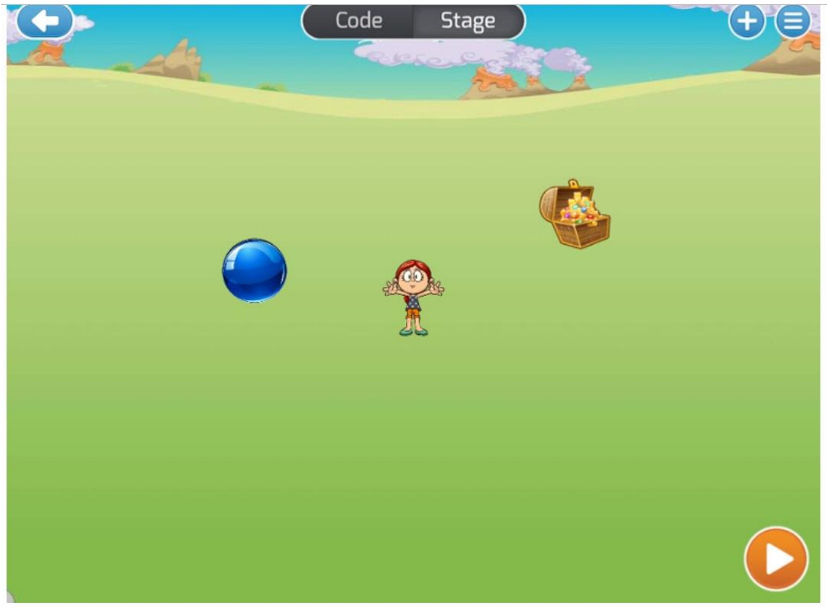
PLTW | Launch

Activity 3 Building Computer Models

Part 1: Set up the actors and the stage

1. Launch Tynker and create a new project with a blank template.
2. Tap on Codey and delete him from the project.
3. Add a new actor. The example shown in this activity uses "Kid Plain 4" from the City category. You may choose another actor if you would like to do so.
4. Resize the actor to around the size of a fingertip. (Pinch zoom to shrink or use the pencil icon and change the scale property to around 25.)
5. Add one of the colored shiny balls found in the Sci Fi category. The example uses blue.
6. Add a new actor that will be the target for the game. This is the object that the player tries to collect. If you want to use the treasure chest, you can find it in the Ocean category.
7. Shrink each actor to a reasonable size for the game.
8. To make the game look more interesting, add a background to the stage. The background shown in the example below is available in the Adventure category.
9. Your screen should now look similar to this:



10. It is good practice to give your project a meaningful name so you can find it easily the next time you are in Tynker. Rename your project to "A3 Dodgeball Game" followed by your initials, "A3 Dodgeball JK LS."

Part 2: Program the main actor's movement

11. As in any design task, first ask about the problem.

What behavior do you want the actor to do?

Move in the direction the tablet is tilted. Move faster if the tablet is tilted a lot, move slower if it is tilted a little bit.

When do I want the actor to do that behavior?

The whole time the program is running.

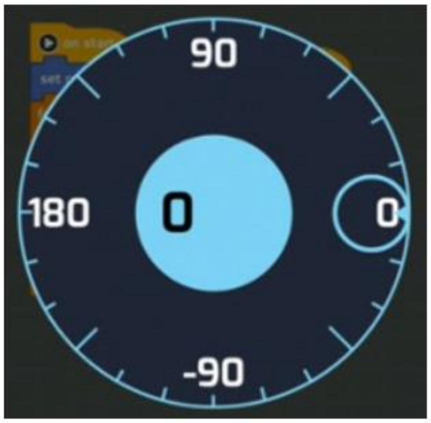
These requirements mean that when the game starts, you want to ***continuously check*** how much the tablet is being tilted, and then set the main actor's motion based on that. This can be done using a ***loop forever*** block—a block that repeats the **code** inside it as long as the game is running.

12. Before you can find the blocks that should go into the loop forever, you must first understand how tilting is detected in Tynker.

Tilt Values in Tynker

Similar to tapping and shaking, tilting the tablet is a type of user input. To detect tilting, the tablet uses its special sensor called a gyroscope. The gyroscope can sense the direction and amount that the tablet is tilted.

