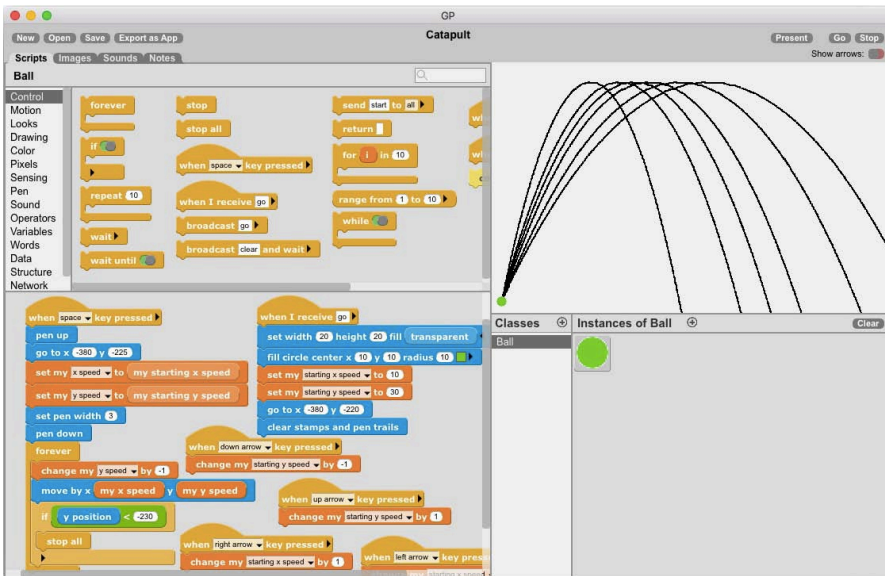




# Build a Catapult

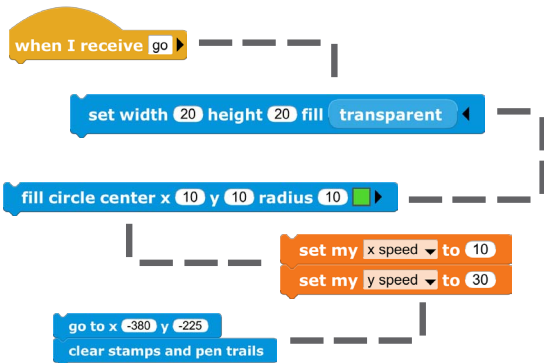


## WHAT TO DO

In this project, you will create a catapult that will launch a ball from one side of the stage to another. A curved line will follow the path of the ball. This project uses two variables - the speed of x and y - to control the speed of the ball. You will control the speed of the ball using the arrow keys. Check out the remixes to see how you could turn this project into a game!

## HOW TO DO IT

1 To get started, create the ball using the **set width and height** as well as the **fill circle center** blocks. Go to the variables category and create two instance variables - **starting x speed** and **starting y speed**. Drag each of these into the scripts area and set the speeds to 10 and 30 respectively. Use the **go to x and y** and **clear stamps and pen trails** block to have the ball start in the same place and clear the lines created each time you click go.

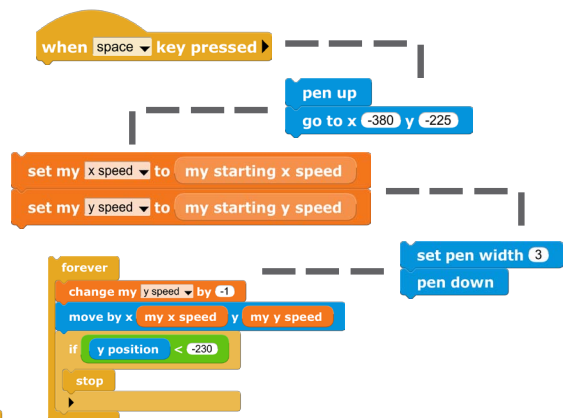


3 Lastly, we want to control the x and y speed using the arrow keys so that the ball can create multiple different curved lines. Use the **increase my starting speed** variable to control the ball's path.



2 When the space bar is pressed, set the **pen width** to the thickness you'd like and add **pen down**. Create two new instance variables that represent the x speed and y speed for the ball. Set these to be **my starting x speed** and **my starting y speed**.

Now, let's make the ball move using the forever block. Add the **increase my y speed** block and set to -1. This simulates gravity. Next, add the **move by x and y block** and input the **my x speed** and **my y speed** blocks from the variables category. Lastly, add an **if** block and instruct it so that if the **y position** is less than -230, **stop all** scripts.



# GP

The image shows a collection of Scratch code blocks for a catapult game. The blocks are organized into several groups:

- Space Key Pressed:** pen up, go to x -380 y -225, set my x speed to my starting x speed, set my y speed to my starting y speed, set pen width 3, pen down, animate, increase my y speed by -1, move by x my x speed y my y speed, if y position < -230, stop.
- Arrow Keys:** when left arrow key pressed, change my starting x speed by 1; when right arrow key pressed, change my starting x speed by 1; when up arrow key pressed, change my starting y speed by 1; when down arrow key pressed, change my starting y speed by 1.
- Go Key Pressed:** when I receive go, set width 20 height 20 fill transparent, fill circle center x 10 y 10 radius 10, set my starting x speed to 10, set my starting y speed to 30, go to x -380 y -225, clear stamps and pen trails.

To the right is a screenshot of the 'Catapult' game in the GP environment. The code blocks from the image are visible in the Scripts area. The Stage shows a catapult launching a ball, with several parabolic paths drawn to show its trajectory. The Classes pane shows a 'Ball' class with a green instance.

**HINT**  
Add a when c key pressed to clear the stamps and pen trails.

when c key pressed  
clear stamps and pen trails

## What's Next?

How might you make this project into a game?

### Add a Target

Click on the  $\oplus$  sign in the Classes pane to create a new class and name it target. Import or draw a target and use the *if/else* block to randomize the target's position every time you click go.



```

when I receive go
  set costume to Pig
  set scale to 0.25
  if random 10 < 5
    go to x random -150 to 360 y -215
  else if
    go to x 360 y random -210 to 150
  
```

### Make it Interactive

To animate the pig, we use the 'sin' block. (Sin is short for 'sine', from trigonometry.) The sine function is useful in animation because it varies smoothly between -1 and 1 as its input goes from 0 to 360, and it repeats that cycle over and over forever as its input increases beyond 360. Using the 'timer' block as the input to the 'sine' block makes the output change over time. How could you change the numbers 15 and 4 in this script to make the pig rock further to each side? Faster? slower?



```

when I receive go
  forever
    set direction to 15 * sin timer / 4 degrees
    if touching Ball ?
      set costume to pig-hit
      stop all
  
```

➤ **How might you extend this game?** Open CatapultGame in the GP "Project Starters" folder. How you might you improve the game with sound effects or by keeping score?