Selected RQs

• Can probability be used to speed up the process of an algorithm, which is systematic and can be slow? For example, are instructions always carried out in a specific order, or can instruction be carried out in a different order depending on the type of an input value?

(submitted by Sujin, 2011W1)

• Can randomness be used to speed up the process of an algorithm, which is systematic and can be slow?

• (1) Are instructions always carried out in a specific order, or (2) can they be carried out in a different order, depending on the value of certain inputs or other variables?

(submitted by Sujin, 2011W1)

(A) Statement (1) is true.

(B) Statement (2) is true.

Selected RQs

What's the difference between hardware and software? I was always under the impression that hardware is the physical components of the computer whereas software was the programming behind it.

Selected RQs

Why/how do computers freeze? Is it because when I try to do too many things at once and they can’t handle it, or is there another reason? (I would like to minimize this behaviour!) When my computer freezes and I've waited awhile for it "unfreeze" and it still doesn't, my last resort is usually to force it to shut down (by pressing and holding the power button) and then turning it on again. It usually works, but this is time consuming and I fear not very healthy for my computer... Is there a better way to tackle freezing problems? And does rebooting hurt the computer in any way?
Selected RQs

• To learn a language, we as humans listen first and then mimic the speaker. How does a computer know what we mean when we "speak" a programming language if to understand the language we must first tell it how to understand the language using the language itself. This seems cyclical. How did we first teach computers to learn the basic language of computers?

(submitted by Colin, 2011W1)

Processes are everywhere

Examples of process specifications:

• Music notation
• IKEA assembly instructions
• Cooking recipes
• programs underlying Google search, Word, Excel (or any other computer application, internet service)
• UBC exam scheduling

A simple recipe

Jello Instant Pudding

1. put 3 cups of milk in a bowl
2. add entire contents of package
3. whisk for 2 minutes
4. transfer to serving bowls
5. let stand for 3-5 minutes
6. serve!

A more interesting recipe

Duck breast with Seville orange & savoy cabbage

source: http://www.bbcgoodfood.com

Ingredients (for 4):

• 4 duck breasts
• 1 large Seville orange , zested and juiced
• 2 tbsp honey
• 2 cloves
• 1 cinnamon stick
• chicken stock fresh, cube or concentrate, made up to 300ml
• 1 savoy cabbage, quartered, heart removed and shredded
• butter
• mashed potato, to serve
A more interesting recipe

Duck breast with Seville orange & savoy cabbage

source: http://www.bbcgoodfood.com

Ingredients (for 4):

• 4 duck breasts
• 1 large Seville orange, zested and juiced
• 2 tbsp honey
• 2 cloves
• 1 cinnamon stick
• chicken stock fresh, cube or concentrate, made up to 300ml
• 1 savoy cabbage, quartered, heart removed and shredded
• butter [How much?]
• mashed potato, to serve [How much? How do I make that?]

1. Heat a non-stick frying pan.
2. Put in the duck breasts, skin side down, then turn down the heat and leave for 10 minutes until the fat on the duck is golden brown and crisp.
3. Pour off the fat, turn the duck over.
4. Then stir together the orange juice, zest and honey and add to the pan with the cloves, cinnamon and stock.
5. Simmer for 10-12 minutes.
6. Remove the duck and rest in a warm place for 5 minutes. Reduce the sauce a little and season.

1. Cook the cabbage in a little butter until wilted but still bright green.
2. Slice the duck.
3. Serve with the cabbage, sauce and some creamy mash.
A more interesting recipe

1. Cook the cabbage in a little butter until wilted but still bright green.
2. Slice the duck.
3. Serve with the cabbage, sauce and some creamy mash.

Bon appétit!

Fundamental concepts:
• Instructions?
• Sequences of instructions?
• Variables?
• Loops / repetition?
• Procedures / functions?
• Conditional statements?
• Arrays?

Challenges:
• Explain how the recipe does / does not satisfy each of the defining properties of an algorithm.
• Modify the recipe so it better satisfies the defining properties of an algorithm.
• Prepare the dish for someone close to you 😊

Selected RQs
• Would two programs written in a different way, but meant to be used for the same task, give the exact same output or would there be a tiny difference between both outputs?

(A) Yes, they would give exactly the same output.
(B) No, they wouldn’t.

