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# CS10 NEWS

UC Berkeley
Teaching Professor
Dan Garcia

# The Beauty and Joy of Computing

bjc

## Higher Order Functions

## Robot 100m dash record!

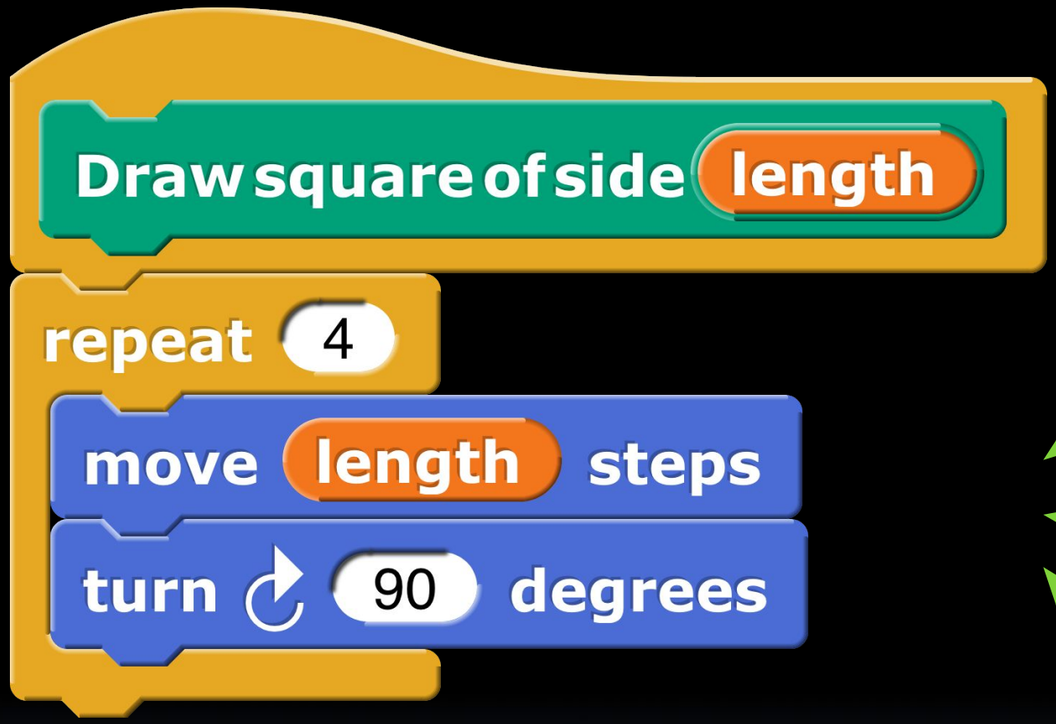
A robot developed at Oregon State University's Agility Robotics set a Guinness World Record for a bipedal robot running the 100-meter dash, completing the run in 24.73 seconds. The robot, known as Cassie, uses machine learning to control its gait when running on outdoor terrain. Said Oregon State's Devin Crowley, "Machine learning approaches have long been used for pattern recognition, such as image recognition, but generating control behaviors for robots is new and different." Oregon State's Jonathan Hurst added, "Using learned policies for robot control is a very new field, and this 100-meter dash is showing better performance than other control methods. I think progress is going to accelerate from here."

www.usatoday.com/story/tech/2022/09/28/robot-oregon-runs-way-guinness-world-record-100-meter-dash/10447838002/

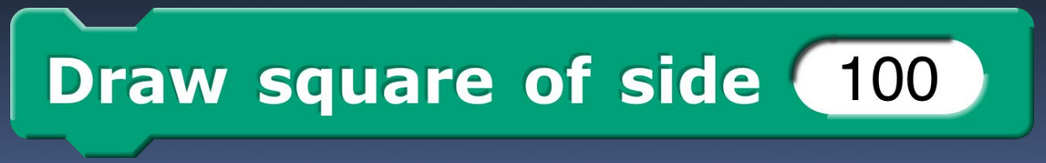

USA
TODAY

# Higher Order Functions… Why? Basics…

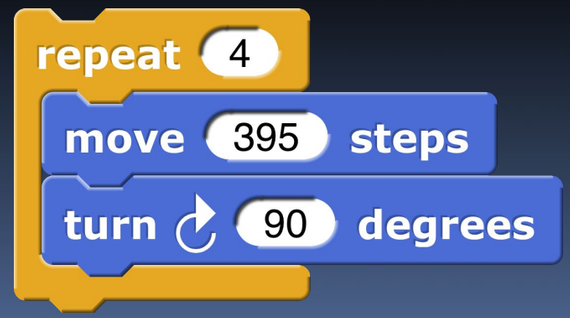
# Why Teach Procedures? Abstraction!



