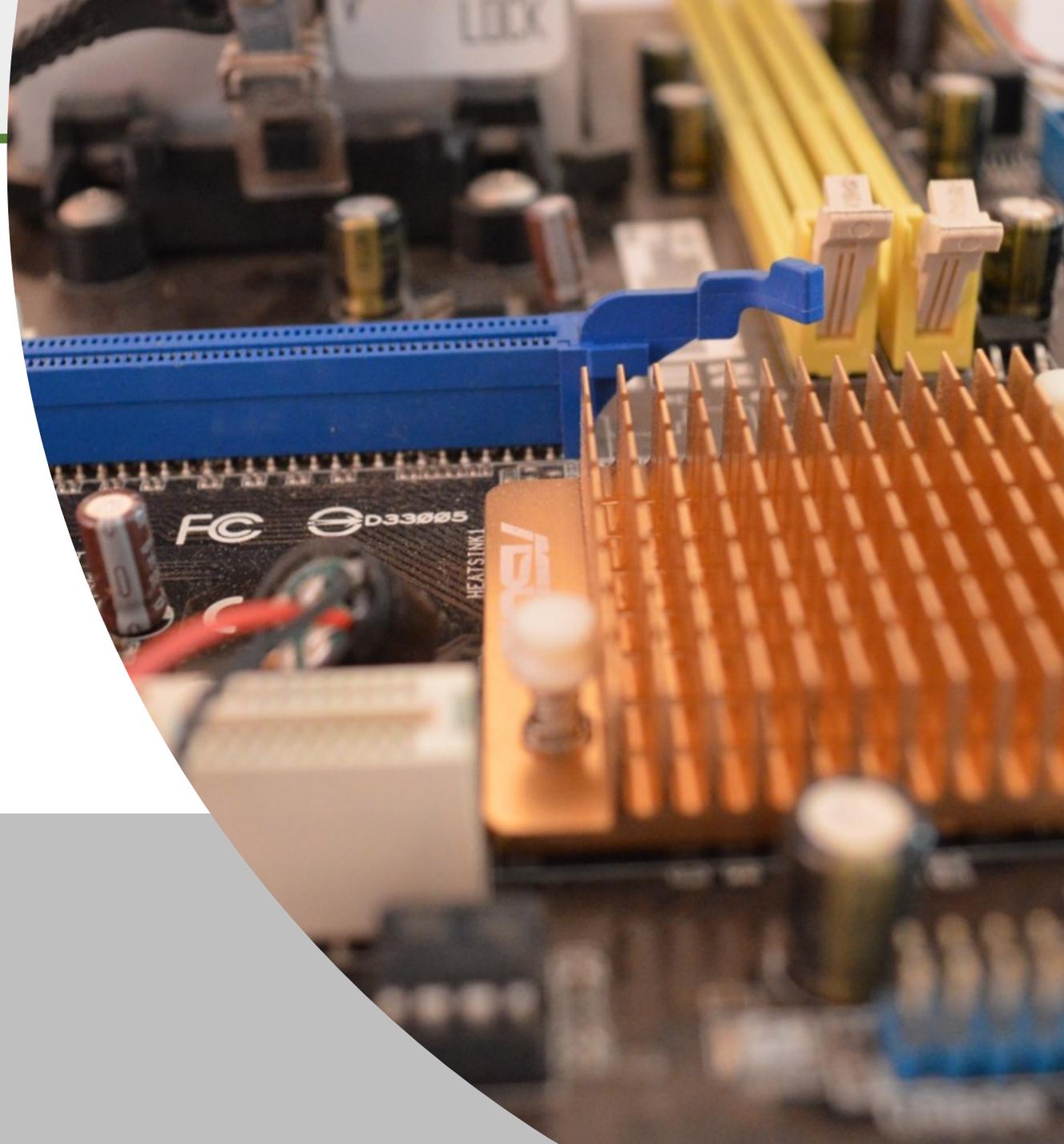


Computer Science Transition workbook

Please complete each of the tasks. You should complete the tasks in this PowerPoint. Where necessary you can add slides to complete the work.

