Solution Pathway

SECTION A – Multiple-choice questions

Question	Answer	Comments
1	A	Arrays are data structures that hold multiple elements of a single data type. The others are all data types.
2	B	A data dictionary lists variables, objects and fields; a use case diagram shows interactions between users and functionality. Pseudocode describes program logic.
3	B	An increase in output would indicate a more efficient system as less time required per task. Timing the task would be considered testing, not evaluation, C is nonsensical and D would check effectiveness.
4	C	SRS is an analysis document, not a design document.
5	C	Internal documentation tells other developers the purpose and intent of the code. It is useful for remembering later on, even if working alone, and is ignored by compilers and interpreters so it adds no extra size to compiled code.
6	B	A mind map is used to document ideas. A UCD shows interaction between users and functionality in a system, a DFD shows how data is transformed through a system and flow chart shows a series of steps in logical order.,
7	A	Data flows are labelled with "names" of data, items (such as data stores and entities) can be reused to improve readability of the diagram, and labels for data in and out of data stores is often repeated.
8	D	Existence checking is checking if required data is present.
9	D	Pay close attention to the subtle but significant differences between < & > and <= & >=, and between AND and OR.
10	B	Data about coaching is not relevant, opting out of emails and other programs would not be part of analysis.
11	A	Sender should identify themselves and provide an easy opt out process to ensure compliance with the Spam Act.
12	A	Selection sort is a simple algorithm with little overhead, well suited to a small list
13	D	A and B are efficiency measures and useability testing is not part of the design process
14	A	Students are not required to use or create XML, but they should know what it is and why it is useful.
15	B	Binary searching is much more efficient for large data sets, but the data must be sorted first.
16	A	Milestones have no duration and no resources allocated to them. They are events, not tasks, and a project can have many milestones.
17	A	Option B refers to correctness. D relates to timeliness.
18	B	Routers typically connect networks, including the internet, and switches intelligently only send traffic to relevant nodes.
19	D	Objectives tend to work towards goals and system objectives and goals work toward organisational objectives and goals.
20	B	Encryption is used to secure data when transferring across networks.

SECTION B – Short-answer questions

Question 1 (2 marks)

DFD lines are the actual data to be transformed by the system, whereas the lines on a UCD show associations between actors and use cases.

Lines on DFD always have arrow heads showing direction of flow, whereas UCD lines use arrow heads to show either initiator or the generalisation relationship.
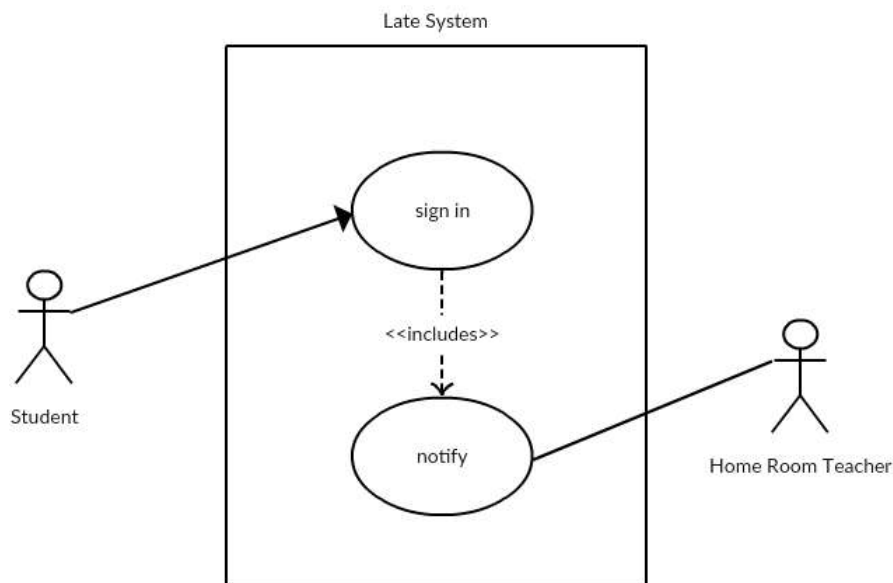
Question 2 (2 marks)

A project is a unique (i.e. once off) series of tasks of fixed duration.