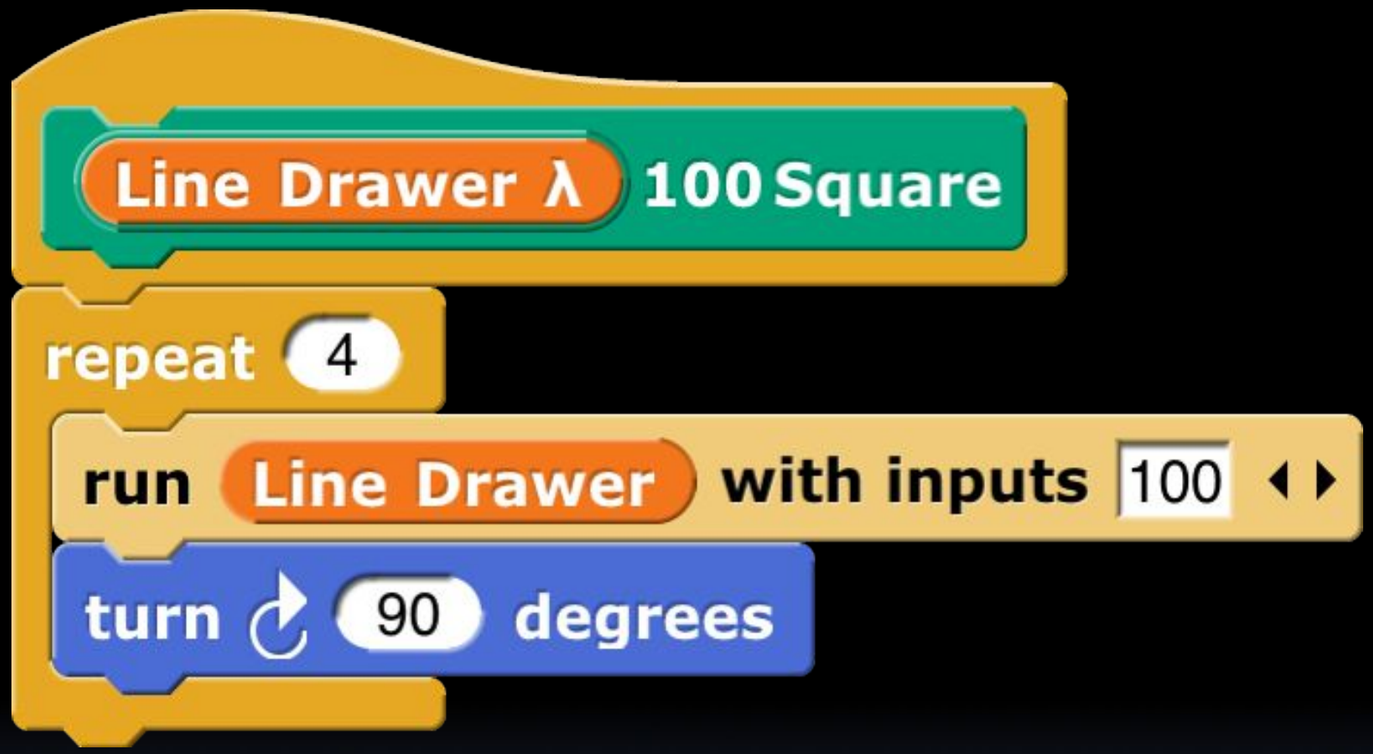

Calling it…

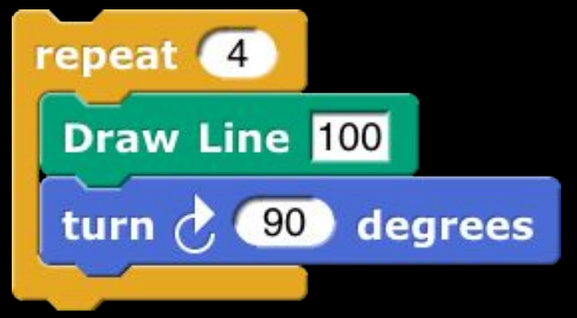





# Higher-Order Procedures? Abstraction!






Calling it…

# Why HOFs are like Pregnant Fish, Sharks

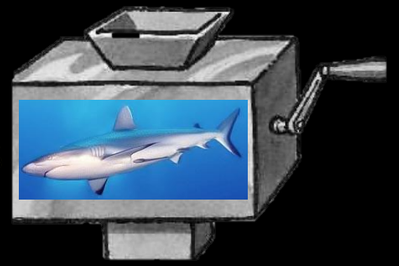
**Data** (e.g,. Sentences, Words, Booleans, Lists)

**Normal Fish**

**Data** (e.g,. Sentences, Words, Booleans, Lists)

**Functions**

**Sharks**



**Data** (e.g,. Sentences, Words, Booleans, Lists)

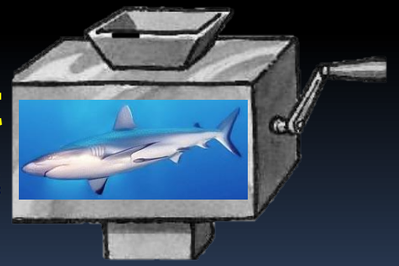
**Data** (e.g,. Sentences, Words, Booleans, Lists)

**Pregnant Fish**

**Functions**

**Functions**

**Pregnant Sharks**



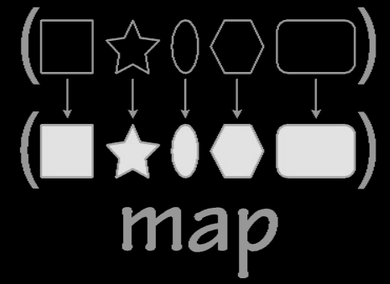
**Functions**

*Source: Brian Harvey, Wikipedia (Fbattail, Aka, Evdaimon)*

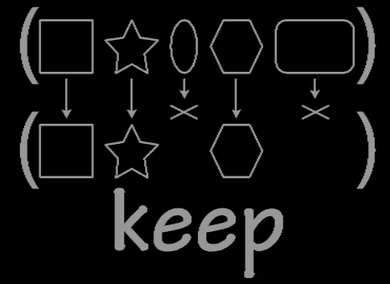
# HOFs you have seen before

Useful HOFs (you can build your own!)

- map `Reporter` over `List`
  - Report a new list, every element `E` of `List` becoming `Reporter(E)`



