Computing

GCSE Computer Science – Algorithms

Assessment Opportunities	Literacy/Reading opportunities	CEIAG Links
Within every half term, there will be a minimum of 2 low stakes quizzes. These will be automatically marked out of 20. **There will also be a end of unit test which will be based on past exam questions. These questions are then marked and gone through as a class.**	Algorithm production - Designing, creating and refining algorithms - OCR - GCSE Computer Science Revision - OCR - BBC Bitesize Standard algorithms - Searching and sorting algorithms - OCR - GCSE Computer Science Revision - OCR - BBC Bitesize 1.2 - Designing Algorithms - OCR GCSE (J277 Spec) | CSNewbs	• Penetration tester • Application analyst • Applications developer • Cyber security analyst • Data analyst • Forensic computer analyst • IT trainer • Machine learning engineer

Curriculum vision:

"Our aim is to deliver a curriculum that is inclusive, relevant and progressive for all learners."

FIRST ASSESSMENT SUMMER 2022

Topic 2.1 – Algorithms: Lesson 1 – Introduction to algorithms

The big picture

Why is this relevant for the learners?

1. Ask students how many problems, or decisions they encounter each day?
2. Explain that these actions, processes etc. are implemented in a computer system through computational thinking, which anyone who uses a computer uses, without knowing it.

Notes: *Use Context Setting task to engage pupils and create discussion.*
May link to flipped resources if you use flipped learning.

Objectives

What should the learners be confident/able to do at the end of the session?

1. Understand the term and processes in computational thinking.
2. Be able to use the skills of abstraction, decomposition and algorithmic thinking.

Notes: *These are the core learning that the students should develop during the lesson. This will link to the activities that provide ability to assess the Objectives.*

Engagement

How will I encourage engagement?

1. Give students the situation: You need to write a program that simulates the International Space Station.
2. Ask them how they would tackle this program.

Notes: *A short activity that stimulates the learners. Ideas taken from big picture activity could be used.*

Assessment for Learning

Expected progress:
- Define the terms computational thinking, abstraction, decomposition and algorithmic thinking.

Good progress:
- Describe key elements in abstraction, decomposition and algorithmic thinking.
- Use abstraction, decomposition and algorithm thinking to design solutions to problems, although these may not be complete.

Exceptional progress:
- Explain how abstraction, decomposition and algorithmic thinking are components of computational thinking.
- Apply abstraction, decomposition and algorithmic thinking to problems.

The sticking points

What activities will the learners undertake?

- Definition of computational thinking
- How abstraction is used when producing a program.
- How decomposition is used when producing a program.
- How algorithmic thinking is used when producing a program.

Notes: *A list of concepts that you want the learner to remember by the end of the lesson.*

Keywords

Learners should be able to use the following words confidently:
- Computational thinking – the use of computers to solve problems.
- Abstraction – representing 'real world' problems in a computer using variables and symbols and removing unnecessary elements from the problem.
- Decomposition – breaking down a large problem into smaller sub-problems.
- Algorithmic Thinking - identifying the steps involved in solving a problem.

Notes: *Multiple Choice Questions will assess these keywords; use the MCQs supplied. You may wish to customise these as needed.*

Notes

Differentiation

How will I enable access to each area of learning for my learners?

- Activity 1 – differentiated worksheets for low, middle and high.
- Activity 2 – differentiated worksheets for low, middle and high.
- Activity 3 – differentiation by expectation and outcome, high achievers should be giving very precise instructions that cover all aspects of each question, whilst lower ability may miss some stages, or use less precise statements.

Notes: *Use of Stretch Task Ideas supplied may support high end differentiation. You will need to modify the resources to meet the needs of your pupils specifically. You may wish to refer to Departmental or School policies on differentiation methods used within your centre.*

Activity 1

What tasks will I ask the pupils to complete to develop their understanding during the lesson?

- Worksheet L1 Activity 1.
- Students are to identify how a map would be represented in a computer system.
- For the low level, students are given instructions to draw the map and told how to do this.
- The medium level have questions to guide them in how to apply abstraction and what they need to consider.
- The high level do not have the hints, and have an extension activity.
- A student could draw their map or read out their answer for other students to compare theirs to when complete.

