Warm-UP:

1. Define position, velocity, and acceleration.

Position: location at given time ; Velocity = $\frac{\text{Position}}{\text{time}}$, acceleration: $\frac{\text{Velocity}}{\text{time}}$

2. Why is it beneficial to know any of the previous terms?

We can determine where an object started and/or where it will end up

3. What is projectile motion? Give an example.

object in air that is only affected by gravity

- Kinematic Equations: three main eq's that allow us to calculate motion values

1) $\boxed{V_f = V_0 + at}$

V_f = Final velocity
V_0 = initial velocity
a = acceleration
t = time

Ex: A squad car traveling east at 7m/s it speeds up to 22 m/s in 1.7s. What is acceleration?

$V_0 = 7 m/s$
$V_F = 22 m/s$
$t = 1.7 s$
$a = ?$

$22 m/s = 7 m/s + a \cdot 1.7 s$
$-7 \quad\quad -7$
$\frac{15 m/s}{1.7} = \frac{a \cdot 1.7}{1.7}$

$\boxed{a = 8.8 m/s^2}$

2) $\boxed{d = V_0 \cdot t + \frac{1}{2} a t^2}$ d = distance

Ex: A sprinter starts from rest and accelerates uniformly. He travels 100.0m in 9.69s what was his acceleration?

$100.0m = 0 + \frac{1}{2} \cdot a \cdot (9.69^2)$
$\frac{100.0m}{46.95} = \frac{46.95 \cdot a}{46.95}$

$\boxed{a = 2.13 m/s^2}$

3) $\boxed{V_f^2 = V_0^2 + 2ad}$

Ex: A banana boat accelerates from 15 km/hr at $2 m/s^2$. How far has it traveled when it reaches 30 km/hr?

3,600 s = 1 hr 1000m = 1 km

$\frac{30 km}{1 hr} \left| \frac{1 hr}{3600 s} \right| \frac{1000 m}{1 km} = 8.33 m/s$ (V_f) $\frac{15 km}{1 hr} \left| \frac{1 hr}{3600 s} \right| \frac{1000 m}{1 km} = 4.167 m/s$ (V_i)

$(8.33 m/s)^2 = (4.167 m/s)^2 + 2 \cdot 2 m/s^2 \cdot d$

$\frac{52.028 \cancel{m^2/s^2}}{4 \cancel{m^2/s^2}} = \frac{2 \cdot 2 m/s^2 \cdot d}{4 m/s^2} \rightarrow \boxed{d = 13.0 m}$

Kinematics Uksht:

1. $V_0 = 0 m/s$
   $V_f = 5.00 m/s$
   $d = 19.6 m$
   $t = ?$ X
   $\boxed{a = ?}$