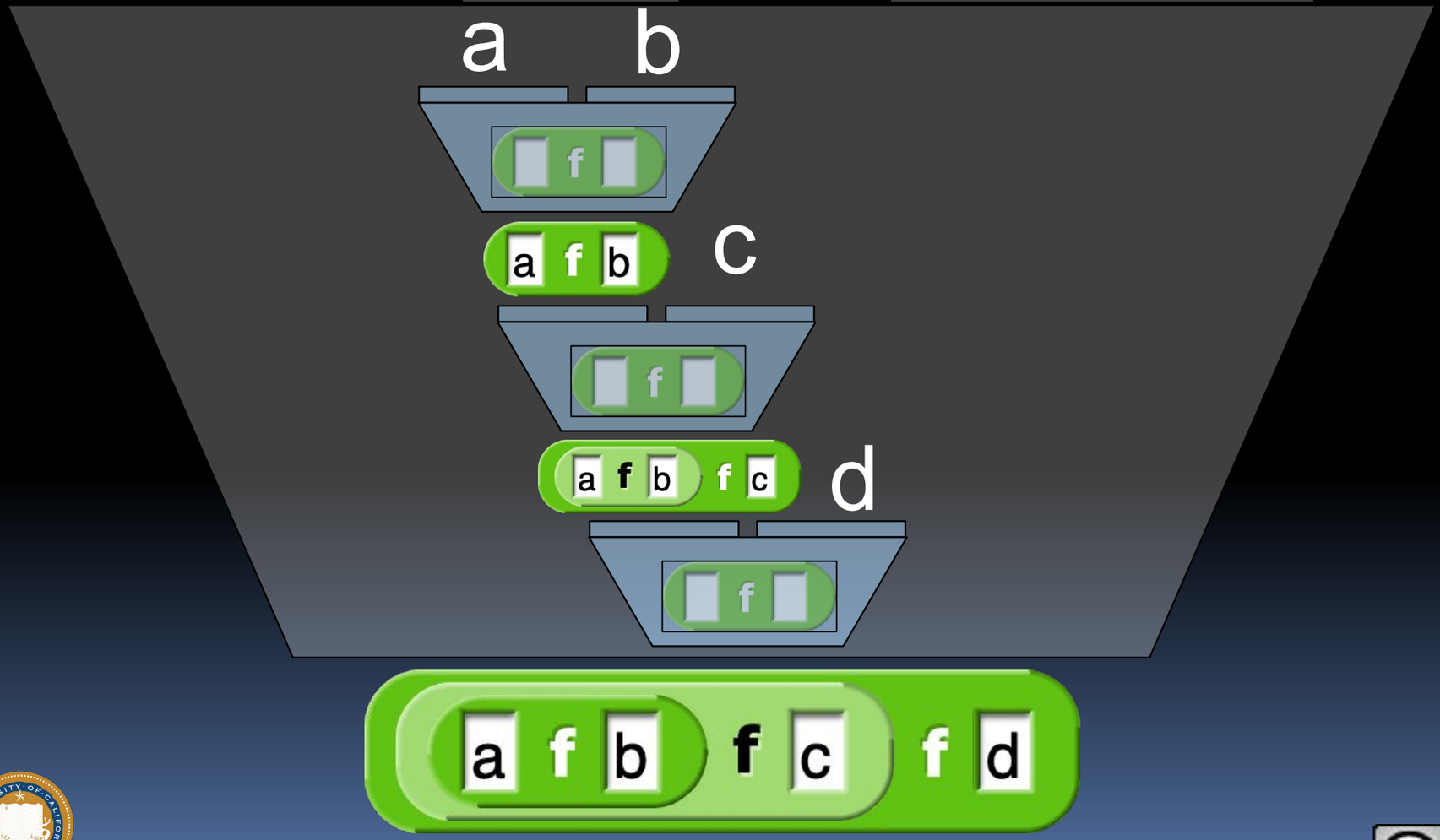

- keep items `Predicate` from `List`
  - Report a new list, keeping only elements `E` of `List` if `Predicate(E)`



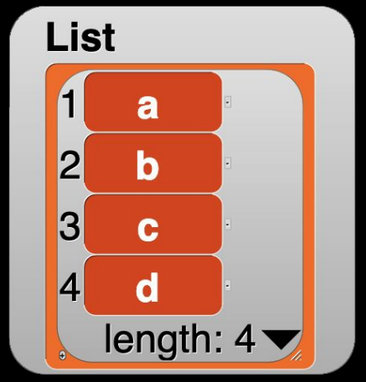

- combine `List` using `Combiner`
  - Combine all the elements of `List` with `Combiner(E)`
  - This is also known as “reduce”

# How `combine` works


**combine `List` using `Combiner`**

# `combine` above the abstraction line




(a b c d)

