Name:

Class Teacher:

Date:

OCR J276

GCSE Computer Science

REVISION BOOKLET

2.2 PROGRAMMING TECHNIQUES

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

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2.1 Algorithms

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2.2 PROGRAMMING TECHNIQUES

TOPIC	☹	😐	☺
The use of variables, constants, operators, inputs, outputs and assignments			
The use of the three basic programming constructs used to control the flow of a program:			
Sequence			
Selection			
Iteration (count and condition controlled loops)			
The use of basic string manipulation			
The use of basic file handling operations:			
Open			
Read			
Write			
Close			
The use of records to store data			
The use of SQL to search for data			
The use of arrays (or equivalent) when solving problems, including both one and two dimensional arrays			
How to use sub programs (functions and procedures) to produce structured code			
The use of data types:			
Integer			
Real			
Boolean			
Character and String			
Casting			
The common arithmetic operators			
The common Boolean operators			

2.2 PROGRAMMING TECHNIQUES

THE USE OF VARIABLES, CONSTANTS, OPERATORS, INPUTS, OUTPUTS & ASSIGNMENTS

THE USE OF THE THREE BASIC PROGRAMMING CONSTRUCTS USED TO CONTROL THE FLOW OF A PROGRAM

SEQUENCE

SELECTION

ITERATION (COUNT AND CONDITION CONTROLLED LOOPS)

THE USE OF BASIC STRING MANIPULATION

THE USE OF BASIC FILE HANDLING OPERATIONS

OPEN

READ

THE USE OF RECORDS TO STORE DATA

THE USE OF SQL TO SEARCH FOR DATA

THE USE OF ARRAYS (OR EQUIVALENT) WHEN SOLVING PROBLEMS, INCLUDING BOTH ONE AND TWO DIMENSIONAL ARRAYS

HOW TO USE SUB-PROGRAMS (FUNCTIONS AND PROCEDURES) TO PRODUCE STRUCTURED CODE

THE USE OF DATA TYPES
INTEGER

REAL

BOOLEAN

CHARACTER AND STRING

CASTING

THE COMMON ARITHMETIC OPERATORS

THE COMMON BOOLEAN OPERATORS

EXAM QUESTIONS

QUESTION 1

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

Fig. 1

```
                    Start
                      │
                      ▼
                 ┌─────────┐
                 │  INPUT  │
                 │firstName│
                 └─────────┘
                      │
                      ▼
                 ┌─────────┐
                 │  INPUT  │
                 │ surname │
                 └─────────┘
                      │
                      ▼
        ┌──────────────────────────┐
        │ name = LEFT(firstName, 3) │
        └──────────────────────────┘
                      │
                      ▼
        ┌──────────────────────────┐
        │     username = name +     │
        │     LEFT(surname, 2)      │
        └──────────────────────────┘
                      │
                      ▼
                 ┌─────────┐
                 │ OUTPUT  │
                 │username │
                 └─────────┘
                      │
                      ▼
                    Stop
```
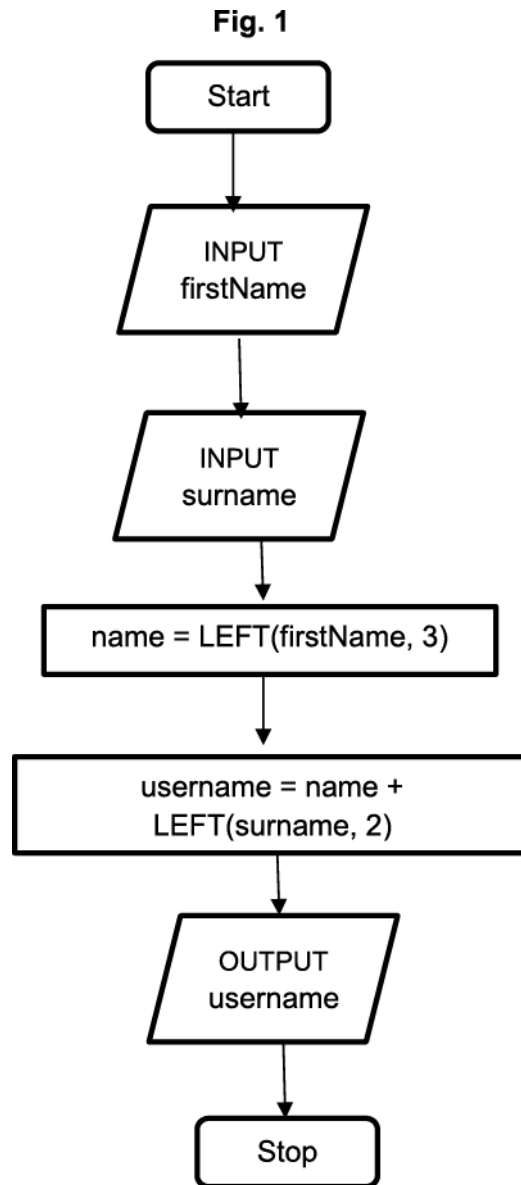
For example, using the process in **Fig 1**, Tom Ward's username would be TomWa. State, using the process in **Fig 1**, the username for Rebecca Ellis.

