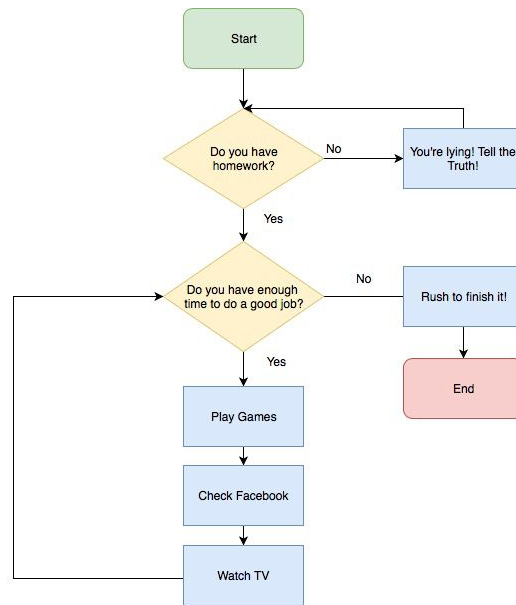
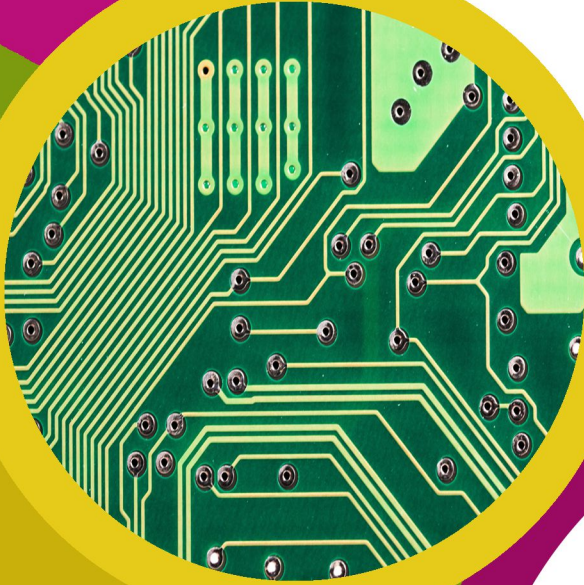


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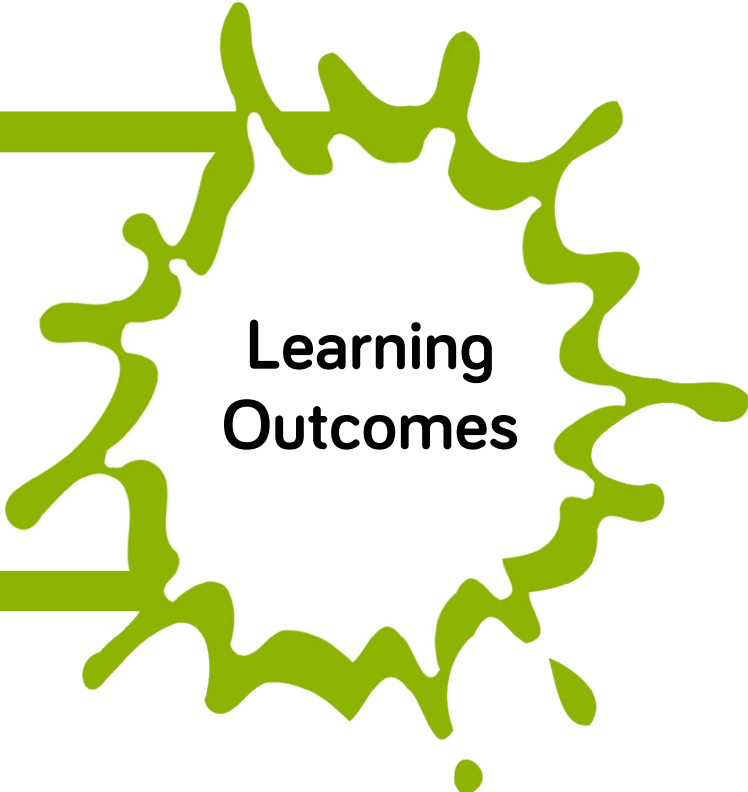
## Algorithms Workbook



## Overview

In this workshop, we will be looking at what algorithms are and how they can be used to solve various day to day problems.

