1. An algorithm stores the position of a character on a straight line as an integer. A user can move the character left or right.

The following algorithm:

- generates one random number between 1 and 512 (inclusive) to store as the position
- prompts the user to input a direction to move (left or right)
- takes a direction as input until a valid direction is input.

```
p = random(1, 512)

print("The position is ", p)

a = ""

while a != "left" and a != "right"

  a = input("Enter direction, left or right")

endwhile
```

If the character moves left, 5 is subtracted from the position.
If the character moves right, 5 is added to the position.

The position of the character can only be between 1 and 512 inclusive.

The function `moveCharacter()`:

- takes the direction (left or right) and current position as parameters
- changes `position` based on `direction`
- sets `position` to 1 if the new position is less than 1
- sets `position` to 512 if the new position is greater than 512
- returns the new position.

Complete the function `moveCharacter()`

```
function moveCharacter(direction, position)
```

```
endfunction
```

[6]

2(a). Students take part in a sports day. The students are put into teams.

Students gain points depending on their result and the year group they are in. The points are added to the team score.

The team with the most points at the end of the sports day wins.

Data about the teams and students is stored in a sports day program.

i. Identify the most appropriate data type for each variable used by the program.

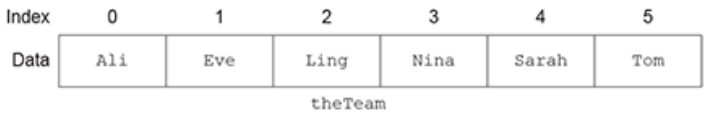
Each data type must be different.

Variable	Example	Data type
`teamName`	`"Super-Team"`	
`studentYearGroup`	`11`	
`javelinThrow`	`18.2`	

[3]

ii. The student names for a team are stored in an array with the identifier `theTeam`

An example of the data in this array is shown:



A linear search function is used to find whether a student is in the team. The function:

- takes a student name as a parameter
- returns `True` if the student name is in the array
- returns `False` if the student name is **not** in the array.

Complete the design of an algorithm for the linear search function.

```
function linearSearch(studentName)
  for count = 0 to ……..…..……
    if theTeam[……..…...……..……] == ……..…..…… then
      return ……..…..……
    endif
  next count
  return False
endfunction
```

[4]

(b). This algorithm calculates the number of points a student gets for the distance they throw in the javelin:

```
01  javelinThrow = input("Enter distance")
02  yearGroup = input("Enter year group")
03  if javelinThrow >= 20.0 then
04    score = 3
05  elseif javelinThrow >= 10.0 then
06    score = 2
07  else
08    score = 1
09  endif
10  if yearGroup != 11 then
11    score = score * 2
12  endif
13  print("The score is", score)
```

Complete the trace table for the algorithm when a student in year 10 throws a distance of 14.3

You may not need to use all the rows in the table.

Line number	`javelinThrow`	`yearGroup`	`score`	**Output**

[4]

(c). The height a student jumps in the high jump needs to be input and validated.
The height is entered in centimetres (cm) and must be between 40.0 and 180.0 inclusive.

i. Write an algorithm to:

Each data type must be different.

- take the height jumped as input
- output "`VALID`" **or** "`NOT VALID`" depending on the height input.

You must use **either**:

- OCR Exam Reference Language, **or**
- A high-level programming language that you have studied.

[4]

ii. The algorithm is tested using a range of tests.

Complete the table to identify an example of test data for each type of test.

Test data (height jumped in cm)	Type of test	Expected output
	Normal	"VALID"
	Boundary	"VALID"
	Erroneous	"NOT VALID"

[3]

(d). The individual results for each student in each event are stored in a database.

The database table `TblResult` stores the times of students in the 100 m race. Some of the data is shown:

StudentID	YearGroup	TeamName	Time
11GC1	11	Valiants	20.3
10VE1	10	Super-Team	19.7
10SM1	10	Super-Team	19.2
11JP2	11	Champions	19.65

Complete the SQL statement to show the Student ID and team name of all students who are in year group 11

```
SELECT StudentID, .....

FROM .....

.....
```

[4]

(e). Abstraction and decomposition have been used in the design of the sports day program.

i. Identify **one** way that abstraction has been used in the design of this program.

