

National 5 Computing Science Assignment Assessment task

Specimen – valid from session 2017-18 and until further notice.

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Instructions for candidates

This assessment applies to the assignment for National 5 Computing Science.

This assignment has 50 marks out of a total of 160 marks available for the course assessment. It assesses the following skills, knowledge and understanding:

- ♦ applying aspects of computational thinking across a range of contexts
- ♦ analysing problems within computing science across a range of contemporary contexts
- ♦ designing, implementing, testing and evaluating digital solutions (including computer programs) to problems across a range of contemporary contexts
- ♦ developing skills in computer programming
- ♦ applying computing science concepts and techniques to create solutions across a range of contexts

During this 8 hour course assignment you are asked to complete three short practical tasks. You may complete the tasks in any order.

Advice on timing each task

Marks are allocated as follows:

- | | | |
|--|----------|----------------|
| ♦ Task 1 – database design and development | 15 marks | (30% of total) |
| ♦ Task 2 – software design and development | 25 marks | (50% of total) |
| ♦ Task 3 – web design and development | 10 marks | (20% of total) |

This split may be used as a guide when allocating your time to each of the three tasks.

Advice on gathering evidence

As you complete each task, you must gather evidence as instructed in each task. Use the evidence checklist provided to make sure you submit everything necessary at the end of the assignment.

Evidence may take the form of printouts of code/screenshots/typed answers, hand-written answers or drawings of diagrams/designs.

Advice on assistance

This is an open-book assessment. This means that you can use:

- ♦ any classroom resource as a form of reference (such as programming manuals, class notes, and textbooks)
- ♦ any files you have previously created throughout the course

The tasks are designed to be completed independently, without any support from your teacher or lecturer. This means that you cannot:

- ♦ ask your teacher or lecturer (or other candidates) how to complete any of the tasks
- ♦ access any assignment files outside the classroom

Computing Science assessment task: evidence checklist

Part A		
Task	Evidence	
1a	Completed task 1 sheet showing analysis of database inputs	<input type="checkbox"/>
1b	Completed task 1 sheet showing data dictionary	<input type="checkbox"/>
	Printout of new database table – showing new fields and their data types have been created	<input type="checkbox"/>
Part B		
Task	Evidence	
1c	Printout of screenshots – showing correct validation has been set up for the new fields	<input type="checkbox"/>
	Printout – showing evidence that a relationship exists between the two tables	<input type="checkbox"/>
1d	SQL statement to add new employee	<input type="checkbox"/>
	Printout of Employee table – showing new record	<input type="checkbox"/>
2a	Printout of your program code	<input type="checkbox"/>
2b	Completed task 2 sheet showing the two test tables	<input type="checkbox"/>
	Printout evidence of test runs – showing inputs and outputs for each of the two test tables	<input type="checkbox"/>
2c	Completed task 2 sheet showing the required test data values	<input type="checkbox"/>
2d	Completed task 2 sheet showing evaluation	<input type="checkbox"/>
3a	Completed task 3 sheet showing the end-user and functional requirements	<input type="checkbox"/>
3b	Printout evidence of HTML and CSS files – showing new page	<input type="checkbox"/>
	Printout of web page – showing how it is viewed in browser	<input type="checkbox"/>

Please follow the steps below before handing your evidence to your teacher or lecturer:

- ◆ Check you have completed all parts of tasks 1, 2 and 3
- ◆ Label any printouts/screenshots with the task number (for example 1c, 2a)
- ◆ Clearly display your name and candidate number on each printout

Task 1: database design and development (part A)

Whitestar Amps design and build amplifiers for electric guitars. Below is a description of the information currently recorded for each employee and the amplifiers the employees build.

When a new employee starts working at Whitestar Amps, their first name, surname, address, contact telephone number and if they have a driving licence is recorded.

Employees build three different models of amplifier (Jazz8, Rock100 and Blues55). After each amplifier has been built and tested it is given a unique serial number which the employee enters onto a paper form. They also include the date, time of day completed, if the amplifier passed testing and their own unique employee number assigned when they were first employed.

