Computing Bridging Task

Computer Science is a creative, practical, reasoning, and problem solving subject applied to the real world.

The programmer gets the chance to create something from nothing, use logic to turn programming concepts into code that a computer can run, and, when things don’t work as expected, use problem solving to figure out what has gone wrong. Programming is a fun, sometimes challenging (and occasionally frustrating) activity, and the skills learned from it can be useful both in school and at work . . . even if your career has nothing to do with computers. And, if nothing else, programming is a great way to spend an afternoon when the weather outside is rubbish.

TASK SET

The tasks below will help you get prepared with some of the things you will be learning on the course. Why do we do this? Well, every year we get students who start the course thinking they are good at using computers but have used them mostly in an ICT way rather than a computing way. So treat this summer task as a crash course so you know the basics. And if you have successfully completed GCSE Computer Science, it also gives you a chance to brush up on skills you may have forgotten as soon as you walked out of the exam hall, and to learn new things you didn’t know.

What you will need

- A Computer with an operating system.
  1. This can be Windows, OS X, or Linux
  2. Access to the internet (for research)
  3. Python (latest version is 3.3)

Task 1 – About You

1. Why have you chosen the study Computer Science at A Level?
2. What do you aim to achieve from the course?
3. What skills are you aiming to develop?
4. What other A Levels have you chosen and why?
5. Describe what you were like as a GCSE student. (Answer honestly! It will help me make your learning more appropriate)
6. Is there anything I need to know about you? (Regarding your learning!)

Task 2 – Research (Answer all questions in full sentences)

1. a. What is meant by the term ‘computational thinking’?
   b. Why is it important?
2. a. Who was John von Neumann?
   b. What is the ‘von Neumann architecture’?
3. a. What are the two vital components of a processor?
   b. Describe how a processor works?
4. Define the following key terms:
   a. Algorithm
   b. Pseudo code
   c. Compiler
   d. Open source
   e. Compression
   f. Utility software
5. a. Explain the following:
   i. binary
   ii. Denary
iii. Hexadecimal
b. What is 573 in binary? (Show your workings in a table)
c. i. Put these in order: TB PB KB MB GB B
   ii. What does each represent?

6. A. What is a truth table and when is it used?
   B. i. Draw a circuit using a variety of logic gates
       ii. Complete a truth table for it.
       iii. Explain how the circuit works.

Task 3 – Programming Challenges

You must complete at least 3 challenges
Challenges 1 and 2 are compulsory
Choose at least 2 more challenges to complete from 3, 4 and 5 or of your own choice.
Download Python 3.3
Google is your friend!

Challenge 1 (Compulsory)

Writing a program which asks the user their name and says hello to them personally.

1. Draw a flowchart to show what the program will do
2. Write the program
3. Add comments to the program to explain each line
4. Screenshot the code and the program and annotate it
5. Explain using key terms why programmers use comments

Extension

Amend your program so a banner is displayed around the users name when it is outputted. (Similar to below)
-------------
**John**
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Challenge 2 (Compulsory)

Writing an adventure game program. The game should have a Start, at least 3 chapters with decisions and an end with an option to play again. Feel free to add any other features of your choice.

1. Draw a flowchart to show how the player will progress through the game
2. Explain what ‘if’, ‘if then’ and ‘else’ statements are and how you will use them.
3. Write your program.
4. Add comments to the program to explain each line
5. Screenshot the code and the program and annotate it

Extension

Add a feature which ask the player their name at the start of the game and welcomes them.

Challenge 3

Write a program that does the following:
The game of Pontoon involves players being dealt two cards each randomly. Each player in turn can choose to have another card dealt to them (“twist”) or stick with what they have got (“stick”). The aim is to get 21 exactly or as close as possible without going over 21 (“bust”).

Create a game where you play the computer to see who wins.

1. Write the program
2. Add comments to the program to explain each line
3. Screenshot the code and the program and annotate it

Extension

Add a feature which ask the player their name at the start of the game and welcomes them

Programming Hint:
Consider the cards from 1 to 10 only to begin with (ignoring Jack, Queen, King and using 1 instead of Ace). Add these other cards later.
This code generates a random number between 1 and 5:

```
random.randint(1, 5)
```

You have to put this line at the start of your program (otherwise the random function won’t work)... import random

Challenge 4

Write a program that does the following task
Help people to calculate the cost of using their mobile phone.

These are their mobile network charges:

<table>
<thead>
<tr>
<th>Type of service</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calls to landlines</td>
<td>35p per minute</td>
</tr>
<tr>
<td>Calls to mobiles on this network</td>
<td>20p per minute</td>
</tr>
<tr>
<td>Calls to mobiles on any other UK mobile networks</td>
<td>29p per minute</td>
</tr>
<tr>
<td>Text to other mobiles on this network</td>
<td>10p per text</td>
</tr>
<tr>
<td>Text to other UK network mobiles</td>
<td>10p per text</td>
</tr>
<tr>
<td>Minimum call charge</td>
<td>29p per minute</td>
</tr>
<tr>
<td>Voicemail</td>
<td>26p per call</td>
</tr>
<tr>
<td>National toll rate numbers (0870, 0871, 0844)</td>
<td>41p per minute</td>
</tr>
<tr>
<td>Local toll rate numbers (0845)</td>
<td>41p per minute</td>
</tr>
</tbody>
</table>

1. Write the program
2. Add comments to the program to explain each line
3. Screenshot the code and the program and annotate it

Extension

Add a feature which ask the player their name at the start of the game and welcomes them
Programming Hint:
Consider just the calls first (top three rows). Then texts, then the minimum charge etc. Use variables and input

Challenge 5

Write a program that does the following task
Estimate the UK population a certain number of years into the future.
Use these facts:

- UK births per day is 8.51
- UK deaths per day is 6.48

1. Write the program
2. Add comments to the program to explain each line
3. Screenshot the code and the program and annotate it

**Extension**
- Consider emigration and immigration (research the figures).
- Use world statistics:
  - World births per second is 4.17
  - World deaths per second is 1.80

**Programming Hint:**
This challenge could be simplified by looking at just the births initially. Rough out the formula for calculating it first – then write the program.

**Extra Challenge - Can you complete the Python Challenge??**

http://www.pythonchallenge.com/

**To discover more about the subject at a higher level:**

- http://www.codecademy.com
- http://www.learnpythonthehardway.org
- http://pythonfiddle.com/
- https://www.jetbrains.com/pycharm/
- http://codingbat.com/python
- https://developers.google.com/edu/python/
- https://www.codeavengers.com/