---

[1]

ii. Identify **one** way that decomposition has been used in the design of this program.

---

[1]

(f). An algorithm works out which team has won (has the highest score).

Write an algorithm to:

- prompt the user to enter a team name and score, or to enter "stop" to stop entering new teams
- repeatedly take team names and scores as input until the user enters "stop"
- calculate which team has the highest score
- output the team name and score of the winning team in an appropriate message.

You must use **either**:

- OCR Exam Reference Language, **or**
- A high-level programming language that you have studied

[6]

3. Tick (✓) **one** box in each row to identify the programming construct where each keyword is used.

Keyword	Programming construct	
	Selection	Iteration
`if`		
`for`		
`while`		

[3]

4(a). The variable message is assigned a value.

```
message = "abcd1234"
```

Complete the table to show the output when each statement executes.

The first output has been completed for you.

Statement	Output
`print(message.length)`	8
`print(message.upper)`	
`print(message.left(4))`	
`print(int(message.right(4))*2)`	

[3]

(b). Write an algorithm in pseudocode to:

- store "`Hello`" in the variable `word1`
- store "`Everyone`" in the variable `word2`
- concatenate `word1` and `word2` to store "`HelloEveryone`" in the variable `message`

[3]

5(a). Give the output of the algorithm.

```
temp = 7
if temp < 10 then
        print(temp)
endif
```

[1]

(b).
```
value = 3
value = value - 1
print(value * 2)
```

[1]

(c).
```
scores = [3, 6, 6, 9, 2, 8]

number = scores[2]

print(number)
```

_____ **[1]**

(d).
```
day = "Monday"

x = day.length

print(x)
```

_____ **[1]**

6(a). OCR Drones flies goods around the country using drones.

A text file is used to store pilot's codes and date of birth.

The text file is named `pilots.txt`. The contents of some of this file is shown:

JP670,17/05/1986 CC200,31/06/1980 SM720,01/04/1976 GC730,06/06/1978

Design an algorithm to:

- Ask the user to input a pilot code and a date of birth
- Write these inputs to the `pilots.txt` text file

[4]

(b). A pilot is allowed to fly a maximum of 9 hours per day. The pilot code and the hours flown for each flight in one day are stored in a 2D array of strings with the identifier `journeys`.

The data in `journeys` is shown.

	[0]	[1]
[0]	"SM720"	"4.5"
[1]	"GC730"	"3"
[2]	"JP670"	"2"
[3]	"GC730"	"3.5"
[4]	"CC200"	"9"
[5]	"RY320"	"12"

The value of `journeys[3,1]` is `"3.5"`.

Create a function, `pilotValid()`, that:

- takes a pilot code as a parameter
- uses the 2D array `journeys` to calculate the number of hours that the pilot has flown
- returns `valid` if the pilot has flown 9 hours or fewer or `warning` if the pilot has flown for more than 9 hours
- uses casting where needed.

You must use either:

- OCR Exam Reference Language, or
- A high-level programming language that you have studied.

[6]

7. Tick (✓) **one** box in each row to identify if each operator is a comparison operator or an arithmetic operator.

Operator	Comparison	Arithmetic
`==`		
`+`		
`DIV`		
`>`		

[4]

8(a). In a computer game, a player collects items. Each item has a score. The score for each item is stored using the data type **real**.

State what is meant by the data type **real**.

[1]

(b). The result of a computer game can be a win, a loss or a draw. The result is stored in a variable with the identifier `result`.

i. State why `result` **cannot** be stored using a Boolean data type.

[1]

ii. Give a suitable data type for `result`. Explain your answer, showing how each result could be stored.

Data type _____

Explanation _____

_____

_____ **[2]**

(c). A player enters a code at the beginning of a computer game. The code is three characters long. The code sets the level of the game. The game has three levels.

