

Name:

Class Teacher:

Date:



OCR J276

GCSE Computer Science




REVISION BOOKLET

2.1 ALGORITHMS

Content in J276 GCSE Computer Science:

- 1.1 Systems Architecture
- 1.2 Memory
- 1.3 Storage
- 1.4 Wireless and Wired Networks
- 1.5 Network Topologies, Protocols and Layers
- 1.6 System Security
- 1.7 Systems Software
- 1.8 Ethical, Legal, Cultural and Environmental Concerns
- 2.1 Algorithms
- 2.2 Programming Techniques
- 2.3 Producing Robust Programs
- 2.4 Computational Logic
- 2.5 Translators and Facilities of Languages
- 2.6 Data Representation

2.1 ALGORITHMS

TOPIC			
Computational Thinking:			
Abstraction			
Decomposition			
Algorithmic Thinking			
Standard Searching Algorithms:			
Binary Search			
Linear Search			
Standard Sorting Algorithms:			
Bubble Sort			
Merge Sort			
Insertion Sort			
How to produce algorithms using:			
Pseudo code			
Flow diagrams			
Interpret, Correct or Complete algorithms			

2.1 ALGORITHMS

COMPUTATIONAL THINKING

ABSTRACTION

DECOMPOSITION

ALGORITHMIC THINKING

STANDARD SEARCHING ALGORITHMS

BINARY SEARCH

LINEAR SEARCH

STANDARD SORTING ALGORITHMS

BUBBLE SORT

MERGE SORT

INSERTION SORT

HOW TO PRODUCE ALGORITHMS USING:

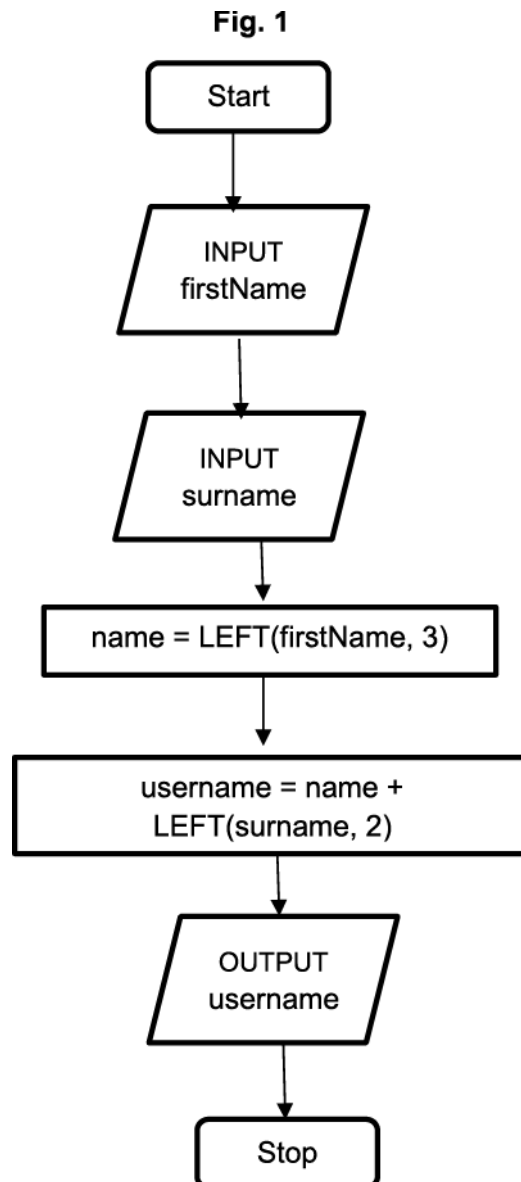
PSEUDO CODE

FLOW DIAGRAMS

INTERPRET, CORRECT OR COMPLETE ALGORITHMS

QUESTION 2

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



For example, using the process in **Fig 1**, Tom Ward's username would be TomWa. State, using the process in **Fig 1**, the username for Rebecca Ellis.

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QUESTION 3

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

		Students			
		0	1	2	3
Days of the week	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. Write the code to output the number of minutes student 0 played computer games on Wednesday.

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[1]

State the output if Heath runs the code: `print(hoursPlayed[2,1])`.