Notes: *Use the Activities given to develop the student's knowledge of the topic. Each activity may need further differentiation/adaptation for your needs. Reference the Common Misconceptions/FAQ guide to support your delivery of the topic.*

Activity 2

What tasks will I ask the pupils to complete to develop their understanding during the lesson?

- Students need to complete the top-down diagram/structure diagram for the game of Battleships.
- Students may need the game of Battleships describing before starting, this can be done alongside Slide 11 where the diagram is presented.
- The low level have the boxes drawn, and the words – they need to put the words into the correct boxes
- The medium level have a hint to help guide them in the completion of the diagram.
- The high level do not have the hint, and they have an extension to draw a further diagram to expand one of the sub-problems.
- For the medium and high level worksheets, there is no set right answer – there can be many diagrams that are all different, but that cover the requirements.

Activity 3 / Extension

How will I challenge high ability learners, or extend the lesson activities if needed?

- Students need to write algorithms (the steps involved in the processes) for the three problems on the board.
- Higher level students should be.

Summary/Plenary

Use MCQs here

- Ask students to work in pairs to test each other on the key term definitions.
- Ask students to add to each other's definitions to make sure they are complete.

Notes: *Use the MCQs to check basic understanding of key words and topics.*

Use the LOR to develop deeper knowledge and allow Peer Assessment and Review. This can be developed to use the LOR ideas as homeworks etc.

Topic 2.1 – Algorithms: Lesson 2 – Designing, creating and refining algorithms

The big picture

Why is this relevant for the learners?

1. Give students the scenario: An APP development company is creating a new game.
2. Do you start programming immediately?

Notes: *Use Context Setting task to engage pupils and create discussion. May link to flipped resources if you use flipped learning.*

Objectives

What should the learners be confident/able to do at the end of the session?

1. Be able to produce an algorithm using a flowchart.
2. Be able to produce an algorithm using pseudocode.

Notes: *These are the core learning that the students should develop during the lesson. This will link to the activities that provide ability to assess the Objectives.*

Engagement

How will I encourage engagement?

1. Ask students to 'do' the algorithm on slide 4 (this can be adapted for your situation and students.
2. Ask students if this is an algorithm.
3. What do they recognise from it? i.e. IF, ELSEIF, ENDIF etc.
4. This can be expanded if time, to ask students to write their own instructions for each other, or the class, to act out (keep an eye on appropriateness of actions).

Notes: *A short activity that stimulates the learners. Ideas taken from big picture activity could be used.*

Assessment for Learning

Expected progress:

- Identify the core symbols in flowcharts.
- Write input, output and processing instructions in pseudocode.
- Use selection in pseudocode.

Good progress:

- Follow selection within a flowchart.
- Identify all symbols used in flowcharts.
- Write algorithms using selection and iteration in pseudocode.

Exceptional progress:

- Follow iteration and subroutines within flowcharts.
- Write complex algorithms using pseudocode.

The sticking points

What activities will the learners undertake?

- The key symbols for a flowchart.
- The key components of pseudocode.

Notes: *A list of concepts that you want the learner to remember by the end of the lesson.*

Keywords

Learners should be able to use the following words confidently:

- Algorithm – the series of steps to solve a problem or perform an action.
- Flowchart – a diagram that shows the inputs, outputs and processes in an algorithm.
- Process – an action that takes place.
- Pseudocode – simplified programming code that is not language specific, used to design algorithms.

Differentiation

How will I enable access to each area of learning for my learners?

- Activity 1, there are 3 different flowcharts for low, medium and high. Medium involves more decisions and calculation, high uses subroutines. Students could work through the different levels if appropriate.
- Activity 2, there are 3 different worksheets, for low, medium and high.
  - Low – the algorithms are more structured and hints are given to help the students address each step of the algorithm.
  - Medium – the algorithms increase in complexity, using loops and selection.
  - High – the algorithms increase in complexity and require additional functions such as the use of MOD.

Notes: *Use of Stretch Task Ideas supplied may support high end differentiation. You will need to modify the resources to meet the needs of your pupils specifically. You may wish to refer to Departmental or School policies on differentiation methods used within your centre.*

Activity 1

What tasks will I ask the pupils to complete to develop their understanding during the lesson?

