Specification & learning objectives

| A Level	Specification point description
2.1.2a	Identify the inputs and outputs for a given situation
2.1.2b	Determine the preconditions for devising a solution to a problem
2.1.2c	The nature, benefits and drawbacks of caching
2.1.2d	The need for reusable program components

Resources

PG Online textbook page ref: 265-267
Hodder textbook page ref: 28-29
CraignDave videos for SLR 19

Identifying inputs and outputs
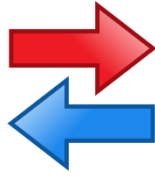
By using analysis techniques it is possible to build a picture of what the solution is required to do. By identifying the inputs of a system one is able to see where the information is coming from, what format it is in and how best to get the information into the system.

In discussion of outputs of the system it is vital to consider what is actually needed to produce the solution to the problem. By focusing on the outputs required, one is able to determine the processing stages required to transform the input into the required output.

When designing and developing solutions the purpose of prototyping is to model the inputs and outputs to confirm, with the client and end user, that the problem has been fully understood.

Key question: What are preconditions for devising a solution to a problem?

Just like analysing the inputs and outputs, the situation and how the inputs are acquired and how outputs are used is just as important.

When determining the preconditions one looks at the whole situation and how the proposed solution will either fit into the current situation or what changes to the current situation needs to be made to best optimise the solution.

For example, if a shop requires a stock control system, they may already have some methods of coding the stock within their organisation. When determining the preconditions one looks at where at whether the solution would be better in using those current stock codes or devising new ones.

The advantage of using the current ones is that the users will be able to use the system more easily; however, it is possible that the coding system currently used is inefficient and therefore a new system would benefit the organisation more.

Key question: What are the benefits and drawbacks of reusable program components?

Developing solutions is a very expensive business and it is impractical to effectively start from scratch every time. Often programmers will build libraries of routines which can be reused with different applications.

For example, if a developer builds an e-commerce website which utilises an online banking system, another program may be able to utilise the online banking system within its development.

Often with computational thinking it is important to think about how the routines could be reused at a later stage. This could be by building a routine that is used by several parts of a program (see next section) or as useful programs to be used in future development.

Key question: What is caching in programming and what are the limitations?

When developing larger database-type systems it may not be possible to store the entire database within the system. If this is the case it may be desirable to cache the data, especially if the data is held on web-based developments.

The concept of caching is that blocks of data are loaded from the database to the machine to allow the processing of information locally which is then uploaded back.

Benefits

- By using blocks of data rather than individual access to and fro, it reduces the load on the database server.
- If the database is held away from the computer at a central source there is an increase in performance of processing the data, as it is performed locally and then transferred back.
- If the data is cached to the machine as a block, if
the database or server fails then that part of the database is backed by cache and can be reloaded when available. This means that the system is less reliant on a reliable connection as it can update where possible and keep the integrity of the data.

Drawbacks

■ While one machine is using that data there is the possibility that another machine may be locked from accessing it.
■ There may also be issues regarding synchronising the data (i.e. if the data updates and is on another machine which is the most up to date).
■ It increases development cost as the caching system will need to be developed.
■ It increases maintenance costs as the database will need to be maintained, especially if web-based.

Typical exam questions

A conference venue hosts many large exhibitions and presentations. Clients book the whole venue and use the various halls and spaces to deliver a variety talks, which delegates can choose to attend. One of the conferences has not been successful, due to the use of the halls.
The abstracted layout is shown.
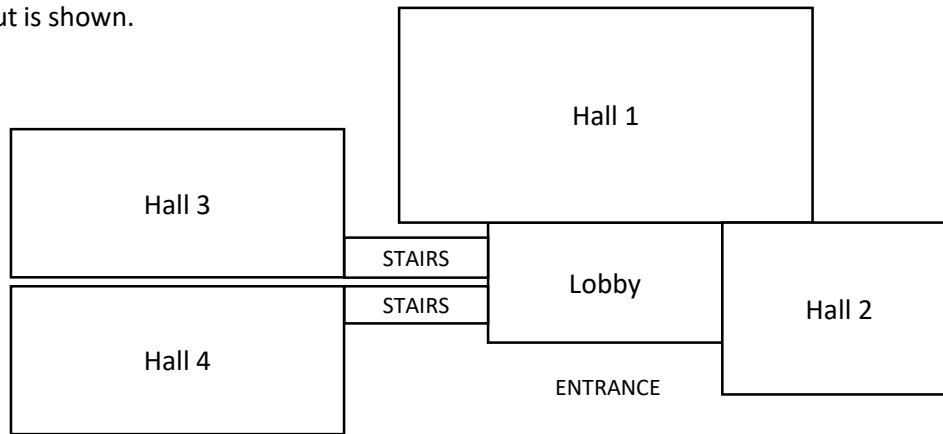
1. State four items of data that could usefully be collected in order to investigate the problem. **[4]**

Programmers use libraries of functions.

2. What advantages are there to using a library of functions in a program? **[4]**

Target: [   ]   Overall grade: [   ]

Minimum expectations & learning outcomes

☐	Terms 206-208 from your A Level Key Terminology should be included and formatted.
☐	You must include an example of a program or real-world scenario amenable to computation that requires preconditions, inputs and outputs.
☐	You must explain how the data required can affect the solution. Consider efficiency and scalability.
☐	You must explain the advantages of reusable program components.
☐	You must explain what is meant by caching in terms of programming (not CPU cache).
☐	Answer the exam questions.

Feedback

Breadth	Depth	Presentation	Understanding
☐ All	☐ Analysed	☐ Excellent	☐ Excellent
☐ Most	☐ Explained	☐ Good	☐ Good
☐ Some	☐ Described	☐ Fair	☐ Fair
☐ Few	☐ Identified	☐ Poor	☐ Poor

Comment & action required

Reflection & Revision checklist

Confidence	Clarification
☹ ☺ ☺	Candidates need to understand that situations require inputs and output, and that outputs can be both digital or in a hard copy format.
☹ ☺ ☺	Candidates may be given a description, diagram, or code for a scenario, and they will need to demonstrate an understanding of what inputs and outputs are needed, and/or are used in that specific scenario.
☹ ☺ ☺	For a description of a program, candidates need to be able to determine what else they need to know before they can produce a solution, for example what information is missing and what else will affect that solution.
☹ ☺ ☺	Candidates need to understand the purpose, benefits and drawbacks of reusable program components.
☹ ☺ ☺	Candidates should understand how these components can be reused, and for a given scenario/program they will need to be able to identify the subprograms that will be needed.
☹ ☺ ☺	Candidates may then be required to write code for these reusable components.
☹ ☺ ☺	Candidates need to have an understanding of the purpose of caching in programming, and how it can be used when writing a program.
☹ ☺ ☺	Candidates need to be able to apply their knowledge of caching to a scenario to demonstrate an understanding of how it can be used.
☹ ☺ ☺	Candidates need to understand the benefits and drawbacks of using caching in a program.