1a Complete the missing information from the analysis of inputs below.

(2 marks)

Employee details:	Amplifier details:
first name surname address telephone number driving licence employee number	serial number date built time completed model passed test (True/False) employee number

Candidate name_____ Candidate number_____

1b Complete the data dictionary for the Amplifier entity.

(5 marks)

Entity name: Amplifier					
Attribute name	Key	Type	Size	Required	Validation
serialNumber	PK	text	10	Y	length = 10
dateBuilt		date		Y	
timeCompleted		time		Y	
model		text	7	Y	restricted choice: Jazz8, Rock100 and Blues55
testPassed		Boolean		Y	
employeeNumber	FK	number		Y	existing employeeNumber from Employee table

Candidate name_____ Candidate number_____

- ◆ Check your answers to part A carefully, as it cannot be returned after you hand it in.
- ◆ When you are ready, hand it in to your teacher or lecturer and collect part B.

Task 1: database design and development (part B)

1c Using the data dictionary below complete the relational database by:

- ♦ creating a new table to store the amplifier data
- ♦ adding all required validation to fields
- ♦ creating a relationship between the two tables

(6 marks)

Your teacher or lecturer will provide you with a partially completed database file. Print evidence to show that you have completed each of the bullet points.

Entity name: Employee					
Attribute name	Key	Type	Size	Required	Validation
employeeNumber	PK	number		Y	range >=1000 AND <= 9999
firstName		text	15	Y	
surname		text	15	Y	
address		text	50	Y	
contactNumber		text	11	Y	length = 11
drivingLicence		Boolean		Y	
Entity: Amplifier					
Attribute name	Key	Type	Size	Required	Validation
serialNumber	PK	text	10	Y	length = 10
dateBuilt		date		Y	
timeCompleted		time		Y	
model		text	7	Y	restricted choice: Jazz8, Rock100 and Blues55
testPassed		Boolean		Y	
employeeNumber	FK	number		Y	existing employeeNumber from Employee table

1d The personal details of a new employee are listed below.

Employee number: 1599
Name: Jeremy May
Address: 67 Red Lane
Driving licence: True
Contact telephone number: 07923782534

Implement the SQL statement that will add this new record to the correct table.

(2 marks)

Print evidence of both the implemented SQL statement and the Employee table (clearly showing the new record).

**INSERT INTO Employee (employeeenumber, firstname, surname, address, contactnumber, drivinglicence)
VALUES ('1599', 'Jeremy', 'May', '67 Red Lane', '07923782534', '1');**

1116	Ieressa	Jones	24 Dundas Street	01316/33989	<input checked="" type="checkbox"/>
1175	Martin	Daly	11 Edinburgh Road	01417676232	<input checked="" type="checkbox"/>
1200	Robbie	Durkin	12 Perth Street	01316111892	<input checked="" type="checkbox"/>
1599	Jeremy	May	67 Red Lane	07896374638	<input checked="" type="checkbox"/>
2266	Greg	Watson	7 McLeod Street	01317679999	<input checked="" type="checkbox"/>
2287	Wendy	Russell	2b McArthur Grove	01312261522	<input type="checkbox"/>
2299	Damela	Anderson	17 St John Street	07532299101	<input checked="" type="checkbox"/>

Task 2: software design and development

In the board game 'Capturing Olympus', six players work as a team to earn points. One point is earned if the six players score a combined total of more than 50 hits. An additional point is earned if the average number of hits is greater than or equal to 10.

Read the following analysis and design carefully.

Program analysis

A program is required to determine the number of points earned by the team. The program will ask the user to enter the number of hits scored by each of the six players and store these values. When all six players' hits have been entered, the program will calculate the total and average number of hits. A message indicating the points earned is then displayed to the user.

