Bishop Challoner
Computer Science Department

Teacher Contacts
Mr Ravenscroft – l.ravenscroft@bishopchalloner.bham.sch.uk
Mr Khitab – o.khitab@bishopchalloner.bham.sch.uk
Mr Ebrahim – b.ebrahim@bishopchalloner.bham.sch.uk

Year 11 Computing – Offsite Work – Week 5

Due: 8th May 2020

Instructions

1. Complete the topic questions on the PDF or in a Word document (provide question numbers) and email your answers to Mr Ebrahim and Mr Khitab. Please include your name and date in the filename. For example, a student called Liam Smith should call the Word document 'topic questions – Liam Smith – 08-05-20'.
2. Engage with the practical lessons on code.org
3. Complete the further revision exercise.
4. Optional – please submit any creations you have made on the Python Turtle activities.

Practical Lesson(s)

Lesson 3 - Please go to studio.code.org/s/course4. When you get there complete lessons 18 and 19, although this is block based programming, the concepts remain the same and therefore the lessons learnt from this are applicable to pseudocode and programming languages. Please feel free to create yourself an account.

Bonus!

Go to:

https://repl.it/languages/python_turtle

Follow the instructions (and examples if needed) on how to use Python Turtle. For those who want the challenge, what is the most complex thing you can create? If you believe you have created something good email it to the teachers emails above!

This weeks theme: Technology!

Computer Science (9-1)

Creating and using Algorithms
Mr Ebrahim

Please note that you may see slight differences between this paper and the original.

Candidates answer on the Question paper.

OCR supplied materials:
Additional resources may be supplied with this paper.

Other materials required:
- Pencil
- Ruler (cm/mm)

Duration: Not set

Candidate forename		Candidate surname	

Centre number						Candidate number				

INSTRUCTIONS TO CANDIDATES

- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions, unless your teacher tells you otherwise.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Where space is provided below the question, please write your answer there.
- You may use additional paper, or a specific Answer sheet if one is provided, but you must clearly show your candidate number, centre number and question number(s).

INFORMATION FOR CANDIDATES

- The quality of written communication is assessed in questions marked with either a pencil or an asterisk. In History and Geography a *Quality of extended response* question is marked with an asterisk, while a pencil is used for questions in which *Spelling, punctuation and grammar and the use of specialist terminology* is assessed.
- The number of marks is given in brackets **[ ]** at the end of each question or part question.
- The total number of marks for this paper is **105**.
- The total number of marks may take into account some 'either/or' question choices.

1. For each of the pseudocode algorithms shown below, tick the appropriate box to show whether they will loop infinitely or not.

Pseudocode	Will loop infinitely	Will not loop infinitely
01 x = 0 02 while True 03 print x 04 endwhile		
01 x = 0 02 while x < 10 03 print x 04 endwhile		
01 x = 0 02 while x < 10 03 print x 04 x = x + 1 04 endwhile		
01 y = 5 02 for x = 1 to y 03 print x 04 next		

[4]

2. Victoria is writing a program using a high level language to display the meaning of computer science acronyms that are entered. The code for her first attempt at this program is shown below.

```
01 a = input("Enter an acronym")
02 if a == "LAN" then
03     print("Local Area Network")
04 elseif a == "WAN" then
05     print("Wide Area Network")
06 ……
07 ……
08 endif
```

(i) Complete the code above to print out an "unknown" message if any other acronym is entered by the user. [2]

(ii) Describe what is meant by a "high level language".

---

[2]

3(a). A programmer has written an algorithm to output a series of numbers. The algorithm is shown below:

```
01  for k = 1 to 3
02      for p = 1 to 5
03          print (k + p)
04      next p
05  next k
06  m = 7
07  print m * m
```

(i) Give the first **three** numbers that will be printed by this algorithm.

---------- [1]

(ii) State how many times line **03** will be executed if the algorithm runs through once.

---------- [1]

(b). Identify **two** basic programming constructs that have been used in this algorithm.

1 ----------

----

2 ----------

---------- [2]

(c).

