

FINAL EXAM / Exam 3 -- Tuesday, October 12 / Wednesday, October 13

Due Oct 13 at 11pm	Points 152	Questions 13
Available Oct 13 at 3:50pm - Oct 13 at 11pm	46 minutes	Time Limit 97 Minutes

Instructions

The Racket file and PDF are inside the Exam as links in Question #1.

You have 90 minutes to complete this exam (plus 7 "Canvas" minutes--an extra bit of time for you to make your ultimate submission to Canvas). You do not need to show templates, but you may receive partial credit if you do. **You also do not need to show test cases** or examples of data definitions except in those cases where they are specifically requested, but you are free to develop them if they will help you write the desired programs.

Your programs may contain only the following BSL/ISL/ASL/Racket constructs:

- define define-struct cond else if local begin max min
 - empty? cons? cons first rest list append length
 - + - * / == < > <= >= and or not
 - string=? string-length string-append substring add1 sub1 error format
 - predicates for any/defined data types
 - filter map andmap ormap foldr foldl build-list apply lambda
 - set! set-structure!
- Plus, of course, any operators introduced by **define-struct** (including mutators)
- Additionally, you may use any constants you find necessary, for example, **empty**, **true**, **false**, **0**, etc.

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	46 minutes	2 out of 152 *

* Some questions not yet graded

Correct answers are hidden.

Score for this quiz: 2 out of 152 *
Submitted Oct 13 at 5:10pm
This attempt took 46 minutes.

Question 1 Not yet graded / 0 pts

CanvasExam3workfileA21.rkt
(https://canvas.wpi.edu/courses/27413/files/4139652/download?download_frd=1)
CS1101Exam3FinalA21_WPI.pdf
(https://canvas.wpi.edu/courses/27413/files/4139653/download?download_frd=1)
Minimize File Preview

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Zoom

CS 1101 A Term 2021 Exam 3 (150 points)
Pledge: _____ (2)
Questions 1 _____ (30)
Questions 2 _____ (90)
Questions 3 _____ (90)
Questions 4 _____ (90)
Questions 5 _____ (90)
Questions 6 _____ (90)
Questions 7 _____ (90)
Questions 8 _____ (90)
Questions 9 _____ (90)
Questions 10 _____ (90)
Questions 11 _____ (90)
Questions 12 _____ (90)
Questions 13 _____ (90)
TOTAL: _____ (130 or 106 with Bonus)
You have 90 minutes to complete this exam (plus 7 "Canvas" minutes--an extra bit of time for you to make your ultimate submission to Canvas). You do not need to show templates, but you may receive partial credit if you do. You also do not need to show test cases or examples of data definitions except in those cases where they are specifically requested, but you are free to develop them if they will help you write the desired program.
Your program may contain only the following BSL/ISL/ASL/Racket constructs:
define define-struct cond else if local begin max min
empty? cons? cons first rest list append length
+ - * / == < > <= >= and or not
string=? string-length string-append substring add1 sub1 error format
predicates for any/defined data types
filter map andmap ormap foldr foldl build-list apply lambda
set! set-structure!
Plus, of course, any operators introduced by define-struct (including mutators)
Additionally, you may use any constants you find necessary, for example, empty, true, false, 0, etc.

Your Answer:

Downloaded

Question 2 2 / 2 pts

Pledge (2 points):

I pledge, on my honor that I am taking this Exam on my own, with help only from the provided starter file and DrRacket (if I have so chosen) and absolutely no one else, sons, notes, book closed, search engines lifted, Help Desk unsuccessful. I further pledge not to discuss the Exam in any way with anyone until Friday, October 15, 2021 because I understand that there are students with circumstances that may cause them to take the Exam after I have completed it.

"My brain is open..."

a. #true
b. #false

True

False

Question 3 Not yet graded / 6 pts

a). (6 points) Create (list -1 0 1 2 3) with an expression involving at least two higher-order functions. (You may define a helper function for use in the expression if you wish, but it is not necessary.)

Your Answer:

(map (lambda (n) (- n 1)) (build-list 5 identity))

Question 4 Not yet graded / 6 pts

b). (6 points) Briefly explain why the lengths of the lists returned by

(map abs (filter positive? (list -1 0 1 2 3)))

and

(filter positive? (map abs (list -1 0 1 2 3)))

are not the same length. It is NOT enough merely to compute the lists or their lengths.

Your Answer:

They are not the same length because filter filters out all of the positive numbers in the list in the first expression first. This leaves (list 0 1 2 3) for map to run the absolute value function on, resulting in (list 0 1 2 3) for the first map. Conversely, when running map with the function abs as it's higher-order parameter first on (list -1 0 1 2 3), the first return is (list 1 0 1 2 3). Then when filter is run with the first-order function parameter: positive?, nothing is filtered out, leaving (list 1 0 1 2 3) as the second expression's answer.

Question 5 Not yet graded / 6 pts

c). (6 points) The higher-order function foldr has the following signature:

foldr: (X Y -> Y) Y ListOfX -> Y

Briefly explain why the isolated Y--the function's middle parameter--must match the Y that is the return value. That is, why must the components started by Y below match?

foldr: (X Y -> Y) Y* ListOfX -> Y*

Your Answer:

The isolated Y in the foldr (or foldl) function must match the function output as the Y value in the foldr parameter is the base value when the list of x returns empty. Since foldr is a higher order function to simplify functions with lists, the Y symbolizes the value that is the base case or when the end of a regular list

function's (empty? lox) returns true. The 'then' value of (empty? lox) is symbolized as Y* as the parameter of foldr. As Y must be able to be passed on or added, to the final response, it must be the same type as the response.

Question 6 Not yet graded / 6 pts

d). (6 points) Briefly explain why a function whose return value comes from a set! call cannot adequately be tested with check-expect.

Your Answer:

A function whose return value comes from set! can not be adequately tested with check-expect because after each call to the function, the variable we are testing can change based off of the amount of times called or arbitrarily amounts of parameters. This means we have to use differing ways to test functions such as showing the variable in scope before and after running the respective function to be tested and stating the EFFECT in the signature can help. This also means we cannot expect one result from the same call to the function, therefore running check-expect obsolete in this case. As a call in one part of the function can return a certain answer, the same call can return a differing answer, creating harder solutions for test cases.

Question 7 Not yet graded / 6 pts

e). (6 points) The call (new1size) takes no arguments and always returns (void). Briefly explain how a function call that takes no arguments can return a value other than (void) and a different value the next call.

Your Answer:

The function can return a new value by incrementing a variable or by using variables. For example, by defining a variable (define NUMBER1E 0), you could write the respective function:

```
(define NUMBER1E 0)  
;example: -> Number  
; consumes nothing, produces increments of a number by 1 starting at 0  
; EFFECT: changes the value of NUMBER1E by 1  
(define (example)  
  (begin (set! NUMBER1E (+ 1 NUMBER1E)) NUMBER1E))
```

The function first sets NUMBER1E as an increment of 1, starting at 0. By using the function begin, racket runs the first function then returns the second call. As seen in the example above, (set! NUMBER1E (+ 1 NUMBER1E)) is first run above, setting the variable NUMBER1E by an increment of 1. Then NUMBER1E is called, returning the variable that racket just updated.

Although the example given with an incremented number is simple, there are many other values a function with no arguments can use to produce a new value each time or to simulate randomness. Some examples include using the system time as a value in the function.

Question 8 Not yet graded / 30 pts

Nomanian Island is a bird watcher's paradise. The Island's forests echo with the songs and sounds of painted warblers and drowsy woodpeckers. The shores of the Island teem with birds found nowhere else in the world such as the streaked gullup and the paisley-footed booby. Birds flock from around the world, binoculars in hand, in hopes of spotting rarities only Nomanian Island can offer them.

Here are some data definitions:

```
(define-struct sighting (spotter species flock banded? eco-status))  
; a Sighting is a (make-sighting String Natural Boolean Boolean Boolean)  
; interpr: represents a sighting where  
; : spotter is the name of the person reporting the sighting  
; : species is the bird's species  
; : flock# is the number of such birds spotted together simultaneously  
; : banded is #true if the spotter notes a biologist's band on any bird's leg  
; : eco-status is "least concern" or "threatened" or "endangered"
```

```
; a ListOfSighting is one of:  
; : empty  
; : (cons Sighting ListOfSighting)
```

Using filter and/or map, write a function satisfying the following signature/purpose:

```
;multi-endangered-spotters: Natural ListOfSighting -> ListOfString  
; consumes number representing a flock size and a list of sightings  
; returns a list of the names of spotters who report any endangered species  
; in a group of the given size or larger, that is, with flock# >= given number
```

Include a signature and purpose for any helper function(s) you write.

Your Answer:

```
;multi-endangered-spotters: Natural ListOfSighting -> ListOfString  
; consumes number representing a flock size and a list of sightings  
; returns a list of the names of spotters who report any endangered species  
; in a group of the given size or more, that is, with flock# >= given number  
;;Include a signature and purpose for any helper function(s) you write.  
(check-expect (multi-endangered-spotters 0 empty) empty)  
(check-expect (multi-endangered-spotters 10 empty) empty)  
(check-expect (multi-endangered-spotters 1 (list SIGHTING1 SIGHTING2 SIGHTING3 SIGHTING4 SIGHTING5 SIGHTING6 SIGHTING7 SIGHTING8 SIGHTING9 SIGHTING10 SIGHTING11 SIGHTING12 SIGHTING13 SIGHTING14 SIGHTING15 SIGHTING16 SIGHTING17 SIGHTING18 SIGHTING19 SIGHTING20 SIGHTING21 SIGHTING22 SIGHTING23 SIGHTING24 SIGHTING25 SIGHTING26 SIGHTING27 SIGHTING28 SIGHTING29 SIGHTING30 SIGHTING31 SIGHTING32 SIGHTING33 SIGHTING34 SIGHTING35 SIGHTING36 SIGHTING37 SIGHTING38 SIGHTING39 SIGHTING40 SIGHTING41 SIGHTING42 SIGHTING43 SIGHTING44 SIGHTING45 SIGHTING46 SIGHTING47 SIGHTING48 SIGHTING49 SIGHTING50 SIGHTING51 SIGHTING52 SIGHTING53 SIGHTING54 SIGHTING55 SIGHTING56 SIGHTING57 SIGHTING58 SIGHTING59 SIGHTING60 SIGHTING61 SIGHTING62 SIGHTING63 SIGHTING64 SIGHTING65 SIGHTING66 SIGHTING67 SIGHTING68 SIGHTING69 SIGHTING70 SIGHTING71 SIGHTING72 SIGHTING73 SIGHTING74 SIGHTING75 SIGHTING76 SIGHTING77 SIGHTING78 SIGHTING79 SIGHTING80 SIGHTING81 SIGHTING82 SIGHTING83 SIGHTING84 SIGHTING85 SIGHTING86 SIGHTING87 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