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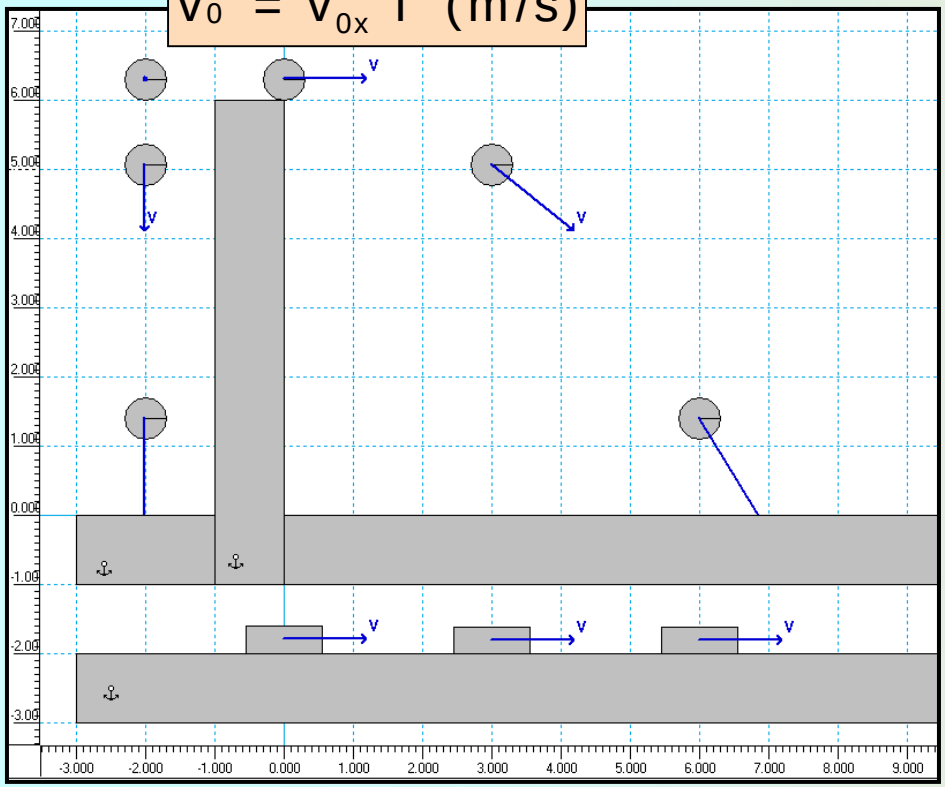
Projectile Motion

Initial velocity:

$$\vec{v}_0 = v_{0x}\,\vec{i} \quad (m/s)$$



A projectile motion consists of a horizontal part with constant speed and a vertical part with constant downward acceleration (free fall).

Each of these motions is independent of the other, but their combination describes the overall motion of the projectile.

The equations of the position vector and velocity (get by differentiation) are:

$$\vec{r} = v_{0x} * t\,\vec{i} + (y_0 - 5\,t^2)\,\vec{j} \quad (m)$$

differentiation

$$\vec{v} = v_{0x}\,\vec{i} - 10\,t\,\vec{j} \quad (m/s)$$

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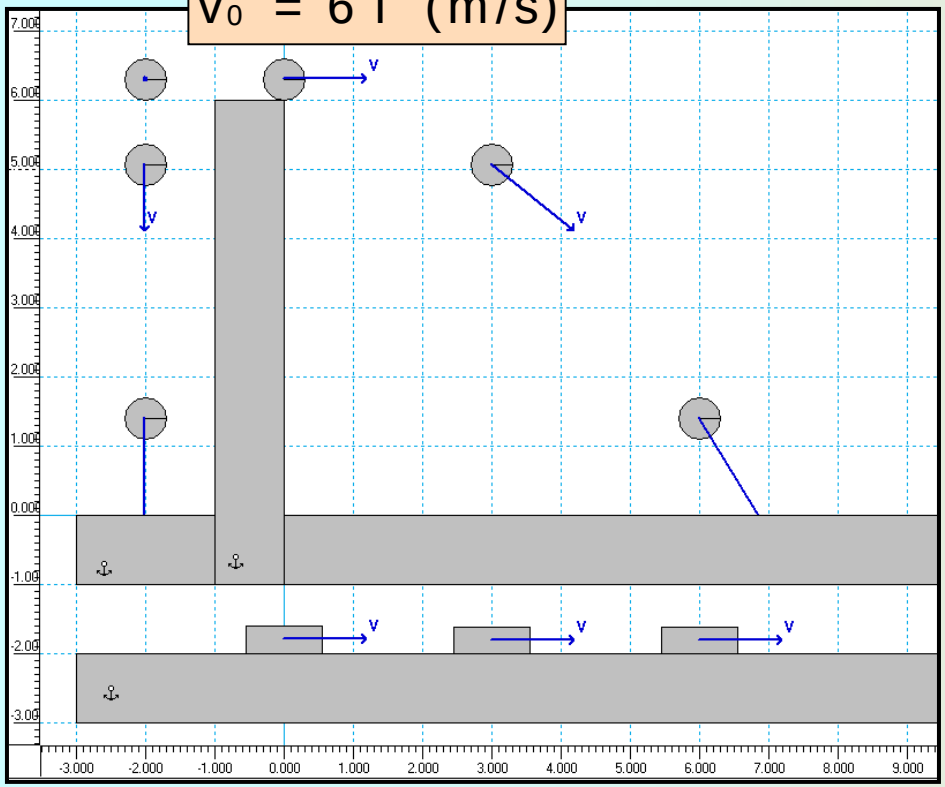
Initial velocity:

$$\vec{v}_0 = 6\,\vec{i} \quad (m/s)$$



In our particular case, the equations of the position vector and velocity (get by differentiation) are:

$$\vec{r} = 6*t\ \vec{i} + (6.3 - 5\,t^2)\ \vec{j} \quad (m)$$

differentiation

$$\vec{v} = 6\,\vec{i} - 10\,t\,\vec{j} \quad (m/s)$$

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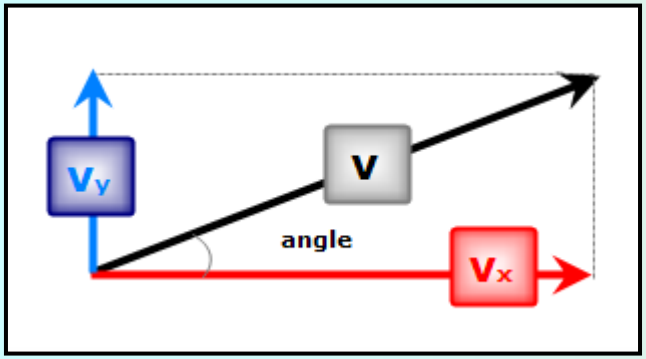


When a body is thrown upwards, the equation of the position vector is slightly different:

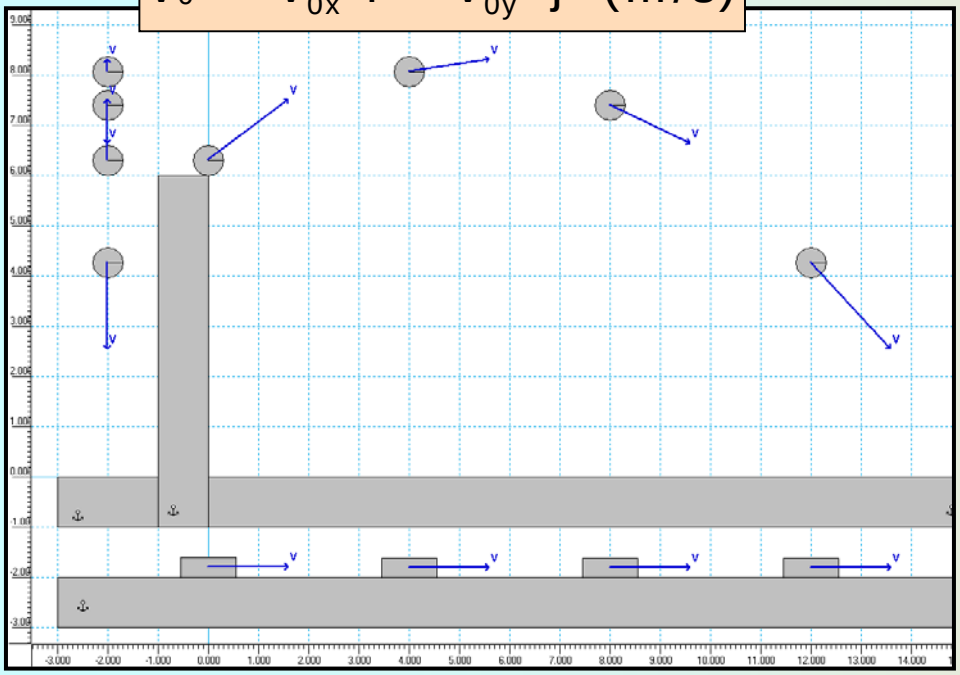
$$\vec{r} = v_{0x} * t \ \vec{i} + (y_0 + v_{0y} * t - 5\,t^2) \ \vec{j} \quad (m)$$

