revise edexcel gcse (9-1) Computer Science

REVISION WORKBOOK



Pearson



REVISE EDEXCEL GCSE (9-1) Computer Science



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A small bit of small print

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Problemsolving

Algorithms



1 (a) What is an 'algorithm'?

(b) The three programming constructs used in algorithms are sequence, selection and iteration. The table below shows an algorithm for authenticating a user's login name and password, which allows only three attempts. Enter sequence, selection or iteration in the blank cell.

(5 marks)

Line	Instruction	Sequence
number		selection or
		iteration
1	If username is not recognised, inform the user that the username is not recognised	
2	Return to step 1	
3	If username is recognised, set number of attempts to 1	
4	Enter password	
5	If password does not match the stored password and	
	the number of attempts is equal to 3, inform the user	
	that the password is incorrect	
6	Increase number of attempts by 1	
7	Return to step 4	
8	If password does not match the stored password and	
	the number of attempts is equal to 3, inform the user	
	they have had three attempts	
9	Return to step 1	
10	If password does match the username, allow user into	
	the system	



(c) An algorithm can be written and displayed as plain, written text. State two other ways of displaying algorithms.

1	
2	
	(2 marks)

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(6 marks)

Algorithms: pseudo-code



1 (a) State what is meant by the term 'pseudo-code'.

		(2
b) Writ You has Use	e an algorithm to convert an 8-bit binary number into a denary number. can assume that the binary number is correctly formatted as 1s and 0s and he correct number of digits so that validation is not required. pseudo-code.	d
The algo values. I Guide fo	rithm should examine each of the 8 binary digits and multiply them by their place should then find the total of these multiplications. See page 32 of the Revision r a reminder on converting binary to denary.	2
you will pseudo-	ave a copy of the pseudo-code command set in the exam. Make sure your code is clear, concise and accurate, and answers the question.	
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		• • • •

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Algorithms: flowcharts

- 1 The algorithm for a game simulates the throwing of three dice to find the player's score.
 - If all three are equal, then the score is the total of the dice.
 - If two are equal, the score is equal to the sum of the two equal dice minus the third.
 - If none are equal, then the score is zero.

Here is part of a flowchart for the algorithm.





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Purpose of an algorithm

Examine the following algorithm. In this algorithm, 'names' is an array.	
SEND 'Please enter the first name.' TO DISPLAY	
RECEIVE firstName FROM (STRING) KEYBOARD	
SEND 'Please enter the family name.' TO DISPLAY	
RECEIVE familyName = FROM (STRING) KEYBOARD	
SEND 'Please enter the last two digits of the intake year.' TO DISPLAY	
RECEIVE intYear FROM (INTEGER) KEYBOARD	
SEND 'Please enter tutor group.' TO DISPLAY	
RECEIVE tutorGroup FROM (STRING) KEYBOARD	
SET index TO 1	
SET unique TO false	
WHILE unique = false DO	
loginName = intYear & familyName & firstName(0) & tutorGroup & index	
FOR check FROM 0 TO LENGTH(names) – 1 DO	
IF names[check] = loginName THEN	
SET index TO index + 1	
ELSE	
SET unique TO true	
END IF	
END FOR	
END WHILE	
SEND loginName TO DISPLAY	
(a) State the purpose of this algorithm.	
	(2 marks)
(b) State the inputs required by the algorithm.	
	(4 marks
(c) An array named 'names' is used in the algorithm. State the role of the variable	
named 'check'.	
	(1 mark
(d) State the login name for the following: Rosie Cooper in the intake year of 2001	
and in tutor group Red. Assume that her login name is unique.	
	(5 marks
(a) State form facts that you can deduce shout the following students 02C menthem OPI	(° ° °)
(e) State four facts that you can deduce about the following student: 02GranthamOBI	ues.
	(4 marks)







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Problemsolving

Completing algorithms



1

Complete the following algorithm which is designed to find the largest of three numbers.



1

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Interpreting correct output



Rosie is writing an algorithm to work out the change to be given to a customer in a car park payment system.

This flowchart is incomplete and does not show all the possible combinations of notes and coins.



Complete the flowchart to show how the numbers of £5 notes and £2 and £1 coins in the change will be calculated. Write your answer in the empty symbols.

(9 marks)



Using trace tables

- 1 Here is an algorithm expressed in pseudo-code.
 - SET list TO [5, 9, 2, 5, 13] 1 RECEIVE item FROM (INTEGER) KEYBOARD 2 3 SET found TO false FOR search FROM 0 to LENGTH(list) DO 4 IF item = list[search] THEN 5 6 found = true 7 END IF 8 END FOR 9 IF found = true THEN 10 SEND 'The item is in the list.' TO DISPLAY 11 ELSE 12 SEND 'The item is not in the list.' TO DISPLAY 13 END IF

Before you start, read through the algorithm very carefully. Make sure that you understand what the algorithm is intended to do. That will help you to find the error in the pseudo-code in part (b).



