If-Expressions

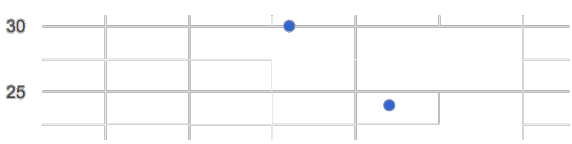
Students build on their knowledge of the image-scatter-plot function, motivating the need for if-expressions in their programming toolkit. This drives deeper insight into subgroups within a population, and motivates the need for more advanced analysis.

Prerequisites	Defining Functions
Relevant Standards K12CS CSTA NGSS	*Select one or more standards from the menu on the left (⌘-click on Mac, Ctrl-click elsewhere).*
Lesson Goals	Students will be able to... • use if-then-else expressions in Pyret • explain the behavior of a (specific) higher order function
Student-facing Lesson Goals	• Let's explore functions that behave differently based on the input.
Materials	• Lesson Slides (Google Slides) • Computer for each student (or pair), with access to the internet • Student workbook, and something to write with • The Mood Generator Starter File (CPO) • All students should log into CPO and open the "Animals Starter File" they saved from the prior lesson. If they don't have the file, they can open a new one
Preparation	• Make sure all materials have been gathered • Decide how students will be grouped in pairs
Supplemental Resources	
Language Table	

Types	Functions	Values
Number	`num-sqrt, num-sqr`	`4, -1.2, 2/3`
String	`string-repeat, string-contains`	`"hello", "91"`
Boolean	`==, <, <=, >=, string-equal`	`true, false`
Image	`triangle, circle, star, rectangle, ellipse, square, text, overlay, bar-chart, pie-chart, bar-chart-summarized, pie-chart-summarized`	
Table	`count, .row-n, .order-by, .filter, .build-column`	

Warmup

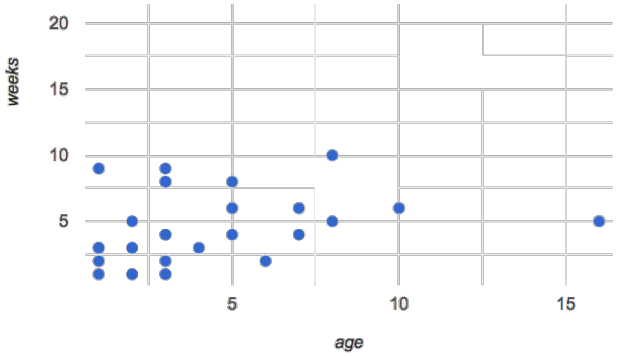
1. Show students this code, which uses `image-url` and `scale` to generate icons of animals.
2. What do they Notice? What do they Wonder? How might



this scatterplot change our analysis?

3. Have students make a scatter plot of animals, using `age` as the x-axis values and `weeks` as the y-axis.

(For now, the scatter plot is *purely* to give students practice with contracts and displays. They are **not** expected to know much about scatter plots at this point.)



If-Expressions

20 minutes

Overview

Students explore a program that makes use of an *if-expression*, develop their own understanding, and modify it.

Launch

So far, all of the functions we know how to write have had a *single rule*. The rule for `gt` was to take a number and make a solid, green triangle of that size. The rule for `bc` was to take a number and make a solid, blue circle of that size. The rule for `nametag` was to take a row and make an image of the animal's name in purple letters.

What if we want to write functions that apply different rules, depending on the input? For example, what if we want to change the color of the nametag depending on the species of the animal?

Investigate

- Open the Mood Generator starter file.
- Complete Mood Generator (Page 37) in your student workbooks.

Synthesize

Have the class share their own explanations for how if-expressions work.

Pyret allows us to write if-expressions, which contain:

1. the keyword `if`, followed by a *condition*.
2. a colon (`:`), followed by a rule for what the function should do if the condition is `true`
3. an `else:`, followed by a rule for what to do if the condition is `false`

We can chain them together to create multiple rules, with the last `else:` being our fallback in case every other condition is `false`.

Better Image Scatter Plots

20 minutes

Overview

Suppose we want to make a scatter plot for the Animals Dataset, but with each dot being a different color depending on the species. This would make it possible to see if different animals are "clustered" in different parts of the plot.

Investigate

Have students open Word Problem: species-color (Page 38). Make sure they all write the Contract and Purpose Statement *first*, and check in with their partner *and* the teacher before proceeding.

Once they've got the Contract and Purpose Statement, have them come up with `examples:` for *each species*. Once again, have them check with a partner *and* the teacher before finishing the page.

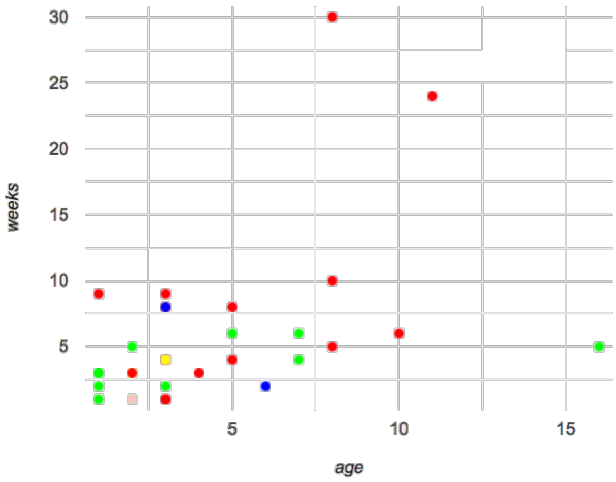
Once another student *and* the teacher has checked their work, have them type this function into their animals starter

files, and use it to make an `image-scatter-plot` using `age` as the x-axis and `weeks` as the y-axis.

Synthesize

1. What do you Notice about this scatter plot?
2. What do you Wonder?

What does this new visualization tell us about the relationship between age and weeks? What other analysis would be helpful here?



Closing

Make sure to direct the conversation *back to Data Science!* Does this scatter plot make us think we should be analyzing animals separately? What other scatter plots might this be useful for?
This scatterplot makes it clear that we may want to analyze each species separately, rather than grouping them all together! In the next lesson, students will learn how to do just that.