- Students are to follow Activity 1 to work out the result of each flowchart, there is a different flowchart for low, medium and high to change the level of difficulty of the flowchart.

Notes: *Use the Activities given to develop the student's knowledge of the topic. Each activity may need further differentiation/adaptation for your needs. Reference the Common misconceptions/FAQ guide to support your delivery of the topic.*

Activity 2

What tasks will I ask the pupils to complete to develop their understanding during the lesson?

- Students need to write a pseudocode algorithm for each of the tasks on the worksheet, there are 3 levels to the worksheet – more information on this is in the differentiation section.

Summary/Plenary

- Ask students to identify the key symbols in flowcharts.
- Ask students to identify the differences between pseudocode and programming code.

Notes: *Use the MCQs to check basic understanding of key words and topics.*

Use the LOR to develop deeper knowledge and allow Peer Assessment and Review. This can be developed to use the LOR ideas as homeworks etc.

Topic 2.1 – Algorithms: Lesson 3 – Correcting and completing algorithms

The big picture

Why is this relevant for the learners?

1. Is everything perfect first time?
2. Discuss how mistakes are always made, even by very experience programmers, when writing new programs.
3. Explain how this is expected, and not a weakness, it is how you find the error(s) and correct it/them that matters.

Notes: *Use Context Setting task to engage pupils and create discussion. May link to flipped resources if you use flipped learning.*

Objectives

What should the learners be confident/able to do at the end of the session?

- Be able to find and correct errors in algorithms.
- Be able to complete algorithms where code is missing.

Notes: *These are the core learning that the students should develop during the lesson. This will link to the activities that provide ability to assess the Objectives.*

Engagement

How will I encourage engagement?

1. You are presented with a pseudocode algorithm that doesn't work.
2. How will you find and fix the errors? What do you do?
3. Discuss different ways and strategies that can be used to find the errors, such as tracing the algorithms, using example data.

Notes: *A short activity that stimulates the learners. Ideas taken from big picture activity could be used.*

Assessment for Learning

Expected progress:

- Identify the core symbols in flowcharts.
- Write input, output and processing instructions in pseudocode.
- Use selection in pseudocode.

Good progress:

- Follow selection within a flowchart.
- Identify all symbols used in flowcharts.
- Write algorithms using selection and iteration in pseudocode.

Exceptional progress:

- Follow iteration and subroutines within flowcharts.
- Write complex algorithms using pseudocode.

The sticking points

What activities will the learners undertake?

- How to tackle finding an error in an algorithm.
- How to tackle completing missing code in an algorithm.

Notes: *A list of concepts that you want the learner to remember by the end of the lesson.*

Keywords

Learners should be able to use the following words confidently:

- Dry run – walking through an algorithm which sample data, running each step manually.
- Trace Table – a table that follows the values of variables to check for accuracy.

Notes: *Multiple Choice Questions will assess these keywords; use the MCQs supplied. You may wish to customise these as needed.*
could be used.

Notes

Differentiation

How will I enable access to each area of learning for my learners?

- Activity 1, there is a low, medium and high level worksheet.
  - Low – the students have a simpler algorithm which uses selection.
  - Medium – the algorithm uses iteration and has more calculations and overwriting of variables.
  - High – the students have a more complex algorithm with iteration and selection.
- Activity 2, there is a low, medium and high level worksheet.
  - Low – the students have a sequence algorithm to complete.
  - Medium – selection is used with multiple calculations.
- High – iteration and selection are combined, along with nested statements.

Notes: *Use of Stretch Task Ideas supplied may support high end differentiation. You will need to modify the resources to meet the needs of your pupils specifically. You may wish to refer to Departmental or School policies on differentiation methods used within your centre.*

Activity 1

What tasks will I ask the pupils to complete to develop their understanding during the lesson?

- Use Activity 1 worksheet, students need to read what the algorithm should do, trace the algorithm, find and correct the errors. There are three different algorithms for low, medium and high – see differentiation for more detail.

Notes: *Use the Activities given to develop the student's knowledge of the topic. Each activity may need further differentiation/adaptation for your needs. Reference the Common Misconceptions/FAQ guide to support your delivery of the topic.*

Activity 2

What tasks will I ask the pupils to complete to develop their understanding during the lesson?

