# Examples Using the 5 Equations of Constant Acceleration

Example 1: Find the distance travelled by an emu accelerating at 2.5 $m/s^2$ from rest in a time of 12 seconds.

$d = ?$

$v_1 = 0$

~~$v_2$~~

$a = 2.5\ m/s^2$

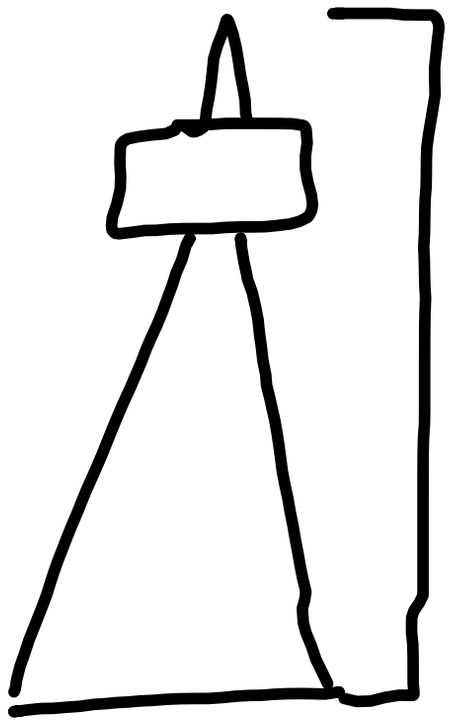
$t = 12\ s$

$d = v_1 t + \frac{1}{2} a t^2$ ($v_1 = 0$)

$d = \frac{1}{2}(2.5)(12)^2$

$d = 180\ m$

pg 72 # 54 from textbook



$V_1 = 0$

$d = 553\,m$

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

$t = ?$

~~0~~

$$d = \cancel{v_1}^{0} t + \frac{1}{2}at^2$$

$$553 = \frac{1}{2}(9.8)t^2$$

$$\sqrt{\frac{553}{4.9}} = \sqrt{\frac{4.9t^2}{4.9}}$$

$$t = \pm 10.62\,s$$

Example 2: A car accelerates uniformly from 18 km/h [S] to 35 km/h [S] in a time of 15 s.

a) Find the "average velocity" of the car in m/s.
b) What distance does the car travel in this time?

~~Ok~~

$V_1 = 18\ km/h\ [S] = 5\ m/s\ [S]$

$V_2 = 35\ km/h\ [S] = 9.7\overline{2}\ m/s\ [S]$

$d = ?$

$t = 15s$

a) $V_{avg} = \frac{V_1 + V_2}{2}$

$= \frac{5 + 9.7\overline{2}}{2}$

$= 7.36\ m/s$

b) $d = \left(\frac{V_1 + V_2}{2}\right)t$

$d = 7.36 \times 15$

$= 110\ m$

Example 3: Find the distance travelled by a student accelerating at $1.5\ m/s^2$ from 2.4 m/s to 4.3 m/s.

Example 4: An Olympic diver falls from rest from the high platform. The official height of such a platform is 10.0 m. At what velocity does the diver hit the water if the acceleration due to gravity is 9.8 m/s$^2$? (Assume down is positive)

$V_2 = ?$

$V_1 = 0$

$d = 10.0\ m$

$a = 9.8\ m/s^2\ [D]$

~~$\Delta x$~~

$2ad = V_2^2 - V_1^2$

$2(9.8)(10.0) = V_2^2 - 0^2$

$V_2 = \sqrt{2 \times 9.8 \times 10}$

$= 14\ m/s$

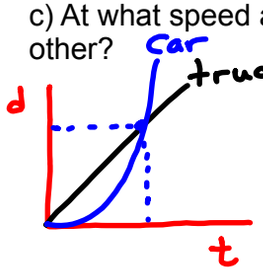
$= 50\ km/h$

Example 5: A truck travels a constant velocity of 22 m/s [N]. The driver sees a traffic light turn from red to green and so does not slow down. Meanwhile, a red sports car is stopped at the red light. At the moment the light turns green and the truck passes her, she begins to accelerate at 4.8 m/s$^2$.

a) At what distance from the intersection does the sports car catch up with the truck?

b) How long did it take for the sports car to catch up with the truck?

c) At what speed are the vehicles travelling when the catch up to each other?




| Truck | Car |
|---|---|
| $V=22\,m/s$ | $V_1=0$ |
| $d=?$ | $d=?$ |
| $t=?$ | $t=?$ |
| $V=\frac{d}{t}$ | $a=4.8\,m/s^2$ |
| $22=d/t$ | $d=\cancel{v_1 t}^{0}+\frac{1}{2}at^2$ |
| $d=22t$ | $d=\frac{1}{2}(4.8)t^2$ |
| | $d=2.4t^2$ |

$d=d$

$2.4t^2=22t$

$2.4t^2-22t=0$ (factor)

$2.4t(t-9.17)=0$

$t=0$ at lights

$t-9.17=0$

b) $t=9.17\,s$ *

a) $d=22t$

$=22(9.17)$

$=202\,m$

c) Truck $V=22\,m/s$

Car

$a=\frac{v_2-v_1}{t}$

$4.8=\frac{v_2-0}{9.17}$

$v_2=4.8\times 9.17$

$=44\,m/s$

not realistic

Example 6: Usain Bolt set a world record in the 100 m dash with a time of 9.58 s.  If he started from rest and accelerated uniformly what was his acceleration?  What was his speed as he crossed the finish line?