

20xx Specimen Paper Model solution

NOTE: The paper itself can be obtained from the AQA exam board website, [here](#).

1a. Binary is used because voltage (or lack of) can represent the binary digits of 0 and 1.

1b. 128 64 32 16 8 4 2 1
 0 1 0 1 1 0 1 1

Check: $64 + 16 + 8 + 2 + 1 = 91_{10}$

1c. $A7_{16}$ in denary...

METHOD 1

Step 1: Draw a conversion table (it's slow, but I personally do it this way, as I know I'll have the right answer)

Binary	Dec	Hex
0000	0	0
0001	1	1
0010	2	2
0011	3	3
0100	4	4
0101	5	5
0110	6	6
0111	7	7
1000	8	8
1001	9	9
1010	10	A
1011	11	B
1100	12	C
1101	13	D
1110	14	E
1111	15	F

Step 2: Look up the appropriate nibbles in the table...

$A = 1010, 7 = 0111$

Step 3: Stick them together to get 10100111

Step 4: Read as a binary number. $128 + 32 + 4 + 2 + 1 = 167$

METHOD 2

7_{16} is the denary number 7.

$$7 \times 16^0 = \underline{7}$$

A_{16} is the denary (base 10) number 10.

$$10 \times 16^1 = \underline{160}$$

(Note: If the question said $A7B_{16}$ then my next line would have been $11 \times 16^2 = \underline{2816}$.)

Added up, they make: $7 + 160 = \mathbf{167}$

1d. Boolean (True/False), Integer (positive/negative whole numbers) and Character (a single letter, number or punctuation mark).

2a. I/O...

Vibration is an output; it's something that the phone turns on/off.

Touch Screen is both; the user sends **in** signals by tapping the screen, and content (e.g. images, video, text) are rendered **out** onto the display.

Microphone is an input. The user sends audio data **in** to the device through it.

Speaker is an output. The CPU in the device sends audio signals **out** to it.

2b. Any 3 of...

Component miniaturisation has allowed for manufacturers to produce increasingly small CPUs, RAM and other core computer parts.

Battery technology and efficient chip design have facilitated devices (e.g. smart phones) which can run for a full working day on a single charge.

Lower manufacturing costs allow hardware vendors to produce high-spec hardware at affordable prices for consumers.

Radio data protocols (e.g. 3G and 4G) allow high-speed broadband data connections over relatively large geographical areas to give consistent coverage.

Display technology has allowed for touch and multi-touch devices that can recognise where a finger is touching the display. Increasingly small pixels allows for higher resolution displays.

Solid State memory technology allows increasingly sophisticated OSs to be stored with ever-larger amounts of spare space for games and 'apps'.

(Note: To get the mark, you simply need to name 3 things. You'd get a mark for 'more power-efficient CPUs', for instance. I'm including the extra detail to help your revision.)

3a. Either CPU could be faster in a different situation.

PC A has the ability to perform 4 different tasks simultaneously. E.g. one core could render graphics for a game while another handles the AI for the enemy characters, another handles sound for background music and the other core is used by the Operating System. In this case, PC A would be faster.

PC B can perform a single task faster, as it has over double the clock (processor) speed. If both CPUs were calculating a single calculation, PC B would likely finish it faster.

(Note: As either CPU could be argued as being 'faster', the mark scheme only awards marks for your justification)

3b. RAM is used to temporarily store data on its way to (or from) the CPU after being loaded from secondary storage (usually a hard drive or SSD). More RAM in these machines means that more instructions can be stored at once and therefore the overall performance of the computer will be faster.

4ai. One of the **parameters** in this function is 'name'. The other is called 'value'.

(Note: parameter is the term used to describe the values that are passed into a function)

4a.ii. 'name' is an array.

(Note 1: I can tell it's an array, as the IF statement provides an index [1] when referring to it)

(Note 2: In python, you'd call this a list if you saw it. You won't get a mark for this in the exam unless asked for something Python specific in a question.)