Question 3 (2 marks)

c.   *Backing up*

d.   *Deleting the data from the original location after he copied it*

Question 4 (3 marks)

1 mark for each correct label.

Question 5 (1 mark)

Decimal calculation

8 GB = 8000 MB

8000 / 1.7 = 4705.9

4705 images will fit

Binary calculation

8 GB = 8192 MB

8192 / 1.7 = 4818.8

4818 images will fit

Either method is acceptable.

Question 6 (6 marks)

```
BEGIN
{find in array}
      INPUT arrayToSearch
      highest ← 0

      FOR i ← 0 TO length(arrayToSearch)-1
          IF arrayToSearch[i] > highest THEN
              highest ← arrayToSearch[i]
          ENDIF
      LOOP

      OUTPUT highest

END
```

1 for indenting correctly
1 for BEGIN/END or START/STOP, or other suitable combination
1 for loop, including initialising and referencing counter (i.e. -1)
1 for correct use of selection
1 for using ← for assignment, rather than equals
1 for input and output (could be read, return or other appropriate actions).

Students may also choose to SORT the data, then select the top. Teachers should consider the accuracy of the algorithm in that case.

Question 7 (4 mark)

Effectiveness criteria might focus on:

- *Readability, clarity, ease of use*

The first design is most likely more efficient, therefore Farah may not have focused on efficiency at all. Students could describe criteria in terms of time, cost or effort, but if these would select option 1, they would not be appropriate.

2 marks for each reasonable and appropriate criterion.

SECTION C – Case study

Question 1 (6 marks)

a. *Advantages of interviews include ability to give clarification, ask follow-up questions, more personal so answers might be more honest, more in-depth responses*
Disadvantages include time consuming, nervousness for Anna interviewing Mr Wiltshire, difficulty in finding a suitable time
1 mark for one appropriate advantage and 1 mark for one appropriate disadvantage.

b. *Surveys (of students, or Mr Wiltshire, or others), competitor analysis, reviewing documentation (i.e. paper ballots and tally sheets or printouts of previous elections)*

c. *Students should discuss the relative disadvantage of the method they chose for this specific case. Responses may include the level detail Sarah can get, that Mr Wiltshire may have ideas that he could not describe to Sarah on paper.*
2 marks for 2 relevant points.

Question 2 (6 marks)

a.

	1	2	3	4	5	6	7	8	9	10	11	12
Fact finding	■											
Complete SRS		■										
System design			■	■								
Development					■	■	■	■	■	■		
Testing										■		
Additional Testing											■	
Finalise solution											■	
Installation												■

*Additional testing refers to useability testing, but is deliberately not labelled this as students are asked to identify this later in the paper.

2 marks for all correct weeks / days allocated, including headings for weeks – these could be school term related

2 marks for all correct dependency arrows indicated

1 mark for testing finishing in line with development.

b. *The beginning of the 4th week of Term 3.*

Question 3 (5 marks)

    A. *Voter*
    B. *Cast Vote*
    C. *Election results*
    D. *Administrator*
    E. *Upload voter details or add voters*

Question 4 (2 marks)

Both voter and administrator can use it.

1 mark for each user identified.

The <<includes>> case is an essential part of the Use Cases "Cast Vote" and "Create Candidate List"

Question 5 (5 marks)

The purpose of the SRS – to outline the document's purpose, to describe what the solution will do and how it will do it. (Not the proposed solutions' purpose, i.e. NOT the purpose of the SPVS)

Environment characteristics – provides a technical description of environment (network, hardware) within which the solution will operate.

Non-functional requirements - describes the attributes the solution should possess including useability, reliability, portability, robustness, maintainability. How it will do it.

Constraints – outlines what conditions need to be considered when designing a solution.

Use case diagrams – used to assist in the description of functional requirements.

Question 6 (2 marks)

Radio buttons are the best option as they allow for only ONE option to be selected, check boxes allow for more than one item to be selected.