....

[1]

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?

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[1]

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

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[6]

QUESTION 2

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
	0	60	30	45	0
Days of the week	**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.

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....

....

[2]

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

....

[1]

State why this data type is the most appropriate.

....

[1]

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.

....

[1]

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

....
[1]

State the output if Heath runs the code:

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

....
[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]

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.

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[8]

QUESTION 3

The area of a circle is calculated using the formula $A = \pi r^2$, where π is equal to 3.142 and r is the radius. Finn has written a program to allow a user to enter the radius of a circle as a whole number, between 1 and 30, and output the area of the circle.

```
01      int radius = 0
02      real area = 0.0
03      input radius
04      if radius < 1 OR radius > 30 then
05      print ('Sorry, that radius is invalid')
06      else
07      area = 3.142 * (radius ^ 2)
08      print (area)
09      end if
```

Identify **two** variables used in the program.

....

....

[2]

Identify **one** item in the program that could have been written as a constant.

....

[1]

Give **one** reason why you have identified this item as a constant.

....

....

[1]

QUESTION 4

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
```

State an example of a constant and a variable in the algorithm above.

Constant:

....

Variable:

....

[2]

State what is meant by selection and iteration using examples from Julie's algorithm.

Selection

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....

Example

....

....

Iteration

....

....

Example

....

....

[4]

QUESTION 5

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]

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

....

....

[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

....

....

[2]

- Wins = 20   Losses = 5

....

....

....

[3]

QUESTION 6

