

GCSE Computing

Revision Pack

NINE

Programming and Algorithms

Name:

Attempt One %

Attempt Two %

Attempt Three %

Areas of Strength

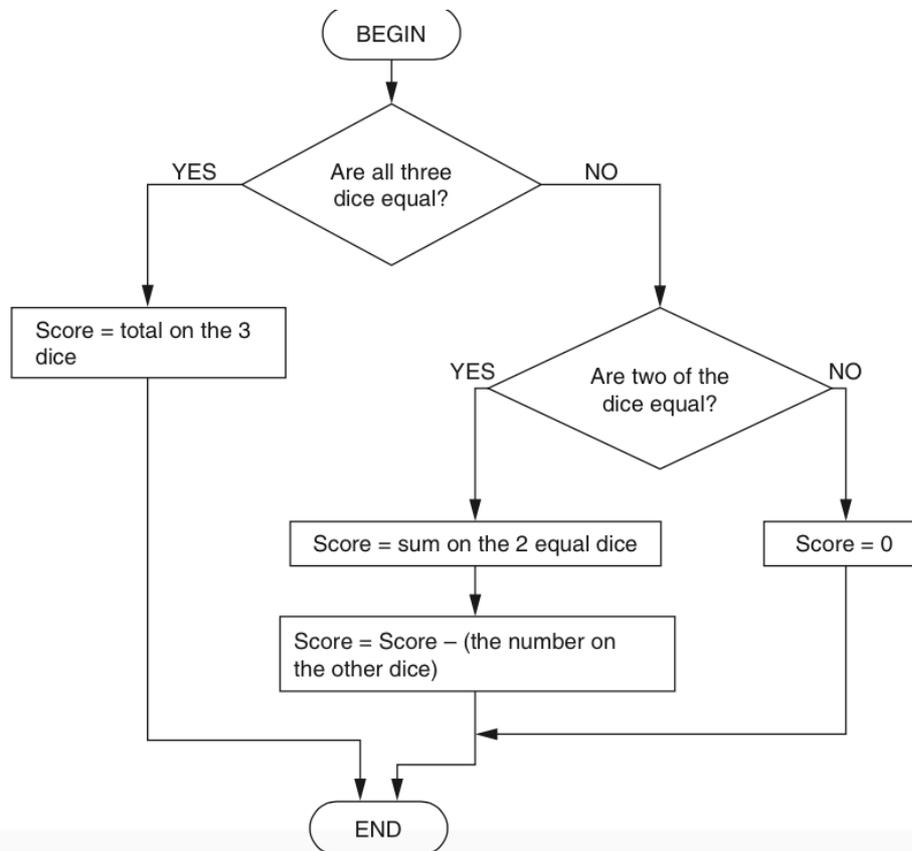
Areas for Development

1. A syntax error can occur when writing a program. State what is meant by a syntax error, giving an example. (2 marks)

2. Describe tools and facilities available in an integrated development environment (IDE) which can help the programmer to identify and correct syntax errors. (4 marks)

Frances is writing a program which simulates a dice game played with three ordinary 6-sided dice.

When the player rolls the three dice, the player is given points according to the algorithm expressed in the flow diagram below.



3. State the value of the score if the dice rolled are

3 4 5 , 4 4 4 , 5 5 6

(3 marks)

4. Some rolls of the dice result in a negative score. State a set of three numbers which can be used to test whether the algorithm produces a negative score when it should, and state the expected output for your test data. (2 marks)

5. When the dice are rolled, the results are stored in an array called DiceResult. For example, if the first dice shows a 5 then the value of DiceResult(1) becomes 5. Describe what is meant by an array. (2 marks)

6. State the data type and size of the array DiceResult giving a reason for each. (4 marks)

The routine for rolling the dice is written as a sequence below.

BEGIN RollTheDice

DiceResult(1) = Random Number between 1 and 6

DiceResult(2) = Random Number between 1 and 6

DiceResult(3) = Random Number between 1 and 6

END

Rewrite this routine so that it uses iteration. (4 marks)

A program contains the following code to calculate the circumference of a bicycle wheel, using the wheel size (diameter).

BEGIN

CONSTANT Pi = 3.141

INPUT WheelSize

Circumference = Pi * WheelSize

OUTPUT Circumference

END

The code uses one constant and two variables.

7. State the names of the constant and the variables. (2 marks)

8. Explain **one** difference between a constant and a variable. (2 marks)

9. The data type of WheelSize is integer and the data type of Circumference is real number. Explain the difference between an integer and a real number. (2 marks)

A dog that is 5 years old is equivalent to a 42 year old human. Ashok is writing a program which converts the age of a dog to the equivalent age for a human.