A variable `level` is assigned a value based on the code entered.

i. Write an algorithm that:

- asks the user to enter a three-character code
- repeats the previous step if the code is not 3 characters long
- if the code entered is `SVA`, assigns the value `2` to `level`
- if the code entered is `UTV`, assigns the value `3` to `level`
- assigns the value `1` to `level` if any other three-character code is entered.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____ **[6]**

ii. When a player completes a level, they move to the next level.

Once level 3 is completed, the game starts again at level 1.

Write a function called `nextlevel()` that:

- takes the current level as a parameter
- works out the integer value of the next level the player moves to
- returns the integer value.

[3]

iii. Complete the line of code to output the value returned from the function `nextlevel()` when the integer value `3` is passed in as a parameter.

```
print(.....(.....))
```

[1]

9(a). OCR Drones flies goods around the country using drones.

Details about the drones that pilots fly are stored in a database table called `TblDrone`.
Some of the data stored in this table is shown.

DroneID	DroneType	Mileage	LastCheck
001	Quadcopter	65 032	65 000
002	Quadcopter	32 128	21 000
003	Octocopter	98 021	98 000

TblDrone

i. Complete the SQL statement to display `DroneID` and `Mileage` for all Octocopter type drones that have a mileage of greater than 50 000 miles.

```
SELECT ……

…… TblDrone

WHERE DroneType = "Octocopter" ……..…… Mileage ……..……..……
```

[4]

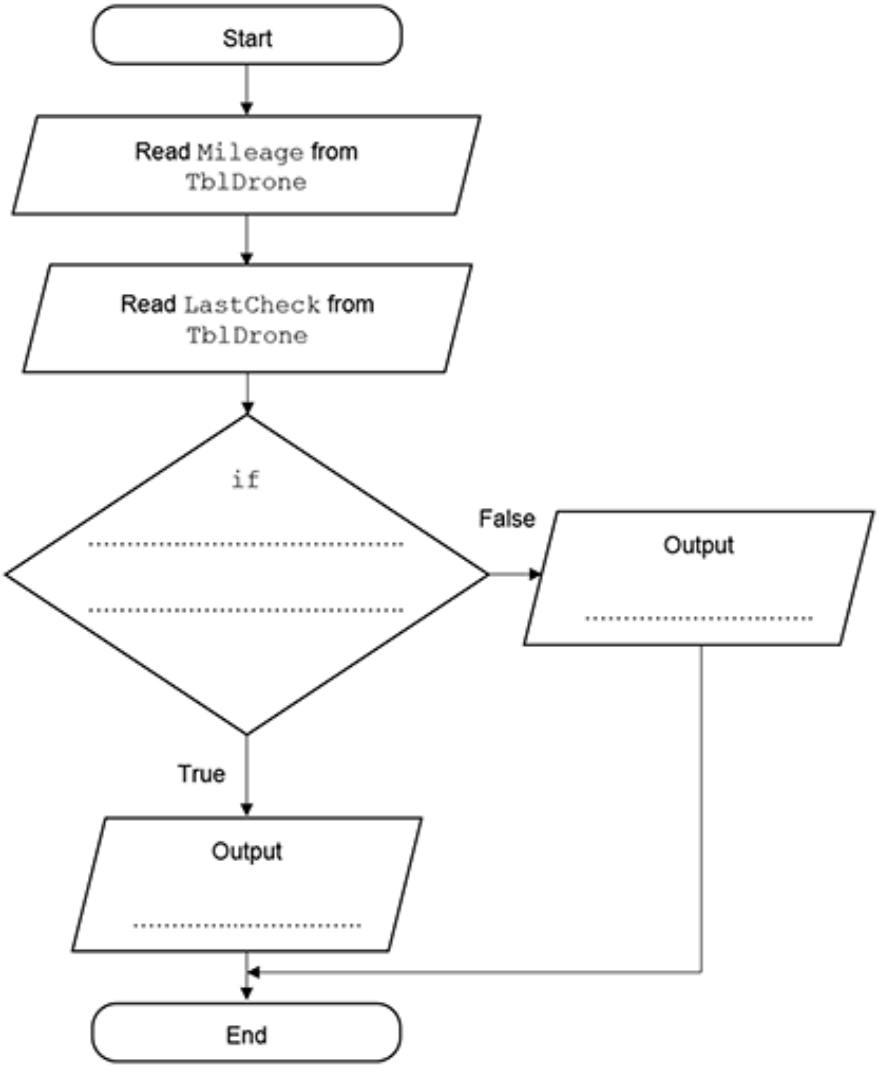
ii. Drones must be checked every 10 000 miles. If the difference between `Mileage` and `LastCheck` is greater than 10 000 then the drone needs to be checked.

