# Acceleration Lab 1

Example 4:

A rocket boosts from a launch pad a 48 ft/sec$^2$. How high is the rocket after 5 sec?

Solution:

| ① Inventory: | ② Select Formula: | ③ Insert values: |
|---|---|---|
| $V_i = 0$<br>$V_f = \otimes$<br>$a = 48$<br>$s = ?$<br>$t = 5$ | $V_f = \otimes$<br>↓<br>$s = V_i t + \frac{1}{2} at^2$<br>$V_i = 0$<br>↓<br>$S = .5at^2$ | $S = .5at^2$<br>$S = .5(48)(5^2)$<br>$S = (24)(25)$<br>**$S = 600$ ft** |

Example 5:

A car goes from 55 MPH to 70 MPH in 10 sec. What is the rate of acceleration?

Solution:

**① Convert to correct standard units:**

| | |
|---|---|
| $\frac{55\ mi}{1\ hr}$ x $\frac{5.28\ x\ 10^3 ft}{1\ mi}$ x $\frac{1\ hr}{3.6\ x\ 10^3 sec}$<br>$\frac{55\ \cancel{mi}}{1\ \cancel{hr}}$ x $\frac{5.28\ x\ \cancel{10^3} ft}{1\ \cancel{mi}}$ x $\frac{1\ \cancel{hr}}{3.6\ x\ \cancel{10^3} sec}$<br>$\frac{55 \times 5.28\ ft}{3.6\ sec} = \frac{290.4\ ft}{3.6\ sec}$<br>**= 80.667 ft/sec** | $\frac{70\ mi}{1\ hr}$ x $\frac{5.28\ x\ 10^3 ft}{1\ mi}$ x $\frac{1\ hr}{3.6\ x\ 10^3 sec}$<br>$\frac{70\ \cancel{mi}}{1\ \cancel{hr}}$ x $\frac{5.28\ x\ \cancel{10^3} ft}{1\ \cancel{mi}}$ x $\frac{1\ \cancel{hr}}{3.6\ x\ \cancel{10^3} sec}$<br>$\frac{70 \times 5.28\ ft}{3.6\ sec} = \frac{369.6\ ft}{3.6\ sec}$<br>**= 102.667 ft/sec** |

| ② Inventory: | ③ Select Formula: | ④ Insert values: |
|---|---|---|
| $V_i = 80.667$ ft/sec<br>$V_f = 102.667$ ft/sec<br>$a = ?$<br>$s = \otimes$<br>$t = 10$ sec | $s = \otimes$<br>$a = \frac{V_f - V_i}{t}$ | $a = \frac{102.667 - 80.667}{10}$<br>$a = \frac{102.667 - 80.667}{10}$<br>$a = \frac{22}{10}$<br>**= 2.2 ft/sec$^2$** |

Example 6:

An aircraft landing with a landing speed of 180 MPH lands on an aircraft carrier by catching the arresting wire and coming to a complete stop in 2 sec. How many G's does the pilot experience?

Solution:

**① Convert to correct standard units:**

$$\frac{180\ mi}{1\ hr} \times \frac{5.28\ x\ 10^3 ft}{1\ mi} \times \frac{1\ hr}{3.6\ x\ 10^3 sec}$$

$$\frac{180\ \cancel{mi}}{1\ \cancel{hr}} \times \frac{5.28\ x\ \cancel{10}^3 ft}{1\ \cancel{mi}} \times \frac{1\ \cancel{hr}}{3.6\ x\ \cancel{10}^3 sec}$$

$$\frac{180 \times 5.28\ ft}{3.6\ sec} = \frac{950.4\ ft}{3.6\ sec}$$

**= 264 ft/sec**

**② Inventory:**

$V_i$ = 264 ft/sec

$V_f$ = 0 ft/sec

a = ?

s = ⊗

t = 2 sec

Remember, the idea is to STOP when landing!

**③ Select Formula:**

s = ⊗

$$a = \frac{V_f - V_i}{t}$$

**④ Insert values:**

$$a = \frac{0 - 264}{2}$$

= −132 ft/sec²

**⑤ Now convert to "G's"**

1 "G" = 32 ft/sec²

−132 ÷ 32 = −4.125 G's

or

4.125 −G's