4aiii. The function returns a Boolean value (either True or False).

4b. Functions are used for a variety of reasons:

1. To make a large block of code easier for the developer to read.
2. To produce a more efficient solution as a set of code can be used repeatedly.
3. To make code easier to maintain (as each function can be improved in isolation).

5a. Ring disadvantages are:

1. A large ring topology with many nodes could potentially be slow as each device forwards data packets.
2. One defective node or connection could cause the network to fail.
3. As the connection is shared by all devices, there are potential security risks.

5bi-iii. The labels are as follows:

An agreed method of communication is a **Protocol**.

A machine that mostly requests information is a **Client**.

Software that is accessed over a network, such as the Internet is a **Web application**.

5c. i-iii.

Updating a database would be handled by the database **server**.

Validating user fields is handled by both the **client and server**.

Checking a username and password would be handled by the **server**.

6a. A syntax error is an error caused by breaking the rules of the programming language. Often caused by misspelling a command-word (e.g. 'printt').

(Note: While we're here, a run-time error is when the computer is asked to do something it can't, like dividing by zero, trying to find the square root of a negative number or looking for an index higher than the number of elements in an array. A logical error is where the code you have will run, but gives the wrong result as the logic in the program is incorrect. Classic mistakes are using > instead of < or adding to a variable when you should be taking something away.)

6bi. **5**. The FOR loop asks 'i' to go up to the length of the array (4 elements) + 1.

6bii. Assuming the array index starts at 1, at the end of the FOR loop, 'i' will be 5, and the program will attempt to access arr[5] which doesn't exist.

6ci. Logical errors are hard because the code will execute but give the wrong answer. The code will need carefully running through (possibly with a trace table) to find the problem.

6cii. The **logical** error is on line **4**. It should say tot += arr[i] instead of tot=arr[i]

7a.

```
answer <- "mobile"
```

```
guess <- USERINPUT "ENTER YOUR GUESS: "
```

```
WHILE answer ≠ guess
```

```
    guess = USERINPUT "WRONG. GUESS AGAIN: "
WHILE END
```

OUTPUT "winner"

7b. Ideas for improvement:

1. A text file containing a large dictionary of words could be used.
2. The game could offer to let you play again once you win.
3. The game could give hints after a number of failed attempts
4. Correct characters could be displayed
5. Instructions on how to play could be presented on startup.

8a. **SupplierCode** is the primary key. This is implied by the other table using it as a foreign key to link to the supplier table.

8b.

ComfyLoafers	43	ST23 5XA
ArmyBoot	47	ST23 5XA

Notes: The first line tells us that the resulting table of data will have three columns: Product name, product quantity and the supplier's postcode.

The second line tells us that this data will be gathered from the Product and Supplier tables.

The third tells us that we will only take rows where the quantity of product is GREATER than 4, AND the supplier is 'Trainers4Us' AND that the Product SupplierCode is the same as the Supplier table's SupplierCode.

8c. **INSERT INTO Product VALUES (444AA, "Slippers", 6.99, 32, 100);**

Notes: As with any SQL statement, the INSERT INTO command words say we're adding rows, and specifies the table. The VALUES part then instructs the SQL parser to use the values provided in that order when populating the row in the table.

9. The definition of an algorithm is: "A series of instructions that solves a problem in a finite number of steps."

Note: That's the 'official' AQA definition.

10. One scenario would be if there is only a small amount of data to be stored and recalled, as the filesize would be smaller.

Another would be a situation where the user is required to be able to edit the contents of the file (without them needing a knowledge of SQL syntax).

Another would be where there is RAM is at a premium and the overhead of having another program running (to parse the SQL) is undesirable.

11a. External code sources tend to have been co-authored and peer reviewed, so are likely to be bug-free and also written efficiently (so they will run faster).

