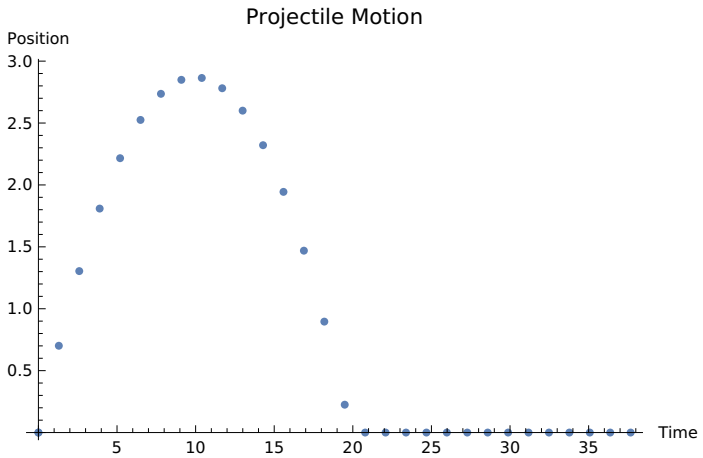
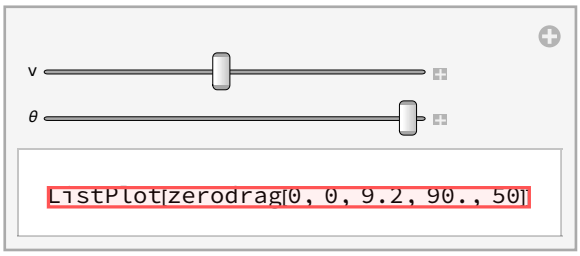
```
(*Plotting the path of a projectile without drag*)
nodrag[x0_, y0_, v_, θ_, t_] := Module[
  (* define local variables *)
  {x, y, g = 9.8},
  (* equation for range *)
  x = x0 + v Cos[θ Degree] t;
  (* equation for height*)
y = y0 + v Sin[θ Degree] t - 1/2 g t^2;
  (*Only print if y is greater than 0, if not print (x,0)*)
  If[y ≥ 0,
   (*return set of points {range, height}*)
{x, y} , {x, 0}
  ]]
(* function nodrag works as expected*)

zerodrag[x0_, y0_, v_, θ_, Np_] := Module[{t = 0.0, δt = 0.1, zdra = {{x0, y0}}},
(* Append positions as long as the y position is greater than zero *)
  Do[AppendTo[zdra, nodrag[x0, y0, v, θ, t]];
   (* Update the time *)
t += δt,
(* Repeat the main loop Np times *)
{Np}];
(* Return the trajectory *)
zdra
]

nun = zerodrag[0, 0, 15, 30, 30];

ListPlot[nun, PlotLabel → "Projectile Motion", AxesLabel → {"Time", "Position"}]
```

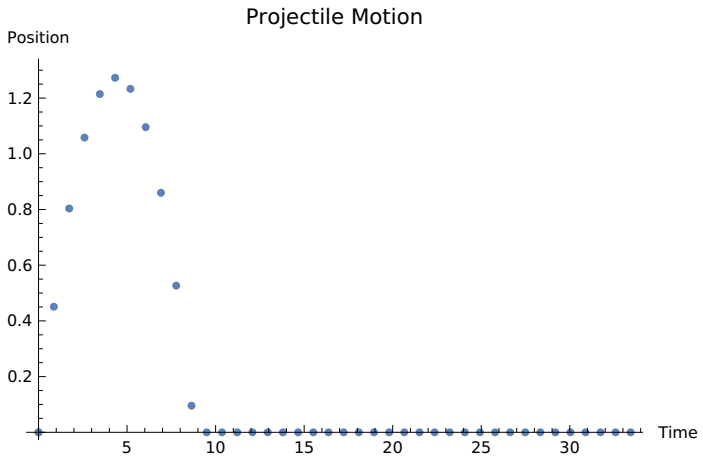


```
(*Listplot works as expected*)

Manipulate[ListPlot[zerodrag[0, 0, v, θ, 50]], {v, 0, 20}, {θ, 0, 90}]
(*Manipulate for zerodrag works as expected*)
```