A flowchart shows the steps needed to check a drone.

The flowchart outputs `"Check"` if the drone needs to be checked.

The flowchart outputs `"No Check"` if the drone does **not** need to be checked.

Complete the flowchart for the algorithm.



[2]

(b). A pilot code is automatically generated when a new pilot joins the company.

This algorithm generates a code for each pilot:

```
01   a = input("Enter first letter of first name")
02   b = input("Enter first letter of second name")
03   c = random(1,100)
04   while c < 100
05       c = c * 10
06   endwhile
07   pilotCode = a + b + str(c)
08   print(pilotCode)
```

Complete the trace table for the given algorithm.

Lines 01 to 03 have already been completed.

You may not need to use all rows in the trace table.

Line number	a	b	c	pilotCode	Output
01	H				
02		K			
03			9		

[4]

(c). A pilot's flying experience is validated. An algorithm checks that the experience is between 0 and 20 years.

```
exp = input("Enter number of years")
if exp >= 0 and exp <= 20 then
     print(True)
else
     print(False)
endif
```

Complete this test plan for the algorithm.

Experience in years	Type of test	Expected output
	Normal	True
20	Boundary	
32		

[4]

(d). Pilots are paid a set amount each day. Pilots also get an additional payment for each mile they have flown that day. These payments are shown in the table.

Flying experience	Pay per day	Pay per mile
Fewer than 2 years	£120.00	£0.45
2 years to 5 years inclusive	£150.00	£0.65
More than 5 years	£180.00	£0.85

For example, a pilot with 3 years' experience who flies 100 miles in one day will receive a total of £215.00 pay. This is calculated in the following way:

- £150.00 pay for the day
- £65.00 additional payment (£0.65 pay per mile x 100 miles)
- Add £150.00 and £65.00 together to get £215.00 total pay

i. Complete the algorithm to:

- Calculate the total pay for the pilot for that day

You must use either:

- OCR Exam Reference Language, or
- A high-level programming language that you have studied.

```
experience = input("Enter years of experience")

miles = input("Enter miles flown")

totalPay = 0
```

```
print(totalPay)
```

[4]

ii. The programmer decides to make a function to calculate the total pay for the pilot.
The function is called `calculatePay()`.

The function takes the values for `experience` and `miles` as two parameters and returns the total pay for the pilot.

Refine the algorithm to use this function and output the pay for the pilot.

You must use either:

- OCR Exam Reference Language, or
- A high-level programming language that you have studied.

```
experience = input("Enter years of experience")

miles = input("Enter miles flown")

…… = calculatePay( …… , ……)

print( totalPay )
```

[2]

10. An insertion sort is one type of sorting algorithm.

A student has written a pseudocode algorithm to perform an insertion sort on a 1D array `names`.

```
names = ["Kareem", "Sarah", "Zac", "Sundip", "Anika"]

for count = 1 to names.length - 1

  pos = count

  while (pos > 0 and names[pos] < names[pos - 1])

    temp = names[pos]

    names[pos] = names[pos - 1]

    names[pos - 1] = temp

    pos = pos - 1

  endwhile

next count
```

An insertion sort contains a nested loop; a loop within a loop. In this pseudocode algorithm the outer loop is a count-controlled loop and the inner loop is a condition-controlled loop.