`combine` **using** `f`

a **f** b **f** c **f** d

Your **f** should be **associative**, and work if it's

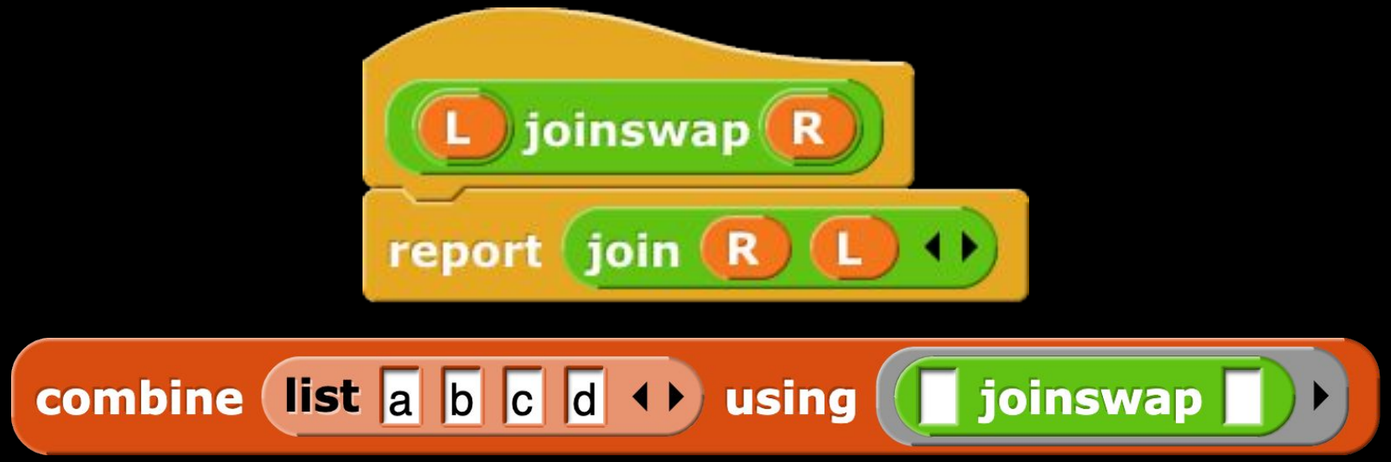

((a **f** b) **f** (c **f** d))

or…


(((a **f** b) **f** c) **f** d)

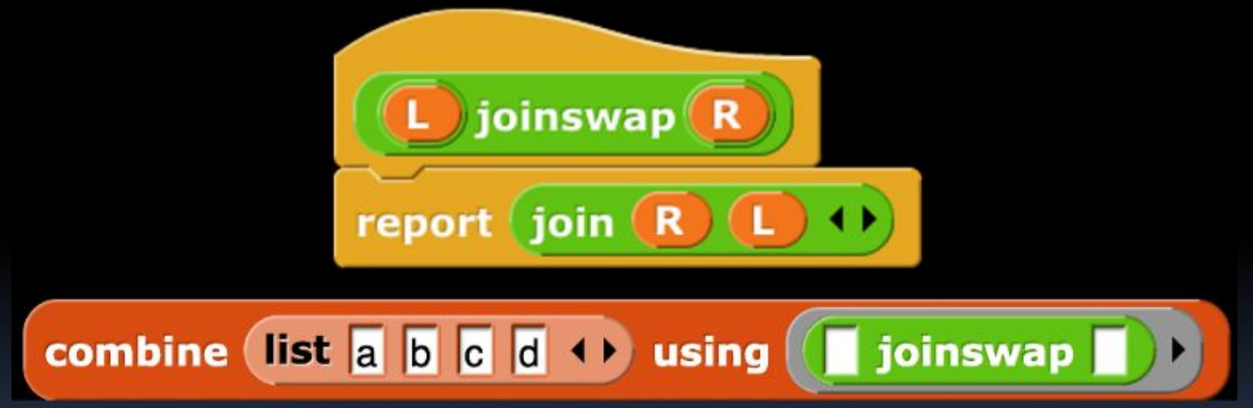
etc…

# (Cal) What is reported?




a) abcd
b) acdb
c) bdac
d) dcba
e) (nothing)

# L14a What is reported?




- abcd
- acdb
- bdac
- dcba
- (Nothing)
- Error

# Acronym

# Acronym Algorithm


(the Beauty and Joy of Computing)

**keep only uppercase words**

(Beauty Joy Computing)