For any programming tasks please make sure that you print screen/snip the completed tasks into this workbook.

Please complete by your first lesson back in September



1 “Tell me about yourself”



Why did you choose Computer Science?

Expected time to complete: ½ hour

In this simple task you get the opportunity to tell me your choices and reasons behind choosing to study Computer Science. Please answer all questions as best you can.

1. Why did you choose to study A level Computer Science?

2. What other courses have you chosen to study at Key Stage 5, and what made you choose this combination?

3. What are you hoping to achieve from studying Computer Science?

4. How would you describe yourself as a learner at GCSE? What skills were you good at, what areas would you like to improve on?

5. What are your other hobbies and interests outside of school? Anything related to Computing?

2 Independent research task



Emerging computer technology

Expected time to complete: 2 hours

In this task you get to investigate any area of emerging computer technology which interests you.

You can pick any area which interests you, but examples could be:

- Artificial intelligence
- Robotics
- Automated self driving cars
- Quantum computing

In no more than ONE side of A4 summarise the area you have chosen under the following four headings:

1. What is it?
2. What are the possible Social, Moral, Cultural and Ethical **benefits** of this technology on society
3. What are the possible Social, Moral, Cultural and Ethical **risks** of this technology on society
4. My conclusion on this technology and what it will mean for our world 10 years from now

Additional help:

For additional help and support in structuring your answer you might like to watch some of the videos from the following Craig 'n' Dave playlists:

OCR:

SLR 17 – Ethical, morale and cultural issues

<https://student.craigndave.org/videos/slr-17-ethical-moral-and-cultural-issues>

AQA:

SLR 19: Moral, social, legal, cultural issues

<https://student.craigndave.org/videos/slr19-moral-social-legal-cultural-issues>



Getting to grips with terminology

An important aspect of being successful with your study of Computer Science is getting to grips with subject related terminology. There are over 240 specific terms you will need to learn!

Below are a handful of the key terms you will need to become familiar with.

Control Unit	Register	Busses
Von Neuman Architecture	Optical Storage	Operating System
Intermediate Code	Device Driver	Compiler
Assembly Language	Machine Code	Lossy Compression
Hashing	Normalisation	TCP/IP Stack
Packet Switching	ASCII	Problem Decomposition

1. Research each of the key terms and write a definition.
2. Resist the urge to simply cut and paste a definition from the first website you find. Many definitions found on The Internet are overly complicated and wordy.
3. Ask yourself:
 - Does my definition make sense?
 - Is it succinct, to the point?
 - Does the definition have appropriate depth and detail for A'Level?
 - Could I give this definition to another student so they could revise from it?

Expected time to complete: 2 hours



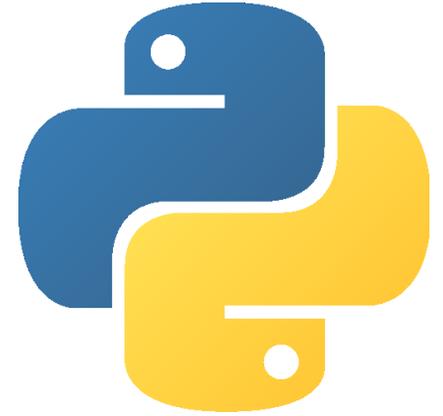


Programming basics

Expected time to complete: 6 hours

Learning to “code” is a fun and essential part of A Level Computer Science. This task is ideal if you haven't done the GCSE in Computer Science or you simply want a nice refresher ahead of starting your A Level course.

1. Head over to the web site: <https://www.learnpython.org/>
2. Complete the following python tutorials under the heading:
 - Hello, World!
 - Variables and Types
 - Lists
 - Basic Operators
 - String Formatting
 - Basic String Operations
 - Conditions
 - Loops
 - Functions
3. Each section presents you with theory, code to run and exercises to try out. Please print screen/snip evidence that you have complete the tasks.
4. If you want to practice writing your own python programs you can download and install a simple python development tool here: <https://www.python.org/downloads/>





Augmented reality

Expected time to complete: 1½ hours

A key skill at A Level is being able to take a topic and then discuss it in the context of different scenarios.