- Use Activity 2 worksheet, students need to read what the algorithm should do, trace the algorithm and complete the algorithm where there are spaces. There is a low, medium and high level – these are described further in the differentiation section.

Summary/Plenary

- Use MCQs for the topic.

Notes: *Use the MCQs to check basic understanding of key words and topics.*

Use the LOR to develop deeper knowledge and allow Peer Assessment and Review. This can be developed to use the LOR ideas as homeworks etc.

Topic 2.1 – Algorithms: Lesson 4 – Linear and binary searches

The big picture

Why is this relevant for the learners?

1. Ask students how they search for an item that they have lost, or how they search for a book in a library.
2. Ask students how they think a search engine finds websites.
3. Ask students how they would tell a computer how to search for something.

Notes: *Use Context Setting task to engage pupils and create discussion. May link to flipped resources if you use flipped learning.*

Objectives

What should the learners be confident/able to do at the end of the session?

1. Be able to use a linear search to find data.
2. Be able to use a binary search to find data.
3. Understand the differences between a linear and a binary search.

Notes: *These are the core learning that the students should develop during the lesson. This will link to the activities that provide ability to assess the Objectives.*

Engagement

How will I encourage engagement?

1. Shuffle and deal 10 cards upside down on the desk in front of you.
2. Only 1 card can be turned over at a time.
3. Do you have a Jack?
4. **Extension:** Can you write an algorithm (series of steps) to search for the Jack.
5. *If you do not have access to decks of cards, use numbers on small pieces of paper.*

Notes: *A short activity that stimulates the learners. Ideas taken from big picture activity could be used.*

Assessment for Learning

Expected progress:

- Perform a linear search correctly.
- Perform a binary search correctly.
- Identify at least one difference between a linear and binary search.

Good progress:

- Describe the steps involved in a linear search.
- Describe the steps involved in a binary search.
- Perform both a linear and binary search.
- Describe at least two differences between a linear and binary search.

Exceptional progress:

- Write an algorithm to perform a linear search.
- Write an algorithm to perform a binary search.
- Explain the differences between a linear and binary search.

The sticking points

What activities will the learners undertake?

- Describe the steps in a linear search.
- Describe the steps in a binary search.
- Understand that a binary search needs the items to be in order.

Notes: *A list of concepts that you want the learner to remember by the end of the lesson.*

Keywords

Learners should be able to use the following words confidently:

- Linear search – Each item in the list is checked in order.
- Binary search – An ordered list is divided in 2 with each comparison.

Notes: *Multiple Choice Questions will assess these keywords; use the MCQs supplied. You may wish to customise these as needed.*

Notes

Differentiation

How will I enable access to each area of learning for my learners?

- Lower level students will need support, and possibly to work in pairs to perform the searches. If doing these activities in pairs, then each student needs an opportunity to perform the search with the other assisting.
- The worksheet (Activity 1 and 2) have instructions on how to perform the searches which can be given to individual students where needed.
- The higher level students should be expected to give clear instructions on how to perform the searches, and to write an algorithm (or attempt to write an algorithm) for each search.

Notes: *Use of Stretch Task Ideas supplied may support high end differentiation. You will need to modify the resources to meet the needs of your pupils specifically. You may wish to refer to Departmental or School policies on differentiation methods used within your centre.*

Activity 1

What tasks will I ask the pupils to complete to develop their understanding during the lesson?

- Students need to work in pairs (or groups of 3 max.).
- Each group needs a pack of playing cards, or a suit of playing cards, or printed out cards with numbers on.
- The students need to put these cards in order from lowest to highest, and then turn them over so they cannot see them.
- The students need to perform a binary search on the cards to try and find the number 8, then to find a King (these can be replaced with your own options depending on what cards or items you are using)
- Worksheet Activity 1 has a list of instructions for students to follow if needed.

Notes: *Use the Activities given to develop the student's knowledge of the topic. Each activity may need further differentiation/adaptation for your needs. Reference the Common Misconceptions/FAQ guide to support your delivery of the topic. Reference the Common Misconceptions/FAQ guide to support your delivery of the topic.*

Activity 2

What tasks will I ask the pupils to complete to develop their understanding during the lesson?