Explain why the inner loop needs to be a condition-controlled loop.

---

[2]

11(a). OCR Security Services is a company that installs intruder alarm systems in commercial buildings.

The systems use a computer that is connected to the door sensors and window sensors.

The following data is stored in the system:

Data stored	Variable identifier	Example data
The user's name	`UserName`	Admin123
A telephone number to call when the alarm is activated	`EmergencyPhoneNumber`	+449999999999
Whether a door sensor is activated	`DoorSensorActive`	True
Whether a window sensor is activated	`WindowSensorActive`	True
A timer that counts, to the nearest second, how long a door sensor has been activated	`DoorActiveTime`	100
A timer that counts, to the nearest second, how long a window sensor has been activated	`WindowActiveTime`	100
Whether the system is armed	`SystemArmed`	True
Whether the system is in test mode	`TestModeActive`	True

Below is a table showing some variables within the program.

Tick (✓) **one** box in each row to identify the most appropriate data type for each variable.

Variable	Boolean	Char	String	Integer	Real
`UserName`					
`EmergencyPhoneNumber`					
`DoorSensorActive`					
`DoorActiveTime`					

[4]

(b). An alarm has an algorithm that decides whether to sound the alarm by checking the data that is stored in the following three variables.

- `SystemArmed`
- `DoorSensorActive`
- `WindowSensorActive`

The alarm will only sound when the alarm has been activated **and** one or both of the door and window sensors are activated. When the system needs to sound the alarm it calls the pre-written procedure `SoundAlarm()`

Write a program that checks the data in the variables and calls `SoundAlarm()` when appropriate.

You must use **either**:

- OCR Exam Reference Language, **or**
- A high-level programming language that you have studied.

[4]

(c). An alarm system has multiple sensors. Each type of sensor has a code. The code for each sensor is given in the table:

Code	Sensor
MS	Motion sensor
DS	Door sensor
WS	Window sensor

A program is written to reset the sensors. The program:

- asks the user to enter the code for the sensor they want to reset
- calls the prewritten function `CheckSensorCode()` to check whether the code entered is a valid code
- the sensor number is read as input if the code is valid and the function `ResetSensor()` is called for the sensor

```
01 sensorType = input("Enter code of the type of sensor to reset")
02 if(CheckSensorCode(sensorType)) then
03   sensorNumber = input(" Please input the number of the sensor to reset")
04   sensorID = sensorType + sensorNumber
05   ResetSensor(sensorID)
06 endif
```

i. Give the line number where there is concatenation.

_____ **[1]**

ii. Give the identifier of a variable used in the program.

_____ **[1]**

iii. Identify the data type of the data returned by the function `CheckSensorCode()`

_____ **[1]**

iv. Give the line number that contains a function call.

_____ **[1]**

v. Identify **two** programming constructs that have been used in the program.

1 _____

2 _____ **[2]**

(d). An alarm system has a log that stores a record each time a sensor is triggered. This is called an event. The record format is given in the table:

Fieldname	Description
`Date`	The date the event happened
`SensorID`	The sensor that was activated
`SensorType`	The type of sensor that was activated – Door, Motion or Window
`Length`	The number of seconds the sensor was triggered (to the nearest second)

The log is stored in a database table called `events`. The current contents of `events` is shown:

Date	SensorID	SensorType	Length
05/02/2023	WS2	Window	38
05/02/2023	MS1	Motion	2
06/02/2023	DS3	Door	1
06/02/2023	MS2	Motion	3
06/02/2023	MS1	Motion	2
07/02/2023	WS1	Window	24
07/02/2023	DS1	Door	1

Write an SQL statement to display the sensor IDs of the door sensors that have been triggered for more than 20 seconds.

[3]

(e). A program written in a high-level language is used to access the data from a database. This program has a procedure, `SaveLogs()`, that stores the data to an external text file.