(i) Describe what is meant by a variable.

---[2]

(ii) Identify **two** variables that have been used in the algorithm above.

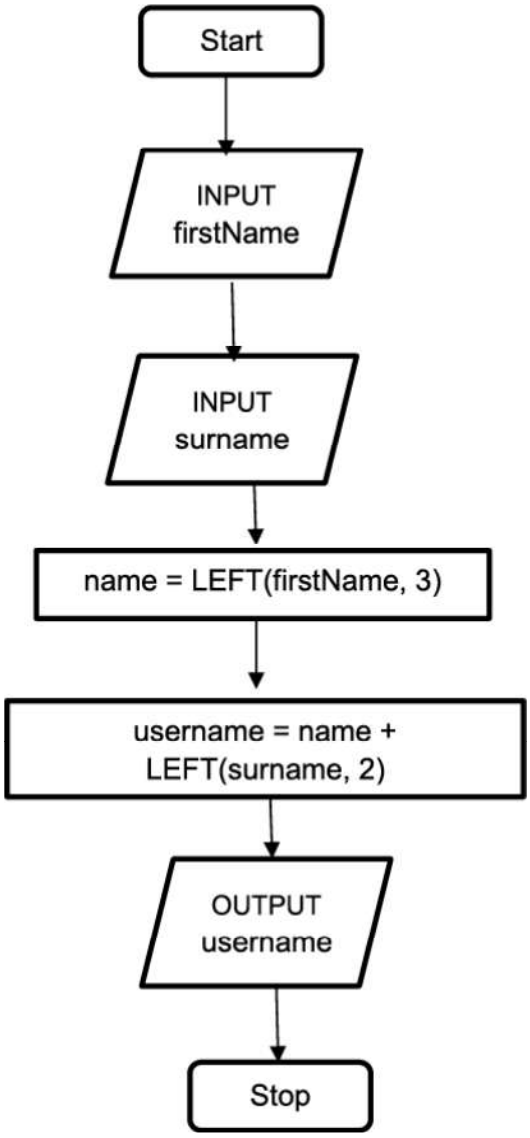
1 ---

2 ---

[2]

4(a). Johnny is writing a program to create usernames. The first process he has developed is shown in the flowchart in Fig. 1.

Fig. 1



For example, using the process in Fig. 1, Tom Ward's user name would be TomWa.

State, using the process in Fig. 1, the username for Rebecca Ellis.

---

[1]

(b). Johnny has updated the process used to create usernames as follows:

- If the person is male, then their username is the last 3 letters of their surname and the first 2 letters of their first name.
- If the person is female, then their username is the first 3 letters of their first name and the first 2 letters of their surname.

• What would be the username for a male called Fred Biscuit using the updated process?

---

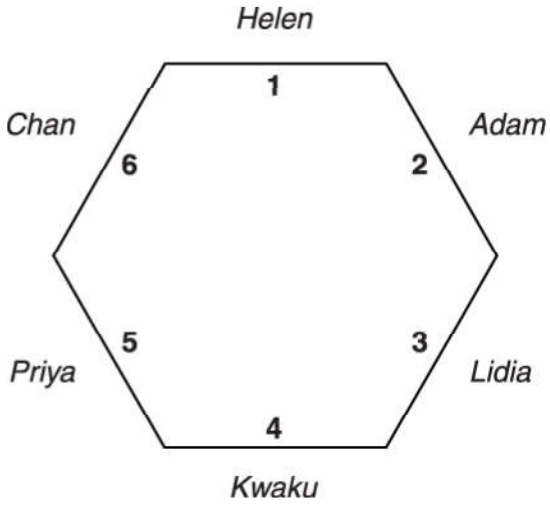
[1]

• Write an algorithm for Johnny to output a username using the updated process.

---

[6]

5(a). A game on a computer shows six players around a table on seats. They are numbered 1 to 6 as shown below.



The names of the players are stored in an array with six elements called PlayerName. The index position of the array is used to indicate the seat number.

For example, the value of PlayerName(1) is "Helen".

State the value of PlayerName(3).