- Students need to work in pairs (or groups of 3 max.).
- Each group needs a pack of playing cards, or a suit of playing cards, or printed out cards with numbers on.
- These cards need to be face down (so the students cannot see what is on them).
- The students need to perform a linear search on the cards to try and find the number 8, then to find a King, then an Ace (these can be replaced with your own options depending on what cards or items you are using).
- Worksheet Activity 2 has a list of instructions for students to follow if needed.

Activity 3 / Extension

How will I challenge high ability learners, or extend the lesson activities if needed?

- Make sure the Worksheets have been collected in from Activity 1 and Activity 2.
- Students need to independently write down a list of instructions for someone else to follow, on how to perform a linear and a binary search.
- Extensions: students need to attempt to put this into pseudocode, or a programming language.

Summary/Plenary

- Ask students to work in pairs.
- Ask one student to give instructions to the other, on how to perform a linear, or binary, search.
- The other student is to carry out the instructions – but correct the first student where necessary.

Notes: *Use the MCQs to check basic understanding key words and topics.*

Use the LOR to develop deeper knowledge and allow Peer Assessment and Review. This can be developed to use the LOR ideas as homeworks, etc.

Topic 2.1 – Algorithms: Lesson 5 – Bubble sort

The big picture

Why is this relevant for the learners?

1. Ask students to consider where items, or objects need to be sorted in the real world and to think about how a computer sorts items.

Notes: *Use Context Setting task to engage pupils and create discussion. May link to flipped resources if you use flipped learning.*

Objectives

What should the learners be confident/able to do at the end of the session?

1. Understand the principles of a bubble sort.
2. Be able to perform a bubble sort on a set of data.
3. Understand how the number of comparisons increases in a bubble sort.

Notes: *These are the core learning that the students should develop during the lesson. This will link to the activities that provide ability to assess the Objectives.*

Engagement

How will I encourage engagement?

1. Ask the students to work in pairs (3s if needed).
2. 1 student is to deal 10 cards, face up.
3. The second student needs to instruct the first on what to do to put the cards in numerical order .

Notes: *A short activity that stimulates the learners. Ideas taken from big picture activity could be used.*

Assessment for Learning

Expected progress:

- Perform a bubble sort correctly.

Good progress:

- Describe the stages involved in performing a bubble sort.

Exceptional progress:

- Write an algorithm to perform a bubble sort.

The sticking points

What activities will the learners undertake?

- How to perform a bubble sort.
- The number of worst case comparisons a bubble sort takes.
- The average number of comparisons a bubble sort takes.

Notes: *A list of concepts that you want the learner to remember by the end of the lesson.*

Key words

Learners should be able to use the following words confidently:

- Bubble sort – moving through a list repeatedly, swapping elements that are in the wrong order.

Notes: *Multiple Choice Questions will assess these keywords; use the MCQs supplied. You may wish to customise these as needed.*

Notes

Differentiation

How will I enable access to each area of learning for my learners?

- Lower level students will need support, and possibly to work in pairs to perform the sort. If doing these activities in pairs, then each student needs an opportunity to perform the search with the other assisting.
- The worksheet Activity 1 has instructions on how to perform the searches which can be given to individual students where needed.
- Activity 2 worksheet has a low, medium and high level.
  - Low has instructions on what needs to be compared, and partially completed lists for the first cycle through the list. For further cycles through, an empty list is given for students to complete.
  - Medium – no additional instructions or structured lists are given students are expected to perform the sort independently (using Activity 1 instructions if needed).
  - High – the students are expected to perform the sort and then begin to write an algorithm to perform the sort, preferably in pseudocode code or a programming language.

Notes: *Use of Stretch Task Ideas supplied may support high end differentiation. You will need to modify the resources to meet the needs of your pupils specifically. You may wish to refer to Departmental or School policies on differentiation methods used within your centre.*

Activity 1

What tasks will I ask the pupils to complete to develop their understanding during the lesson?

- Students can work in pairs, independently, or in groups of 3 if needed.
- Students need to deal 10 cards face down (these can be from a deck of playing cards, of cards with different numbers on).
- The students need to follow the bubble sort instructions to put the cards in order – this can be repeated until students are confident with the process.
- The worksheet Activity 2 has instructions on that can be given to students, or groups to remind them of the steps.

