ABRHS PHYSICS (CP) NAME: _____

More Constant Acceleration Problems

1. A happy physics student is leaving school for the day. This student uniformly accelerates her car from rest with an acceleration of 1.2 m/s^2.
   a. How long does it take her to reach 15 m/s?

$v_i = 0$ m/s
$a = 1.2$ m/s^2
$v_f = 15$ m/s

$v_f = at + v_i$

$15 = (1.2)t + 0$ → $15 = 1.2t$

$t = 12.5$ seconds

   b. How far does she travel in this time?

$d = \frac{1}{2}at^2 + v_i t$

$d = \frac{1}{2}(1.2)(12.5)^2 + (0)(12.5)$ → $d = \frac{1}{2}(1.2)(12.5)^2$

$d = 93.75$ m

2. A car is uniformly accelerated at the rate of 2.5 m/s^2 for 12 s.
   a. If the original speed of the car is 8 m/s, what is its final speed?

$a = 2.5$ m/s^2
$t = 12$ s
$v_i = 8$ m/s
$v_f = ?$

$v_f = at + v_i$

$v_f = (2.5)(12) + 8$

$v_f = 38$ m/s

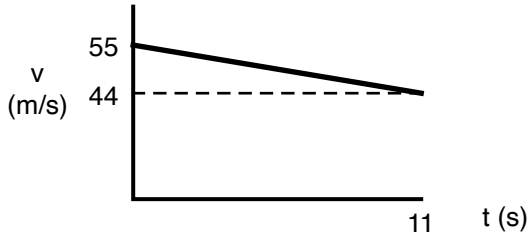
   b. How far does the car travel in this time?

$d = \frac{1}{2}at^2 + v_i t$

$d = \frac{1}{2}(2.5)(12)^2 + (8)(12)$ → $d = 180 + 96$

$d = 276$ m

3. The velocity vs time graph for a car is shown to the right.
   a. Describe the motion.



Car slowed down at a constant rate, going from 55 m/s to 44 m/s in 11 seconds.

   b. What is the acceleration of the car?

$a = \frac{v_f - v_i}{t} = \frac{44 - 55}{11} = \frac{-11}{11} = -1$ m/s^2

   c. How far does the car travel during this time?

$v_i = 55$ m/s
$v_f = 44$ m/s
$t = 11$ s
$a = -1$ m/s^2

$d = \frac{1}{2}at^2 + v_i t$

$= \frac{1}{2}(-1)(11)^2 + (55)(11)$

$= -60.5 + 605$

$d = 544.5$ m

OR

or $\bar{v} = \frac{v_i + v_f}{2} = \frac{55 + 44}{2} = 49.5$ m/s

then $d = \bar{v}t = (49.5)(11)$

$d = 544.5$ m

ABRHS PHYSICS (CP) NAME: _____

More Constant Acceleration Problems

4. Mary is riding her bike with a speed of 14 m/s, when she slows down at a constant rate and comes to rest in 7 seconds.
   a. What is Mary's acceleration?

$v_i = 14$ m/s
$t = 7$ s
$v_f = 0$ m/s
$a = ?$

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

$a = \frac{0 - 14}{7}$

$a = -2 \text{ m/s}^2$

   b. How far does Mary travel while slowing down?

$d = \frac{1}{2}at^2 + v_i t$

$d = \frac{1}{2}(-2)(7)^2 + (14)(7)$

$d = -49 + 98$

$d = 49$ m

5. A ball rolling down an incline for 0.75 seconds undergoes a uniform acceleration of 4.2 m/s^2. The ball has an initial speed of 2.2 m/s when it starts down the incline.
   a. How far does the ball roll?

$t = 0.75$ s
$a = 4.2 \text{ m/s}^2$
$v_i = 2.2$ m/s

$d = \frac{1}{2}at^2 + v_i t$

$d = \frac{1}{2}(4.2)(0.75)^2 + (2.2)(0.75)$

$d = 1.18 + 1.65$

$d = 2.83$ m

   b. How fast is the ball moving at the bottom of the incline?

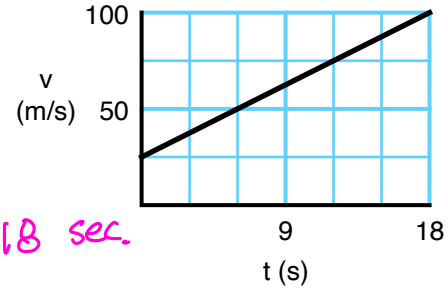
$v_f = at + v_i$

$v_f = (4.2)(.75) + 2.2$

$v_f = 3.15 + 2.2$

$v_f = 5.35$ m/s

6. The velocity vs time graph for a plane is shown to the right. How far does the plane travel in the time shown? (*Hint: there are two ways to do this & each way requires two steps!*)



From the graph we have the following:

$v_i = 25$ m/s $v_f = 100$ m/s $t = 18$ sec.

$d = \frac{1}{2}at^2 + v_i t$

Hey! we need to find a first!

So $a = \frac{v_f - v_i}{t} = \frac{100 - 25}{18} = \frac{75}{18} = 4.17 \text{ m/s}^2$

Then $d = \frac{1}{2}at^2 + v_i t = \frac{1}{2}(4.17)(18)^2 + (25)(18)$

$d = 675 + 450$

$d = 1125$ m

OR

$d = \bar{v}t$

Hey! we need to find $\bar{v}$ first!

So $\bar{v} = \frac{v_i + v_f}{2} = \frac{25 + 100}{2}$

$\bar{v} = 62.5$ m/s

Then $d = \bar{v}t = (62.5)(18)$

$d = 1125$ m

More Constant Acceleration Problems

Answers:

1. a) 12.5 s b) 93.8 m

2. a) 38 m/s b) 276 m

3. a) car slows down from 55 m/s to 44 m/s in 11 seconds b) –1 m/s^2 c) 545 m

4. a) –2 m/s^2 b) 49 m

5. a) 2.83 m b) 5.35 m/s

6.) 1125 m (& first steps were either: v_{ave} = 62.5 m/s or a = 4.17 m/s^2)