As the code is for use on a website, it's likely to also be less susceptible to security vulnerabilities. It will save the programmer time that they would otherwise have to spent

implementing the same input fields for themselves. It may also include more functionality that that which the programmer could implement for themselves with the time they have available.

Note: Always read the question. When I initially read this and started typing, it was only later that I spotted that the question was specifically about input fields on a web form.

11b. As the code is written by a third party, any bugs that manifest will need fixing by the original authors of the code unless the programmer is very confident. Secondly, the documentation to accompany the code may not be very detailed. Finally, the code may not be a perfect fit for what the programmer wants, so may not fully meet the needs of their brief.

12. The ASCII character set is encoded in 7 bits; as such, it can only produce a maximum of 128 characters (if we include 0000000_2). By the time the lower-case and upper-case Latin (e.g. English) alphabet characters have been stored, then the counting numbers, then the various European accented letters (e.g. é), there isn't enough capacity left to store the characters of other languages (E.g. Arabic, Chinese).

13. Reasons why social networking is used to organise protests:

Firstly, the communications between user devices and the different social networks servers are end-to-end encrypted, so government agencies will find it difficult/impossible to decrypt and read all the communications between them.

Secondly, the variety of different devices that they social networks can be used on (e.g. PC, laptop, tablet, 'phone) makes contacting others around the country/World very convenient. As the services are all accessible via the web, sending communications in this way allows protest organisers to contact large numbers of people in almost real-time.

Thirdly, Social Media is often publicly visible by anyone who wishes to see it. This would allow other interested parties to follow the published items, possibly further increasing support for the cause that the protesters are campaigning for.

Fourthly, the media in question could be delivered in a variety of formats that can be played on most web-enabled devices. As well as text, photos, video and sound clips can also be sent.

Notes: The question asked for 3 things; I gave 4. It can't hurt!

14. Two development lifecycles that could be used are:

1. The **waterfall** model. This is a traditional method of development in which software moves through analysis (setting out the requirements of the new system), then design (how it should look, the user's experience, what the functions will be called, etc), then implementation (writing the code) and finally testing/evaluation (making sure it works, then identifying areas of strength/weakness with it.

This has the advantage of having clearly defined steps, and is easy to administrate. The disadvantage is that this is an inflexible method of working, and it is difficult to

'unwind' the steps once they have been completed at each stage.

The **agile SCRUM** model consists of working in taking small parts of the problem to be solved, working on them in short coding sprints and then having the new features tested. The process is then repeated until the program is complete.

The advantage is that the coding team will need to communicate constantly so they know what's happening with their project and this method leads to quick development and deployment of software. Unfortunately, this isn't always an ideal method for developing large systems which are more complex and require more planning.

The **spiral** method (often used for large, complex projects) sees a more gradual method of development. The project requirements are set out in detail (analysis) and a design is made for a simplified version of the final program (a prototype). This is then written and tested/evaluated to ensure the program is going in the direction. A more detailed version of the software (building on the first prototype) is then designed and written, then evaluated. This process of making increasingly complex prototypes continues until the final product is produced.

Because there are so many evaluation/testing stages, if a problem is identified early in the development of the system, it can be corrected before the program is developed too much further – ideal for complex programs. A disadvantage of the spiral method is that it can be costly to have so many design and testing stages, slowing the time for development.

Notes: For long-answer questions like this, you need a strategy to ensure you're going to get as many of the marks as possible. This question here asks for TWO methods, and is worth 8 marks. As this question is also assessing your English, ability to organise information and use of vocab, we'll need to ensure we present this well to get all the marks. Let's get organised:

We can reasonably assume that there will be 4 marks for each method you identify. We then need to look at the key words in the question to see what's being asked for...

Within each method, it's going to be safe to assume that naming a development method will be the first mark, describing it briefly will get you a second, an advantage will secure the third mark and the final mark will come from identifying a disadvantage.

If we build our answer to cover these things in this order (for two methods) and we use the correct technical vocabulary where appropriate, we'll get 100% for this question.