Notes: *Use the Activities given to develop the student's knowledge of the topic. Each activity may need further differentiation/adaptation for your needs. Reference the Common Misconceptions/FAQ guide to support your delivery of the topic. Reference the Common Misconceptions/FAQ guide to support your delivery of the topic.*

Activity 2

What tasks will I ask the pupils to complete to develop their understanding during the lesson?

- Students need to complete a bubble sort on the list of data provided.
- They need to show each stage of the process.

There is a low, medium and high level, with differing support (see section on differentiation).

Summary/Plenary

- Ask one student to given instructions to the other on how to perform the bubble sort, the students must correct any incorrect instructions that they are given.

Notes: *Use the MCQs to check basic understanding of key words and topics.*

Use the LOR to develop deeper knowledge and allow Peer Assessment and Review. This can be developed to use the LOR ideas as homeworks etc.

Topic 2.1 – Algorithms: Lesson 6 – Merge sort

The big picture

Why is this relevant for the learners?

1. Bubble sort is one method of sorting and is great in some situations ...
2. ... but there is not only one method of sorting.
3. Do you ever use a bubble sort?

Notes: *Use Context Setting task to engage pupils and create discussion. May link to flipped resources if you use flipped learning.*

Objectives

What should the learners be confident/able to do at the end of the session?

1. Understand the principles of a merge sort.
2. Be able to perform a merge sort on a set of data.

Notes: *These are the core learning that the students should develop during the lesson. This will link to the activities that provide ability to assess the Objectives.*

Engagement

How will I encourage engagement?

1. Ask students to deal 10 cards (or other appropriate media).
2. Ask students to sort them, but they cannot use a bubble sort.
3. Ask students to share their sorting method(s) either in pairs, groups or as a class.

Notes: *A short activity that stimulates the learners. Ideas taken from Big Picture activity could be used.*

Assessment for Learning

Expected progress:
- Perform a merge sort.

Good progress:
- Describe the stages involved in a merge sort.

Exceptional progress:
- Write an algorithm to perform a merge sort.

The sticking points

What activities will the learners undertake?

- How to merge two ordered lists.
- The steps involved in performing a merge sort.

Notes: *A list of concepts that you want the learner to remember by the end of the lesson.*

Keywords

Learners should be able to use the following words confidently:

- Merge sort – a list is split into individual lists, these are then combined (2 lists at a time).
- List: a set of data.

Notes: *Multiple Choice Questions will assess these keywords; use the MCQs supplied. You may wish to customise these as needed.*

Notes

Differentiation

How will I enable access to each area of learning for my learners?

- Activity 3. There is a low, medium and high worksheet.
  - Low, students have a structure on their worksheet with instructions on how to perform the sort.
  - Medium, students have been given the steps involved.
  - High – the students are not given any prompts and have an extension activity to consider how a list of names would be sorted (as opposed to working with numbers).

Notes: *Use of Stretch Task Ideas supplied may support high end differentiation. You will need to modify the resources to meet the needs of your pupils specifically. You may wish to refer to Departmental or School policies on differentiation methods used within your centre.*

Activity 1

What tasks will I ask the pupils to complete to develop their understanding during the lesson?

- Students need to work in pairs, or small groups to merge the two lists on slide 8.
- They need to show each step of the process**.**

Notes: *Use the Activities given to develop the student's knowledge of the topic. Each activity may need further differentiation/adaptation for your needs. Reference the Common Misconceptions/FAQ guide to support your delivery of the topic.*

Activity 2

What tasks will I ask the pupils to complete to develop their understanding during the lesson?

- Students can work independently, or in pairs.
- Students need to deal 10 cards (playing cards, or paper with numbers on) face up.
- They need to follow the steps to perform a merge sort on the cards.
- This process can be repeated by dealing additional cards or swapping if working in groups.
- The worksheet 'Activity 1' has the steps involved listed, it can be given to some students to help remind them how to perform the sort.

Activity 3

How will I challenge high ability learners, or extend the lesson activities if needed?

- Students need to use the worksheet to perform a merge sort on the list of data.
- The worksheet is differentiated for low, medium and high learners – see the section on differentiation for more detail.

Activity 4

How will I challenge high ability learners, or extend the lesson activities if needed?