(submitted by Iselle, 2011W1)
The textbook states that "it is not possible to establish correctness by testing" (Snyder, p.179). I do not understand how this can be--if a manufacturer's product tester tests for a desired output, that output will either work or it will not, right?

(submitted by Veronica)

Sometimes you get the same error via seemingly different inputs (say blue screen of death for example). Is this the result of the computer being configured to respond to "bundled" group of errors or is it a general "i don't know" message from the computer?

(submitted by Williard, 2011W1)

Can algorithms be designed to run simultaneously on parallel 'tracks'?

(A) Yes  (B) No

(submitted by Iselle, 2011W1)

**A more interesting recipe**

**Duck breast with Seville orange & savoy cabbage**

*source: [http://www.bbcgoodfood.com]*

**Ingredients (for 4):**

- 4 duck breasts
- 1 large Seville orange, zested and juiced
- 2 tbsp honey
- 2 cloves
- 1 cinnamon stick
- 300ml chicken stock
- 1 savoy cabbage, quartered, heart removed and shredded
- 1 tbsp butter
Duck breast with Seville orange & savoy cabbage

**Ingredients (for $k$):**
- $k$ duck breasts
- $k/4$ large Seville orange, zested and juiced
- $k/2$ tbsp honey
- $k/2$ cloves
- $k/4$ cinnamon stick
- $k/4*300ml$
- $k/4$ savoy cabbage, quartered, heart removed and shredded
- $k/4$ tbsp butter

**Ingredients (for numPersons):**
- numPersons duck breasts
- numPersons/4 large Seville orange, zested and juiced
- numPersons/2 tbsp honey
- numPersons/2 cloves
- numPersons/4 cinnamon stick
- numPersons/4*300ml
- numPersons/4 savoy cabbage, quartered, heart removed and shredded
- numPersons/4 tbsp butter

**Variables**

Using variables can make programs ...

- more versatile
- easier to understand (use meaningful variable names!!)
- easier to modify, extend, adapt

**Instructions**

**Common types of instructions:**

- input/output
- graphics (display object, move object, set visual properties ...)
- audio (play sound, ...)
- timing (wait, ...)
- variable assignments
Selected RQs

- I've found that a simple error in HTML or even Scratch takes awhile to find and fix, even for the TA's. When programmers are working in professional environments, and encounter the same problems, how do they go about solving them? I'm sure they have deadlines to meet - do they just use the same concepts of "reproducing the error, understanding the problem and checking the obvious causes"?

(submitted by Daria, 2011W1)

Is there any type of program that can check if there's any typo or code that doesn't make sense (i.e., putting "(" instead of ")", missing units) as we're typing so that we can know what mistakes we're making immediately and don't have to go through all the codes to debug it? Like showing suggestions aside for the person to see rather than changing mistakes into what computers think is right automatically? Or like highlighting the parts that the computer can't read. Wouldn't that make debugging much easier? Are computers smart enough to do that?

(submitted by Hsueh Shih Lin)

Dealing with precision and the importance of accuracy, why is it that it is so crucial to respect upper- and lowercase in pathnames and passwords, but it doesn't seem to matter in the name part of an email address? It is that it is automatically corrected in the same way that major websites buy up the similar URLs and redirect them to the appropriate site?

Upper- vs lower-case sometimes matters (almost all programming languages; file names, path names in Unix), sometimes not (HTML, e-mail addresses)

Exercise: Loops in Scratch

- to make the triangle to turn faster while still ending at "home base", should I

A. increase 36
B. increase 10
C. increase 0.01
D. none of the above
Loops are used for repeating parts of a process

Types of loops:

- Repeat ... \( k \) times
- Repeat ... until \( \text{condition} \)
- While \( \text{condition} \) do ...

A fancy way of writing \( k \)-times repeats:

- \( \text{for } (i=1; i \leq \text{max}; i++) \{ \ldots \} \)
- \( \text{for } (i=0; i < \text{max}; i++) \{ \ldots \} \)
- \( \text{for } (i=1; i \leq \text{max}; i = i+2) \{ \ldots \} \)
- \( \text{for } (i=\text{max}; i \geq 1; i = i-1) \{ \ldots \} \)

Selected RQs

- Is Javascript a programming language? If so, what is it compiled by? The internet browser? Or is it not compiled but interpreted by an internet browser?

(submitted by Anne-Sophie, 2011W1)