C211/H211: **Introduction to Computer Science** Problem sets **Problem set 2: Robert Indiana** Problem set 1: Paint a date in DrRacket Problem set 2: Robert

Indiana

On this page:

numbers

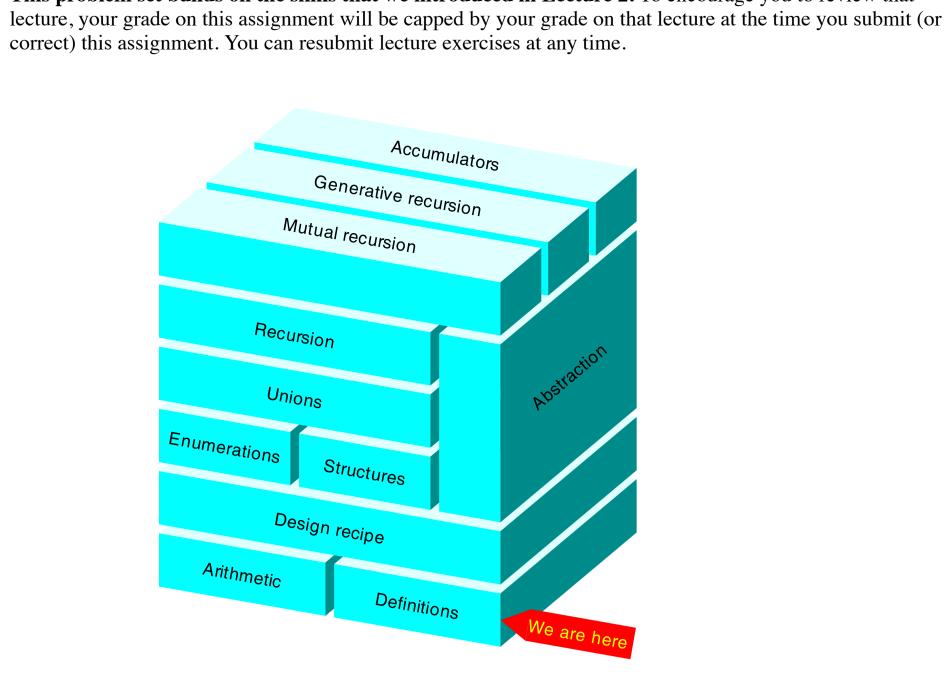
2 Eat/Die 3 Womb 4 Extra fun

Problem set 2: Robert Indiana

1 Warmup: calculating

This assignment is due on Wednesday, January 17 at 11:59pm. Submit it using Handin as assignment ps2. Your submission is only accepted if the message "Handin successful" appears. Corrections can be presented until Friday, February 9. This problem set builds on the skills that we introduced in Lecture 2. To encourage you to review that

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Any advice for future students? Think back to 3 months ago when you were just starting the course. What would have helped you then? Please share your wisdom here, and we will pass it on to the next generation. Start Froblem 22 5 20 5 1/2.

God to office hox s. Manage time.

COMMENT TO CLOSS.

## In every problem set, clearly delimit your work for each exercise using a comment like "; Exercise 1".

1 Warmup: calculating numbers

Exercise 1. Define the variable x to be a big number. Then define the variable y to be the cube of x. Put digits only in your definition of x, not in your definition of y. (If you're not sure how to define a variable, review <u>Lecture 2: Definitions</u> Exercise 1.) Exercise 2. In comments, show step-by-step calculations that lead from your definition of y to its computed

numeric value. Show a separate step for each time your definition of x is used, and for each time a bigger number is produced. So, your calculations should include at least 2 steps (depending on how many times your definition of y uses x). (If you're not sure how to calculate step-by-step, review Lecture 1: DrRacket and arithmetic Exercises 10 and 13 and Lecture 2: Definitions Exercise 3.) Exercise 3. Define a function cube that takes a number x as input and returns its cube. We've already given

the signature and purpose for the function: ; cube : Number -> Number

; produce the third power of the given number Here are some examples of using cube:

; (cube 4) should be 64 ; (cube 1) should be 1

And your definition should look like this: (define (cube x)

FILL-IN-THIS-BLANK) (If you're not sure how to define a function, review Lecture 2: Definitions Exercise 5.) Use your new function

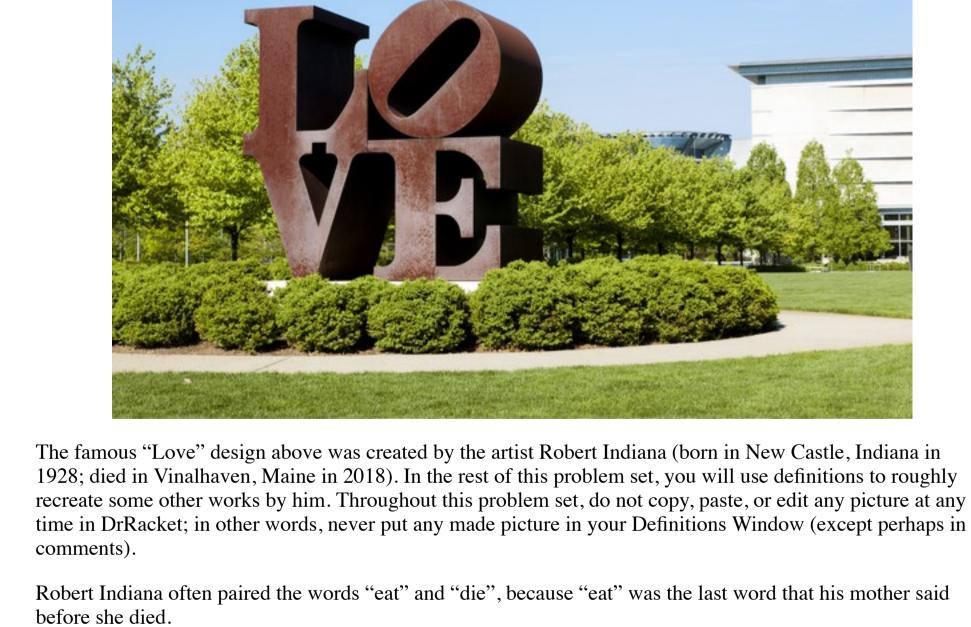
to compute the cube of 10. **Exercise 4.** Let us compute the cube of the cube of the cube of 3. In comments, show step-by-step calculations that begin with

Show a separate step for each time your definition of cube is used, and for each time a bigger number is produced. So, your calculations should include at least 6 steps. (If you're not sure how to calculate step-bystep, review Lecture 2: Definitions Exercise 8.)

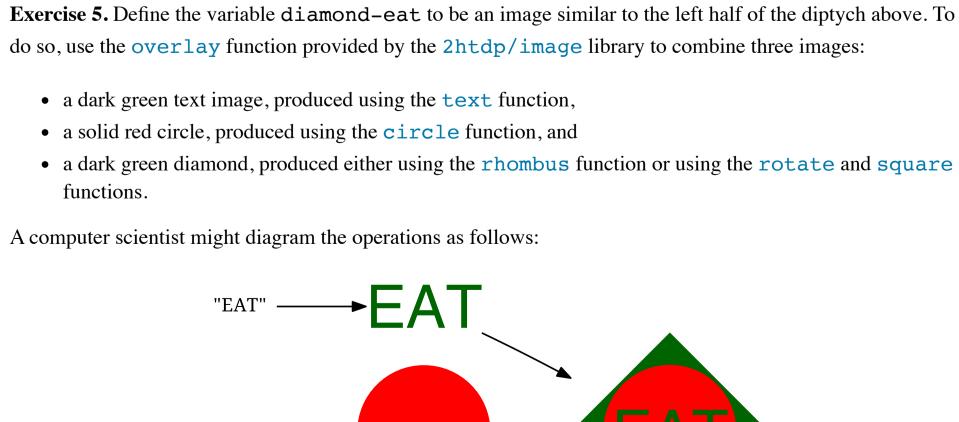
; (cube (cube (cube 3)))