When customers pay using a card such as the one below, shops use computer systems to process the payment.

Tick **one** box in each row to show which of the data types given is the most appropriate data type for each of the following data items.

Data item	Date	Integer	Real	String
The amount paid				
The customer's card number				
When the payment is made				

[3}

QUESTION 7

A computer program calculates the correct dose in grams of a type of medicine. The algorithm used is shown by the flow diagram below.
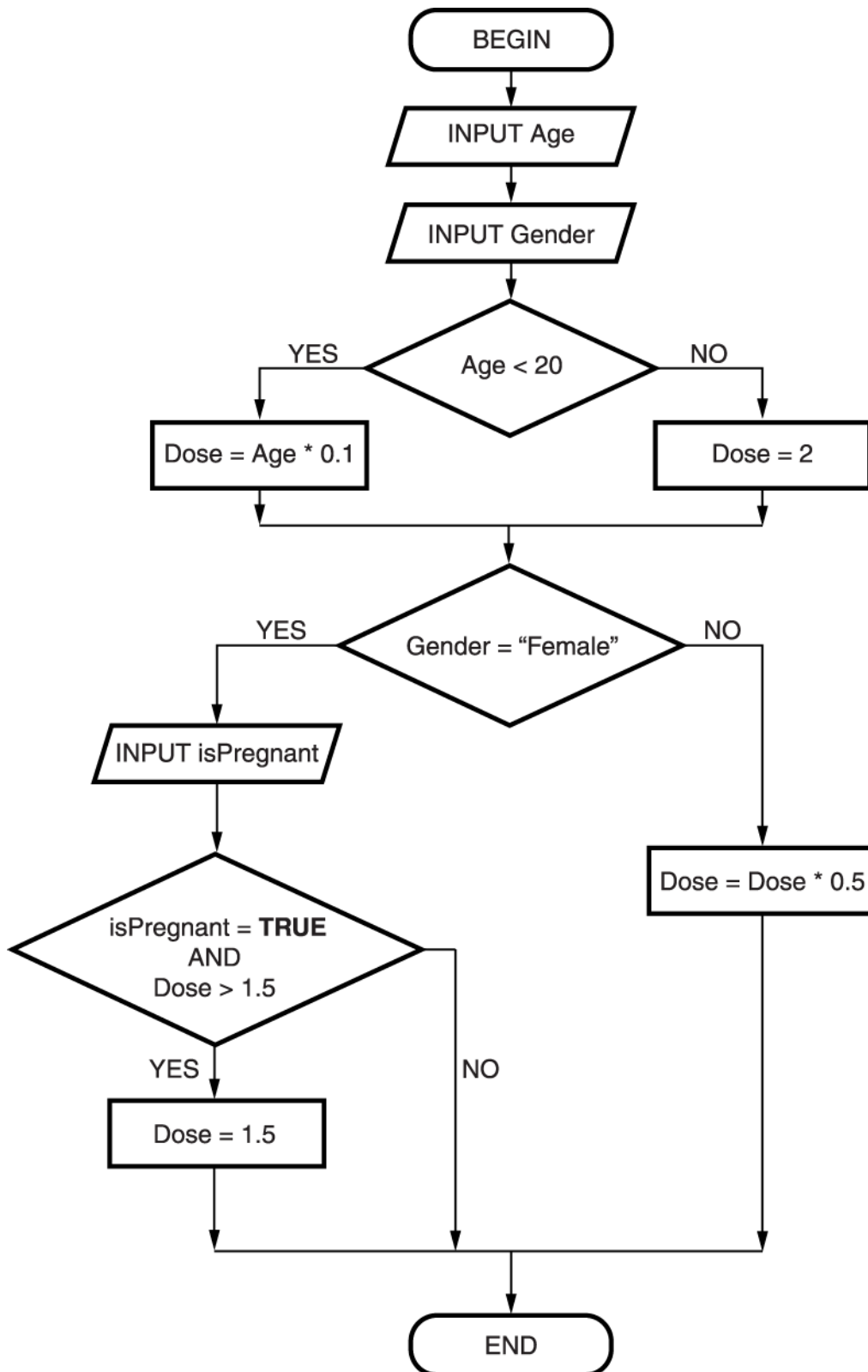
The data type of the variable Age is Integer. State the data type of the following variables used in the flow diagram.

Variable	Data Type
Gender	
Dose	
isPregnant	

[3]

QUESTION 8

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]

Line 03 defines a constant. Describe what is meant by a constant.

....

....

[2]

Identify the most appropriate data type for the following variable `numberOfWords`. Give a reason for your choice.

………

………

………

[2]

Joseph is changing his algorithm and needs to store the name and price of his new book in new variables. State the most appropriate data type(s) for these variables.

Name

………

Price

………

[2]

QUESTION 9

Charlotte runs a website which stores details about movies. The users can log onto the website and leave ratings for movies. The website uses a database with three tables:

- The table `FILM` contains the following fields; `FilmID, Title, Year, Director, Category`
- The table `USER` contains the following fields; `UserID, FirstName, Surname, DateofBirth`
- The table `RATING` stores, amongst other fields, the rating a user has given a film (a score out of 5).

An extract of the data in the table `RATING` is shown below.

RatingID	FilmID	UserID	Rating
00214	16CM12	20_Elliot	4.5
00215	55HR8	Jade01	1
00216	12HR15	Sunil_99	1
00217	16SF8	Jade01	2

Explain why **FilmID** has been included in the **RATING** table.

....

....

....

[3]

Give **one** example of a record that could be stored in the user table.

....

....

[1]

Charlotte uses a query to list films. The query uses the following criteria:

                    (Rating < 2) AND (UserID = "Jade01")

List the RatingID(s) of the rating(s) that will be selected from the extract shown.

....

....

[1]

Write the criteria for a query that will select all Films produced in the Year 2015 in the Category "**Comedy**".

....

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....

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[3]