GCE AS/A LEVEL

2500U10-1

TUESDAY, 14 MAY 2024 – AFTERNOON

COMPUTER SCIENCE – AS unit 1

Fundamentals of Computer Science

2 hours plus your additional time allowance

Surname _____

First name(s) _____

Centre Number _____

Candidate Number 2 _____

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	6	
2.	8	
3.	8	
4.	8	
5.	8	
6.	6	
7.	6	
8.	4	
9.	8	
10.	8	
11.	8	
12.	6	
13.	6	
14.	10	
Total	100	

ADDITIONAL MATERIALS

A calculator.

INSTRUCTIONS TO CANDIDATES

Use black ink, black ball-point pen or your usual method.

Write your name, centre number and candidate number in the spaces provided on the front cover.

Answer ALL questions.

Write your answers in the spaces provided in this booklet. If you run out of space, use the additional page(s) at the back of the booklet, taking care to number the question(s) correctly.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets at the end of each question or part-question.

The total number of marks available is 100.

Assessment will take into account the quality of written communication used in your answers.

Answer ALL questions.

1. Draw a truth table for the following Boolean expression: [6 marks]

$$X = P \oplus Q + R.(P + \overline{Q})$$

2 (a) Describe the typical contents of a TCP/IP packet.
[5 marks]

2 (b) Explain network collisions, how they are detected, and dealt with. [3 marks]

3. Clearly showing each step, simplify the following Boolean expression: [8 marks]

$$A.(B + C) + \overline{C}.(A + C) + B.(B + \overline{A})$$

4 (a) Describe the term ‘word length’ in relation to a CPU. [1 mark]

4 (b) **Convert the denary number 27_{10} and the hexadecimal number $7E_{16}$ into two 8-bit binary numbers. Add the two numbers together using binary addition, leaving your answer in binary.**

You must show all of your workings. [4 marks]

(c) **Using the binary number 101.0101_2, demonstrate truncation to one binary place, and calculate the effect upon accuracy in terms of relative error.**

[3 marks]

5. **A builders' merchant wants to convert imperial measurements for length (inches) into metric measurements.**

The conversion from inches into metric measurements is as follows:

1 inch = 2.54 cm
1 inch = 0.0254 m

Write an algorithm, using pseudo-code, that will allow a user to input:

- **the imperial measurement (in inches)**
- **whether the output is to be in cm or m.**

As the number of values to be input is unknown, your algorithm should terminate when a user inputs a rogue value less than 0.0.

Your algorithm should output a suitable error message for any measurement entered that is not a real data type, for example a, B, z, @.

Your algorithm should be written using self-documenting identifiers. [8 marks]

6. Describe the difference between fixed and variable length records. Give an example of data that could be contained in each. [6 marks]

7. Explain the difference between sequential and indexed sequential file access. [6 marks]

8. Describe computer-based processes that protect the security of data. [4 marks]

9. Consider the constructs in the algorithm on the separate A3 sheet opposite.
Note: there is no need to dry-run the algorithm.