The procedure `SaveLogs()`:

- takes the string of data to be stored to the text file as a parameter
- takes the filename of the text file as a parameter
- stores the string of data to the text file.

Write the procedure `SaveLogs()`

You must use **either**:

- OCR Exam Reference Language, **or**
- A high-level programming language that you have studied.

[6]

(f). OCR Security Services need to identify the total number of seconds the sensors have been activated on a specific date.

The data from the database table `events` is imported into the program written in a highlevel programming language.

The program stores the data in a two-dimensional (2D) string array with the identifier `arrayEvents`

The data to be stored is shown in the table.

Date	SensorID	SensorType	Length
05/02/2023	WS2	Window	38
05/02/2023	MS1	Motion	2
06/02/2023	DS3	Door	1
06/02/2023	MS2	Motion	3
06/02/2023	MS1	Motion	2
07/02/2023	WS1	Window	24
07/02/2023	DS1	Door	1

In this table, the value of `events[1, 1]` contains "`MS1`".

i. An array can only store data of one data type. Any non-string data must be converted to a string before storing in the array.

Identify the process that converts integer data to string data.

_____ **[1]**

ii. Write a program that:

- asks the user to input a date
- totals the number of seconds sensors have been activated on the date input
- outputs the calculated total in an appropriate message including the date, for example:
- `Sensors were activated for 40 seconds on 05/02/2023`

You must use **either**:

- OCR Exam Reference Language, **or**
- A high-level programming language that you have studied.

[6]

12(a). Tick (✓) **one** box in each row to identify whether the OCR Reference Language code given is an example of selection or iteration.

OCR Reference Language code	Selection	Iteration

`for i = 1 to 10`
`  print(i)`
`next i`		

`whilescore != 0`
`  playgame()`
`endwhile`		

`if playerHit() then`
`  score = 0`
`endif`		

`switch bonus:`
`  case 0:`
`  score = 9`
`  case 1:`
`  score = 7`
`  case 2:`
`  score = 5`
`endswitch`		

[4]

(b). Write pseudocode to increment a value held in a variable score by one.

[1]

13. Each member of staff that works in a restaurant is given a Staff ID. This is calculated using the following algorithm.

```
01 surname = input("Enter surname")

02 year = input("Enter starting year")

03 staffID = surname + str(year)

04 while staffID.length < 10

05    staffID = staffID + "x"

06 endwhile

07 print("ID " + staffID)
```

i. Define the term **casting and** give the line number where casting has been used in the algorithm.

Definition _____

_____

Line number _____

[2]

ii. Complete the following trace table for the given algorithm when the surname "Kofi" and the year 2021 are entered.

You may not need to use all rows in the table.

Line number	surname	year	staffID	Output
01	Kofi			
02		2021		

[4]

14. Jack's program uses the addition (+) arithmetic operator. This adds together two numbers.

i. State the purpose of each of the arithmetic operators in the table.

Arithmetic operator	Purpose
*	
/	

[2]

ii. Complete the description of programming languages and translators by writing the correct term from the box in each space.

continues	crashes	debugging	error	executable
high-level	interpreter	language	low-level	many
no	one	stops	with	without

Jack writes his program in a ..... language. This needs to be translated into assembly or machine code before it can be executed. This is done using a translator.

One type of translator is an interpreter. This converts one line of code and then executes it, before moving to the next line. It ..... when an error is found, and when corrected continues running from the same position. This translator is helpful when debugging code.

A second type of translator is a compiler. This converts all of the code and produces an error report. The code will not run until there are ..... errors.

The ..... file produced can be run ..... the compiler.

[5]

15(a). Customers at a hotel can stay between 1 and 5 (inclusive) nights and can choose between a basic room or a premium room.

A typical booking record is shown in the table:

`firstName`	Amaya
`surname`	Taylor-Ling
`nights`	3
`room`	Premium
`stayComplete`	False

i. State the most appropriate data type for the following fields:

Nights _____

Room _____

[2]

ii. Give the name of **one** field that could be stored as a Boolean data type.