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[1]

State the output if Heath runs the code:

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

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[1]

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

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[3]

Heath has the day of the week stored as a number, e.g. 0 = Monday, 1 = Tuesday. Write a sub-program that takes the number as a parameter and returns the day of the week as a string.

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[5]

QUESTION 4

Willow has created a hangman program that uses a file to store the words the program can select from. A sample of this data is shown in **Fig 3**.

Fig. 3

crime	bait	fright	victory	nymph	loose
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Show the stages of a bubble sort when applied to data shown in **Fig 3**.

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[4]

Willow has created a hangman program that uses a file to store words the program can select from. A second sample of data is shown in **Fig 4**.

Fig. 4

amber	house	kick	moose	orange	range	tent	wind	zebra
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Show the stages of a binary search to find the word 'zebra' when applied to the data shown in **Fig 4**.

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[4]

QUESTION 5

Jim is writing a program to calculate the wages of workers in a teddy bear factory. Workers sometimes get a £50 bonus. Here is an algorithm used to calculate whether a worker should get a bonus.

```
Limit = 200
INPUT WagesEarned
IF WagesEarned < Limit THEN
    Pay = WagesEarned
ELSE
    Pay = WagesEarned + 50
END IF
```

State the value of Pay after this code is executed for each of the following values of WagesEarned.

- WagesEarned = 50 Pay =
- WagesEarned = 200 Pay =

[2]

The wages earned by a worker is either £2 for every teddy bear they have made or £5 for every house they have worked, whichever is larger. Write an algorithm that:

- allows the user to input the number of teddy bears made and the number of hours worked
- calculates the wages for the number of teddy bears made
- calculates the wages for the number of hours worked
- outputs the larger of the two results

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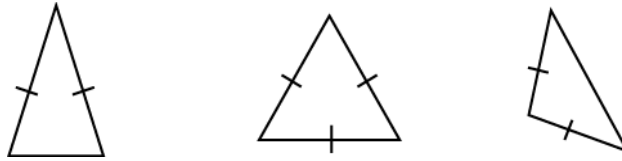
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[6]

QUESTION 6

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 length 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"

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QUESTION 7

Julie is writing a computer game that simulates a 100m race. Each time the space bar is pressed, the position of the player moves up by 1. When the position reaches 100, the player has won. Here is Julie’s algorithm for the program.

```
CONST PlayerKey = " "  
Position = 0  
REPEAT  
  INPUT KeyPressed  
  If KeyPressed = PlayerKey THEN  
    Position = Position + 1  
  END IF  
UNTIL Position = 100
```

To make the game more interesting, Julie changes the rules. Each time the spacebar is pressed, the position of the player will now move up by a random number. State **two** changes that need to be made to include this new rule. Justify each change.

Change 1

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Justification

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Change 2

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Justification

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QUESTION 8

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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QUESTION 9

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.

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[2]

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

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[2]

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

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[2]

- Wins = 20 Losses = 5

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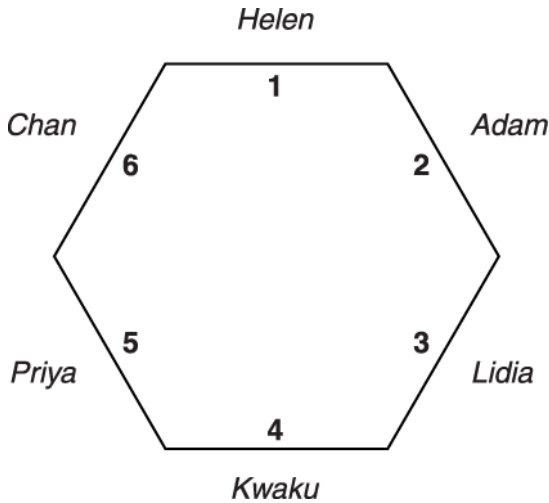
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[3]

QUESTION 10

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)`.

