CoderDojo Activity Cards:

How to use:

Student comes to mentor, and together they choose a card to do next.

The idea is always to choose a card that is interesting, and at the right level for the moment, so the student needs to tell the mentor what they can do already. There are lots of cards and no intention to do every card in the pack. It is always fine to ask someone else, a student or mentor for help with a card. It can be good to have more than one person work on the same card, working as a pair.

The Cards (Animation2.html):

Number	Description and Notes
1204-01	Change ball to bounce up and down rather than left to right. Uses .top in place of .left. Make sure you set .top to be 0 at the start. If you forget to change the 'bounce' condition, then the ball will keep going until it is off screen - and then the page will get longer and longer...
1204-02	What does the ".." mean in "../images/coder.png"? What happens if you change it to a "."? Where do you need to move the coder.png file to to make it work again?
1204-03	When you click on the ball it stops moving. When you click again it starts moving again. Which code makes it do that? How can you change that code to make it change direction when you click on the ball?
1204-04	The ball is currently 50 pixels wide. Change it to be 100 pixels wide (and 100 pixels high). Make sure it still bounces at the right time. If you don't do anything to fix the bounce it will bounce too late on the bottom and right edge.
1204-05	Find a mentor and explain to them, or have them explain to you, or take it in turns explaining, what each of the following is: **A pixel, an html tag, a function, a default value, a div**

Number	Description and Notes
1204-06	Use logo.border='10px'; to add a square box around the ball that is 10 pixels wide. You'll find the ball bounces later than it should. Fix the code so that the ball bounces at the right time.
1204-07	At the moment the ball moves by 2 pixels every time it moves. Change it to move by 5 pixels every time it moves. Make sure it is moving faster when moving right to left as well as when moving left to right.
1204-08	Make the ball bounce sooner. First make it bounce when it reaches half the width of the screen. Hint: "winW / 2" means 'window width divided by two'. Now also make it bounce before it gets to the left hand side, when it is 100 pixels away from the left hand side. If you wanted the ball to start at 100 pixels from the left, how would you do that?
1204-09	Do 1204-07 first. What is a variable? Make a variable using "var speed=2;" and make the ball move by 'speed' pixels each time it moves instead of by 2. Change speed to 5 (much faster than 2), then to 3 (a bit faster than 2) by just changing the variable's initial value. Can you make the ball go faster each time it bounces? Hint: speed=speed+1;.
1204-10	Add some comments into the javascript code to make it clearer what is going on.

Number	Description and Notes
1204-11	What happens if we change both lines which have "animator = setTimeout(animate,20);" so they just read "setTimeout(animate, 20);". Try it. Does anything go wrong? Hint: where else is 'animator' used?
1204-12	Add the line <img src="../images/coder.png" border=5px style="background-color:#0000ff"></img> into your html file. If the background of the ball doesn't change to be blue then get help from another student who has done this one before.
1204-13	What is a negative number? What is -3 + 4? What is -3 * 4? Get a friend to ask you a question with a negative number in it and see if you can answer it.
1204-14	Do 1204-09 and 1204-13 first. moveRight is a boolean variable. It can be true or false. You are going to change it to be an integer variable with values +2 or -2. Then you are going to use this line: logo.style.left = parseInt(logo.style.left) + moveRight + 'px'; to replace several lines in the original code. What do you think this new line does? How can you make this change?
1204-15	Go to http://www.w3schools.com/html/default.asp and find out ONE new thing about html you didn't know before. Use the green "Try it yourself" button to try it out. It is best to start with something you find easy. If you're sharing this card with someone else, you need to find one new thing each. Come back to a mentor and tell them what you found.

Number	Description and Notes
1204-16	The line: logo.style.left = parseInt(logo.style.left) + 2 + 'px'; has 'px' in it because logo.style.left is a position in pixels. What is a pixel? 245 is a number. '245px' is a string - it has something which isn't a number in it. Is 'Hello' a number or a string? Is '99' a number or a string? Is 'NinetyNine' a number or a string (as far as the computer is concerned)? parseInt is a built in function that removes 'px' from the end of string. Why do we remove the px, then add 2, then put the px back on the end? What would happen if we just had: logo.style.left = logo.style.left + 2 + 'px'; ?
1204-17	Make sure you can do 1204-14 and 1204-01 first. Now modify the code so that you have two variables, moveRight AND moveDown, each of which can be +2 or -2. moveRight should change sign when you hit the right boundary or the left boundary. moveDown should change sign when you hit the top boundary or the bottom boundary. When you have this working, you should have a ball that bounces round the screen. Hint: use 'moveRight = -moveRight' to change the sign of MoveRight when it hits a boundary.
1204-18	Without actually doing the activity card, which activity cards would you have to do in order to do activity card 1204-17? These are 'dependencies'. 1204-17 depends on 1204-14 which in turn depends on 1204-09 and so on.
1204-19	What happens if we change the 20 in animator = setTimeout(animate,20); to 200? What is a millisecond? What happens if we set it to 2?
1204-20	Get Chrome browser installed on your machine and use right-click and inspect element to see what is going on in the bouncing ball example.