Inputs

- ◆ a valid number of hits scored by each of the six players

Processes

- ◆ calculate the total hits achieved by all six players
- ◆ calculate an average number of hits (total/6)
- ◆ determine if the six players have earned points

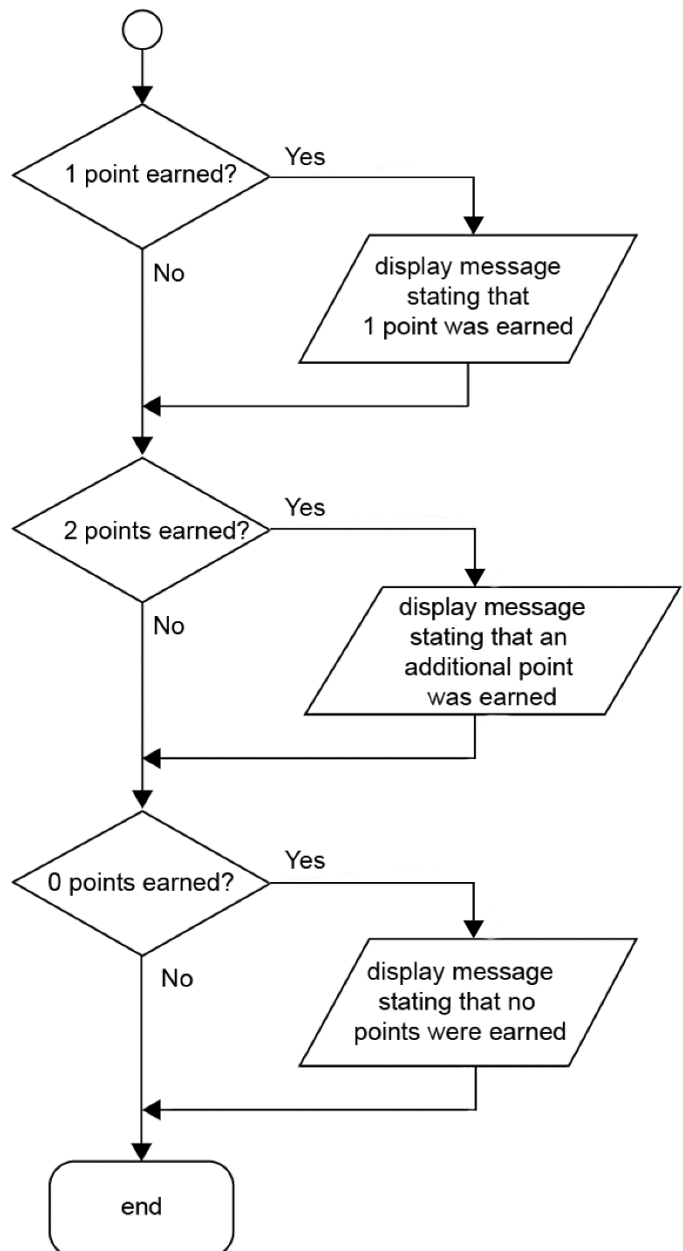
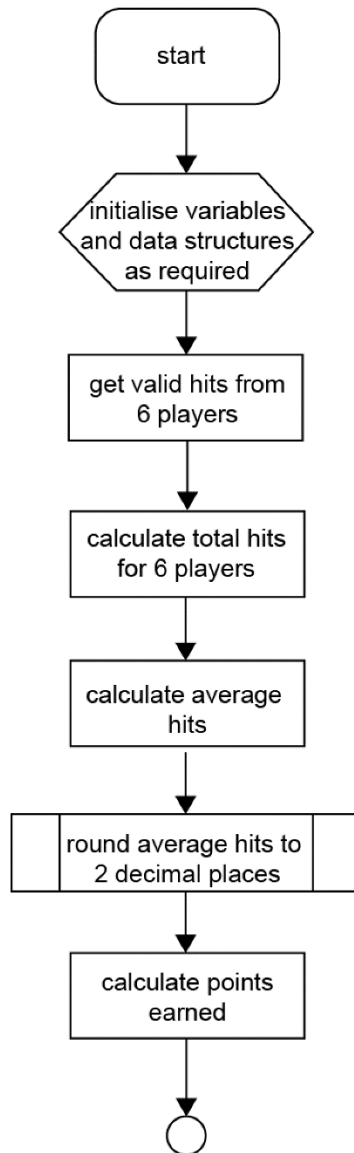
Outputs

