest ? c) What is its speed after traveling 30 m ?

+3

A) $-.45\,m/s^2$ B) 33.40sec C) 14.18 m/s

9. A falling object on the moon requires.10 seconds to travel the last 35 m before hitting the ground. From what height above the ground did it fall from? The acceleration due to gravity on the moon is 1.62 m/s^2.

+1

37.791m

10. A stone takes 2.1 seconds to hit the water from the top of a bridge. What is the height of the bridge? What speed does the stone strike the water?

+2

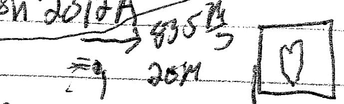
5
$x_i = 0$
$v_i = 0$
$v_f = v_i + at$
$a = +9.8$
$t = 2.1$

A) 21.6m
B) 20.58 m/s

Review

Motion 2012A

1.



$S = 20$

$x_i = 0$

$v_i = 835\ m/s$

$v_f = 835\ m/s$

$a = 0$

t

$S = x_i + v_i t + \frac{1}{2} a t^2$

$20 = 0 + 835t + \frac{1}{2} a t^2$

$\boxed{t = .024\ sec}$

2.

$S = 65.21\ m$

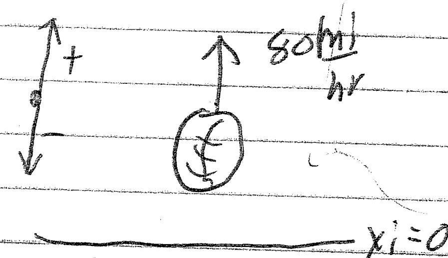
$x_i = 0$

$v_i = 80\ \frac{mi}{hr} = 35.75\ \frac{m}{s}$

$v_f = v_i + at = 0\ m/s$

$a = -9.8\ m/s^2$

$t = 3.648\ sec$

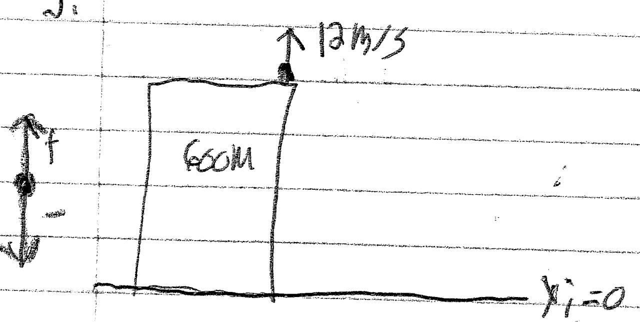


$-9.8 = \frac{0 - 35.75}{t}$

$t = 3.648\ sec$

$S = 0 + 35.75(3.648) + \frac{1}{2}(-9.8)(3.648)^2 = 65.21\ m$

3.



$S = 0\ M$

$x_i = 600\ m$

$v_i = 12\ m/s$

B $v_f = v_i + at$ $12 + (-9.8)(12.36) = \boxed{-109.28\ \frac{m}{s}}$

$a = -9.8\ m/s^2$

A $\boxed{t = 12.36}$

$S = x_i + v_i t + \frac{1}{2} a t^2$

$0 = 600 + 12t + \frac{1}{2}(-9.8)t^2$

$-4.9t^2 + 12t + 600 = 0$

$t = 12.36$ $t = \cancel{-9.91}$

4.

	Model T	Cop
s	3566.31 m	93.39 m
x_i	3500	0
v_i	9.0 m/s	15 m/s
v_f	12.3 m/s	15 m/s
a	.53 m/s²	0 m/s²
t	= 6.226	↔ 6.226

$$a = \frac{v_f - v_i}{t}$$

$$.53 = \frac{12.3 - 9.0}{t}$$

$$\frac{.53t}{.53} = \frac{3.3}{.53}$$

$$t = 6.226$$

$$S_T = 3500 + 9.0(6.226) + \tfrac{1}{2}(.53)(6.226)^2$$
$$= 3566.31$$

$$S_{cop} = 0 + 15(6.226) + \tfrac{1}{2}(0)t^2 = 93.39\text{m}$$

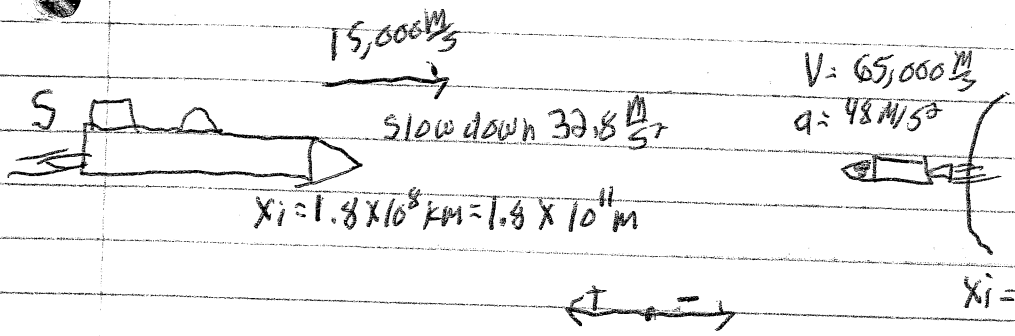
$$S_T = S_{cop}$$

$$3566.31 + 12.3t + \tfrac{1}{2}(0)t^2 = 93.39 + 15t + \tfrac{1}{2}(0)t^2$$

$$\frac{-2.7t}{-2.7} = \frac{-3472.92}{-2.7}$$

$$t = 1286.76.$$

Total Time 1292.99 sec = 21.54 min.