Number	Description and Notes
1204-21	What does this line do? logo.onclick = toggleAnimate; Can you add a different function instead that changes the size of the ball when you click on it? If you get this working, show it to a mentor.
1204-22	Add a second ball that does nothing. You only need to modify the setup function, and make a second logo, called logo2.
1204-23	Do 1204-22. Modify the setup function so that it calls two functions. First setuplogo() then animate(). Check that it still works. Now create a second function, setuplogo2() and modify setup so that it calls both these functions before calling animate().
1204-24	Do 1204-23 first. In document.body.appendChild(logo); 'appendChild' is a function. It is taking an argument which is 'logo'. After you've done 1204-23, talk with someone who knows how to do this about how to merge setuplogo and setuplogo2 into one function.
1204-25	Write a new activity card for the animation2.html example. How good do you think the card is for teaching? What does someone who uses it need to know already? Does that need a card too?

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Number	Description and Notes
1204-26	How many lines are there in the javascript program? Hint: find out how to set line numbers in your editor. Talk with someone about how you would modify the code to have two balls bouncing. Do you need twice as much code?
1204-27	Modify the code so that the ball starts out still and has to be clicked before it will move.
1204-28	Explain what the line "window.onload=setup" means. What happens if it is not there? What happens when you resize the browser window? Can you explain why it happens?
1204-29	This is step one in fixing the code so that the ball will bounce correctly when the window is resized. Move the code that sets up winH and winW into a function, called doSizing() and call that function as the first thing you do in setup(). Now do card 1204-31
1204-30	In 1204-06 we used logo.border=10px, but 'border' is deprecated. What does 'deprecated' mean? What should we use instead of border? ~~Use the interent to find out about the getYear and getFullYear functions in javascript.~~ Can you give an example of an html tag that is deprecated? What should we use instead? ~~Hint: search the internet for "strike through html".~~
1204-30a	In 1204-06 we used logo.border=10px, but 'border' is deprecated. What does 'deprecated' mean? What should we use instead of border? Use the internet to find out one difference between python 2.7 and python 3.0.

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1204-31	Do 1204-29 and 1204-28 first. Now use http://www.w3schools.com/jsref/event_onresize.asp to find out about the 'onresize' event. Use it in addition to using onload so that where the ball bounces changes correctly when you resize the window.
1204-32	Add this code to your html, somewhere between <body> and </body>. You should get a large blue rectangle. The first 0 means zero red, the second 0 means zero green and the 255 means as much blue as possible. Try rgb(255,0,0) for as much red as possible. Try rgb(0,255,0) for as much green as possible. Try varying the 255 by replacing it with other values, like 85. Can you tell the difference between this blue rgb(0,0,170), and this blue rgb(0,0,153)? Do card 1204-36 next.
1204-32-0x	Add this code to your html, somewhere between <body> and </body>. You should get a large blue rectangle. In the #0000FF the first 00 means zero red, the second 00 means zero green and the FF means as much blue as possible. Try #FF0000 for as much red as possible. Try #00FF00 for as much green as possible. Try varying the FF by replacing it with other values, like 55. Can you tell the difference between this blue #0000AA, and this blue #000099? Do card 1204-36 next.
1204-33	Do 1204-32 first. Now instead of creating the div in the html, create it in the setup() function.
1204-34	Do 1204-17 first, so that you have a ball that bounces left and right and up and down. Now add the background from 1204-33. Modify the background so that it is 100 pixels in from each of the edges. Now modify the bouncing too so that it is 100 pixels in from the edges too.
1204-35	Find out about the random function: http://www.w3schools.com/jsref/jsref_random.asp How could you use it in the bouncing ball animation?

Number	Description and Notes
1204-36	Do card 1204-32 or card 1204-12. If you change the rgb(0,0,255) to rgb(255,0,0) what happens? What about rgb(0,255,0)? Which is darker, rgb(0,153,0) or rgb(0,51,0)? You can mix colours. What colour is rgb(51,51,0) ? [Try it].
1204-36-0x	Do card 1204-32-0x or card 1204-12. If you change the #0000FF to #FF0000 what happens? What about #00FF00? Which is darker, #009900 or #003300? You can mix colours. What colour is #333300 ? [Try it].
1204-37	Can you do 1204-34 with variables, so that you can choose whether the border is 100 pixels or 50 pixels, or 150 pixels by changing one number in just one place in your code?
1204-38	Can you modify 1204-34 so that coloured background changes size too when the window changes size?
1204-39	What does the '!' mean in run = !run? To be sure, add this line immediately before: alert("run is "+run); and run the example and click on the bouncing ball.
1204-40	If your mum or dad is around, choose a different activity card and get *a mentor* to show *you* how to do it - with your mum or dad watching. Now *you* explain it to your mum or dad - and check that *they* understand.