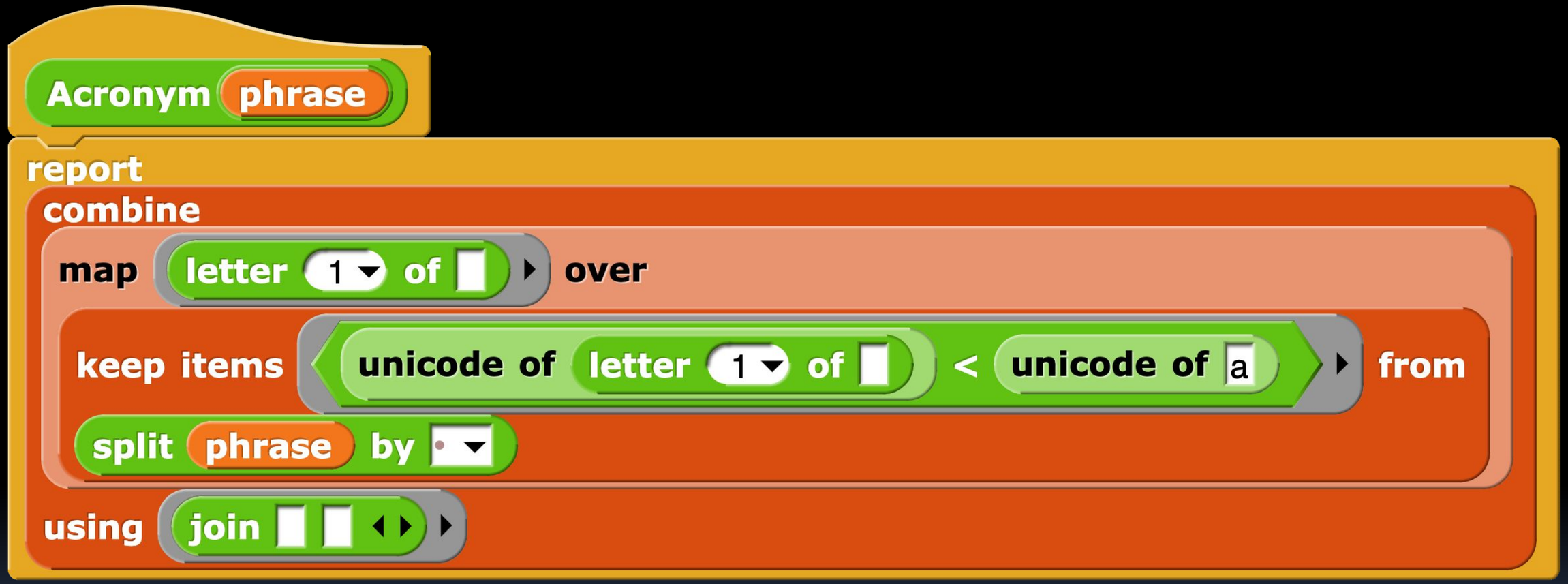
**map first letter only**

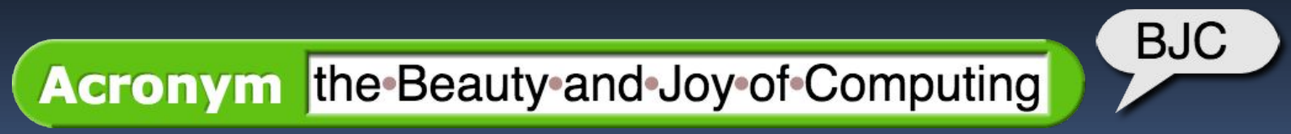
(B J C)