- ◆ a message is displayed if one point has been earned
- ◆ a message is displayed if the additional point has been earned
- ◆ a message is displayed if no points have been earned

Assumptions

- ◆ the number of hits a single player can achieve is greater than or equal to 0 and less than or equal to 30
- ◆ the average should be displayed to two decimal places
- ◆ one point is earned if the total number of hits is greater than 50. An additional point is earned if the average number of hits is greater than or equal to 10

Program design (flow chart)



Task 2: software design and development

- 2a Using the program analysis and flowchart design, implement the program in a language of your choice. Ensure the program matches the design.

(15 marks)

Print evidence of the program code.

- 2b Complete the table below to create two sets of test data. You must demonstrate that the program correctly outputs the messages that one or both points have been earned.

(3 marks)

Type of test	Input		Expected output	Actual output
Normal	Player 1	12	Program displays message stating one point earned.	Attach printouts of inputs and outputs as evidence.
	Player 2	14		
	Player 3	16		
	Player 4	23		
	Player 5	27		
	Player 6	6		
Normal	Player 1	3	Program displays message stating two points earned.	Attach printouts of inputs and outputs as evidence.
	Player 2	21		
	Player 3	25		
	Player 4	27		
	Player 5	14		
	Player 6	12		

Test your program using both sets of test data. Print evidence of inputs and outputs to show that you have completed each test.

- 2c The program should ensure that only a valid number of hits can be entered for each of the six players.

State **two** extreme and **one** exceptional numerical value that could be used as part of a test run to check that only a valid number of hits can be entered:

(2 marks)

Extreme 1: 0

Extreme 2: 30

Exceptional : -10

Candidate name_____ Candidate number_____

2d Evaluate your program by commenting on the following:

Fitness for purpose (1 mark)

I feel my program is fit for purpose as it successfully executes all the requirements of the task. My program also matches the supplied design.

My solution:

- allows the user to input the hits for six players using a fixed loop.
- Validates the players hits between 0 and 30
- Rounds the average to two decimal places
- Keeps a running total within the loop using a series of IF statements to assign the correct number of points.
- Calculates the average player hits
- Displays all the relevant information to the screen

Efficiency of your code (1 mark)

My code is efficient because:

I have used a DO WHILE loop instead of a DO LOOP Until to validate the number of player hits. This is more efficient because using a DO LOOP UNTIL requires at least one check to be carried out even if they have input valid information. This is because the condition comes at the end of the sequence.

I have used Nested IF statements instead of 3 individual IF statements which is better as this places less demand on the computers resources.

I have stored the input using an array instead of using 6 individual variables. This reduces the amount of code required and by using a fixed loop, it is more efficient to fill the array and display the information to the screen.

Robustness of your completed program (1 mark)

My code is robust as it can cope with normal, extreme and exceptional test data. I have tested it thoroughly using a variety of test data, as demonstrated in my screenshots.

It can cope with negative numbers and invalid input and allows the user to re-enter a valid number.

The only thing that crashes my program is when you type in a letter when the program expects a number. This is outwith the requirements for this task.

Readability of your code (2 marks)

My code is readable because I have included:

- Internal commentary throughout to explain the main parts of my program.
- Meaningful variable names have been used.
- Indentation has been used to line up the start and end of my programming constructs.

Candidate name_____ Candidate number_____

Task 3: web design and development

Woodline Academy holds a 'pupil of the month' competition. They wish to add a new page to their school website each month with the following content:

- ◆ the school name
- ◆ the month of the competition
- ◆ the name of the winning pupil
- ◆ a photo of the winning pupil
- ◆ a sound recording of an interview with the winning pupil

3a State **one** end-user requirement and **two** functional requirements for the new page.