Most theory-based exam questions will be asked in the form of a scenario, simply regurgitating what you know on the topic without contextualising your answer to the scenario will often result in low marks!

The topic for this exercise is “Augmented Reality”. It is a truly fascinating area of technology which has the potential to change almost every aspect of our daily lives.

Watch this brief video to learn more:
<https://www.youtube.com/watch?v=vQtwWzfzKXI>

After watching the video complete the next slide which asks you to discuss the benefits, limitations and risks of augmented reality in the context of:

- Medicine & health care
- Gaming & entertainment
- Schools & learning
- Travel & tourism
- Social media
- Transport & navigation

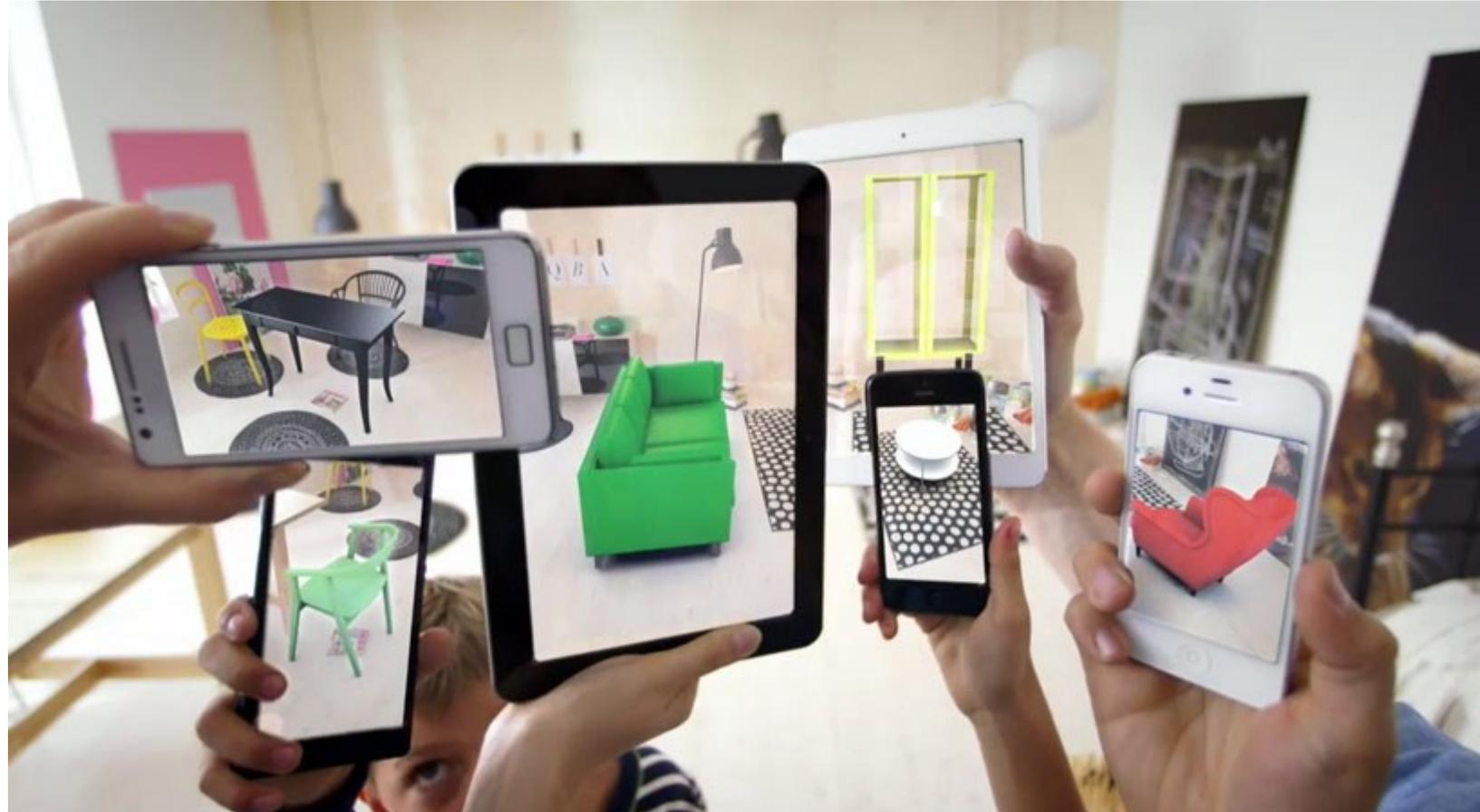


Image by Oyundari Zorigbaatar (20 March 2016) <https://creativecommons.org/licenses/by-sa/4.0/legalcode>



Augmented reality

Expected time to complete: 1½ hours

Medicine & health care

Discuss the **benefits, limitations** and **risks** of augmented reality in this context:

- Enter your answer here

Gaming & entertainment

Discuss the **benefits, limitations** and **risks** of augmented reality in this context:

- Enter your answer here

Schools & learning

Discuss the **benefits, limitations** and **risks** of augmented reality in this context:

- Enter your answer here

Travel & tourism

Discuss the **benefits, limitations** and **risks** of augmented reality in this context:

- Enter your answer here

Social media

Discuss the **benefits, limitations** and **risks** of augmented reality in this context:

- Enter your answer here

Transport & navigation

Discuss the **benefits, limitations** and **risks** of augmented reality in this context:

- Enter your answer here



Looking under the hood of the processor

Expected time to complete: 2 hours

The CPU “Central Processing Unit” is the central core of any computer system. You will study what it contains and how it work in depth at A Level.

1. Start by watching the following 3 videos from Craig ‘n’ Dave
 1. **AQA:** <https://student.craigndave.org/videos/aqa-alevel-sl17-the-processor-and-its-major-components>
 2. **AQA:** <https://student.craigndave.org/videos/aqa-alevel-sl17-alu-cu-registers-and-buses>