**combine into one word (join)**

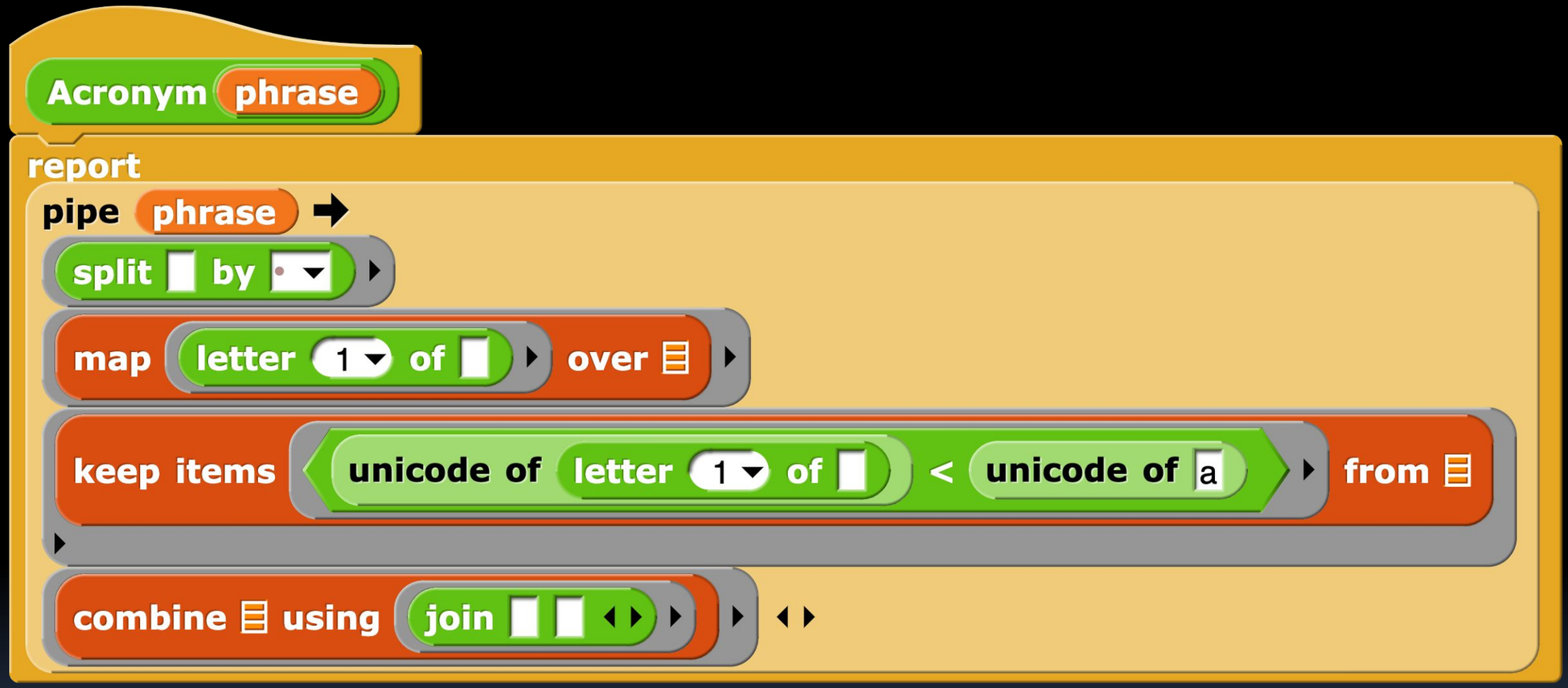
BJC

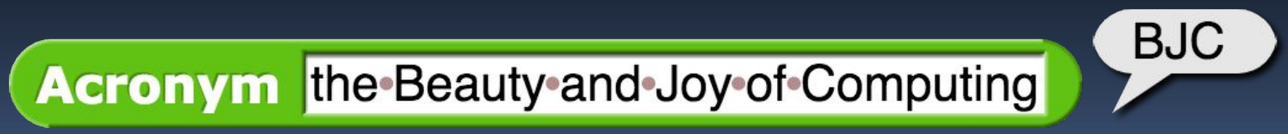
# Acronym (uses `map`, `keep`, `combine`)



