## Projectile Motion

IB PHYSICS | MOTION

## Reminder of our Equations

| Units | $m$ | $m s^{-1}$ | $\mathrm{~ms}^{-1}$ | $m s^{-2}$ | $s$ |
| :---: | :---: | :---: | :---: | :---: | :---: |
| $v=u+a t$ |  | $u$ | $v$ | $a$ | $t$ |
| $s=u t+\frac{1}{2} a t^{2}$ | $s$ | $u$ |  | $a$ | $t$ |
| $v^{2}=u^{2}+2 a s$ | $s$ | $u$ | $v$ | $a$ |  |
| $s=\frac{(v+u) t}{2}$ | $s$ | $u$ | $v$ |  | $t$ |

## Dropping the Ball

How much time will it take this ball to hit the ground when dropped? The impact velocity?

| $s$ | -25 m |
| :---: | :---: |
| $u$ | $0 \mathrm{~m} \mathrm{~s}^{-1}$ |
| $v$ | $?$ |
| $a$ | $-9.81 \mathrm{~m} \mathrm{~s}^{-2}$ |
| $t$ | $?$ |

## Air Time - Comparison

## $\xrightarrow[10 \mathrm{~m} / \mathrm{s}]{\longrightarrow}$

## Which ball will have more air time?

## Air Time - Comparison



## Horizontal Projectile



## One Dimensional Motion

## Vertical Accelerating

# Horizontal <br> Constant Velocity <br> $$
[\mathbf{v}=\mathrm{d} / \mathrm{t}]
$$ 



## Two-Dimensional Projectile



## Which one lands first??

## Which one lands first??



## Lesson Takeaways

$\square$ I can compare the motion of an object dropped from rest and an object with an initial horizontal velocity
$\square$ I can calculate the air time and speed for a horizontal projectile

I can describe how the vertical and horizontal components are independent from each other for a projectile's motion
$\square$ I can compare the air time for two projectiles given their trajectories.