(a) Identify the data structure used to store the numbers in the list.

•••••		(1 mark)
(b) There is	s an error in the pseudo-code.	
(i) Stat	te the number of the line in which there is an error.	
••••••		(1 mark)
(ii) Giv	e the correct version of this pseudo-code.	
		(1 mark)

(c) Complete the trace table to show the execution of the algorithm if the search item is 13. You may not need to fill in all the rows in the table.

item	found	search	list[search]	output

(5 marks)

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Identifying and correcting errors



1 Part of an algorithm that a student has created to simulate the change given by a payment system is shown below. A user enters their payment and the algorithm determines the notes and coins that should be returned.

1	SET charge to RANDOM(0, 50)
2	SET payment TO 0
3	SET money TO 0
4	SEND 'Please enter payment' TO DISPLAY
4	RECEIVE money FROM (REAL)KEYBOARD
6	SET payment TO payment + money
7	WHILE payment < charge DO
8	SEND 'The charge is ' & charge & '. Please enter more money.' TO DISPLAY
9	RECEIVE money FROM (REAL) keyboard
10	SET payment TO payment - money
11	END WHILE
12	SET change TO payment - charge
13	SEND 'Thank you. Change required is £ & change TO DISPLAY
14	WHILE change >= 10.00 DO
15	SEND '£10 note' TO DISPLAY
16	SET change TO change – 10.00
17	END WHILE
18	WHILE change > 5 DO
19	SEND '£5 note' TO DISPLAY
20	SET change TO change – 5.00
21	END WHILE
22	WHILE change >= 2.00 DO
23	SEND '£2 coin' TO DISPLAY
24	SET change TO change + 2.00
25	END WHILE

There are **five** errors in this algorithm. Some are logic errors and some are syntax errors. Identify the line numbers and correct the errors.

5	 (5 marks)
4	
3	
2	
1	

Had a go 🗌	Copyrighted Material Nearly there 🗌 Nail
	Linear sear
(a) Describe how a lin	near search algorithm works.

search

Nailed it!

