PiXL Independence:

Computer Science - Student Booklet

KS4

Practical Programming

Contents:

i. Multiple Choice Quizzes

10 credits for each set of questions answered.

Quiz 1

1. Which is a way of locating an item by dividing in half the portion of the list that could contain the item, until you have narrowed down the possible locations to just one?

    a. Linear search
    b. Bubble sort
    c. Binary search
    d. Merge sort
    e. Insertion sort

2. What is one convention that will make a program more maintainable?

    a. Use of Boolean datatypes wherever possible
    b. Commenting the code
    c. Variable names being shortened to single letters
    d. Using an IDE which has a lot of extra functions

3. What will the result of `11 MOD 3` be?

    a. 8
    b. 3
    c. 2
    d. 14
    e. 1

4. Here is a line from a program: `chesspiece='Knight'.`
   What will `chesspiece.length` return?

    a. 6
    b. 10
    c. Knight
    d. chesspiece.Knight

5. Which statement is true?

    a. Logic errors are easier to find than syntax errors
    b. The program will work fully with a syntax error
    c. The IDE highlights logic errors
    d. Using True instead of False will cause a logic error

6. When a programmer has finished her code, the first type of test will most likely attempt to find out if each subprogram works on its own. What type of testing is this?

    a. Functional testing
    b. Unit testing
    c. Integration testing
    d. Black box testing

Quiz 2

1. Here is a list to be sorted in ascending order by a bubble sort [4,2,13,12,1,3]. After the first pass through (or iteration) what will the list look like?

    a. [4,2,12,1,3,13]
    b. [4,2,12,3,1,13]
    c. [4,2,13,1,3,12]
    d. [2,4,12,1,3,13]
    e. [1,2,3,4,12,13]

2. What is a logic error?

    a. Rules of language not followed
    b. Variable used before being assigned
    c. An error that causes an unexpected output
    d. Wrong data type being operated e.g. trying to add an integer to a string
    e. When a list index is out of range.

3. A program which controls a drinks dispenser has a variable called `buttonPressed` which records whether the dispense button has been pressed. What is the most appropriate data type for `buttonPressed`?

    a. Integer
    b. String
    c. Boolean
    d. Real (float)

4. Which of these statements is used in selection?

    a. while
    b. else
    c. for
    d. repeat
    e. until

5. Which is not an advantage of authentication?

    a. Can control different levels of access
    b. Can make programs shorter and more efficient
    c. Can ensure only authorised user can access programs
    d. Can protect data from unauthorised access

6. What will int(a) return?

    a. a
    b. The ASCII value of ‘a’
    c. Error
    d. 1

Quiz 3

A car shop has a database of models. The fields are as follows: `Car_Reg, Make, Model, Price`.

1. What would the data type of `Car_Reg` be?

    a. Boolean
    b. Real (float)
    c. String
    d. Integer

2. What would the data type of `Price` be?

    a. Boolean
    b. Real (float)
    c. String
    d. Integer

3. Which field would be best as a primary key?

    a. Car_Reg
    b. Make
    c. Model
    d. Price

4. `myArray=['Mack','B','Synth','The Wall','Singer']`. What is the value of `myArray[1]`?

    a. Mack
    b. B
    c. Synth
    d. The Wall
    e. Singer

5. Which of these statements is used for iteration?

   a. if
   b. else
   c. elif (else if)
   d. for
   e. print
   f. case

6. Which array can a binary search be used on?

   a. [19,1,6,8,4]
   b. [1,4,6,8,19,67]
   c. [9,2,2,2,3,7]
   d. [‘b’,’x’,’c’,’e’,’d’]

Quiz 4

1. A program asks for a user's age for entry into a database. Which kind of validation would be most appropriate?

    a. Look up
    b. Length check
    c. Range check
    d. Check digit

Here is an algorithm for part of a program which generates a username for a new user of a system.

```
User enters surname
User enters forename
User enters year of birth
username equals first two letters of surname + first letter of forename +last two digits of year
while username already exists
    username equals surname + first letter of forename + last two digits of year
```