End-user requirement (1 mark)

My website will users to

- ◆ view the winning pupil's photograph
- ◆ play the winning pupil's interview

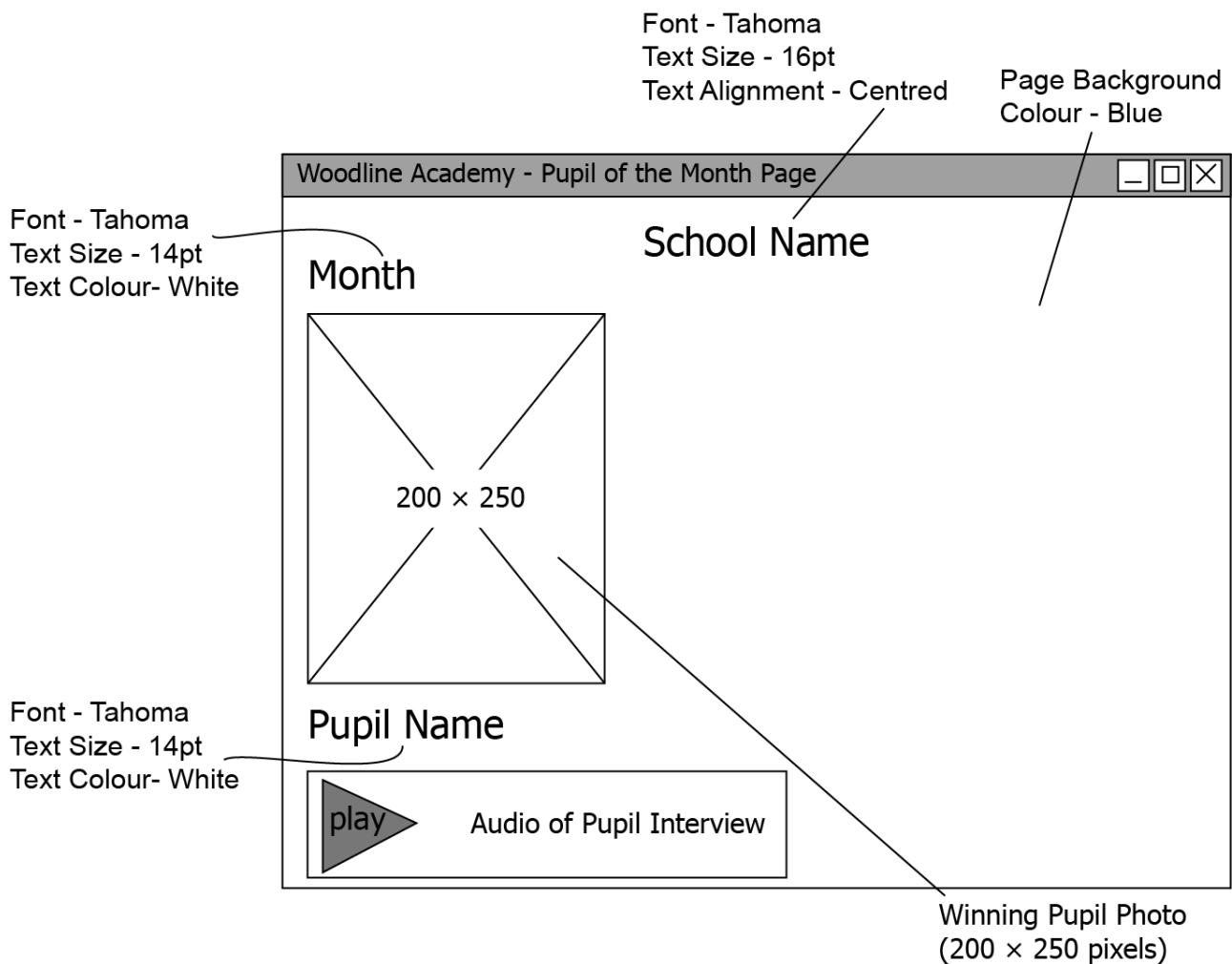
Functional requirements (2 mark)

The functional requirements are that my website:

- ◆ must be able to play sound
- ◆ must be able to display the photograph
- ◆ must be able to display the text

Candidate name_____ Candidate number_____

- 3b A wireframe design of the new page (annotated with required styles) is shown below.



You have been given the following two files:

- ♦ winning pupil photo
- ♦ pupil interview

Implement the above design using HTML and an external CSS.

(7 marks)

Print evidence of the following:

- ♦ HTML file
- ♦ CSS file
- ♦ Web page

Marking instructions

Marking instructions are provided for this specimen assessment task. In line with SQA's normal practice, they are addressed to the marker. They will also be helpful for those preparing candidates for course assessment.

Marking instructions will not be provided with annual assessment tasks, as candidate evidence will be submitted to SQA for external marking.

General marking principles

This information is provided to help you understand the general principles that must be applied when marking candidate responses in this assignment. These principles must be read in conjunction with the specific marking instructions, which identify the key features required in candidate responses.

- a Marks for each candidate response must **always** be assigned in line with these general marking principles and the specific marking instructions for this assessment.
- b Marking should always be positive. This means that, for each candidate response, marks are accumulated for the demonstration of relevant skills, knowledge and understanding: they are not deducted from a maximum on the basis of errors or omissions.

Specific marking instructions

Task	Expected response	Additional guidance	Marks available	
1	Database design and development – part A			
1a	<p>1 mark for identifying:</p> <ul style="list-style-type: none"> ♦ employee number <p>1 mark for identifying:</p> <ul style="list-style-type: none"> ♦ first name ♦ surname ♦ address (or street, town) ♦ telephone number ♦ driving licence 	<p>Must identify all five attributes</p>	2	Analysis (2)
1b	<p>1 mark for completion of each row:</p> <ul style="list-style-type: none"> ♦ serialNumber – PK ♦ timeCompleted – time ♦ model – restricted choice: Jazz8, Rock100 and Blues55 ♦ testPassed – Boolean ♦ employeeNumber – FK 	<p>No marks awarded for application specific field types in “Type” column (for example date/time, yes/no)</p> <p>Restricted choice must list all three choices</p>	5	Design (5)

Task	Expected response	Additional guidance	Marks available	
1	Database design and development – part B			
1c	1 mark each for: <ul style="list-style-type: none"> ♦ all fields created with correct data types ♦ primary key (serialNumber) ♦ presence check on every field ♦ restricted choice on model, with correct three options ♦ length check = 10 characters on serialNumber ♦ linked table enforcing referential integrity 	Fields required: <ul style="list-style-type: none"> ♦ serialNumber – text ♦ dateBuilt – date ♦ timeCompleted – time ♦ model – text ♦ testPassed – Boolean ♦ employeeNumber – FK 	6	Implementation (8)
1d	1 mark each for: <ul style="list-style-type: none"> ♦ INSERT INTO Employee ♦ correct data, in correct order 	Sample answer: INSERT INTO Employee VALUES (1599, 'Jeremy', 'May', '67 Red Lane', '07923782534',true);	2	

Task	Expected response	Additional guidance	Marks available	
2	Software design and development			
2a	Array used in program		1	Implementation (15)
	Use of the following variables: <ul style="list-style-type: none"> ♦ total hits ♦ average ♦ points 	Variable names may differ in code All three variables are required for 1 mark	1	
	Fixed loop repeating six times (to enter player hits)		1	
	Input validation – conditional loop used		1	
	Input validation – correct loop condition	hits >= 0 and hits <= 30	1	
	Input validation – input of player hits	Award 1 mark if not implemented within input validation loop	1	
	Input validation – error message		1	
	Running total calculated correctly		1	
	Round function used with average		1	
	Calculation of bonus points: <ul style="list-style-type: none"> ♦ for one bonus point ♦ for an additional bonus point 		2	
	Selection (if) used to display message showing one bonus point earned	(totalHits > 50) Output must be within selection	1	
	Selection (if) used to display message showing additional bonus point earned	(average >= 10) Output must be within selection	1	
	Selection (if) used to display message showing zero bonus points earned	(totalHits <= 50) Output must be within selection	1	
	Matches design – same sequence of events as flow chart		1	