•••••	
(b) Da the Wi Us	wid has compiled a list of all the people invited to his party and has stored e names in an array called partyList. rite an algorithm in pseudo-code to check whether Elaine's name is on the lise pseudo-code.
The an any sty progra	swer should, if possible, be written in the Edexcel pseudo-code, but you may use /le of pseudo-code providing its meaning can be understood by a competent mmer.
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in	a a		H	ad a	go		Nea	rly t	her	e 🗌	Na	aile	d it!	
1	g Descril	be the	stages	of a bi	Bi	search	on a lis	Se st of ite	ea.	rc,	h ascence	ling o	rder.	· · · · · · · · · · · · · · · · · · ·
2	A stud	ent ha	s the f	ollowin	ig list o	of frie	nds.				Q. 1			 (4 marks)
	Show t to find data sh	he sta the na lown i	ges of ame 'S n the l	a binar tephen' ist.	ry sear from	rch the	You sl each t	hould in time and	dicate d then	which show t	item will	l be se sub-lis	lected t.))
3	Show t this tab	he sta ble.	ges of	a binar	ry sear	rch to	find the	numbe	er '9' 1	from th	ne data	show	n in	(4 marks)
	<u> 1 </u>	6	9	13		21	28	36	42	69	76	85	94	 (4 marks)
	ler in 1	1 Descrifting 1 Descrifting 2 A study Ahme Show t to find data sh	1 Describe the 1 Describe the	lem- Hereing 1 Describe the stages 1 Describe the stages 2 A student has the f Ahmed Ann Show the stages of to find the name 'S data shown in the l	Image: Had a 1 Describe the stages of a binary 1 Describe the stages of a binary 2 A student has the following Ahmed Ann Claire Show the stages of a binary data shown in the list.	Image: Provide stage of a binary st	2 A student has the following list of frie Ahmed Ann Claire David Show the stages of a binary search to find the name 'Stephen' from the data shown in the list.	Copyrighted Had a go Neal Binary I Describe the stages of a binary search on a lis A student has the following list of friends. Ahmed Ann Claire David Mary Show the stages of a binary search to find the name 'Stephen' from the data shown in the list. Vou si each fi for the stages of a binary search to find the his table. 1 6 9 13 15 21 28	2 A student has the following list of friends. Ahmed Ann Claire David Mary Mar Show the stages of a binary search to find the name 'Stephen' from the data shown in the list. You should in each time and the stages of a binary search to find the name 'Stephen' from the data shown in the list. Show the stages of a binary search to find the number this table. Show the stages of a binary search to find the number this table. Show the stages of a binary search to find the number this table. A student has the following list of friends. A student has the following list of friends. And Ann Claire David Mary Mar Show the stages of a binary search to find the number this table. 1 6 9 13 15 21 28 36	Copyrighted Materia Had a go Nearly ther Binary sea 1 Describe the stages of a binary search on a list of items se 	Copyrighted Material Had a go Nearly there Material Had a go Nearly there Show the stages of a binary search on a list of items sorted in this table. Show the stages of a binary search to find the number '9' from the this table. Show the stages of a binary search to find the number '9' from the this table. Show the stages of a binary search to find the number '9' from the this table. Show the stages of a binary search to find the number '9' from the this table. Show the stages of a binary search to find the number '9' from the this table.	Copyrighted Material Had a go Nearly there Na Binary search on a list of items sorted in ascend Astudent has the following list of friends. Ahmed Ann Claire David Mary Matt Peter Steph Show the stages of a binary search to find the name 'Stephen' from the data shown in the list. You should indicate which item will each time and then show the new stephen' from the list. Show the stages of a binary search to find the number '9' from the data this table. 1 6 9 13 15 21 28 36 42 69 76	Copyrighted Material Had a go Nearly there Naile Binary search Describe the stages of a binary search on a list of items sorted in ascending of a binary search on a list of items sorted in ascending of a binary search on a list of items sorted in ascending of a binary search on a list of items sorted in ascending of a binary search on a list of items sorted in ascending of a binary search of friends. Ahmed Ann Claire David Mary Matt Peter Stephen Show the stages of a binary search to find the name 'Stephen' from the data shown in the list. You should indicate which item will be se each time and then show the new sub-list 3 Show the stages of a binary search to find the number '9' from the data show this table. 1 6 9 13 15 21 28 36 42 69 76 85	Copyrighted Material Had a go Nearly there Nailed it! Binary search on a list of items sorted in ascending order. Describe the stages of a binary search on a list of items sorted in ascending order. Astudent has the following list of friends. Ahmed Ann Claire David Mary Matt Peter Stephen Zoe Show the stages of a binary search to find the name 'Stephen' from the data shown in the list. Usual of the stages of a binary search to find the name 'Stephen' from the data show in in the list. Show the stages of a binary search to find the number '9' from the data shown in this table.





Complete the table to show the correct order of the lines.

Order	Line	A loop will
1	SET swapped to True	to compar
	END FOR	values and they are in
	FOR index FROM 1 to LENGTH(list) - 1 DO	It will have there are r
3	SET swapped to False	The best re
	<pre>IF list[index - 1] > list[index] THEN</pre>	place the of the w
	SET swapped TO True	correct p
10	END IF	swap co
6	SET temp TO list[index] - 1	• put the the if sta
	WHILE swapped = True	• set the v
	SET list[index - 1] TO list[index]	swapped
	END WHILE	
	SET list[index] TO temp	1

A loop will need to be set up to move through the list to compare the adjacent values and swap them if they are in the wrong order. It will have to run until there are no swaps.

The best responses should:

- place the start and end of the while loop in the correct positions
- order the lines of the swap correctly
- put the start and end of the if statements in the correct positions
- set the value of the swapped variable correctly.

(5 marks)

Hada						
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		ЛЛ	~ 4 6 	201	4	
		TAT	erge	501	l	
The merge	sort algorith	m divides up	a list into sma	aller and s	maller secti	ons and
then sorts t	them into ord	ler before put	ting them bac	ck togethe	r again.	
Explain th	e auvantage c	f using this t	connique.			
Use a merg Show all th	ge sort to put the stages of th	the data showne process.	wn below into	ascending	g order.	
33	25	46	2	8	69	9
	1	1 1				1
·····						
·····						
·····						
· · · · · · · · · · · · · · · · · · ·						



Programming

Variables and constants

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- 1 Program code makes use of variables and constants.
 - (a) Explain what is meant by a variable.

Had a go



- (2 marks) (b) State how a constant differs from a variable. (1 mark) (c) State why variables and constants should be given meaningful names. (1 mark) (d) The algorithm shown below searches for a value in a list. 1 SET mysteryNumber TO 6 2 SET correct TO False 3 WHILE correct = False DO RECEIVE guess FROM (INTEGER) KEYBOARD 4 5 IF guess = mysteryNumber THEN
 - 6 set correct to True
 - 7 END IF
 - 8 END WHILE

Complete the table to show the variables used and why they are used in the program.

