



# CoreModels

## Projectile Motion

A Core Learning Goals Activity for Science and Mathematics

**Summary:** Students learn to use STELLA to represent the components of velocity and displacement in two dimensions.

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## PROJECTILE MOTION TEACHER GUIDE

### Overview:

This model is an extension of the Simple Kinematics model. It causes the kids to recognize that there is now a displacement in 2 dimensions, that the velocity at an angle has two components, and allows them to produce a graph comparing the displacements in the x and y direction for a variety of angles.

This activity could be used as an activity where the students build the model, or the teacher uses an already built model to reinforce the concepts of projectile motion.

### Prior Knowledge/Skills Required:

The students should have completed the activities on kinematics and free fall. If this is their first Stella model, then they should have a knowledge of the basic kinematics equations and the vector nature of velocity. They should be able to find the components of the velocity vector using basic trig. Hopefully, the students will have also developed an appreciation to the fact that the acceleration due to gravity is always directed down, no matter the motion of the object.

### Drill Question:

The football team has a dilemma. The starting quarterback is hurt and we need to help out the second string quarterback with his throwing. If he can throw the football at 100 m/s, which would be incredible and I would immediately retire and become his agent, at what angle will he be able to throw the ball the greatest distance?

When throwing an object at an angle, how does the ball move according to a spectator sitting on the side?

Answer: The spectator sees the ball go up into the air and fall back down and land a distance along the horizontal plane from the thrower.

Obviously then this problem involves motion in two different directions, **up** and **down** and **over**. In physics, we call **up** and **down** the y direction and **over** the x direction.