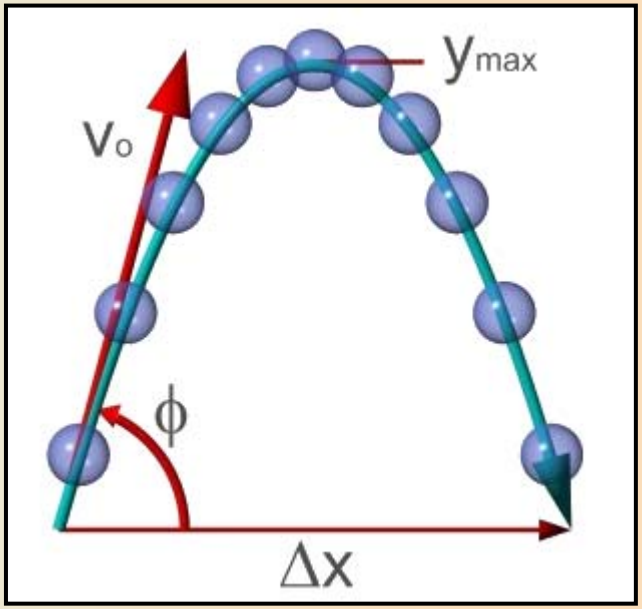
differentiation

$$\vec{v} = v_{0x} \ \vec{i} + (v_{0y} - 10 * t) \ \vec{j} \quad (m/s)$$

Initial velocity:

$$\vec{v}_0 = v_{0x} \ \vec{i} + v_{0y} \ \vec{j} \quad (m/s)$$





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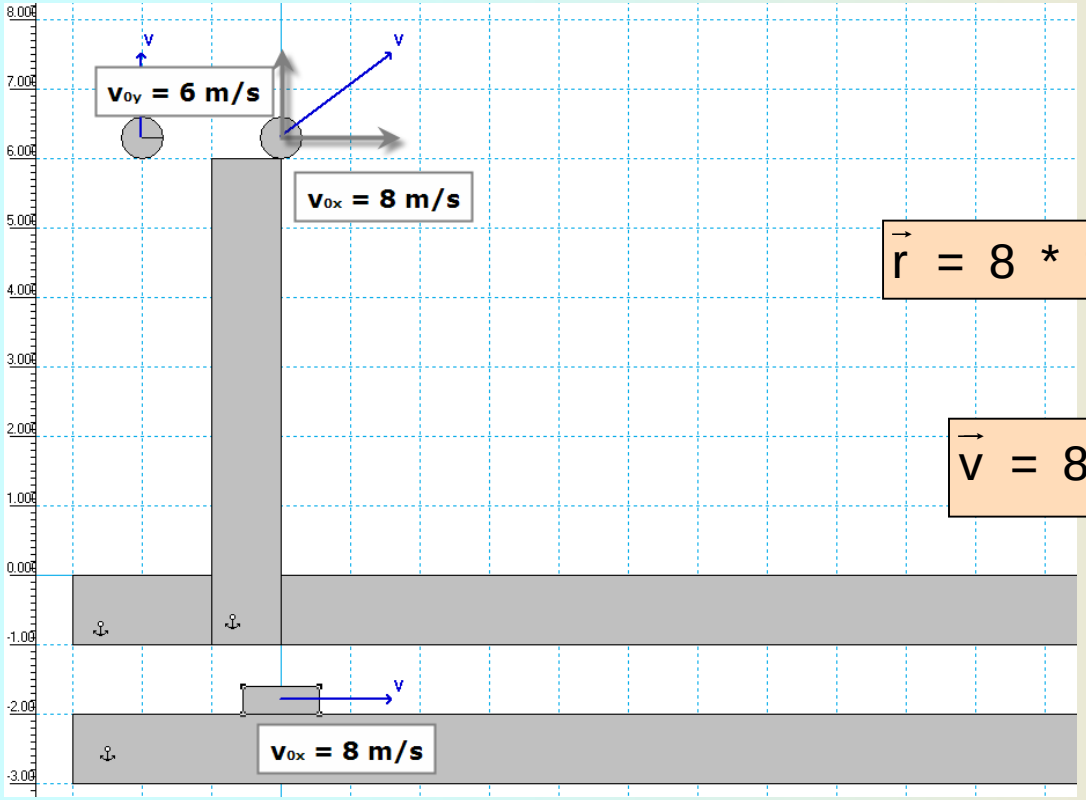
Projectile Motion



In our particular case, the equations of the position vector and velocity (get by differentiation) are:

$$\vec{r} = 8 * t \ \vec{i} + (6.3 + 6 * t - 5\, t^2) \ \vec{j} \ \ (m)$$

differentiation

$$\vec{v} = 8\, \vec{i} + (6 - 10 * t)\, \vec{j} \ \ (m/s)$$