The program uses the following method:

The user inputs age of the dog in years ,If the age is 2 or less, the human equivalent is 12 times the age ,If the age is more than 2, the human equivalent is 24 for the first 2 years, plus 6 for every additional year.

10. Write an algorithm to calculate and output the human equivalent of the age of a dog using the method described. (5 marks)

Debbie has a program on her mobile phone, which calculates the cost of the calls she has made.

11. The program uses the following variables. State the most appropriate data type for each variable. (5 marks)

Variable name	Purpose	Data type
Network	The name of the mobile phone network operator used (e.g. Toki Weka)	
CallLength	The length of a call made. (e.g. 1.5 for one and a half minutes)	
SameNetwork	Whether a call was made to a phone on the same network	
TotalCalls	The total number of calls made (e.g. 10)	
RunningCost	The calculated cost of all calls (e.g. £12.00)	

The algorithm to update the data when a new text call is made is shown below

```
PROCEDURE Update
  TotalCalls = TotalCalls + 1
  IF SameNetwork = TRUE THEN
    RunningCost = RunningCost + 0.01
  ELSE
    RunningCost = RunningCost + (CallLength * 0.10)
  END IF
END PROCEDURE Update
```

So far TotalCalls = 10 and RunningCost = £12.00

Debbie makes a 3 minute call to a phone on the same network.

12. State the values of TotalCalls and RunningCost after they have been updated using this algorithm. (2 marks)

Debbie now makes a 5 minute call to a phone on a different network.

13. State the values of TotalCalls and RunningCost after they have been updated using this algorithm. (2 marks)

Vimal is writing a program to convert the time from the 24 hour clock to the 12 hour clock. Here is an extract from his program. This extract contains **two** errors.

```
IF (hours > 12) ADN (hours < 24) THEN
    hours = hours + 12
END IF
```

14. Explain why there is an error in the **first** line, and state what type of error this is. (3 marks)

15. Explain why there is an error in the **second** line, and state what type of error this is. (3 marks)

16. Explain why a program written in a high level language needs to be translated before it can be executed. (3 marks)

A compiler and an interpreter are two different types of translator.

17. Describe **one** difference between a compiler and an interpreter. (2 marks)

Zak is writing a program that uses an array called WordList. This array contains 10 foreign words in alphabetical order. The contents of the array are shown below.

WordList (1)	akesi
WordList(2)	esun
WordList(3)	jaki
WordList(4)	kala
WordList(5)	lipu
WordList(6)	mama
WordList(7)	nasa
WordList(8)	olin
WordList(9)	taso
WordList(10)	walo

18. The value of WordList(1) is “akesi”. Complete the following statements.

The value of WordList(6) is

The value of WordList(.....) is “taso”

(2 marks)

Zak needs to write a routine that:

allows the user to input a word

goes through the items in the array WordList in turn, starting from the WordList(1)

if it finds the word that the user has input, it outputs “Word found”.

19. Write an algorithm for this routine in pseudocode. (5 marks)

A mail-order company buys dresses from America and France to sell in the UK.

The company uses the following algorithm to convert sizes before printing them in its catalogue. Half sizes are not possible (e.g. size 12.5).

```
INPUT Size
INPUT Origin
IF Origin = "America" THEN
    Size = Size + 2
ELSE
    IF Origin = "France" THEN
        Size = Size - 26
    END IF
END IF
PRINT Size
```

20. Describe what is meant by a variable. (2 marks)

The company sells the following dresses.

Dress A Origin: France Size: 40

Dress B Origin: America Size: 8

Dress C Origin: UK Size: 12

21. State the size which will be printed in the catalogue using the algorithm given. (3 marks)

22. State the most appropriate data type for the variables Origin and Size, giving a reason for your choice. (4 marks)

The program in a vending machine uses an array called Coins to store the value in pence of all the coins that have been entered in the current sale. A maximum of 10 coins can be entered in each sale. After each sale, the array is reset so that all values are 0.

Here is an example of the contents of the array Coins during a sale.

.	0	100	20	50	5	0	0	0	0	0
---	---	-----	----	----	---	---	---	---	---	---

23. In the example above, the value of Coins(1) is 10. State the value of Coins(4) and Coins(10) (2 marks)

An algorithm to reset the contents of the array Coins after each sale is shown below. This algorithm contains a logic error.

```
i=1
REPEAT
    Coins(i) = 0
    i=i+1
UNTIL i = 10
```

24. State what is meant by a logic error. (1 mark)

25. Explain why the algorithm above contains a logic error. (2 marks)

26. Write an algorithm to calculate the total value of the coins entered in the current sale using the contents of the array Coins. (5 marks)

A program includes the following code.