 3. **AQA:** <https://student.craigndave.org/videos/aqa-alevel-sl17-performance-of-the-cpu>
2. Produce a fully annotated diagram on a single sheet of A4 / A3 paper which shows how the CPU works.
3. Make sure the diagram includes and covers:
 - Major CPU components and what they are for:
 - Arithmetic Logic Unit (ALU)
 - Control Unit (CU)
 - Cache
 - The main registers
 - Program Counter (PC)
 - Memory Address Register (MAR)
 - Current Instruction Register (CIR)
 - Memory Data/Buffer Register (MDR / MBR)
 - Fetch-decode-execute cycle
 - Include annotations which explain how the performance of a CPU can be improved by:
 - Increasing the clock speed
 - Increasing the cache size
 - Increasing the number of cores





Types of networks

Carry out some research on computer networks, in particular LANs, WiFi, Network topologies and connectivity devices. Use the symbols on the right (feel free to revise them) to create an appropriate network over the floorplan on the next slide.

Make sure your network meets all the following requirements:

- Each member of the main office needs a desktop PC
- Angela, Pam, Dwight and Oscar also use an office issued smart phone
- The following rooms need access to WiFi:
 - Meeting room (top right)
 - Reception
 - Conference Room
 - Main office
- Use a circle with a transparent fill (so you can see the network underneath) with a width and height of 12.5cm to provide the WiFi coverage needed to cover the rooms above:
 - The circles need to have a WAP at the centre
 - The 12.5cm diameter circles represent the maximum range of each WAP
 - The WAP icons must be attached to a wall
 - You must use the minimum number of WAP possible to provide the coverage needed
- All desktop PCs use wired connections in a star network configuration
 - The top left server room, conference room and main office need to be on one subnet with its own switch
 - All other rooms are on a separate subnet and will require its own hardware for this
 - The two subnets need to be appropriately connected together
- The top left room needs to have a server placed in it and connected appropriately to the local subnet
- The server room needs hardware to appropriately connect the LAN to "The Internet"
- Reception needs a photocopier and it needs connecting to the local subnet
- A firewall should be placed somewhere appropriate