1. Improved knowledge of Decomposition and Abstraction.
2. Greater experience of designing, writing and using Algorithms.
3. Improved confidence in implementing Algorithms using Python.
4. Greater experience in applying algorithms to other STEM subjects.



## Learning Outcomes

## Attendee Prerequisites

1. Basic experience of Python Programming.

## What is an Algorithm?

In your own words, write down what you think an algorithm is below:

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## Making a Cup of Tea

Write the instructions you give for making a cup of tea. Make sure you explain what order to do things in.

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## Define Algorithms

In our daily lives algorithms are everywhere, but we may not realise it! An Algorithm is:

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It is important to remember when writing an algorithm to:

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Where do we use algorithms in everyday life?

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## Guess Who

How many questions were needed? \_\_\_\_\_

What questions did you ask?

i) \_\_\_\_\_?

ii) \_\_\_\_\_?

iii) \_\_\_\_\_?

iv) \_\_\_\_\_?

v) \_\_\_\_\_?

vi) \_\_\_\_\_?

vii) \_\_\_\_\_?

viii) \_\_\_\_\_?

Which questions were the most useful? \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_

Did you change your questioning? How?

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## What is Decomposition?

In your own words write down what you think decomposition is below:

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## Decomposition of a Game

Let's use your favourite game as an example:

What type of game is it? What is the main objective/how do you win? Is it single player or multiplayer? How do you interact with the world?

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## LEGO Building

Did the creations look the same? \_\_\_\_\_

If not, whose fault do you think it is and why?

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What would have made the task easier?

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Who or what may experience the same problem as the student following the instructions?

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What makes a good algorithm and briefly say why:

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_

## Get Artistic

In the space below, try and draw the picture from the slides:

## Get Artistic Reflection

How did you decide what to include and what not to include? What were your reasons for including certain things and not others?

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## What is Abstraction?

Abstraction is:

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Why is abstraction useful? And to whom?

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Think of two different scenarios where abstraction is used:

1. 

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2. 

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## Making a Cup of Coffee

Put the following instructions into the correct sequence in the flowchart at the bottom of the page.

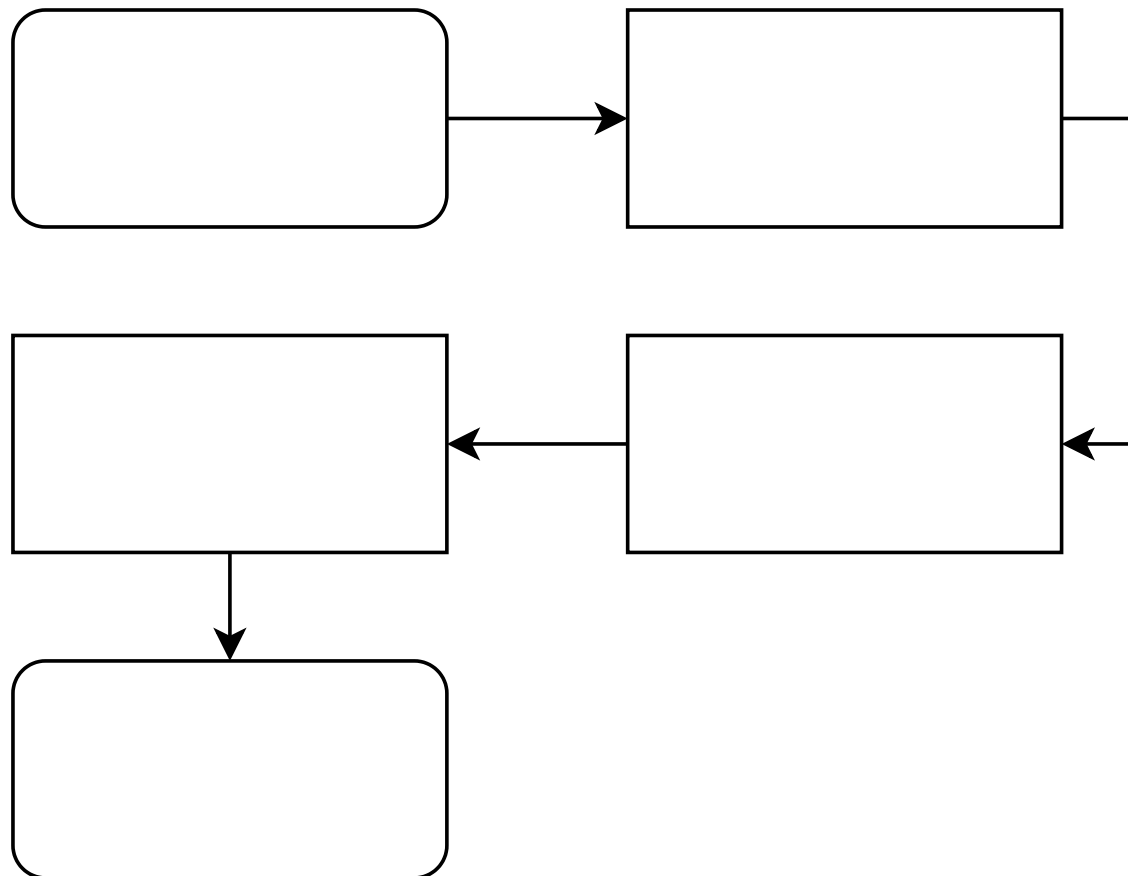
**'Start'**

**'Turn on kettle'**

**'Stir and drink'**

**'Coffee granules in cup'**

**'End'**

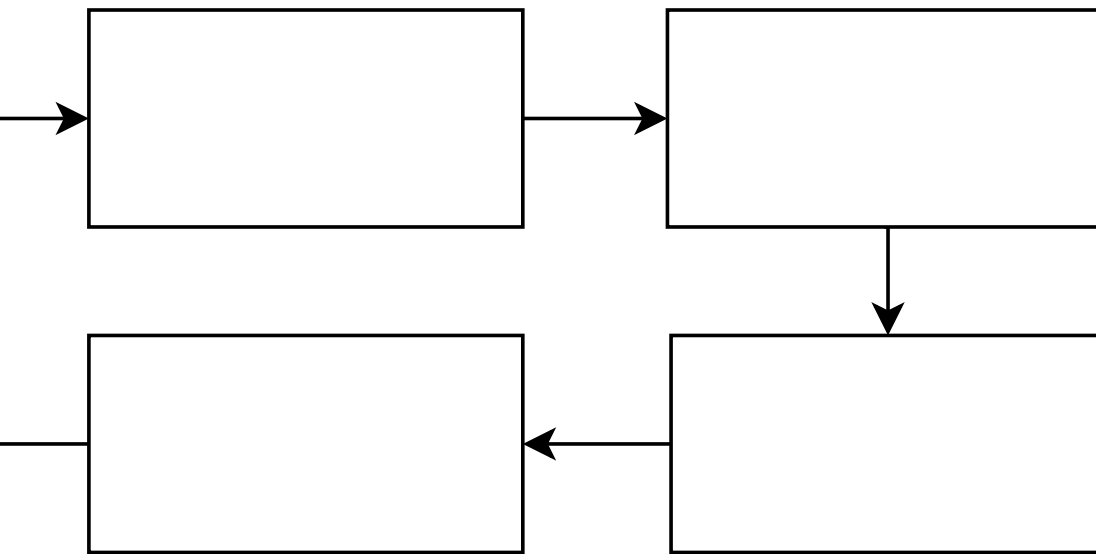


'Get cup'

'Add sugar or milk'

'Fill kettle with water'

'Once kettle stops boiling  
pour water into cup'



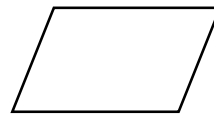
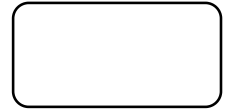
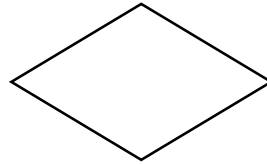
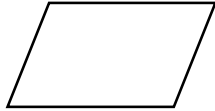
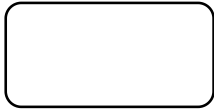
## Vertebrates Flowchart

Use the space provided to create your flowchart which allows you to differentiate between the five types of vertebrates.



## Login System Flowchart

Use the provided shapes and instructions to create the flowchart for logging into a system. Make sure you use all of the shapes and instructions.



'Start'

'End'

'Password correct?'

'Please enter  
your  
password'

'Password accepted.  
Welcome!'

'Password incorrect.  
Please try again.'