If A > B

Then A=B

B=A

End If

27. The code uses the variables A and B. Describe what is meant by a variable. (2 marks)

28. State the final values of the variables A and B if the values at the beginning of the code are

A=4 B=9

Final value of A = Final value of B =.....

A=6 B=2

Final value of A = Final value of B =.....

(2 marks)

29. The intention of lines 02 and 03 is to swap the contents of the variables A and B. This does not work. Rewrite the code so that the contents of the variables are swapped correctly. (3 marks)

A gym has many different types of exercise equipment. To use any equipment, members need to enter an individual 4-digit number. A computer system records how long each member has spent on each type of equipment and uses this information to charge the members.

30. Complete the table below with two input values which could be used to test that the computer system correctly checks that the member has entered their number correctly. For each item of test data

Explain why it is used and State the expected outcome

Test data	Reason for test	Expected outcome

(6 marks)

A display board can show a flashing message of up to 20 characters.



A program allows users to input the message to be displayed and the number of times it should flash.

31. State the data type of each item of the input data.

Message

Number of flashes

(2 marks)

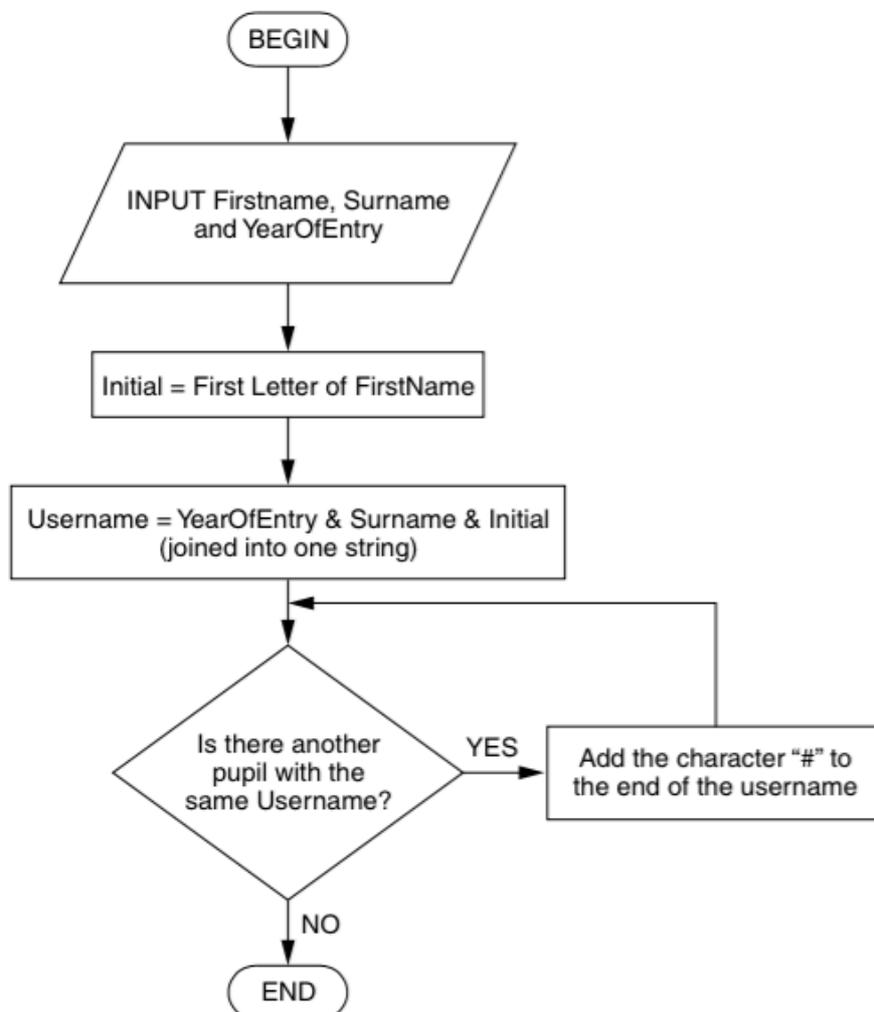
32. Write an algorithm for the program which:

Allows the user to input the message and the number of flashes

Rejects the message if it is longer than 20 characters and stops

Otherwise it repeatedly displays the message and clears the display for the correct number of times. (5 marks)

A school uses a computer program to give every new pupil a username for logging onto computers. The algorithm used to choose the username is shown below.