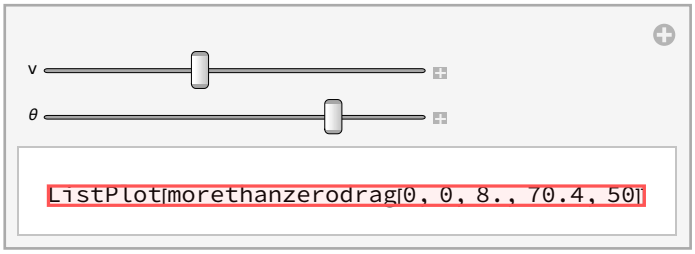

```
ClearAll["Global`*"]
```

```
(*Plotting the path of a projectile WITH drag*)
yesdrag[x0_, y0_, v_, θ_, t_] := Module[
  (* define local variables *)
  {x, y, g = 9.8, k = 5.2 * 10^-3},
  (* equation for range *)
  x = (((v Cos[θ Degree])/k)) (1 - e^-k t);
(* equation for height*)
  y = -g (t/k) + (((k (v Sin[θ Degree])) + g)/k^2) (1 - e^-k t);
  (*Only print if y is greater than 0, if not print (x,0)*)
  If[y ≥ 0,
   (*return set of points {range, height}*)
{x, y} , {x, 0}
  ]]
(*Function yesdrag works as expected. For same input in both nodrag and yesdrag,
the values for yesdrag are less than the values of nodrag*)
morethanzerodrag[x0_, y0_, v_, θ_, Np_] := Module[{t = 0.0, δt = 0.1, mdra = {{x0, y0}}},
(* Append positions as long as the y position is greater than zero *)
  Do[AppendTo[mdra, yesdrag[x0, y0, v, θ, t]];
   (* Update the time *)
t += δt,
(* Repeat the main loop Np times *)
{Np}];
(* Return the trajectory *)
mdra
]
some = morethanzerodrag[0, 0, 10, 30, 40];
ListPlot[some, PlotLabel → "Projectile Motion", AxesLabel → {"Time", "Position"}]
(*ListPlot works as expected*)
```



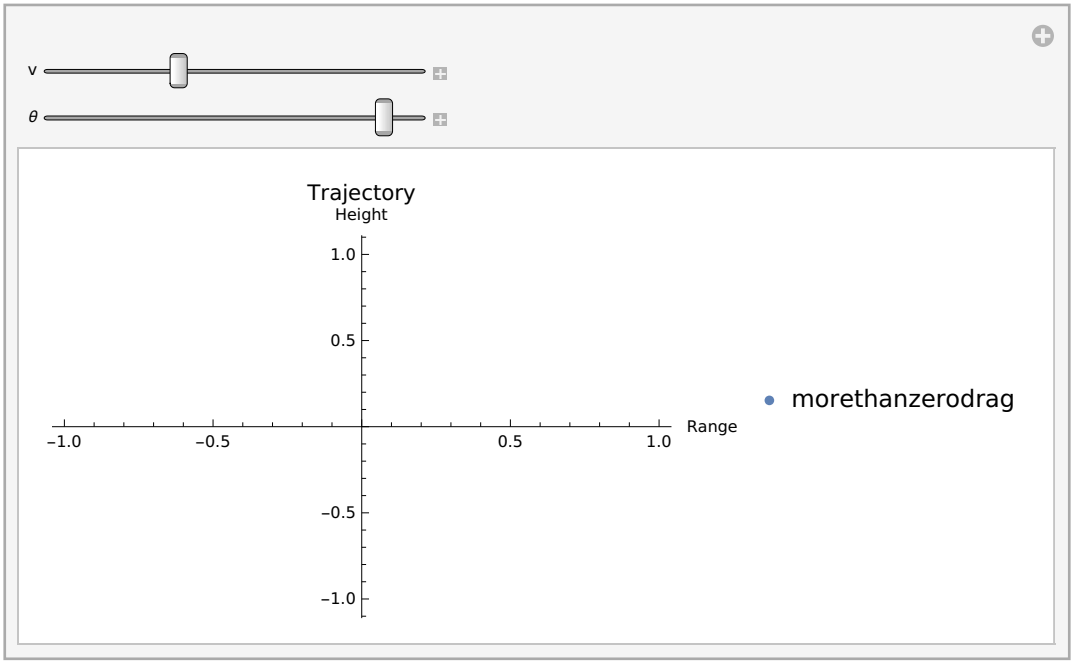

```
(*Comparison of the ListPlots for "nun" and "sum"
 (the set of points for zerodrag and morethanzerodrag) is as expected,
morethanzerodrag doesn't go as high or as far due to drag*)
```

```
Manipulate[ListPlot[morethanzerodrag[0, 0, v, θ, 50]], {v, 0, 20}, {θ, 0, 90}]
(*Manipulate for morethanzerodrag works as expected*)
```



Below is the plot for both the functions with drag and without drag.

```
Manipulate[ListPlot[{morethanzerodrag[0, 0, v, θ, 50], zerodrag[0, 0, v, θ, 50]},
  PlotLegends → {morethanzerodrag, zerodrag}, PlotLabel → "Trajectory",
  AxesLabel → {"Range", "Height"}], {v, 0, 50}, {θ, 0, 90}]
```




```
(*The Manipulation of both zerodrag and morethanzerodrag works as expected*)
```