Additional help:

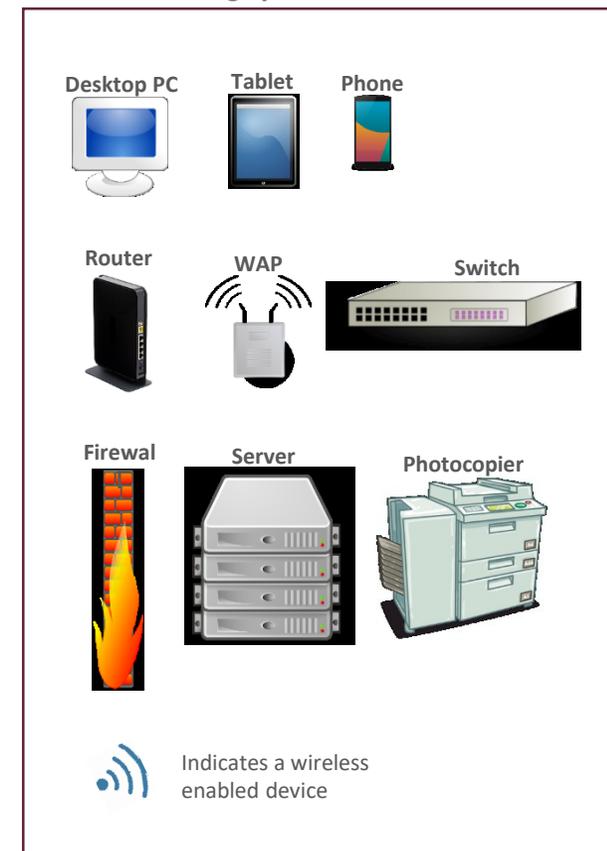
For additional help and support in structuring your answer you might like to watch some of the videos from the following Craig 'n' Dave playlists:

AQA: SLR21 – Network and the Internet

<https://student.craigndave.org/videos/slr21-networks-the-internet>

Expected time to complete: 2 hours

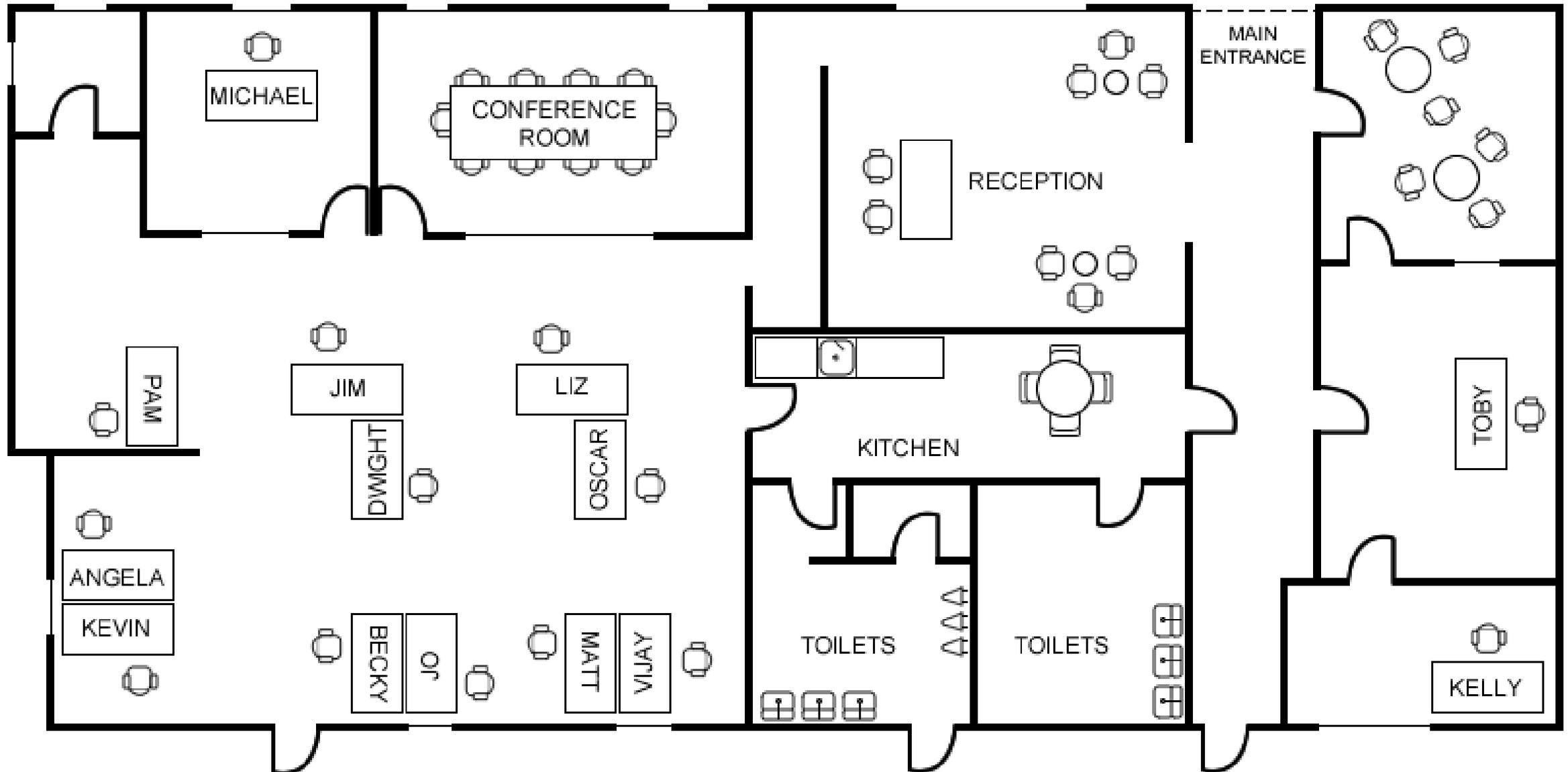
Use the following symbols:





Types of networks

Expected time to complete: 2 hours





Algorithms: from theory to practice

Expected time to complete: 4 hours

A core concept of computer science is that of data structures and algorithms.

It is also an area which many students struggle with during examinations.

Probably the most basic algorithm is that of the “linear search”.

If you have done the GCSE course you will have learnt about this searching algorithm already.

Start by learning or refreshing your knowledge of the linear search algorithm by using the videos on this page:

- <https://www.craigndave.org/algorithms-linear-search>

Once you are happy with the theory complete the exercises on the following slides.





Algorithms: from theory to practice

Expected time to complete: 2 hours

1. Describe what the linear search algorithm does.

2. What are the applications of the linear search algorithm?

3. Write out the steps of the linear search algorithm in simple-structured English.

4. Draw a simple diagram which illustrates the linear search algorithm.



Algorithms: from theory to practice

Expected time to complete: 2 hours

5. Write out pseudocode for the linear search algorithm.

- The algorithm should use an array called items which is pre-populated with the following values: "Florida", "Georgia", "Delaware", "Alabama", "California"
- The algorithm should ask the user to "Enter the state to find:"
- If the algorithm locates the state entered by the user in the array it should report back to the screen "Item found at position n"
- If the algorithms can not locate the state entered by the user in the array it should report back to the screen "Item not found"



Algorithms: from theory to practice

Expected time to complete: 2 hours

6. Have a go at coding the linear searching algorithm in a programming language of your choice.
 - The program should work use an array called items which is pre-populated with the following values: "Florida","Georgia","Delaware","Alabama","California"
 - The program should ask the user to "Enter the state to find:"
 - If the program locates the state entered by the user in the array it should report back to the screen "Item found at position n"
 - If the program can not locate the state entered by the user in the array it should report back to the screen "Item not found"

Cut and paste the code you have written into the box below: