CSPB 2824 - Stade - Discrete Structures

Started on	Thursday, 28 September 2023, 3:12 PM
State	Finished
Completed on	Thursday, 28 September 2023, 3:54 PM
Time taken	41 mins 42 secs
Grade	**10.00** out of 10.00 (**100**%)

Question **1**

Correct

Mark 1.00 out of 1.00

Suppose you perform a Binary Search to try and find the location of x = 7 in the list {2, 3, 4, 8, 11, 12, 14}. As expected, you start with **i** =1 and **r** = 7 (the list indices - not the list values). After the first step of Binary Search, what are the new values of **i** and **r**?

Select one:

- a. i = 1 and r =3
- b. i = 5 and r =7
- c. i = 1 and r =4 ✔
- d. i = 2 and r =8

Your answer is correct.

Correct

Marks for this submission: 1.00/1.00.

Question **2**

Correct

Mark 1.00 out of 1.00

Consider the pseudocode below for the function `mysteryFunction(input)`. What should the function output be if the input is $input = [9, 3, 13, 3, 4, 10, 5, 10]$? You may assume that array indexing begins at 0, which is the left-most element in the given `input` object (i.e., `input[0]` $= 9$).

```
def mysteryFunction(input)
  k = 0
  x = input[k]
  for i = 1, 2, ..., length(input)
    if (input[i] < x), then (k = i, and x = input[i])
  return (k)
```

Select one:

- 13
- 2
- 1 ✔
- 3

Your answer is correct.

Solution:

We initialize k and x to point at the first index and element of the input list, respectively.

Then for each index i along the length of the list, we reset k to i if the i^{th} element of `input` is less than the current value for x, and we reset x to the new minimum.

Once we reach the end of the `for` loop, k should have the index of the minimum of the list `input` (and x should have the value of the minimum.

Note that the `if` statement to reset x is not triggered unless there is strict inequality, so the second value of 3 in the input list does not change k or x.

Correct

Marks for this submission: 1.00/1.00.

Question **3**

Correct

Mark 1.00 out of 1.00

Consider the pseudocode below for the function `mysteryFunction(input)`. What should the function output be if the input is $\texttt{input} = [4, 5, 8, 2, 11, 2, 5, 11]$? You may assume that array indexing begins at 0, which is the left-most element in the given `input` object (i.e., $\texttt{input}[0] = 4$).

```
def mysteryFunction(input)
  k = 0
  x = input[k]
  for i = 1, 2, ..., length(input)
    if (input[i] > x), then (k = i, and x = input[i])
  return (k)
```

Select one:

- 2
- 7
- 11
- 4 ✔

Solution:

We initialize k and x to point at the first index and element of the input list, respectively.

Then for each index i along the length of the list, we reset k to i if the i^{th} element of `input` is greater than the current value for x, and we reset x to the new maximum.

Once we reach the end of the `for` loop, k should have the index of the maximum of the list `input` (and x should have the value of the maximum.

Note that the `if` statement to reset x is not triggered unless there is strict inequality, so the second value of 11 in the input list does not change k or x.

Correct

Marks for this submission: 1.00/1.00.

Question **4**

Correct

Mark 1.00 out of 1.00

Review the first 4 examples in Rosen 2.6

Select the true statements about Matrices:

Select one or more:

- [x] a.
  Matrices can only be added if they are the same size. ✔

b.
In order to multiply them, matrices must have the exact same dimensions.

c.
Matrices can be only be added if the number of columns in the first matrix matches the number of rows in the second.

d.
Matrices can only be multiplied if the number of columns in the first matrix matches the number of rows in the second. ✔

Your answer is correct.

Correct

Marks for this submission: 1.00/1.00.

Question **5**

Correct

Mark 1.00 out of 1.00

What does it mean that matrix multiplication is not commutative?

a. You can multiply them in any order you want and get the same answer.

b. There exists at least one pair of Matrices such that AB != BA (if fact quite a few - but we only need one to say this) ✔

c. There is only one right way to multiple 2 matrices.

d. For all matrices A and B, AB does not equal BA

e. Duh, they don't commute to work.

Your answer is correct.

Correct

Marks for this submission: 1.00/1.00.

Question **6**

Correct

Mark 1.00 out of 1.00

Matrix Addition is commutative.

(you may just look this up in the book)

Select one:

- True ✔
- False

Correct

Marks for this submission: 1.00/1.00.

Question **7**

Correct

Mark 1.00 out of 1.00

Find A*B*C by multiplying (A*B) *C

Now find A*B*C by multiplying A*(B *C)

Using just your answers, which of the following are correct?

$$A = \begin{bmatrix} 1 & 2 \\ 1 & 1 \\ 2 & 3 \\ 1 & 1 \end{bmatrix}$$

$$B = \begin{bmatrix} 1 & 2 & 3 & 1 \\ 1 & 1 & 1 & 2 \end{bmatrix}$$

$$C = \begin{bmatrix} 2 & 1 \\ 1 & 1 \\ 1 & 1 \\ 2 & 3 \end{bmatrix}$$

- a. Matrix multiplication is associative.
- b. Matrix multiplication is not associative, one example is enough to show this.
- c. none of the above

d. We cannot say if Matrix multiplication is associative or not with one example.

Correct. If it appears associative with one example, we still need a proof to show it is true for all matrices. However, if we had seen that it was NOT associative for this example, that would have been enough to say "It's not associative."

e. A*B*C = A*(B*C) = (A*B)*C for all A, B, C

Your answer is correct.

Correct

Marks for this submission: 1.00/1.00.

Question **8**

Correct

Mark 1.00 out of 1.00

Consider the following.

How many individual "multiplications" are required to find (AB)*C? (every time you 1 *2 or 3*1 etc..)

$$A = \begin{bmatrix} 1 & 2 \\ 1 & 1 \\ 2 & 3 \\ 1 & 1 \end{bmatrix}$$

$$B = \begin{bmatrix} 1 & 2 & 3 & 1 \\ 1 & 1 & 1 & 2 \end{bmatrix}$$

$$C = \begin{bmatrix} 2 & 1 \\ 1 & 1 \\ 1 & 1 \\ 2 & 3 \end{bmatrix}$$

Answer: 64 ✔

Correct

Marks for this submission: 1.00/1.00.

Question **9**

Correct

Mark 1.00 out of 1.00

Consider the following again.

How many individual "multiplications" are required to find A(B*C)? (every time you 1 *2 or 3*1 etc..)

$$A = \begin{bmatrix} 1 & 2 \\ 1 & 1 \\ 2 & 3 \\ 1 & 1 \end{bmatrix}$$

$$B = \begin{bmatrix} 1 & 2 & 3 & 1 \\ 1 & 1 & 1 & 2 \end{bmatrix}$$

$$C = \begin{bmatrix} 2 & 1 \\ 1 & 1 \\ 1 & 1 \\ 2 & 3 \end{bmatrix}$$

Answer: 32 ✔

Correct

Marks for this submission: 1.00/1.00.

Question **10**

Correct

Mark 1.00 out of 1.00

When writing an efficient algorithm (one that runs fast) for multiplying 3 matrices, which of the follow is/are true?

Select one or more:

- [x] a.
  Inductive reasoning from a previous quiz problem suggests that A * (B*C) a faster algorithm than using (A*B) *C. ✔
- [x] b.
  You will get the same answer, whichever way you multiple. However, we should consider if one way is faster than the other. ✔
- [ ] c.
  Since the final answer is the same either way, order of multiplication of the 3 matrices does not matter.
- [ ] d.
  You cannot multiply 3 matrices together.
- [ ] e.
  Inductive reasoning from a previous quiz problem suggests that (A*B) *C a faster algorithm than using A * (B*C).
- [x] f.
  We should verify our results of inductive reasoning (for which way is faster) with a mathematical proof before creating an algorithm. ✔

Your answer is correct.

Correct

Marks for this submission: 1.00/1.00.