## Pizza Flowchart







## Compound Interest Notes

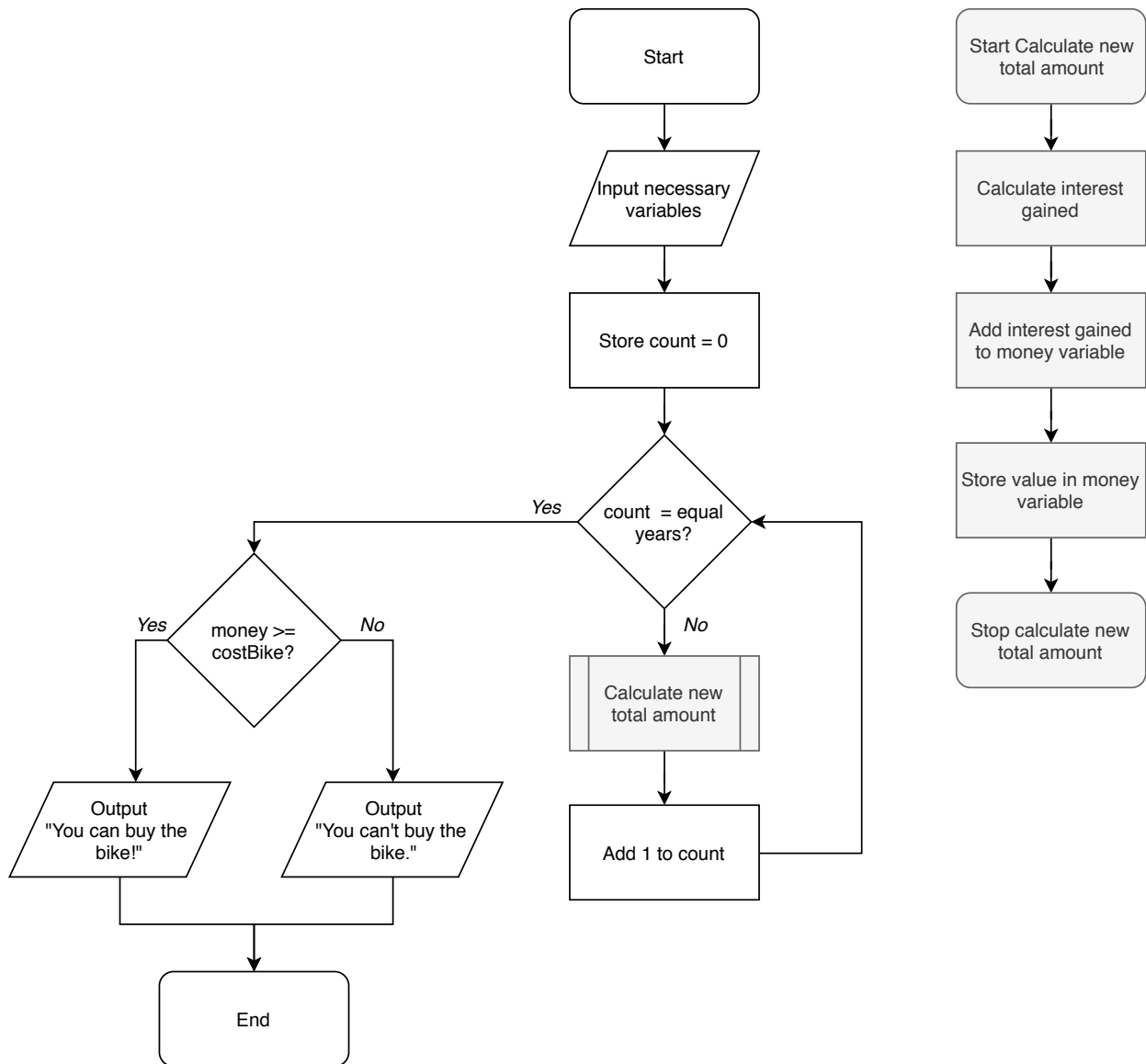
Use this space for making notes on how to solve a Compound Interest problem:

## Compound Interest

Year	Base Amount	Interest (10%)	Total
1	£1000	$£1000 \times 0.1 = \text{£}100$	$£1000 + £100 = \text{£}1100$
2			
3			
4			
5			
6			
7			
8			
9			
10			

## Compound Interest in Python

Use this flowchart and your notes to help you implement a solution for this type of Compound Interest question in Python.