; = FILL IN REMAINING STEPS

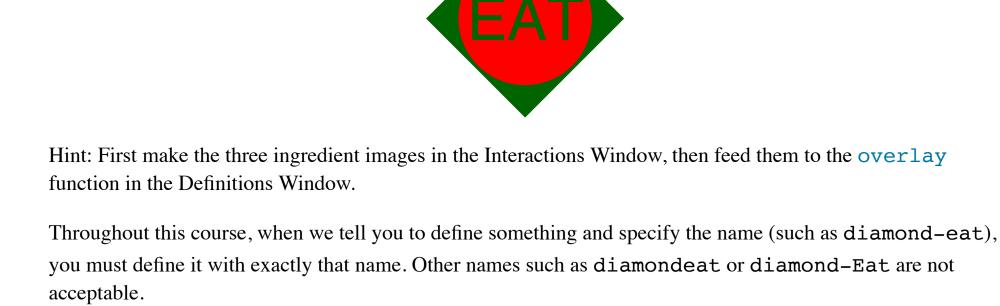
2 Eat/Die



Exercise 5. Define the variable diamond-eat to be an image similar to the left half of the diptych above. To do so, use the overlay function provided by the 2htdp/image library to combine three images:



When you hit the "Run" button, then in the Interactions Window after the prompt ">" type diamond-eat and hit Enter, DrRacket should respond with some picture like this:



really bugs you, you can try using the text/font function to choose a different font. Exercise 6. Define a function diamond that takes a string and returns an image of it inside a circle inside a diamond. Your function should have this signature and purpose:

Note: On some computers, the text may be off center because of font differences. Don't worry about it! If it

; diamond : String -> Image ; draw a diamond with the given text inside

; (diamond "EAT") should be the picture above For example, when you hit the "Run" button, then in the Interactions Window after the prompt ">" type

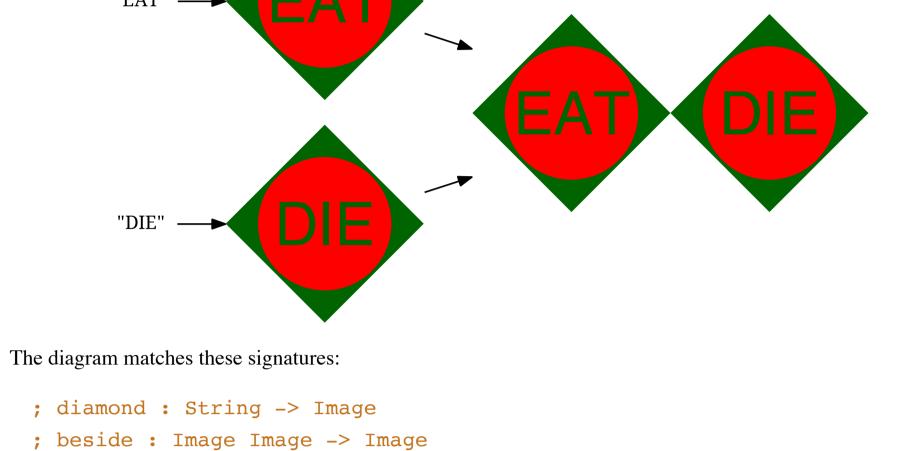
(diamond "EAT") and hit Enter, DrRacket should respond with the same picture as above. Check that, then change your definition of diamond-eat to (define diamond-eat (diamond "EAT"))

without affecting the image value of diamond-eat.

the 2htdp/image library. A computer scientist might diagram the operations as follows:

Exercise 7. Define the variable diptych to be an image similar to Robert Indiana's diptych above. To do so,

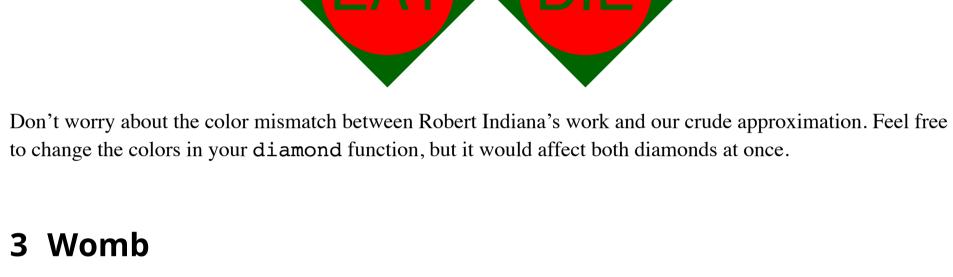
use your diamond function twice, and combine the resulting images using the beside function provided by



## Remember that using something means putting its name in your code, so your definition of diptych should

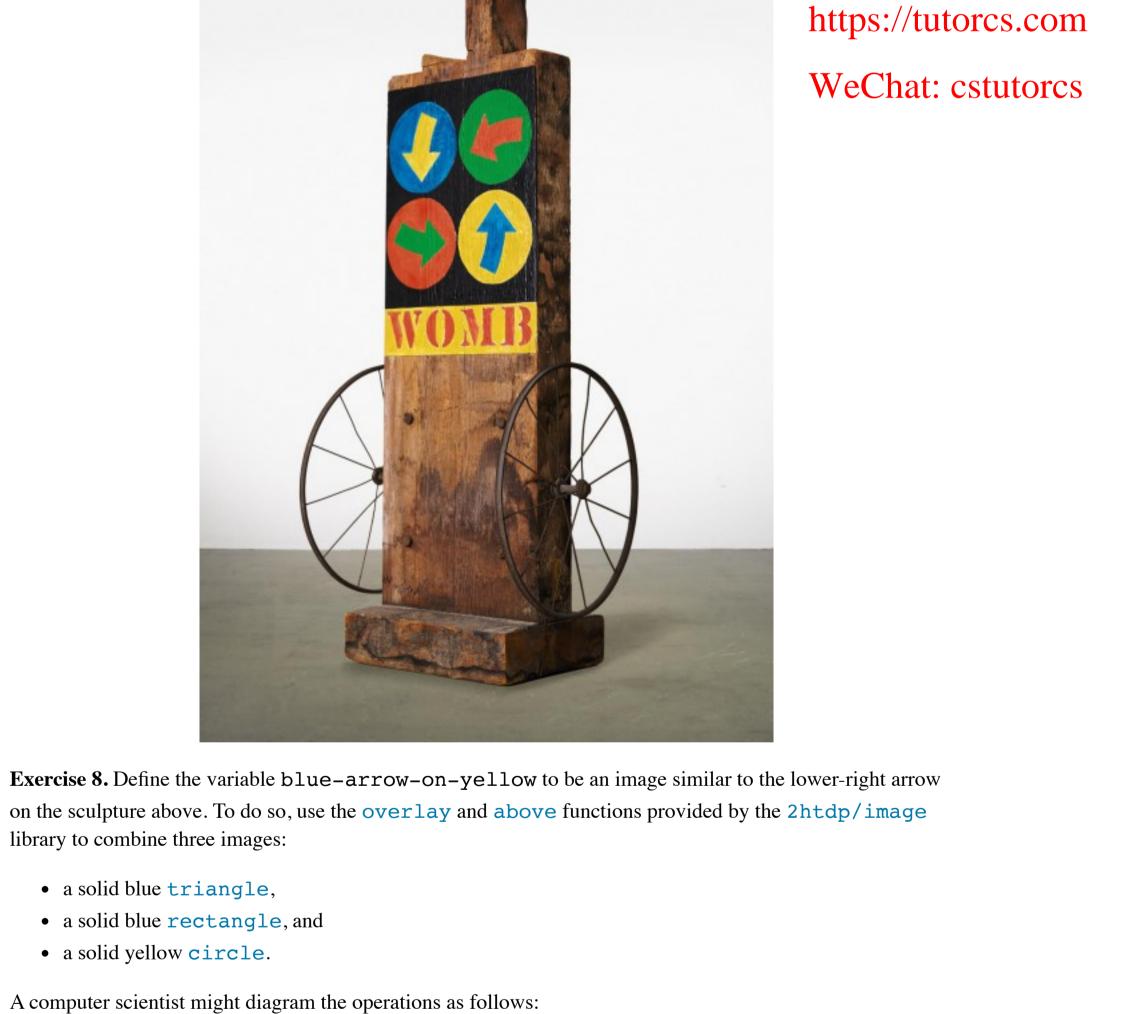
contain the name diamond twice, and not the names overlay or text or circle. Again, your definition should not contain any picture either. When you hit the "Run" button, then in the Interactions Window after the prompt ">" type diptych and hit

Enter, DrRacket should respond with some picture like this:

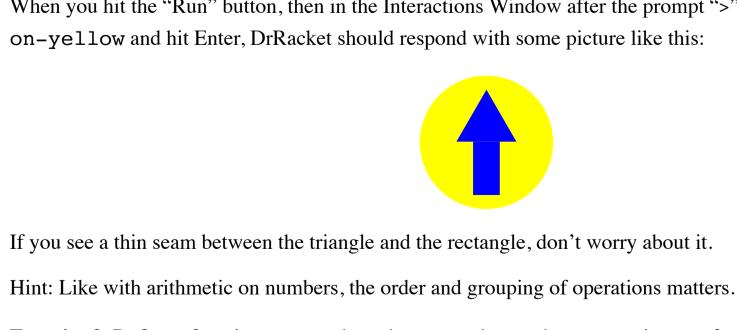


Assignment Project Exam Help

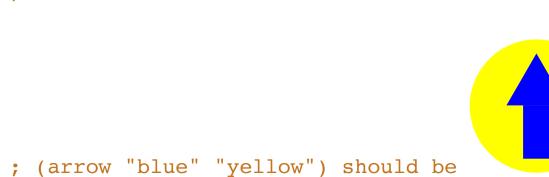
3 Womb



When you hit the "Run" button, then in the Interactions Window after the prompt ">" type blue-arrowon-yellow and hit Enter, DrRacket should respond with some picture like this:



Exercise 9. Define a function arrow that takes two colors and returns an image of an arrow of the first given color inside a circle of the second given color. Your function should have this signature and purpose: ; arrow : Color Color -> Image ; draw an arrow of the first color inside a circle of the second color



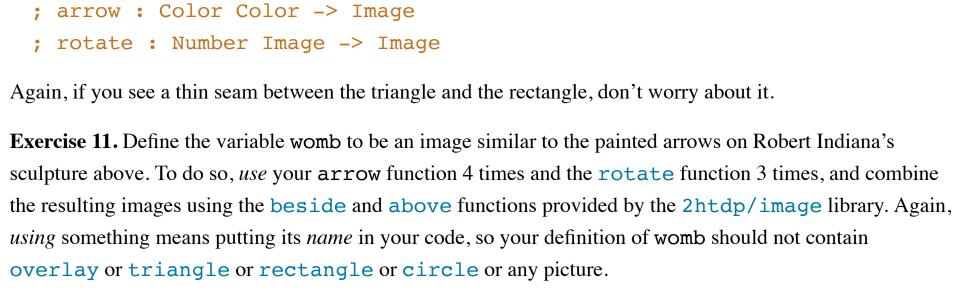
For example, when you hit the "Run" button, then in the Interactions Window after the prompt ">" type (arrow "blue" "yellow") and hit Enter, DrRacket should respond with the same picture as above. Check that, then change your definition of blue-arrow-on-yellow to (define blue-arrow-on-yellow (arrow "blue" "yellow"))