2. What would username equal if the first user was Ivy Rorschach, born in 1955?

    a. rorschachi1955
    b. rorschachi55
    c. roi1955
    d. ro55
    e. roi55

3. Ida Rorschach, born in 1955, signs up. What is her username?

    a. rorschachi1955
    b. rorschachi55
    c. roi1955
    d. ro55
    e. roi55

Here is the pseudocode for a function to find the area of a circle.

```
1 function circle(radius)
2     pi=3.142
3     area=pi*radius*radius
4     return print(area)
5 endfunction
```

4. What will happen if the function is called like this `circle(2)`

   a. “area”
   b. nothing
   c. 2
   d. 12.57
   e. 6.28

5. In the function, `pi` is a...

   a. Global variable
   b. Parameter
   c. Constant
   d. Local variable

6. `area` is a….

   a. Global variable
   b. Parameter
   c. Constant
   d. Local variable

Quiz 5

1. Which of the following Boolean statements is correct?

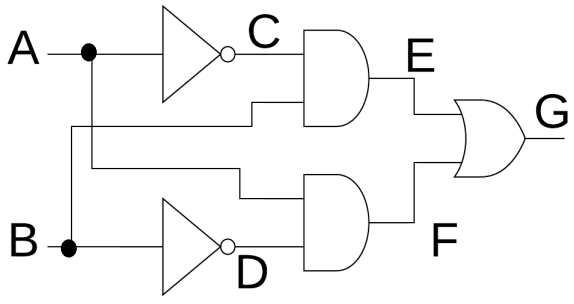
   a. A>B will give the result False if A =10 and B=5
   b. A=<B will give the result False if A=1 and B=1
   c. A>B will give the result True if B=10 and A=4
   d. A<B will give the result False if B=3 and A=4
   e. A>B will give the result True if A =10 and B=5

2. What is this truth table for?

A	B	OUT
0	0	0
0	1	1
1	0	1
1	1	1

   a. AND
   b. OR
   c. NOT
   d. XOR
   e. NOR
   f. NAND

3. A=1, B=0



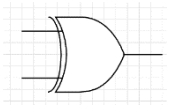
   a. C=0, D=1, E=0, F=1, G=1
   b. C=1, D=1, E=0, F=1, G=0
   c. C=1, D=1, E=0, F=1, G=1
   d. C=0, D=1, E=0, F=1, G=0
   e. C=1, D=1, E=0, F=1, G=1

4. Simplify A+A.B

   a. A
   b. B
   c. A+B
   d. A.B

5. Which of the following is False?

   a. A.0=0
   b. A.A=A
   c. A.1=1

6. What is this symbol? 

   a. OR
   b. AND
   c. XOR
   d. NOR
   e. NAND
   f. NOT

Quiz 6

1. A program for a game stores users' names and their high score. What is the most appropriate way of storing this?

    a. 1D array
    b. Constant
    c. 2D array
    d. Global variable
    e. Local variable

2. Here is a description of a sorting algorithm. "A list is repeatedly split in half until it is a number of lists containing one element each. Pairs of lists are then repeatedly sorted and joined together until a complete sorted list is made". What kind of sort is being described?

    a. Bubble sort
    b. Merge sort
    c. Insertion sort
    d. Quick sort

3. Here is pseudocode algorithm for a program to work out how much to pay a worker. p is overall pay in £. What will the value of p be if the user enters 8 for h and 50 for m?

```
1 h=input('Hours worked')
2 m=input('Items made')
3 if h<=5 then
4     p=h*m*0.5
5 else
6     p=h*m*0.5+(h-5)*10
7 endif
```

    a. 200
    b. 230
    c. 260
    d. 203
    e. 210

4. The algorithm above uses

    a. Sequence
    b. Iteration and sequence
    c. Sequence, selection, iteration
    d. Sequence and selection

5. A client gives a programmer a detailed brief outlining what she wants from a programming solution. What is the process where the unnecessary detail is removed from a client's requirements?

    a. Validation
    b. Abstraction
    c. Decomposition
    d. Sequence
    e. Conversion