---

[1]

(b). Describe what will happen if the code for the game includes an instruction to print the value of PlayerName(7).

---

[2]

(c). During the game, each player sometimes moves clockwise by a given number of places.

For example, if the number of places is 2, Helen will move to seat 3, Priya will move to seat 1 etc.

Write an algorithm that will update the contents of the array PlayerName after a move has occurred. Your algorithm should:

- allow the number of places to move to be input
- use iteration
- ensure that all of the existing players' names are moved to the correct position in the array.

[6]

6. Joseph is an author and programmer, and he needs to estimate how many pages his new book will have.

Each page has an average of 300 words. Each chapter starts with a chapter title page.
The number of pages is estimated by;

- dividing the number of words by 300
- ignoring the decimal part of the division
- adding the number of chapters to this total.

Joseph uses the algorithm below to estimate the number of pages, but his algorithm does not give the correct result.

```
01 INPUT numberOfWords
02 INPUT numberOfChapters
03 CONST wordsPerPage = 300
04 numberOfPages = RoundDown(numberOfWords / wordsPerPage)
05 numberOfPages = numberOfWords + numberOfChapters
06 OUTPUT numberOfPages
```

Joseph has used a `RoundDown` function to remove the decimal part of the division, e.g. `RoundDown(6.2)` would return 6, `RoundDown(7.8)` would return 7.

State whether this algorithm uses selection, sequence or iteration.

[1]

7. Joseph is an author and programmer, and he needs to estimate how many pages his new book will have.

Each page has an average of 300 words. Each chapter starts with a chapter title page.
The number of pages is estimated by;

- dividing the number of words by 300
- ignoring the decimal part of the division
- adding the number of chapters to this total.

Joseph uses the algorithm below to estimate the number of pages, but his algorithm does not give the correct result.

```
01  INPUT numberOfWords
02  INPUT numberOfChapters
03  CONST wordsPerPage = 300
04  numberOfPages = RoundDown(numberOfWords / wordsPerPage)
05  numberOfPages = numberOfWords + numberOfChapters
06  OUTPUT numberOfPages
```

Joseph has used a `RoundDown` function to remove the decimal part of the division, e.g. `RoundDown(6.2)` would return 6, `RoundDown(7.8)` would return 7.

There is an error in line `05` of the algorithm.

Write a corrected line of code to replace line `05`.

[1]

8(a). Heath is researching how long, to the nearest minute, each student in his class spends playing computer games in one week (Monday to Friday). He is storing the data in a 2D array.

Fig. 2 shows part of the array, with 4 students.

Fig. 2

Days of the week	Students: 0	1	2	3
0	60	30	45	0
1	180	60	0	60
2	200	30	0	20
3	60	10	15	15
4	100	35	30	45

For example, student 1, on Monday (day 0), played 30 minutes of computer games.

Explain why Heath is using an array to store the data.

---

[2]

(b).

(i) Identify a data type that could be used to store the number of minutes in this array.

---

[1]

(ii) State why this data type is the most appropriate.

---

[1]

9(a). Santos is writing a program that guesses the number of goals a team will score in a football match.

The algorithm for his program is shown below:

```
01  CONST Noise = 10
02  INPUT Wins
03  INPUT Losses
04  Goals = 0
05  Net = Wins - Losses
06  WHILE Net > Noise
07   Goals = Goals + 1
08   Net = Net - Noise
09  END WHILE
10  OUTPUT Goals
```

State what is meant by a constant and give an example from the algorithm above.

---

[2]

(b). State what is meant by a variable and give an example from the algorithm above.

---

[2]

(c). State the number of goals that will be output by this algorithm for the following inputs.
Explain how you obtained your answer in each case.

Wins = 30 Losses = 25

[2]

Wins = 20 Losses = 5

[3]

10. OCR High School uses a computer system to store data about students' conduct. The system records good conduct as a positive number and poor conduct as a negative number. A TRUE or FALSE value is also used to record whether or not a letter has been sent home about each incident.

An example of the data held in this system is shown below in Fig. 1:

StudentName	Detail	Points	LetterSent
Kirstie	Homework forgotten	−2	FALSE
Byron	Good effort in class	1	TRUE
Grahame	100% in a test	2	FALSE
Marian	Bullying	−3	TRUE

Fig. 1

A single record from this database table is read into a program that uses an array with the identifier `studentdata`. An example of this array is shown below:

```
studentdata = ["Kirstie", "Homework forgotten", "-2", "FALSE"]
```

The array is zero based, so `studentdata[0]` holds the value "Kirstie".

Write an algorithm that will identify whether the data in the `studentdata` array shows that a letter has been sent home or not for the student. The algorithm should then output either "sent" (if a letter has been sent) or "not sent" (if a letter has not been sent).

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[4]

11(a). Heath is researching how long, to the nearest minute, each student in his class spends playing computer games in one week (Monday to Friday). He is storing the data in a 2D array.

Fig. 2 shows part of the array, with 4 students.

Fig. 2

Days of the week \ Students	0	1	2	3
0	60	30	45	0
1	180	60	0	60
2	200	30	0	20
3	60	10	15	15
4	100	35	30	45

For example, student 1, on Monday (day 0), played 30 minutes of computer games.

Heath wants to output the number of minutes student 3 played computer games on Wednesday (day 2). He writes the code:

```
print (hoursPlayed[3,2])
```

The output is 20.

(i) Write the code to output the number of minutes student 0 played computer games on Wednesday.

---

[1]

(ii) State the output if Heath runs the code:

```
print (hoursPlayed[2,1])
```

---

[1]

(iii) State the output if Heath runs the code:

```
print (hoursPlayed[3,1] + hoursPlayed[3,2])
```

---

[1]

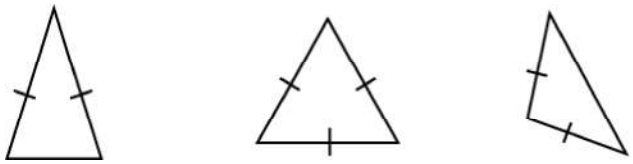
(iv) Write an algorithm to output the total number of minutes student 0 played computer games from Monday (day 0) to Friday (day 4).

[3]

(b). Heath needs to work out the average number of minutes spent playing computer games each day for the class, which contains 30 students. Write an algorithm to output the average number of minutes the whole class spends playing computer games each day.

[8]

12. An isosceles triangle is a triangle that has at least two equal sides. The diagram below shows examples of isosceles triangles. In each diagram the marked sides are equal.

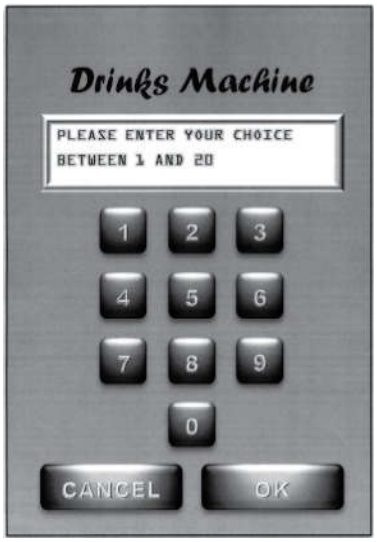


Write an algorithm for a computer program that determines whether a triangle is an isosceles triangle.

- The user inputs the lengths of the three sides as Length1, Length2 and Length3
- If any two sides have the same length the program outputs “Isosceles”
- Otherwise the program outputs “Not Isosceles”

[5]

13. * A free drinks machine in an office provides 20 different drinks.



The machine has a small keypad with keys 0 to 9, OK and CANCEL. It also has a small LCD screen, which can display a short message.

To get a drink, users select an item number between 1 and 20 with the keypad and confirm their choice by pressing OK. If they make a mistake they can press the CANCEL button and start again. If the selection is valid and the drink is available it dispenses the drink. The display screen is used to show suitable short messages throughout the process.

Write an algorithm for the process described above.

The quality of written communication will be assessed in your answer.

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[6]