## Bubble Sort

Give a brief description of Bubble Sort:

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Write out each step of sorting the list in the slides using the Bubble Sort algorithm:

## Merge Sort

Give a brief description of Merge Sort:

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Write out each step of sorting the list in the slides using the Merge Sort algorithm:

## Linear Search

Give a brief description of Linear Search:

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Write out each step or create a flowchart for completing a Linear Search of a list:

## Binary Search

Give a brief description of Binary Search:

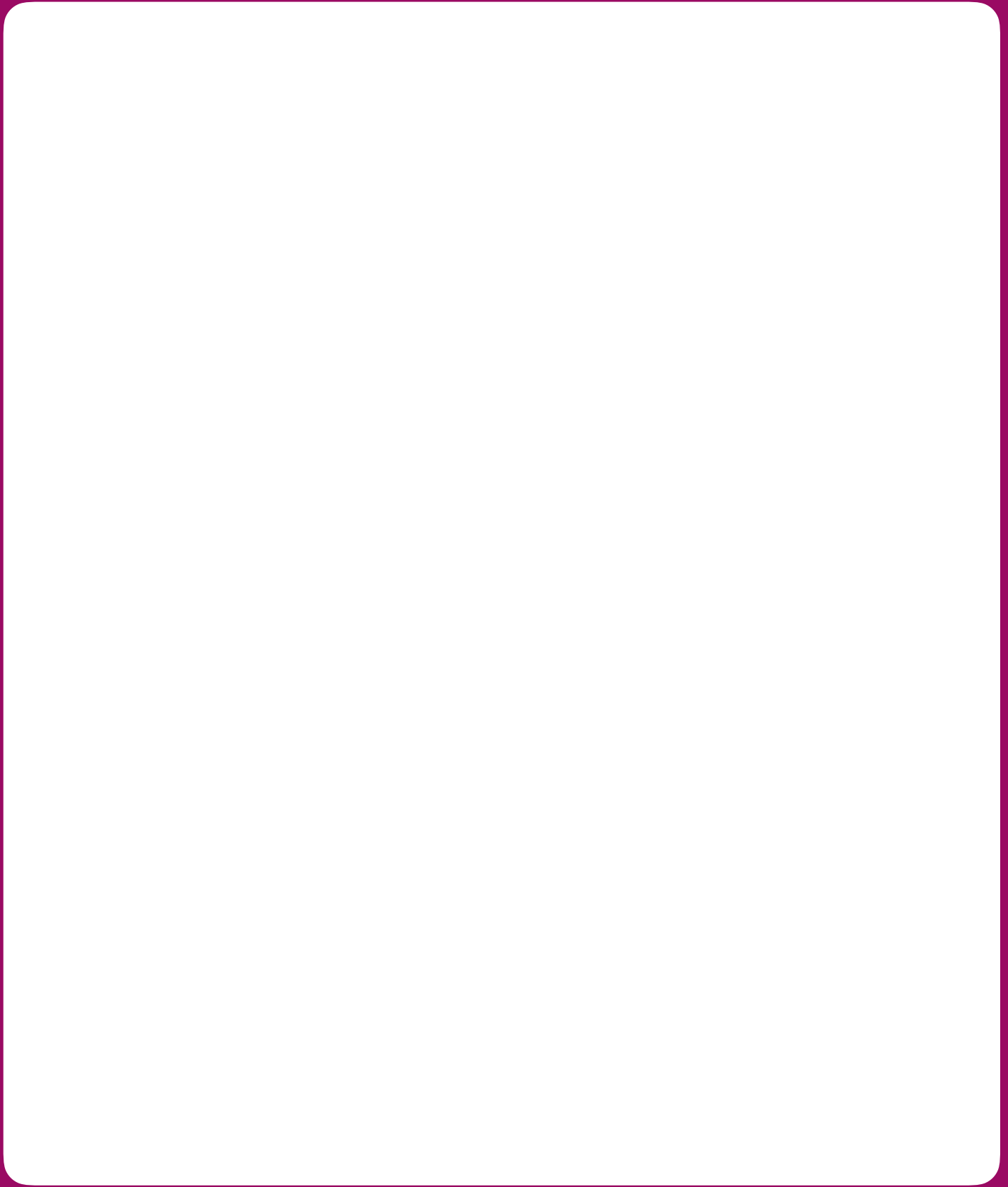
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Write out each step or create a flowchart for completing a Binary Search of a list:

## Notes







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