6. What will 11//4 (sometimes written as 11DIV5 in pseudocode) return?

    a. 2.75
    b. 2
    c. 3
    d. 2.5

Quiz 7

1. What will `str(2)` return?

   a. 2
   b. Error
   c. '2'
   d. 2.0

2. In the pseudocode algorithm below, what will be the output if the user inputs 100?

```
1 number=input('Input a number')
2 while number>2 and number<10
3     number=input('Input a number')
4 endwhile
5 print(number*2)
```

   a. 200
   b. Input a number
   c. 100100

3. **`myArray=[ ['Luke','Intrest'], ['Kevin','Congleton'], ['Byron','Gregson'], ['Nicky','Klosterman'], ['Irma','Roswell']]`** What is myArray[1,0]?

   a. Luke
   b. Intrest
   c. Kevin
   d. Congleton
   e. Byron
   f. Gregson

4. A student writes a program using an IDE. Which of these features is not provided by the IDE?

   a. Help files
   b. Code completion
   c. Colour coding of code
   d. Logic Error identification
   e. Syntax Error identification

5. In this part of a program, which values will result in an output of ‘Pass’?

```
if a==True and d==9 and c==False or b>15 then
    print('Pass')
else
    print('Fail')
endif
```

a. a=False, b=7, c=False, d=9
b. a=True, b=10, c=False, d=9
c. a=True, b=10, c=False, d=10
d. a=False, b=7, c=True, d=9

6. In the pseudocode below, what input will result in an output of ‘correct’?

```
chesspiece=input('What is another name for castle?')
while chesspiece.lower!='rook'
    chesspiece=input('Incorrect')
endwhile
print('correct')
```

a. ‘Rook’
b. ‘ro ok’
c. ‘Knight

Quiz 8

1. What is the denary number 103 in binary?

   a. 01100001
   b. 00111011
   c. 01111101
   d. 01100111
   e. 11101110

2. What is 10010010_2 in denary?

   a. 146
   b. 250
   c. 208
   d. 238
   e. 138

3. What is $3B_{16}$ in binary?

   a. 10111011
   b. 10001011
   c. 10110011
   d. 00111011
   e. 10001001

4. What is $1F_{16}$ in denary?

   a. 30
   b. 35
   c. 105
   d. 31
   e. 15

5. What is 10011001 + 00111111?

   a. 10011000
   b. 11010000
   c. 11011000
   d. 10001000
   e. 01011000

6. Perform an arithmetic shift of one place left on 00011011_2 and convert the result to denary.

   a. 27
   b. 50
   c. 270
   d. 54
   e. 13

Quiz 9

1. To divide a binary number by 4, what kind of shift is required?

    a. One place to the left
    b. Two places to the left
    c. Three places to the left
    d. One place to the right
    e. Two places to the right
    f. Three places to the right

2. How many characters can be represented using extended ASCII?

    a. 128
    b. 256
    c. 255
    d. 127

3. Multiply the binary 00001010_2 by 2_{10}

    a. 00101000
    b. 00110100
    c. 10100000
    d. 00010100

4. This is when a calculation is performed on a number to generate a digit. A calculation can then be made on the number and the result compared with the digit to see if there is an error in the number.

    a. Overflow
    b. Check digit
    c. Arithmetic shift left
    d. Arithmetic shift right

5. Which is the correct ascending order of prefix?

   a. kilo, Giga, Mega, Terra, Peta
   b. kilo, Mega, Giga, Terra, Peta
   c. Peta, Terra, Giga, Mega, kilo
   d. kilo, Mega, Giga, Peta, Terra

6. What situation will arise when these two bytes are added together: 11111111_2+11111111_2?

   a. Syntax error
   b. Overflow error
   c. Impossible to add two bytes containing all 1's

Quiz 10

1. Which is an advantage of using a text file to store data?

   a. Makes the program more efficient
   b. Does not lose data when the program stops
   c. Good for storing text only
   d. Good for storing arrays

2. `town='Sleaford'`. What will `print(town[0:2])` return?

   a. 'S'
   b. 'Sl'
   c. 'Sle'
   d. 'Slea'

3. A student is playing a game where two dice are rolled 10 times, then the scores are added. The results are stored in an array in a computer program. The most suitable method to find if a total of 7 has been rolled is:

   a. Binary search
   b. Linear search
   c. Bubble sort
   d. Merge sort
   e. Insertion sort