Exercise 10. Use your arrow function and the rotate function provided by the 2htdp/image library to

without affecting the image value of blue-arrow-on-yellow.

recreate the upper-right arrow on the sculpture:

The diagram matches these signatures:



your Handin submission.

Exercise 12. Recreate The Electric American Dream:

C211.

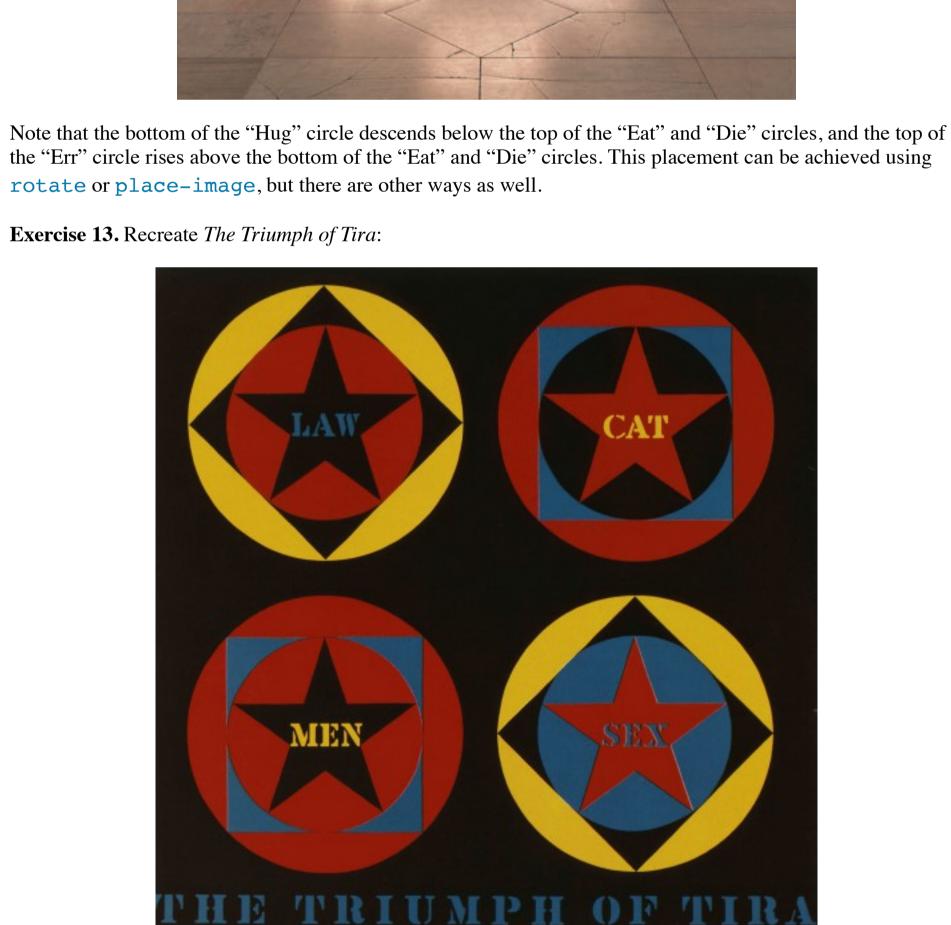
Hint: Diagram the operations; plug together these signatures: ; arrow : Color Color -> Image ; rotate : Number Image -> Image ; beside : Image Image -> Image ; above : Image Image -> Image 4 Extra fun