Mark Johnson joins the school in 2012. No other pupil called Johnson joins the school in the same year.

33. State the username which Mark will be given and explain how you obtained your answer from the flow diagram. (3 marks)

A pupil has the username 2010alim####.

34. State **four** facts that we can work out from this username. (4 marks)

A games developer is developing an online game that can be played on games consoles, desktop computers or mobile phones.

35. The program is written in high-level code and then translated to machine code. Describe **two** differences between high-level code and machine code. (4 marks)

36. One type of translator which can be used is an interpreter. Describe how an interpreter translates the high-level code to machine code. (2 marks)

37. State the name of a **different type** of translator, other than an interpreter, which can be used to translate high-level code to machine code. (1 mark)

38. The online game is developed by a large team of programmers. Explain, with examples, why a large team of programmers need to agree standards when developing the game. (6 marks)

A taxi uses a computer to communicate with central office and to calculate customers' fares.

39. The program in the computer uses sequence, selection and iteration. State whether the operations below use **sequence**, **selection** or **iteration**. (3 marks)

Performing a series of different set-up operations when the computer is switched on.

Beeping repeatedly after a message is sent, until the driver presses a button to show that the message has been read. .

Deciding whether to use the DayTimeRate or the EveningRate functions to calculate a customer's fare.

40. The computer measures the distance travelled as a real number and then rounds it up to the next integer. State what is meant by a real number and an integer (2 marks)

The cost of a day-time journey is £3 for the first kilometre and £2 for every kilometre after that.

If there are five or more passengers in the taxi, an extra 50% is added to the charge.

41. Write an algorithm to calculate the cost of a day-time journey.

Your algorithm should:

allow the number of passengers and the distance of the journey to be input as whole numbers,

calculate the cost of the journey,

output the cost that has been calculated.

(7 marks)

Charley is writing a program for music students. To make sure that there are no logic errors in the program, Charley uses a test plan.

42. Describe what is meant by a logic error. (2 marks)

43. The program uses the letters in the following list to represent musical notes. CDEFGAB When the user inputs a letter from this list, the program outputs the next three notes in the list. If it gets to the end of the list, it starts again from the beginning, so the next note after B is C. Complete the test plan below by stating, for each input data, the expected outcome and a reason for the test. (6 marks)

Input Data	Expected outcome	Reason for test
C
A
H

Jim is writing a program to calculate the wages of workers in a teddy bear factory.

Jim uses an Integrated Development Environment (IDE) to create the program.

44. Describe **two** tools in an IDE that can help Jim when creating the program. (4 marks)

Workers sometimes get a £50 bonus. Here is the 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
    
```

45. 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 marks)

The wages earned by a worker is either £2 for every teddy bear they have made or £5 for every hour they have worked, whichever is larger.

46. 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.

(6 marks)

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
```

47. State what is meant by a constant and give an example from the algorithm above. (2 marks)

48. State what is meant by a variable and give an example from the algorithm above. (2 marks)

49. 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 marks)

Wins = 20 Losses = 5 (3 marks)

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.

50. Write an algorithm for the process described above. (6 marks)

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.