$S_F = S_M$

$1.8 \times 10^{11} + -15000t + \frac{1}{2}(32.8)t^2 = 0 + +65000t + +\frac{1}{2}48t^2$

$1.8E^{11} + -15000t + 16.4t^2 = 65000t + 24t^2$

$-7.6t^3 + \cancel{-80000}t + 1.8E11 = 0$

~~$t = 157,231.378$ sec~~

$t = 148723.57$ sec

$V_{FF} = -15000 + +32.8(148723.57) = +4.86E6 \frac{m}{s}$ away from the Planet

$S_F = S_M$

$1.8E11 + -15000t + \frac{1}{2}0t^2 = 0 + 65,000t + \frac{1}{2}48t^2$

$-24t^2 + -80000t + 1.8E11 = 0$

$t = 84951.91$ sec

$\Delta t = 148723.57 - 84951.91 = 63771.666$ sec $= 17.71$ hr

$S_F - S_M = 100,000E3$

$1.8 \times 10^{11} + -15000t + \frac{1}{2}(32.8)t^2 - (0 + 65000t + \frac{1}{2}48t^2) = 1E11$

$-7.6t^2 + -80000t + 1.8 \times 10^{11} = 1E11$

$-7.6t^2 + -80000t + .8E11 = 0$

$t = 97,469.58$ sec

	RR	Cogsite
6. s	420.4M	420.386M **D**
x_i	50	0
v_i	15	5
v_f	1.653 m/s	13.898 m/s
a	-.3 m/s²	.2
t	44.49sec	44.49sec

$S_{RR} = S_C$

$50 + 15t + \frac{1}{2}(-.3)t^2 = 0 + 5t + \frac{1}{2}(.2)t^2$

$-.15t^2 + 15t + 50 = 5t + .1t^2$

$-.25t^2 + 10t + 50 = 0$

A

$t = 44.49\text{sec}$

C) $V_{fRR} = 15 + (-.3)(44.49) = 1.653$ m/s

B) $V_{fC} = 5 + (.2)(44.49) = 13.898$ m/s

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7. $S_{Ball\ 1st} = S_{Ball\ 2nd}$

$x_i + -20t + \frac{1}{2}(-9.8)t^2 = 0 + 50t + \frac{1}{2}(-9.8)t^2$

$x_i = 50t + 20t$

$x_i = 70t$

$x_i = 492.4$ m

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8. s 252.2

x_i 0

v_i 15.1

v_f 0

$a = \frac{0-15.1}{t} = \frac{-15.1}{t}$

t

$252.2 = 0 + 15.1t + \frac{1}{2}\frac{-15.1}{t}t^2$

$252.2 = 15.1t + -7.55t$

$\frac{252.2}{7.55} = \frac{7.55t}{7.55}$

$t = 33.40$

$a = \frac{-15.1}{33.40}$

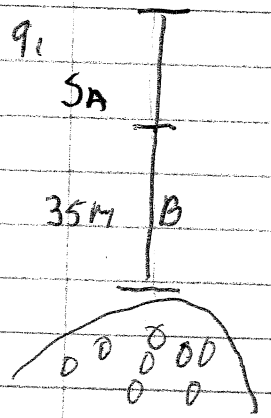
$= -.45$ m/s²

8. cont.

$s = 30$
$x_i = 0$
$v_i = 15.1$
$v_f =$
$a = -.45 m/s^2$
$t =$ ____

$s = x_i + v_i t + \frac{1}{2} a t^2$
$30 = 0 + 15.1t + \frac{1}{2} -.45t^2$
$t = 2.049$ sec

$V_f = V_i + at$
$= 15.1 + -.45(2.049) = \underline{14.18} \frac{m}{s}$



B
$s = 35$
$x_i = 0$
$v_i = \underline{349.919}$
$v_f = \underline{350.081}$
$a = 1.62$
$t = .1$

$s = x_i + v_i t + \frac{1}{2} a t^2$
$35 = 0 + v_i(.1) + \frac{1}{2}(1.62)(.1)^2$
$v_i = 349.919$

A
s
$x_i = 0$
$v_i = 0$
$v_f = ~~350.081~~ 349.919$
$a = 1.62$
$t = 215.999$

$s = 0 + 0t + \frac{1}{2}(1.62)(215.999)^2$
$s = 37791$ m

total distance $= 37791 + 35 = \boxed{37826 m}$
$= 23.51 mi$

10. $S = 0 + 0t + \frac{1}{2}(9.8)(3.1)^2 = 21.61m$

$x_i = 0$

$v_i = 0$

$v_f = v_i + at = 0 + 9.8(3.1) = 30.38 m/s$

$g = 9.8$

$t = 3.1$