Help other students by answering this ungraded question: what did you have to learn to finish this problem set that we didn't teach? Post your answer to Discord in the #ps2 channel, or put it as a comment at the bottom of

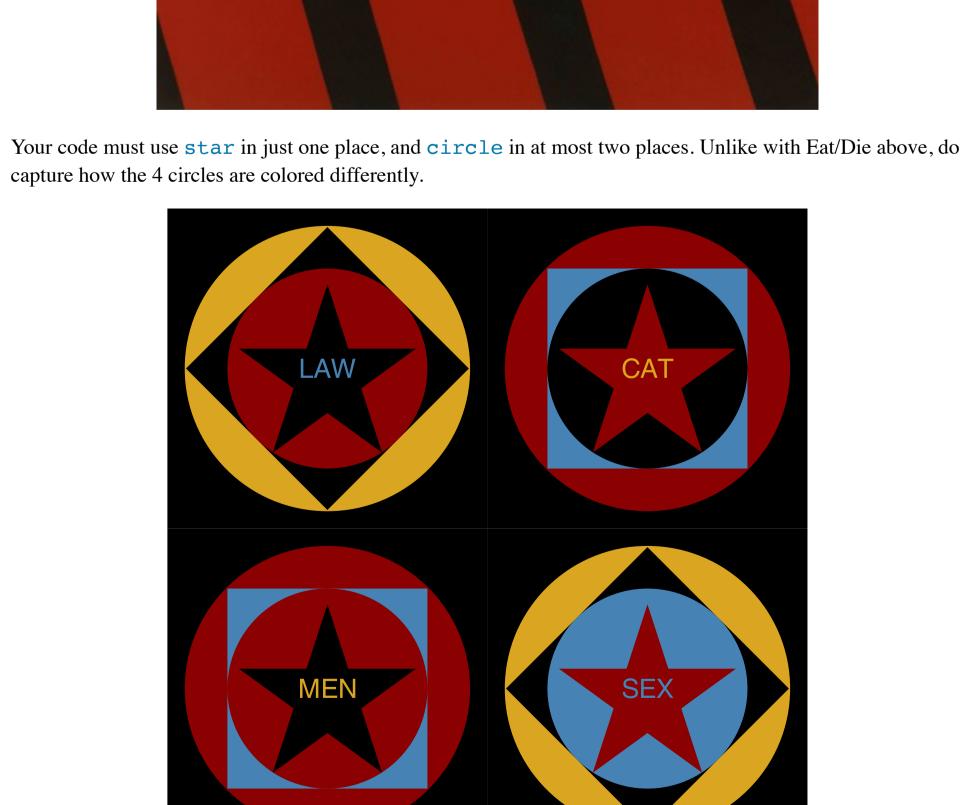
Students in H211 should complete all the Extra fun exercises; they are optional and not graded for students in

When you type womb in the Interactions Window, DrRacket should respond with some picture like this:





HE TRIUMPH OF TIRA



bands of color. For example, the flag of France has three vertical bands, whose colors are dark blue, white, and red. With this flag as with many other flags, the three bands are equally wide, and together they form a rectangle that is 150 wide and 100 tall. Define a function vertical-triband that takes three colors as inputs and produces a vertical triband flag image. For example, (vertical-triband "dark blue" "white" "red") should produce the flag of France. Hint: before defining a function, first produce

Exercise 14. Many flags are triband, meaning that they are composed of three parallel

Exercise 15. Some triband flags have horizontal rather than vertical bands. For

a flag.

example, the flag of the Netherlands has three horizontal bands, whose colors are dark red, white, and dark blue. *Use* vertical-triband to define a function horizontal-triband that takes three colors as inputs and produces a horizontal triband flag image. For example, (horizontal-triband "dark red" "white" "dark blue") should produce the flag of the Netherlands. Hint: besides verticaltriband, also use scale/xy and rotate.

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"las complejidades de

nuestro ser, su fuego y su álgebra" —Jorge Luis