4. Part of a database for a vinyl record shop is shown below.

ID	Artist	Album	Price	InStock
001	The Wall	New Pacts	15.50	3
002	Sonny Blount	Lanquidity	15.75	1
003	OC Ease	Weird Essex	25.00	2
004	Half Digestive	90 Miles From Home	21.00	0
005	Nelly Youth	Motor Biker	20.00	3
006	Candle	To Go Home	18.00	3

What would the query SELECT Artist WHERE Price<20 and InStock>2 return?

a. The Wall, Sonny Blount, Candle
b. Sonny Blount, Half Digestive
c. The Wall, Candle
d. OC Ease, Half Digestive

5. What is the best data type for Price?

a. Integer
b. Char
c. String
d. Real
e. Boolean

6. A new field is to be added. Reorder will indicate whether more items need to be reordered or not. What is the most appropriate data type for this?

a. Integer
b. Char
c. String
d. Real
e. Boolean

ii. Exam Questions

10 credits each

1. Bella is writing a computer program for a text based adventure game.

   a. The computer program has to sort the following array of high scores.
   [3,9,11,7,2,8,6,17]. Show below the stages of a merge sort when applied to this data.

(6 marks)

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   b. The program has to find ***spear*** from the following array of weapons.

axe	cutlass	hammer	lance	mace	pike	spear	sword

   Show the stages of a binary search when applied to this list.

(3 marks)

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2. Here is a pseudocode program to check the length of a username.

```
1  function checkName(name)
2      pass=False
3      while name.length!=4
4          name=input('Enter your username')
5      endwhile
6      pass=True
7      return pass
8  endfunction
9  user=input('Enter a username')
10 correctLength=checkname(user)
```

a. Identify the local variables in this program.

(2 marks)

_____

_____

_____

b. Identify the global variables in this program.

(2 marks)

_____

_____

_____

c. What would be the value of correctLength if user='Gary4'?

(1 mark)

_____

d. Explain the difference between local and global variables.

(2 marks)

_____

_____

_____

_____

e. Why is it good practice to use local variables wherever possible?

(3 marks)

3. Below is a pseudocode algorithm for part of an adventure game which simulates a battle.

```
1  magic=0
2  attack=input('What is your given attack value')
3  defence=input('What is your given defence value')
4  health=15
5  for i=0 to 4
6      if attack>defence then
7          damage=attack-defence
8          health=health-damage
9          attack=attack-1
10     elseif attack==defence then
11         health=health
12         attack=attack-1
13     else
14         magic=magic+1
15     endif
16 next i
```

a. Complete the trace table if attack =5 and defence = 3. You may not have to use all of the rows.

(5 marks)

i	defence	attack	magic	damage	health

b. The programmer is going to put the code which simulates the battle into a function (sub program). What is a benefit of using a subprogram in as part of a larger program?

(2 marks)

4. A toy factory wants a program to calculate how much to pay its workers.

   The pay is based on how many wooden toys are assembled, the hours worked and the hours worked overtime.

   The standard rate is hours worked, multiplied by toys made, multiplied by 0.75. If a worker works over 8 hours, then the pay is the standard rate for the 8 hours plus the additional hours, multiplied by toys made, multiplied by 1.5. If less than 5 hours is worked, the pay is the amount of toys made multiplied by 1.5.

   Write a program in pseudocode to calculate the workers' pay.

(10 marks)

5. A pseudocode program that finds which player has the highest score in a computer game is shown below.

```
1  set highScores=[['Johnny',23] ['Paul',19] ['Steve',50] ['Sid',13]]
2  set highscore=0
3  set topgun=''
4  for i=0 to 3
5      if highScoresscores[i,1]>highscore then
6          highscore=scores[i,1]
7          topgun=players[i,0]
8      else
9          highscore=highscore
10         topgun=topgun
11     end if
12 next i
```

a. When the program is executed what will be the values of highscore and topgun?

(1 mark)

b. What program feature is found on the lines indicated?

(4 marks)

Line	Program feature
1	
6	
5	
3	

c. Lines 1 and 2 could be replaced by a single data structure. What would this look like?