# Acronym (uses map, keep, combine)

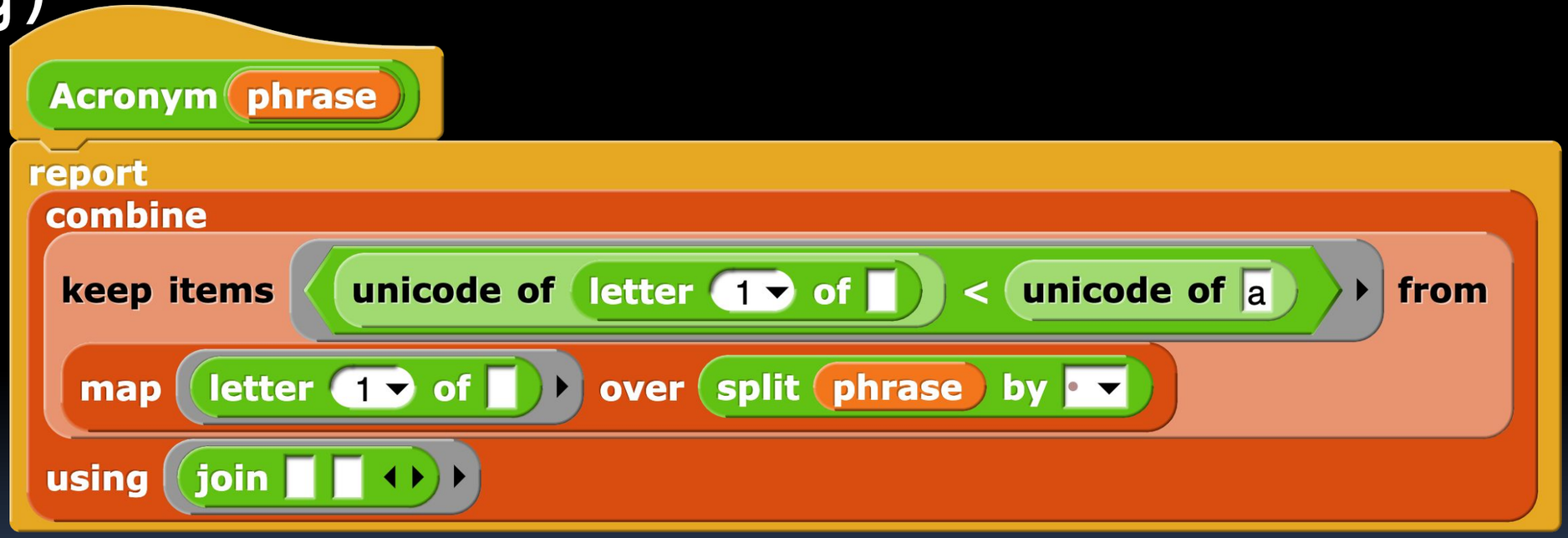



# (Cal) Clicker Question

What is reported if I swap **`keep`** and **`map`** in `Acronym` and call it on **`(the Beauty and Joy of Computing)`**

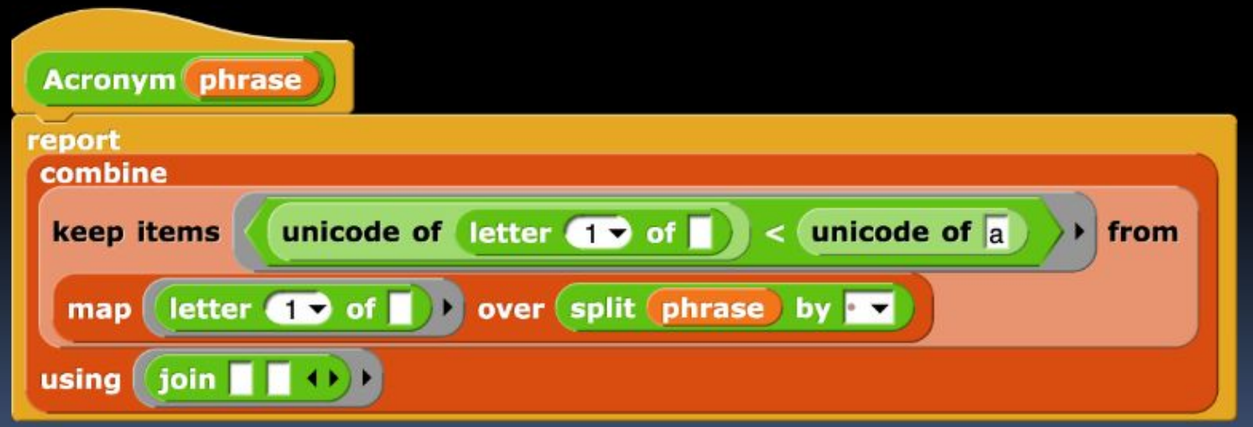
a) bjc
b) BJC
c) CJB
d) (nothing)
e) Error



When poll is active, respond at **pollev.com/ddg**

Text **DDG** to **22333** once to join

# L14b What is reported if we swap keep and map in Acronym and call it on the Beauty and Joy of Computing




- bjc
- BJC
- CJB
- (nothing)
- Error

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# HOF Tools & Demo

# HOF tools, sharks, pregnant fish, mymap