- Ask students to work in pairs (or 3s).
- They need to set up **one** list that they will both sort.
- One student needs to perform a bubble sort.
- One student needs to perform a merge sort.
- They need to record how many moves/comparisons each sort makes.
- Discuss which was fastest, and in which scenario each is fastest.

Summary/Plenary

- Ask one student to give a second instructions to perform a merge sort on either a set of data, cards etc. The second student must correct any mistakes during the process.
- This can be repeated so each student has to describe the steps.

Notes: *Use the MCQs to check basic understanding of key words and topics.*

Use the LOR to develop deeper knowledge and allow Peer Assessment and Review. This can be developed to use the LOR ideas as homeworks etc.

Topic 2.1 – Algorithms: Lesson 7 – Insertion sort

The big picture

Why is this relevant for the learners?

1. Ask students to think back to the different sorting methods.
2. Ask them to think about any other ways of sorting – how many different methods can you sort one list of items?

Notes: *Use Context Setting task to engage pupils and create discussion. May link to flipped resources if you use flipped learning.*

Objectives

What should the learners be confident/able to do at the end of the session?

1. Understand the principles of an insertion sort.
2. Be able to perform an insertion sort on a set of data.

Notes: *These are the core learning that the students should develop during the lesson. This will link to the activities that provide ability to assess the Objectives.*

Engagement

How will I encourage engagement?

1. Remind students about the two different methods of searching.
2. Ask students to 'invent' a third way of sorting data, use a pack.

Notes: *A short activity that stimulates the learners. Ideas taken from Big Picture activity could be used.*

Assessment for Learning

Expected progress:
- Perform an insertion sort.

Good progress:
- Describe the stages involved in an insertion sort.

Exceptional progress:
- Write an algorithm to perform an insertion sort.

The sticking points

What activities will the learners undertake?

- The steps involved in performing an insertion sort.

Notes: *A list of concepts that you want the learner to remember by the end of the lesson.*

Keywords

Learners should be able to use the following words confidently:

- Insertion sort – each item is taken in turn, compare to the items in a sorted list and placed in the correct position.
- Ordered List: Elements are arranged in sequence.
- Unordered List: Unarranged elements.

Notes: *Multiple Choice Questions will assess these keywords; use the MCQs supplied. You may wish to customise these as needed.*

Notes

Differentiation

How will I enable access to each area of learning for my learners?

- Activity 2 worksheet has 3 levels, low, medium and high.
  - Low – students have a structure to complete the list and the first two steps have been completed.
  - Medium – students are required to recall the steps and perform the search independently.
  - High – after completing the sort, students need to compare this sort to a merge and bubble sort to decide which is faster, and when.

Notes: *Use of Stretch Task Ideas supplied may support high end differentiation. You will need to modify the resources to meet the needs of your pupils specifically. You may wish to refer to Departmental or School policies on differentiation methods used within your centre.*

Activity 1

What tasks will I ask the pupils to complete to develop their understanding during the lesson?

- Students can work independently, or in pairs.
- Students need to deal 10 cards (playing cards, or paper with numbers on) face up.
- They need to follow the steps to perform an insertion sort on the cards.
- This process can be repeated by dealing additional cards or swapping if working in groups.
- The worksheet 'Activity 1' has the steps involved listed, it can be given to some students to help remind them how to perform the sort.

Notes: *Use the Activities given to develop the student's knowledge of the topic. Each activity may need further differentiation/adaptation for your needs. Reference the Common Misconceptions/FAQ guide to support your delivery of the topic.*

Activity 2

What tasks will I ask the pupils to complete to develop their understanding during the lesson?

- Students need to use the worksheet 'L5 Activity 2' to complete the sort on the list of data.
- There is a low, medium and high level for the worksheet, details of these are in the section differentiation.

Activity 3 / Extension

How will I challenge high ability learners, or extend the lesson activities if needed?

- Students need to work in groups of 3.
- They need to create one list of up to 12 items that are out of order.
- Each student needs to perform a different sort on the data, recording how many comparisons and moves each sort takes.
- They need to discuss which is faster, and why.

Summary/Plenary

- Use MCQs on sorting algorithms.

Notes: *Use the MCQs to check basic understanding of key words and topics.*

Use the LOR to develop deeper knowledge and allow Peer Assessment and Review. This can be developed to use the LOR ideas as homeworks etc.

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