(1 mark)

d. Rewrite lines 6,7 and 8 to make the program work with the new data structure.

(3 marks)

6.

a. Kara takes a picture of a landscape for an art project with a digital camera. Explain how a computer will store the digital image.

(2 marks)

b. Kara needs to e-mail the image to her teacher but the file is too big. She uses lossy compression to resolve this. Describe how this method will compress the image.

(2 marks)

c. Kara has to send a text file explaining her work to her teacher. Explain if lossy or lossless compression should be used and why?

(2 marks)

d. Give two reasons why lossy compression can be beneficial to a computer user.

(2 marks)

e. Kara also records some narration for her school project. The file is in mp3 format. Explain what bit depth and sample rate are and how they affect the size and quality of the file.

(4 marks)

7. Duncan is developing a program. The section of code below is to check if a username is the right length and if the username is admin then extra permissions while be granted.

```
1  x=input('Enter your username')
2  while x.length!=5
3      x=input('Enter a username which is 5 characters long')
4  endwhile
5  if x=='admin' then
6      p=True
7  else
8      p=False
```

a. Give two ways that Duncan can improve the maintainability of his code.

(2 marks)

b. Give one other way that the username could be validated.

(1 mark)

c. Explain how an IDE can help Duncan develop his program.

(4 marks)

d. Duncan could use a compiler or an interpreter to turn his program into machine code. Explain the difference between the two.

(4 marks)

8.

a. Showing your workings and complete the table below, converting between denary, binary and hexadecimal numbers as necessary.

(5 marks)

Hexadecimal	Denary	Binary
$9B_{16}$		10011011_2
	199_{10}	11000111_2
DD_{16}		
	122_{10}	01111010_2

b. Showing your workings, add 10111011_2 01110101_2

(2 marks)

c. Explain what problem will arise when both bytes in part b are added.

(1 mark)

d. Demonstrate what effect a shift of one place to the left will have on the following byte 00100100_2

(2 marks)

9. A vinyl record shop keeps a database of its stock. Below is an extract.

Stock_No	Artist	Album	In_stock	Re_order
001	Davis Bowlie	Loan	5	False
002	Rick Pawson	Pheasant	3	True
003	Deer	Leave Me Alone	11	False
004	Milko	Schmilco	9	False
005	Coppery Dan	Crisp Logic	2	True

a. When the shop owner enters in a product, it is subject to input validation. Describe input validation

(1 mark)

b. Give two input validation checks for the In_stock field.

(2 marks)

c. Give one input validation check for the Re_order field.

(1 mark)

d. Using the database above, describe the difference between a record and a field.

(2 marks)

e. The shop also has a database for storing details about staff and their bank details for payment. To access the database requires authentication. Describe authentication.

(1 mark)

f. Why might the shop want multiple layers of authentication for the database?

(2 marks)

_____

_____

_____

_____

10. A program for making sure a username is between 5 and 10 characters is shown below. The program contains a logic error.

```
1 username=input('Enter a username')
2 while username.length<5 and username.length<10
3     username=input('Enter a username')
4 print('Username has been set to ',username)
```

a. What is a logic error?

(1 mark)

_____

_____

_____

b. There is one change required to fix the logic error. Rewrite the line below.

(1 mark)

_____

_____

_____

c. Describe what a syntax error is.

(1 mark)

_____

_____

_____

d. Finding errors is part of testing. Describe the difference between iterative testing and final testing.

(4 marks)

iii. Wider Reading

50 credits each

https://www.justsoftwaresolutions.co.uk/articles/maintainable_code.html

http://softwaretestingfundamentals.com/white-box-testing/

https://www.guru99.com/black-box-testing.html

https://www.toptal.com/developers/sorting-algorithms

http://eewang.github.io/blog/2013/04/22/sort-algorithms/

https://thenextweb.com/insider/2016/03/31/5-technologies-will-flip-world-authentication-head/#.tnw_szr5rN0l

https://www.seguetech.com/advantages-and-drawbacks-of-using-stored-procedures-for-processing-data/

http://www.robelle.com/smugbook/todebug.html

http://python-textbok.readthedocs.io/en/1.0/Sorting_and_Searching_Algorithms.html#searching-algorithms

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