_____ **[1]**

iii. Booking records are stored in a database table called `TblBookings`.

The following SQL statement is written to display all customer bookings that stay more than one night.

```
SELECT ALL

FROM TblBookings

IF Nights < 1
```

The SQL statement is incorrect.

Rewrite the SQL statement so that it is correct.

_____

_____

_____

_____

_____

_____

_____ **[4]**

(b). When a new booking is recorded, the details are entered into a program to validate the values. The following criteria are checked:

- `firstName` and `surname` are not empty
- `room` is either "basic" or "premium"
- `nights` is between 1 and 5 (inclusive).

If any invalid data is found "NOT ALLOWED" is displayed.
If all data is valid "ALLOWED" is displayed.

i. Complete the following program to validate the inputs.

You must use **either**:

- OCR Exam Reference Language, **or**
- a high-level programming language that you have studied.

```
firstName = input("Enter a first name")

surname = input("Enter a surname")

room = input("Enter basic or premium")

nights = input("Enter between 1 and 5 nights")

stayComplete = False
```

[5]

ii. Complete the following test plan to check whether the number of nights is validated correctly.

Test data (number of nights)	Type of test	Expected output
2		ALLOWED
	Boundary	ALLOWED
	Erroneous / Invalid	NOT ALLOWED

[3]

(c). A Basic room costs £60 each night. A Premium room costs £80 each night.

i. Create a function, `newPrice()`, that takes the number of nights and the type of room as parameters, calculates and returns the price to pay.

You do **not** have to validate these parameters.

You must use **either**:

- OCR Exam Reference Language, **or**
- a high-level programming language that you have studied.

[4]

ii. Write program code, that uses `newPrice()`, to output the price of staying in a Premium room for 5 nights.

You must use **either**:

- OCR Exam Reference Language, **or**
- a high-level programming language that you have studied

[3]

(d). A hotel car park charges £4 per hour. If the car is electric, this price is halved to £2 per hour.

Write an algorithm to:

- take as input the number of hours the user has parked and whether their car is electric or not
- calculate and output the total price
- repeat continually until the user enters 0 hours.

You must use **either**:

- OCR Exam Reference Language, **or**
- a high level programming language that you have studied.

[6]

16. Complete the truth table in **Fig. 1** for the Boolean statement `P = NOT(A AND B)`.

A	B	P
0	0	1
0	1	.....
1	0	.....
1	1	0

Fig. 1

[2]

17. The database table `Results` stores the results for each student in each of their chosen subjects.

StudentName	Subject	Grade
Alistair	English	3
Jaxon	Art	5
Alex	Art	4
Anna	French	7
Ismaael	Art	9

Complete the SQL query to return all of the fields for the students who take Art.

```
SELECT _____
FROM   _____
WHERE  _____
```

[3]

18. A cinema uses the following criteria to decide if a customer is allowed to see a film that has a 15 rating:

> Customers have to be 15 years of age or older to see the film. They also need to either have a ticket or have the money to buy a ticket.

The table shows the inputs to the system that will output whether the customer can watch the film.

Input	Criteria (True / False)
A	The customer is 15 or over
B	The customer has a ticket
C	The customer has the money to buy a ticket

The cinema has three screens: "Red", "Black" and "Yellow".

The function `freeseats()` counts how many seats are available in each screen. The name of the screen is passed in as a string parameter and the number of free seats is returned as an integer.

Write code using the function `freeseats()` to find the number of seats available in screen Red and assign this to a variable with identifier `redseats`.

---

[2]

19(a). OCR Tech is an online shop that sells electronics such as TVs and game consoles.

Items for sale are stored in the database table `tblStock`. An extract of this table is shown.

ItemCode	**ItemName**	**Price (£)**	**Stock**
GSC5	GameStation5 console	249.99	102
TV4K	4K Television	499.99	18
ABRR	Audiobook reader	59.99	27
NAGC	TV streaming stick	24.99	192

`tblStock`

Tick **(✓) one** box in each section to identify the correct SQL statement to select the item code and item name for all items that have a price of £60 or over.