Question 7 (6 marks)

a.   *Programming with objects:*
- *allows for easier re-use of code*
- *re-use improves development times*
- *improves maintainability as structure and organisation of code is clearer*
- *aids with modularisation (breaking complex code into more manageable segments),*
- *hides implementation of routine functions and attributes (using methods for example)*
- *inheritance, encapsulation, polymorphism, abstraction which are the tenants of Object-oriented programming.*

1 mark for naming an advantage; 1 mark for describing either how or why it helps.

b.

Attribute	Data type
voterId	*Number-integer*
surname	*Character-string*
firstName	*Character-string*
hasVoted	*Boolean*

Question 8 (4 marks)

a.   *Allows development to focus on outcomes/benchmarks.*
Allows development to be compared against criteria throughout.

1 mark for each reason.

b.   There is a range of acceptable responses but they should be focused on effectiveness (rather than efficiency), realistic, within the context of this case study and measurable. Evaluation criteria are often best set as questions as it helps students focus on working towards the "answer", but statements are acceptable.

Examples might be:
- *Are there any informal votes? / There are no informal votes.*
- *Are candidates always listed in random order? / Candidates are always listed in random order*

Question 9 (4 marks)

While not explicitly cited in the study design, CSV data is an accepted and standard way to manage data and files, as is the use of databases and XML which is specifically mentioned in the study design.

Students should have a basic understanding that:

- *Formal databases require more difficult setup and administration, portability issues and often more challenging connection, but provide significant benefits in speed and organisation in particular when dealing with larger data sets.*
- *CSV files are easier to setup and maintain, often simpler to connect with and manipulate, suitable for small datasets, which this would be.*
- *XML provides much of the benefits of CSV but is better suited for transfer of data between systems, as it is self-describing.*

2 x 1 mark for 1 advantage of CSV and 1 mark for why it might be preferable **for Sarah in this case.**

Question 10 (3 marks)

From the algorithm, write a line that shows an example of:

Iteration   `FOR i ← 0 TO count(votesArray) - 1`

Assignment   `candidate ← votesArray[i] (there are other alternatives)`

Associative array/dictionary `candidatesArray[candidate] ← candidatesArray[candidate] + 1`
The question explicitly states "write a line" so students should copy the complete line with their example.

Question 11 (5 marks)

a.   *Function – as it returns a value; as opposed to a procedure which does not.*   1 mark

b.   4 marks

```
IF candidate.value > max THEN
    max ← candidate.value
    winner ← candidate.key
ENDIF
```

1 mark for correct indenting
1 mark for selection statement, including THEN, ENDIF
1 mark for assignment statement of max
1 mark for assignment statement of winner.

Note: Associative arrays/dictionaries are new to this study design and as there is no standard for pseudocode and no VCAA examples to draw from, teachers should assess this in the context of how they approached the topic with their own students.

Question 12 (1 mark)

Useability testing

Question 13 (3 marks)

Responses should be case study specific and might consider:
- *Some people might miss out on voting.*
- *Some people who are not supposed to vote might be voting.*
- *The vote is invalid for these or other reasons.*
- *A loss of confidence in the system meaning Mr Wiltshire will look for another solution.*
- *People may not believe that the vote was fair, so not respect the result.*

1 mark for each appropriate reason.

Question 14 (5 marks)

a.　*Her evaluation criteria from the design stage*

b.　*A strategy must involve multiple steps (i.e. at least 2). A simple statement about the correct winner being found is not enough. The response might consider what data is required, how that data will be collected and the decision reached. As students completed this process for the SAT they should be able to use that knowledge to imagine a strategy for Sarah's case.*

　　1 mark for multiple steps
　　2 marks for reasonable steps to take that would determine success or otherwise of the project
　　1 mark for referring to case study explicitly.

Question 15 (4 marks)

Factors might include:

- *Coding taking longer than expected due to inexperience causing delays in beginning testing and not meeting deadline.*
- *Availability of Mr Wiltshire or testers preventing completing this element on time.*
- *Changes of dates by external parties causing conflicts with schedule.*
- *Failure to update the Gantt chart regularly as changes occurred to stay focused on timeline making plan unreliable.*
- *Missing elements of the Gantt chart, such as resources or milestones reducing effectiveness of plan to monitor progress.*

1 mark for each factor and 1 mark for its impact.