51. State the data type of the following variables used in the flow diagram.

Variable	Data Type
Gender	
Dose	
isPregnant	

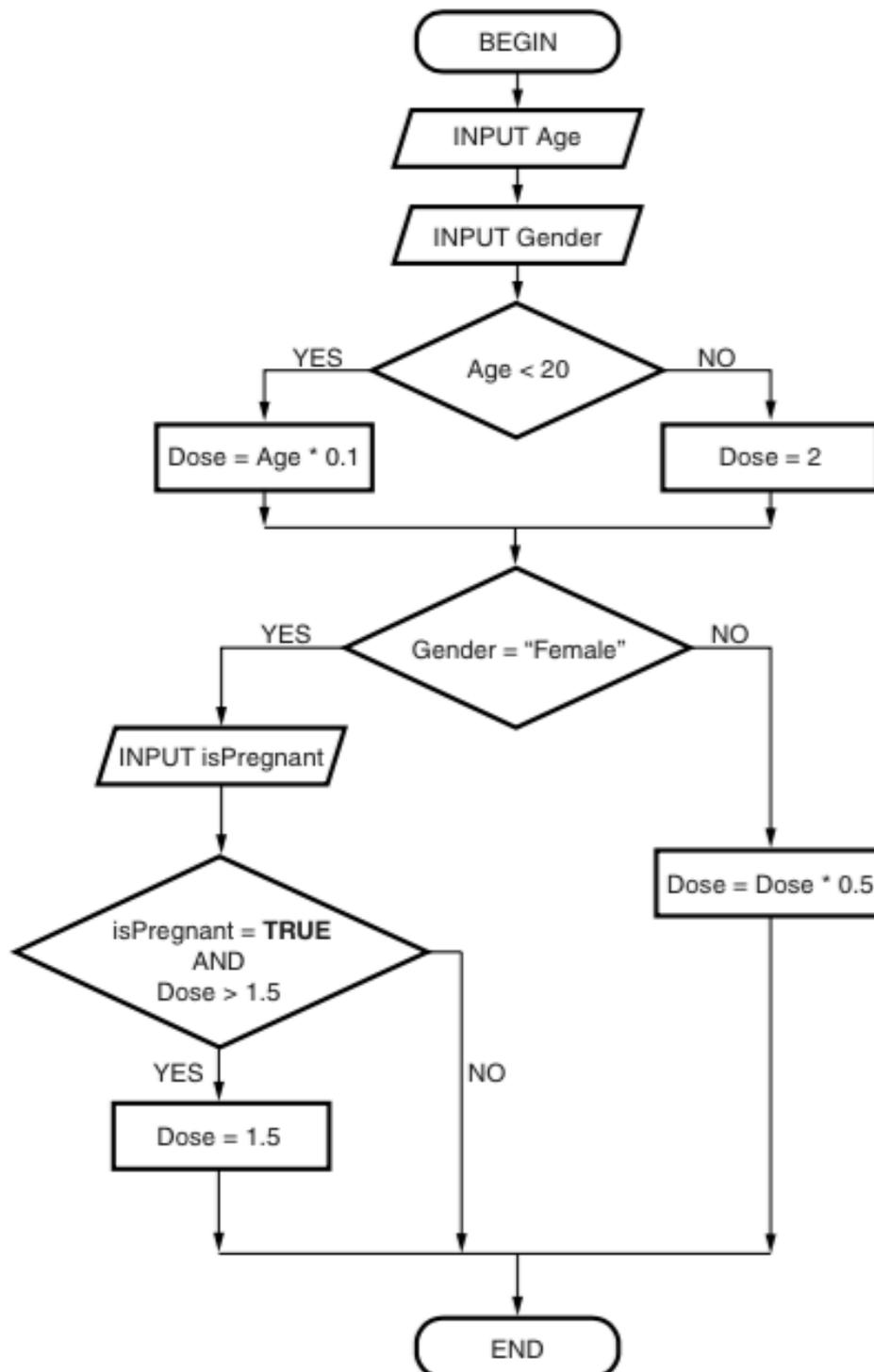
(3 marks)

52. Use the flow diagram to calculate the correct dose of medicine for a male aged 30.

(3 marks)

53. Use the flow diagram to calculate the correct dose of medicine for a pregnant female aged 19.

(4 marks)



54. Graeme is a freelance programmer. He has written a program for a client and gives the client both the high level code and the machine code of the program.

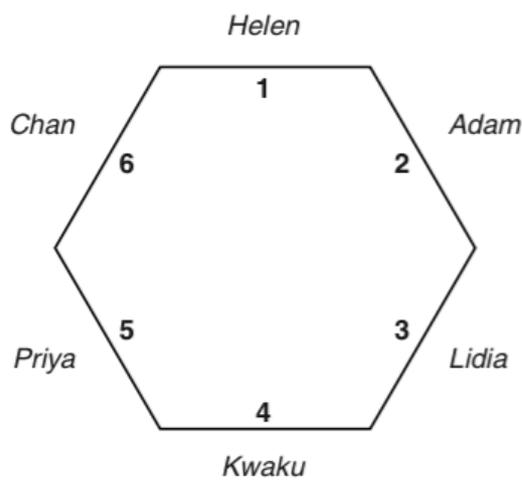
55. Describe what is meant by high level mode, machine code (4 marks)

56. State why Graeme needs a compiler. (1 mark)

Graeme hires a small team of programmers to work with him on larger projects.

57. Describe the standards that Graeme and his team should apply to the code they produce, justifying why these standards are needed. (6 marks)

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".

58. State the value of `PlayerName(3)`. (1 mark)

59. Describe what will happen if the code for the game includes an instruction to print the value of `PlayerName(7)`. (2 marks)

During the game, each player sometimes moves clockwise by a given number of places.

For example, if the number of places is 2, Helen will move to seat 3, Priya will move to seat 1 etc.

60. Write an algorithm that will update the contents of the array `PlayerName` after a move has occurred. Your algorithm should:

allow the number of places to move to be input

use iteration

ensure that all of the existing players' names are moved to the correct position in the array.

(6 marks)