There are four values that are supplied by the gyroscope: tilt angle, tilt amount, x tilt, and y tilt. For this program, you need the **tilt angle** and **tilt amount** values.

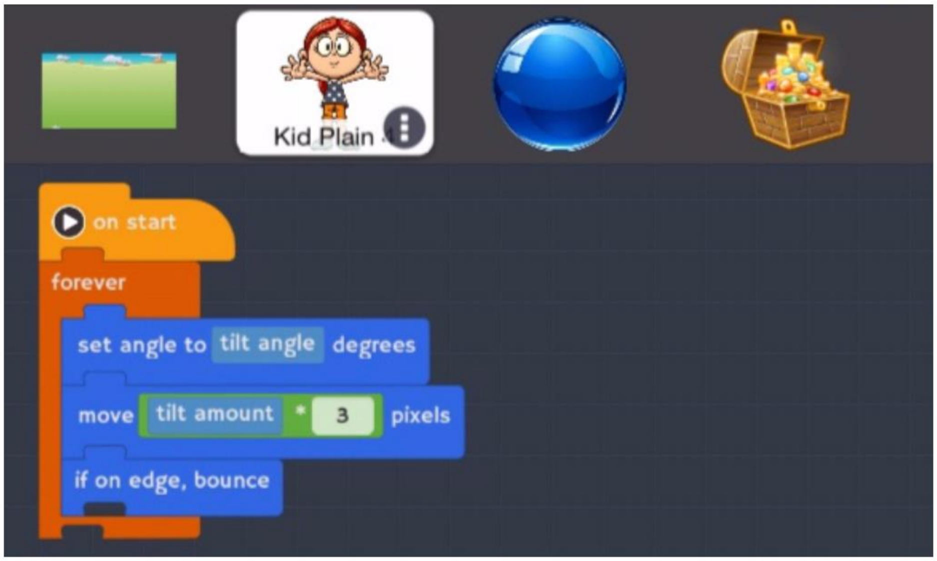


Tilt angle reports the angle toward which the tablet is being tilted. Tilt angle is reported in degrees from 0 to 180 when tilting toward the top of the screen, and 0 to –180 when tilting toward the bottom of the screen, as in the image above.
Tilt amount indicates the magnitude, or how large the tilt is. If the tablet is tilted a great deal away from being flat, the tilt amount is big. If the tablet is almost flat, the tilt amount is small.

a. Based on this information, you can program the main actor to move in the **direction of the tilt angle** at a **speed based on the tilt amount**.
b. Select **the kid** and go to his/her **code area**. Drag out the blocks shown in the table and put them together as shown in the image that follows the table. The block names in the table are the default names. Remember to **change the values in the white boxes on the blocks**!

Note: If your main actor already had code blocks that were automatically added for you, delete those blocks before adding new blocks.

Block Name	Category	Color
on start	Control/Flow	orange
forever	Control/Flow	dark orange
set angle to 0 degrees	Motion	dark blue
move 10pixels	Motion	dark blue
if on edge, bounce	Motion	dark blue
tilt angle	Sensing	light blue
tilt amount	Sensing	light blue
0 * 0 (multiplication)	Math	green



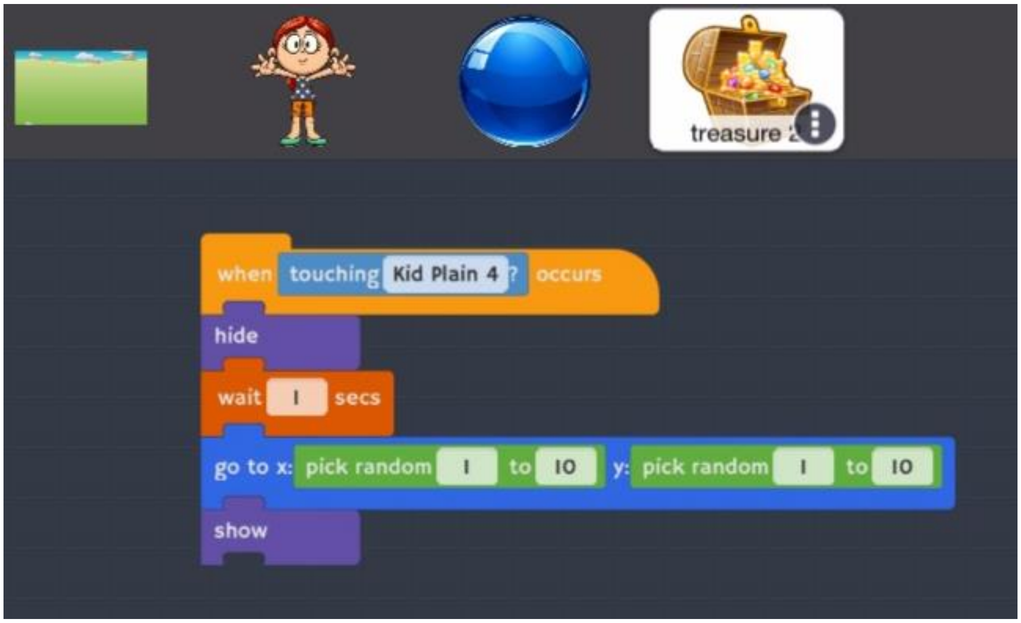
```
on start
forever
  set angle to tilt angle degrees
  move tilt amount * 3 pixels
  if on edge, bounce
```