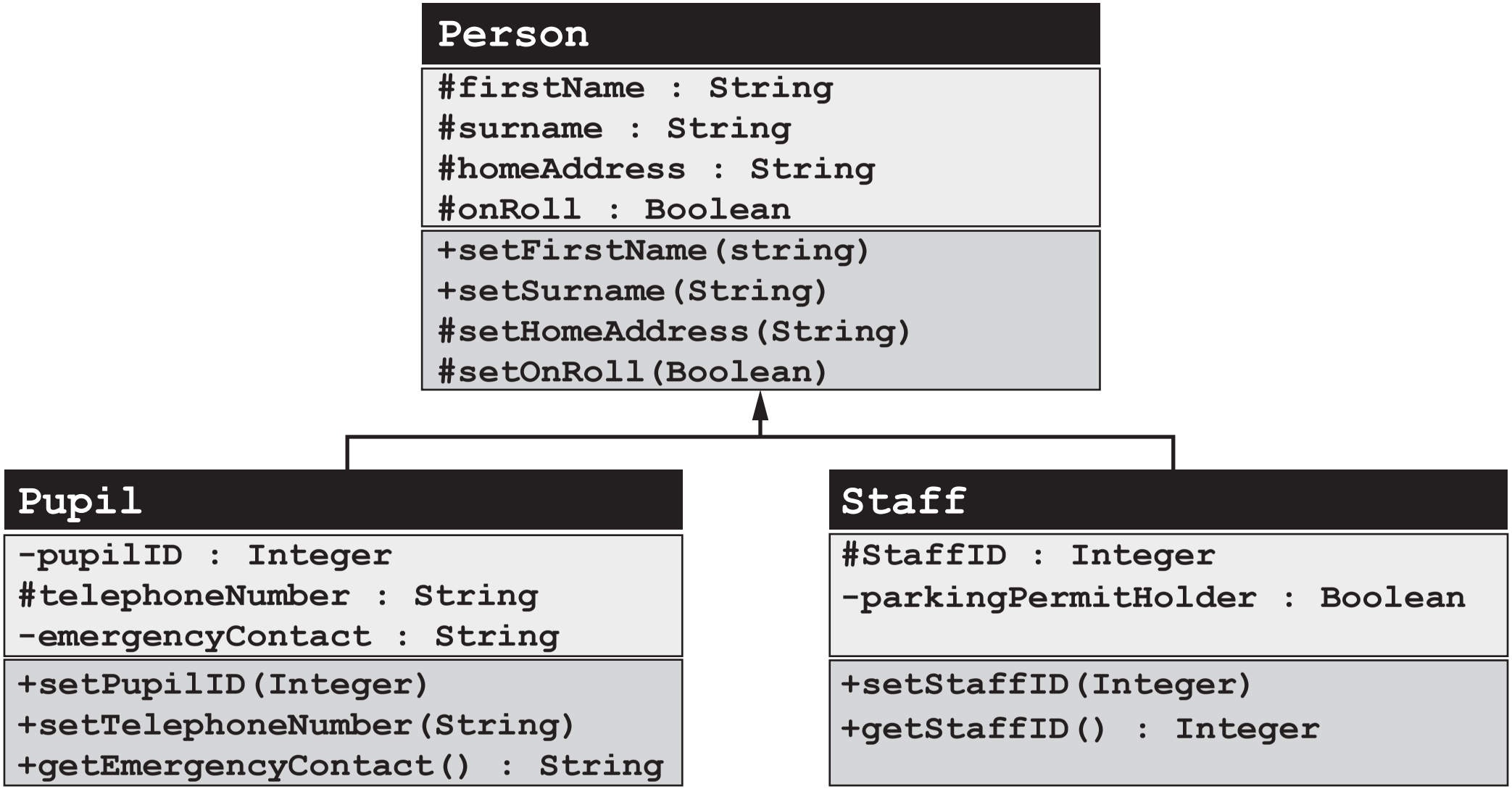
Identify and describe the purpose of the following constructs in the algorithm:

(a) Constant. [2 marks]

9 (b) Variable. [2 marks]

9 (c) Selection. [2 marks]

9 (d) Repetition. [2 marks]


Person
#firstName : String
#surname : String
#homeAddress : String
#onRoll : Boolean
+setFirstName(string)
+setSurname(String)
#setHomeAddress(String)
#setOnRoll(Boolean)
Pupil
-pupilID : Integer
#telephoneNumber : String
-emergencyContact : String
+setPupilID(Integer)
+setTelephoneNumber(String)
+getEmergencyContact() : String
Staff
#StaffID : Integer
-parkingPermitHolder : Boolean
+setStaffID(Integer)
+getStaffID() : Integer

10. **Object-oriented programming is a paradigm that organises code into reusable, modular objects that can interact with each other to accomplish specific tasks.**

Consider the class diagram for a school (opposite):

(a) **Describe the relationship between an object and a class. [2 marks]**

10 (b)

Give ONE example for each of the following from the class diagram opposite page 25.

(i) Super class. [1 mark]

(ii) Sub class. [1 mark]

10 (b) (iii)

Method that does not require a parameter.