Read the algorithm carefully to identify the variables and to understand why they have been used. The first one has been done for you.



Variable	Use within the program
mysteryNumber	This is used to hold the number which must be guessed.

(6 marks)

Programming

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Had a go 🗌 Nearly there

Arithmetic operators

Nailed it!

(4 marks)



Guided

 Calculate the result of the following expression using the correct order of operations. Show the result of each stage. The first one has been done for you.

result = $6 * 8 / 2 + (15 - 6) + 3^3$

result = $6 * 8 / 2 + 9 + 3^3$



Guided

2 Complete the table below by filling in the value of number after each line of code is executed. The first one has been done for you.

Resultnumber
number = 15



3 A number trick asks you to think of a number, double it, add six, divide it in half and then subtract the number you started with. The result should always be 3. Write an algorithm using pseudo-code that asks a user to input a number, then carries out each of the operations and outputs the result.

Read the question very carefully to identify all the arithmetic operations needed. You should see that you will need two variables to store the numbers! Do a dry run of your algorithm to check that the result is correct.

(3 marks)

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Programming

Relational operators

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Guided

1 Complete the table below by evaluating each of the statements listed and stating whether it is True or False.

The first one has been done for you.

Statement	True/False
7 * 3 <> 10 + 11	False
8 + 10 > 8 * 2	
9 * 3 <= 10 + 17	
$10 + 15 \ge 6 * 5$	
9 * 2 = 6 * 3	

You first need to work out the results of the calculations and then compare them using the operators.

(5 marks)



2 Alina has sto1red her computer science marks in an array named 'marks'. Write an algorithm using pseudo-code that prompts Alina to enter a new mark and then outputs the number of marks in the array that are: equal to it less than it greater than it.

•••••••••••••••••••••••••••••••••••••••	• • • • • • • • • • • • • • • • • • • •
	••••••
	•••••••

.....

(6 marks)

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Logical operators



Guided

1 Complete the table below to show the output of each algorithm. The first solution has been completed for you.

Read and work through the algorithms carefully and write the expected outcome in the second column.

Algorithm	Output
SET number TO 3	Out of range.
IF number > 0 AND number < 2 THEN	
SEND 'Within range.' TO DISPLAY	
ELSE	
SEND 'Out of range.' TO DISPLAY	
END IF	
SET number TO 6	
IF NOT(number = 3) OR number <> 5 THEN	
SEND 'Number is acceptable.' TO DISPLAY	
ELSE	
SEND 'Number is not acceptable.' TO DISPLAY	
END IF	
SET colour TO 'red'	
SET size TO 'm'	
SET price to 25	
IF colour = 'blue' OR colour = 'red' AND size = 'm'	
AND price <= 30 THEN	
SEND 'This would be OK.' TO DISPLAY	
ELSE	
SEND 'Not OK.' TO DISPLAY	
END IF	
SET number1 TO 6	
SET number2 TO 9	
<pre>IF (number1 <= 9 OR number2 >=10) AND NOT(number1 *</pre>	
number2 <50) AND (number2 - number1 = 3) THEN	
SEND 'These numbers are OK.' TO DISPLAY	
ELSE	
SEND 'Not OK.' TO DISPLAY	
END IF	

Nailed it! Programming

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Selection

1 A teacher wants a program that will output a comment when a mark is input, according to the following rules.

Mark	Comment
90 and above	Excellent
70 to 89	Very good
60 to 69	Good
50 to 59	Satisfactory
Below 50	Unsatisfactory

The algorithm should allow the teacher to enter a mark and then use comparison operators to decide the range the mark is in and display the appropriate comment.

Be careful when you are selecting the ranges. A mark can only be put in one range.

Write an algorithm using pseudo-code that prompts the teacher to enter a mark and then displays the appropriate comment.

(5 marks)

Programming

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Iteration

1	The algorithm shown below searches for a value in SET list TO [5, 9, 2, 5, 13] SEND 'Please enter the search item.' TO DI RECEIVE item FROM (INTEGER) KEYBOARD SET found TO False FOR search FROM 0 TO LENGTH(list) -1 DO IF item = list[search] THEN SET found TO True END IF END FOR IF found = True THEN SEND 'The item is in the list.' TO DISP ELSE SEND 'The item is not in the list.' TO I END IF	n a list. SPLAY LAY DISPLAY
	The algorithm is not very efficient because it continues iterating through the list even if the search item has been found. Rewrite the algorithm to improve the efficiency by stopping the search when the item has been found.	You need to change the algorithm so that it breaks out of the loop if the item is found. Remember – there is another type of loop!

(4 marks)