c. Press Play and tilt the tablet to see your main actor move around the screen. Explore what happens when you change the number that multiplies the tilt amount. This is called a *scalar*. It scales up the tilt amount so that the Move block gets a bigger number and the kid moves faster.

Part 3: Program the treasure chest's behavior

13. Ask: What behavior do I want the target actor (the treasure chest) to do? When should the actor do it? Answer: When touching the kid, disappear for 1 second, reappear in random location.
14. Find the blocks described in the table below and assemble them in the **treasure chest's code area** as shown in the picture that follows.

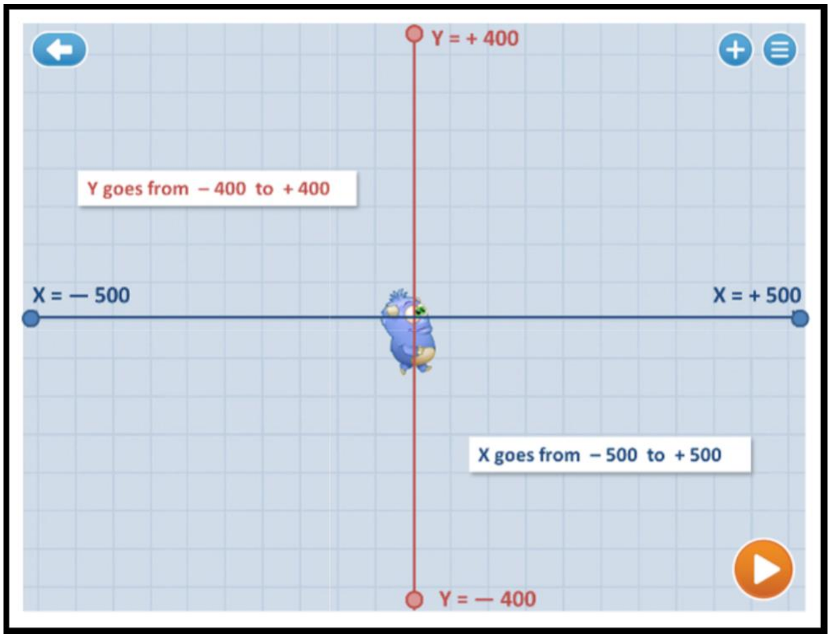
Block Name	Category	Color
when true occurs	Control/Flow	orange
touching select actor?	Sensing	light blue
hide	Looks	purple
wait 1 secs	Control/Flow	dark orange
go to x:0 y:0	Motion	dark blue
pick random 1 to 10	Math	green
show	Looks	purple



```
when touching Kid Plain 4 ? occurs
hide
wait 1 secs
go to x: pick random 1 to 10 y: pick random 1 to 10
show
```