Task	Expected response	Additional guidance	Marks available	
2	Software design and development			
Task	Expected response	Additional guidance	Marks available	
2	Software design and development			
2b	Both test tables completed to produce the required output (one bonus point or two)	Table 1 hits should total 51-59 Table 2 hits should total >=60	1	Testing (5)
	In first table, printed evidence of successful run of test data	Both inputs and outputs should be printed	1	
	In second table, printed evidence of successful run of test data	Both inputs and outputs should be printed	1	
2c	Completion of test data for input validation of player's hits for 1 mark each: <ul style="list-style-type: none"> ♦ extreme: 0 and 30 ♦ exceptional: any suitable, eg 1, 31 	Only accept numerical answers for exceptional test data	2	
2d	Evaluation of the following for 1 mark each: <ul style="list-style-type: none"> ♦ whether the program is fit for purpose, including explanation of code ♦ efficient use of coding constructs ♦ how robust the program is, including if it copes with unexpected inputs Evaluation of the following for 2 marks: <ul style="list-style-type: none"> ♦ readability – 1 mark for each comment on the readability of the candidate's own code 	Efficiency answers may refer to: <ul style="list-style-type: none"> ♦ two loops not required for inputs and running total ♦ single variable only required for hits if implemented in one loop ♦ complex selection structure could have been used in place of three "ifs" ♦ array used instead of six variables for hits 	5	Evaluation (5)

Task	Expected response	Additional guidance	Marks available	
3	Web design and development			
3a	End-user requirements could include the following for 1 mark: <ul style="list-style-type: none"> ♦ view the winning pupil's photograph ♦ play the winning pupil's interview 		1	Analysis (3)
	Functional requirements could include two of the following for 1 mark each: <ul style="list-style-type: none"> ♦ must be able to play sound ♦ must be able to display the photograph ♦ must be able to display the text 		2	

Task	Expected response	Additional guidance	Marks available
3	Web design and development		
3b	<p>Using the printout of the HTML file, confirm the following for 1 mark each:</p> <ul style="list-style-type: none">♦ all text and graphics content added (within structural head, title, body, tags, p, H1, div, etc)♦ audio tag used♦ link to external CSS file added in <head> section <p>Using the printout of the CSS file, confirm the following for 1 mark each:</p> <ul style="list-style-type: none">♦ School Name Text styled correctly♦ Month and Pupil's Name styled using a single CSS rule♦ graphic size correct (CSS or HTML)♦ background colour changed (CSS or HTML)	<p>Text and graphics checklist:</p> <ul style="list-style-type: none">♦ School Name♦ Month♦ Pupil's Photo♦ Pupil's Name <p>CSS for School Name Text</p> <pre>h1 { font-size: 16px; font-family: "Tahoma"; text-align: center; }</pre> <p>CSS for Month/Pupil's Name Text:</p> <pre>h2 { font-size: 14px; font-family: "Tahoma"; text-color: white; }</pre> <p>CSS for tag</p> <p>Internal style:</p> <pre>style="width:200px;height:250px;"</pre> <p>External stylesheet:</p> <pre>img { width:200px;height:250px; }</pre> <p>CSS for page background</p> <p>internal style:</p> <pre><body style="background-color:blue;"></pre> <p>External stylesheet:</p> <pre>body {background-color:blue;}</pre>	7

Implementation (7)

Administrative information

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History of changes

Version	Description of change	Date

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