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[1]

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

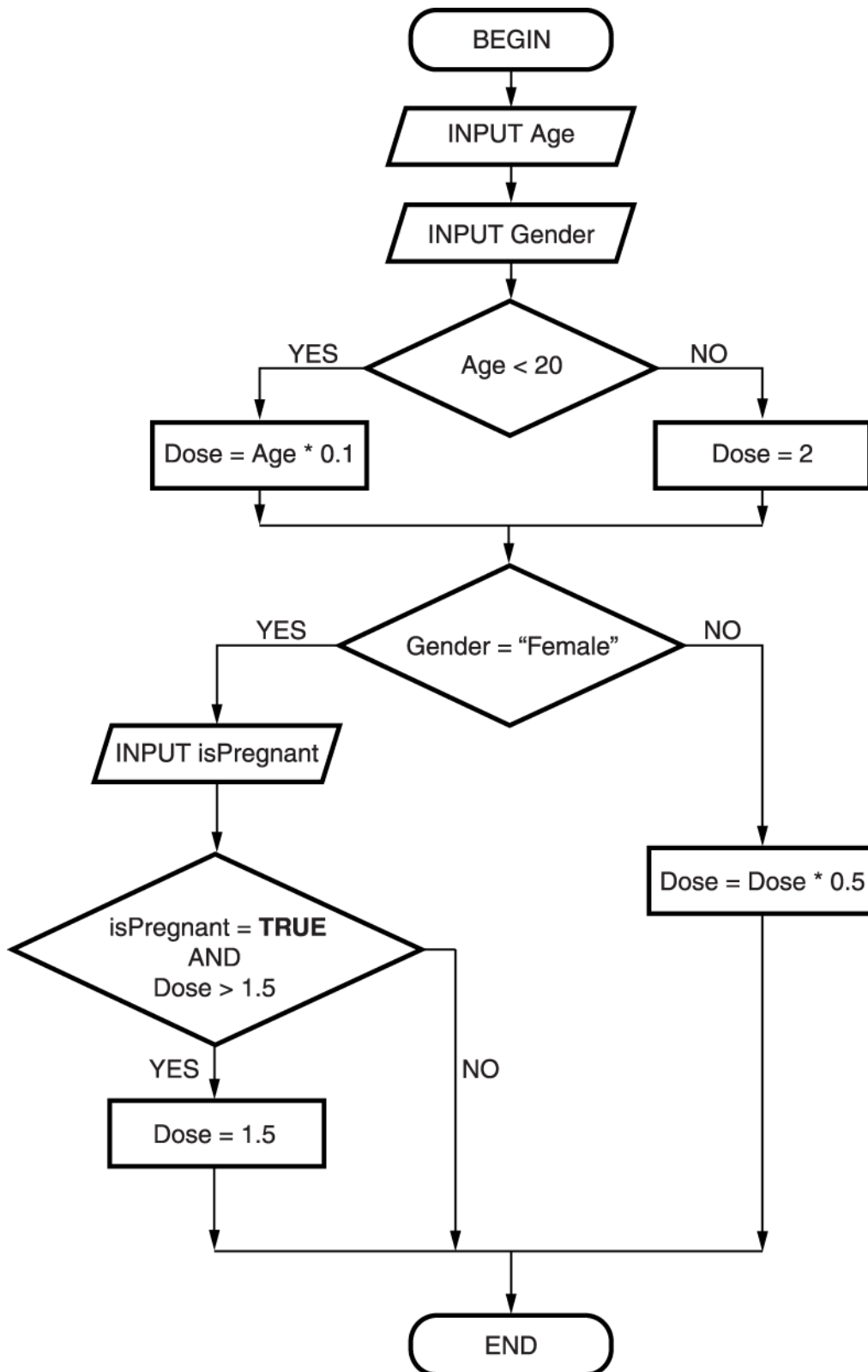
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[2]

QUESTION 11

A computer program calculates the correct dose in grams of a type of medicine. The algorithm used is shown by the flow diagram below.



Use the flow diagram to calculate the correct dose of medication for a male aged 30. You must show your working.

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[3]

Use the flow diagram to calculate the correct dose of medicine for a pregnant female aged 19. You must show your working.

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[4]

QUESTION 12

A memory game is played where:

- three players (A, B and C) have to choose a number between 0 and 100
- if the number has already been chosen, a message is displayed that says "taken"
- if the number has not already been chosen, the players letter is placed next to it
- the quantity of numbers that have not yet been chosen is displayed

The winner is the player who has chosen the most unique numbers by the end of the game. The numbers are stored in an array; `numbers ()`. A number that has not yet been chosen is stored as an empty string `""`. The players are represented by `"A"`, `"B"` and `"C"`. Fig 5 shows an extract from the array.

Number:	0	1	2	3	4	99	100
Player:	A	C	B		A			B	