Number	Description and Notes
1204-41	Make the ball double in size each time it bounces. Now when it gets to size 200, make its size go back to 50 again.
1204-42	Change the logo to be a soccer ball.
1204-43	Do 1204-17 and 1204-05 first. In your modified animation2.html we have variables moveRight and moveDown which change the position logo.style.left and logo.style.top by 2 pixels. Change things to make the update indirectly. Make new variables x and y and update these using moveRight and moveDown, then use x and y to update logo.style.left and logo.style.top. You'll need to use +'px' and parseInt() correctly. For 3D animation programmers use x and y and z.
1204-44	Do 1204-42 first. If you had ten images of the logo each one rotated slightly, how would you use that to make the ball spin? (you don't actually have to do this, just tell us how you would do it).
1204-45	Talk with a mentor about the names of the variables and functions. What would happen if we changed moveRight to h all the way through the program? Would it make a difference? What are the advantages of short variable names? What are the advantages of long variable names? Do all the functions in the program have names that reflect what the functions actually do?

Number	Description and Notes
1204-46	Add a div that displays the (x,y) position of the ball/logo - see 1204-42 for what that means. You probably will want to use the innerText or innerHTML property - use w3Schools to find out about them and what the difference is.
1204-47	Do 1204-43. (Bouncy.js) Start moveRight and moveDown with values of 10. The ball should move much faster. Add a new variable, gravity with value 3. Add the line moveDown = movedDown + gravity before the line y = y + moveDown. What do you expect to happen? Will the ball still move in a straight line?

The Cards (Bouncy.html):

Number	Description and Notes
1204-60	What does **var h=10** do in bouncy.js? What happens if you set **h=0** instead?
1204-61	What happens if you change **g=3** to a different value? If you make it smaller? Bigger?
1204-62	What does **bouncy = bouncy * 0.95** do in the onkeypress event? What value will **bouncy** have after 2 keypresses? After 4 keypresses?
1204-63	What happens if you set **bouncy = 1.02** Why?
1204-64	Modify the code so that the ball starts off not moving, and only moves when you press the "S" key. Look up the onkeypress() event in http://www.w3schools.com/jsref/event_onkeypress.asp Does it start for both the "S" and "s" keys (upper case and lower case)?
1204-65	What dimensions is the image "football.jpg"? What size is it displayed as? Why is that? Hint: look at the bouncy.css file.
1204-66	What does **var e = document.getElementById('ball')** do? How does it find the container holding the ball?
1204-67	What happens if you change the class attribute of the image from **medium** to **big**? Does the ball bounce correctly now on the left of the window? Does it bounce correctly on the right of the window? On the bottom? Modify the code so that the ball bounces correctly no matter what size the ball is set to.
1204-68	Remember 1204-31 from the animation2.html example? Add in handling for the onresize() event so that the ball bounces correctly when the window is resized.

1204-69	Complete 1204-64 first. Modify the code so that the ball slows down (gets less bouncy) when the "L" key is pressed, but gets more bouncy when the "P" key is pressed.
1204-70	Complete 1204-68 first. When the ball has stopped bouncing, what happens when you press the "P" key? Does it start bouncing again? If not, can you modify the code to make it start up again.
1204-71	Modify the code to use the image "soccer-ball-animated.gif" instead of football.jpg from the images directory. This is a spinning ball image. Note that it spins as well as bounces. What happens when the ball stops bouncing?
1204-72	Do 1204-70 first, then modify the code so that when the spinning ball stops bouncing, it also stops spinning. Hint: there is another image in the images directory called soccer-ball-one-frame.jpg
1204-73	How would you modify the code so that there was more than one ball bouncing around? Modify the code so that three balls are bouncing around the screen, starting at different locations.
1204-74	Complete 1204-69 and 1204-73 first. Now modify the code so that a different key makes each ball slow down or speed up: Make A,S and D slow down balls 1, 2 and 3, and make J, K and L speed up balls 1,2 and 3
1204-75	(**Very Advanced**) The ball does not really bounce like a "real" ball: it does not bounce according to Newton's Laws of Motion. If you have done Newton's Laws in physics, modify the code so that the ball falls and bounces according to Newton's Laws $s = ut + (g * t**2)/2$ Use 1px = 1cm, and g = 980 cm/s/s for gravity on Earth
1204-76	(**Even More Advanced**) Complete 1204-73 and 1204-75 first. Now modify the code again so that one ball bounces under Earth gravity (980 cm/s/s), one under Mars gravity (380 cm/s/s) and one under the Moon's gravity (160 cm/s/s)