	Tick (✓) **one** box
`SELECT ItemCode AND ItemName`	
`SELECT ItemCode, ItemName`	
`SELECT ItemCode & ItemName`	

	Tick (✓) **one** box
`FROM tblStock`	
`FROM table`	
`FROM database`	

	Tick (✓) **one** box
`WHERE Price <= 60`	
`WHERE Price > 60`	
`WHERE Price >= 60`	

[3]

(b). Customers can use a discount code to reduce the price of their purchase. Valid discount codes and their value (in pounds) are stored in a global two-dimensional (2D) array with the identifier `discount`. The following table shows part of this 2D array.

	0	1
0	PVFC7	10
1	CPU5	5
2	BGF2	15

For example, `discount[2,0]` holds discount code BGF2 and `discount[2,1]` holds the discount of 15 pounds.

A function searches through the 2D array and applies the discount to the price. The price and discount code are passed in as parameters. The algorithm design is not complete.

i. Complete the design for the algorithm.

```
function checkdiscount(price, code)
    newprice = price
    size = len(discount) - 1
    for x = 0 to ...................
       if discount[x,0] == ............... then
          newprice = ................ - discount[................]
       endif
    next x
    ..............................
endfunction
```

[5]

ii. Identify **two** variables used in this function design.

1 _____

2 _____

[2]

iii. Write a program that:

- asks the user for an item price and discount code
- uses the `checkdiscount()` function from **part (i)** to calculate the price of the item after any discount has been applied
- repeats bullet points 1 and 2 until a price of 0 is entered
- outputs the total cost of all items entered, after any discounts have been applied.

You must use **either:**

- OCR Exam Reference Language, **or**
- A high-level programming language that you have studied

[6]

20(a). The area of a circle is calculated using the formula $\pi \times r^2$ where π is equal to 3.142 and r is the radius.

A program is written to allow a user to enter the radius of a circle as a whole number between 1 and 30, then calculate and output the area of the circle.

```
01 radius = 0
02 area = 0.0
03 radius = input("Enter 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 endif
```

Explain, using examples from the program, **two** ways to improve the maintainability of the program.

1 _____

_____

_____

_____

2 _____

_____

_____

_____

[4]

(b). Identify **two** variables used in the program.

1 _____

2 _____

[2]

(c).

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

_____ **[1]**

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

_____ **[1]**

(d). Tick (✓) **one** box in each row to identify whether each programming construct has or has **not** been used in the program.

	Has been used	Has **not** been used
Sequence		
Selection		
Iteration		

[3]

21(a). A teacher researches the length of time students spend playing computer games each day.

Tick (✓) **one** box to identify the data type you would choose to store the data and explain why this is a suitable data type.

Data Type	**Tick (✓) one box**
String	
Integer	
Real	
Boolean	

Explanation: _____

_____

[2]

(b). Data for one week (Monday to Friday) is stored in a 2D array with the identifier `minsPlayed`.

The following table shows part of this array, containing 4 students.

			Students			
			Stuart	Wes	Victoria	Dan
			0	1	2	3
Days of the week	Mon	0	60	30	45	0
	Tue	1	180	60	0	60
	Wed	2	200	30	0	20
	Thu	3	60	10	15	15
	Fri	4	100	35	30	45

The teacher wants to output the number of minutes Dan (column index 3) played computer games on Wednesday (row index 2). The following code is written:

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

Write program code to output the number of minutes that Stuart played computer games on Friday.

You must use **either**:

- OCR Exam Reference Language, **or**
- a high-level programming language that you have studied.

---

[1]

(c). The following program uses a condition-controlled loop.

```
x = 15
y = 0
while x > 0

    y = y + 1
    x = x - y

endwhile
print(y)
```

Complete the trace table to test this program.

x	y	output

[4]

END OF QUESTION PAPER