[1 mark]

10 (c)

Describe the difference between public, private and protected methods. [3 marks]

11. Describe the contents and use made of the following documentation:

(a) User documentation. [4 marks]

(b) Maintenance documentation. [4 marks]

12. Explain the role of Integrated Development Environment (IDE) tools in developing and debugging programs. [6 marks]

13. Describe the following stages in the compilation process:

(a) Lexical analysis. [3 marks]

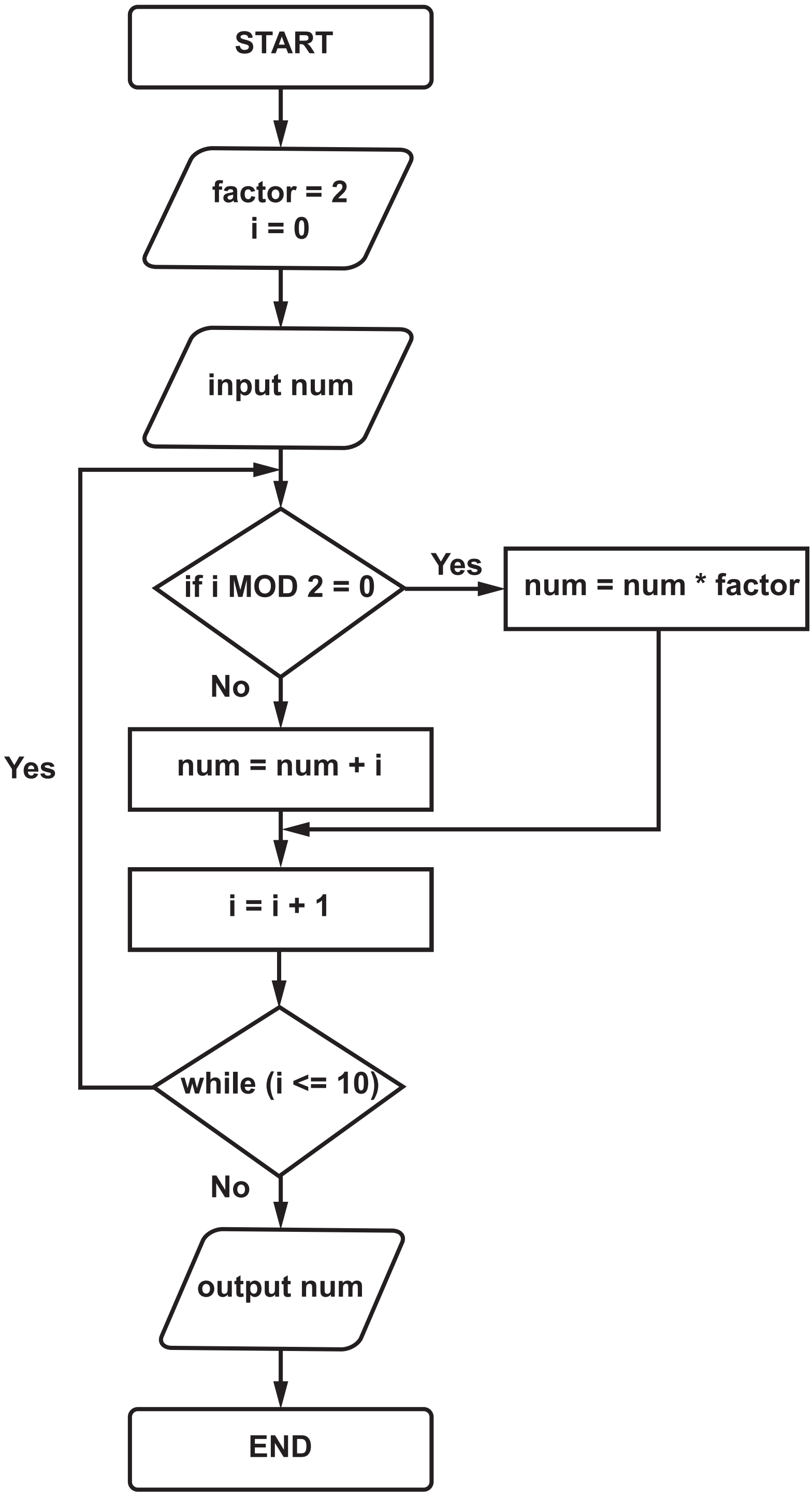
(b) Semantic analysis. [3 marks]

14. Describe the role of the operating system in providing a user interface and managing hardware resources. [10 marks]

END OF PAPER

Question number	Additional page, if required. Write the question number(s) in the left-hand margin.

Question number	Additional page, if required. Write the question number(s) in the left-hand margin.


START
factor = 2
i = 0
input num
if i MOD 2 = 0
Yes
num = num * factor
No
num = num + i
Yes
i = i + 1
while (i <= 10)
No
output num
END