15. What values should go in the x: pick random and y: pick random blocks?

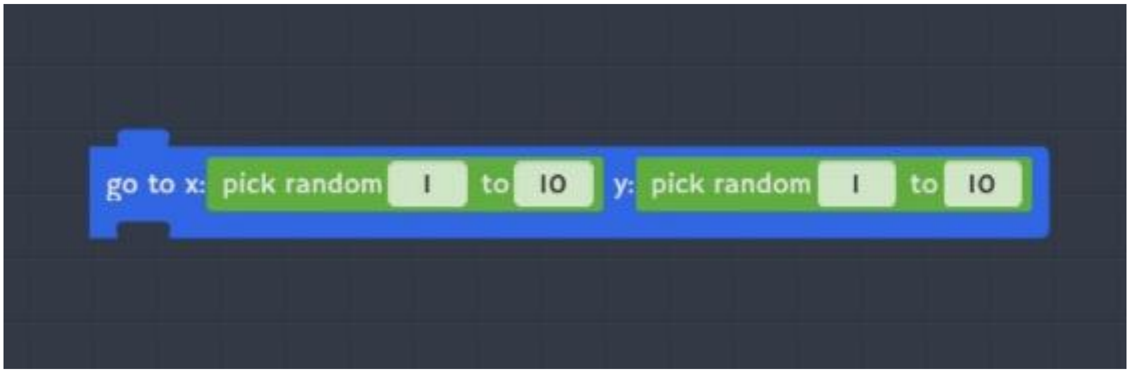
Since you want the treasure chest to move all around the screen you can tell Tynker to choose random x-coordinates between the lowest and highest x values and random y-coordinates between the lowest and highest y values. Look at the grid below to find out about these values.



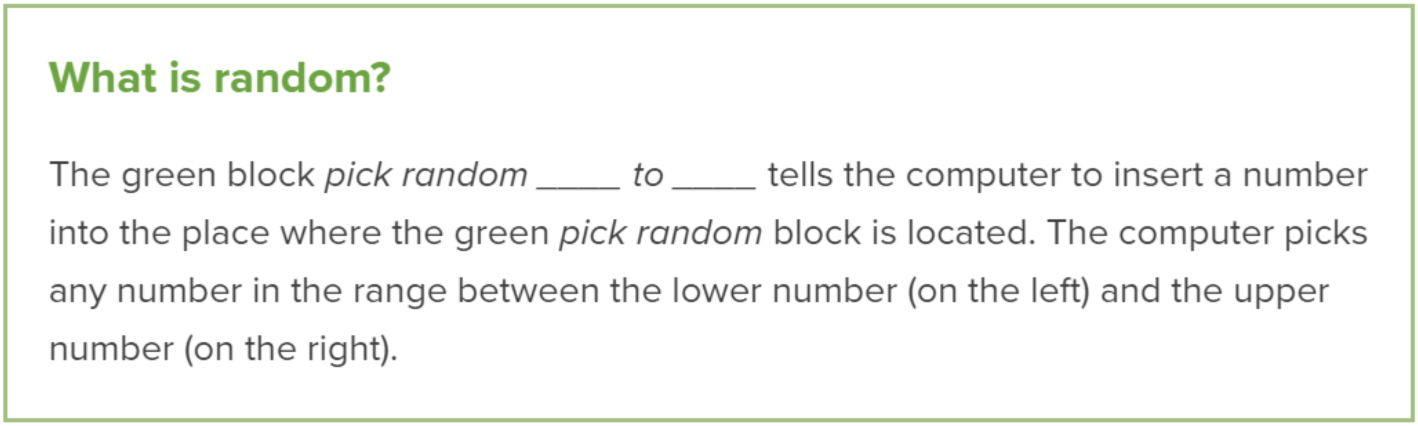
Given that the lowest x value is –500 and the highest x value is 500, what numbers go into the slots labeled Min x and Max x on this block?

Given that the lowest y value is –400 and the highest y value is 400, what numbers go into the slots labeled Min y and Max y on this block?

__Note:__ It is a good idea to leave an extra margin of 50 all around the screen so that the actor doesn't appear right on the edge of the screen. For example, instead of –500 for the lowest x, use –450 instead.



```
go to x: pick random 1 to 10 y: pick random 1 to 10
```



What is random?

The green block *pick random* _____ *to* _____ tells the computer to insert a number into the place where the green *pick random* block is located. The computer picks any number in the range between the lower number (on the left) and the upper number (on the right).

13. Stop and **Test**

- Remember, programmers go through many cycles of testing, finding errors, and fixing before their programs work right.
- Click Play and watch your game in action. Test the desired behavior. Complete the following checklist:
    - □ Does the kid move in the direction the tablet is tilted?
    - □ Does the treasure disappear when the kid touches it?
    - □ Does the treasure reappear one second after being captured?