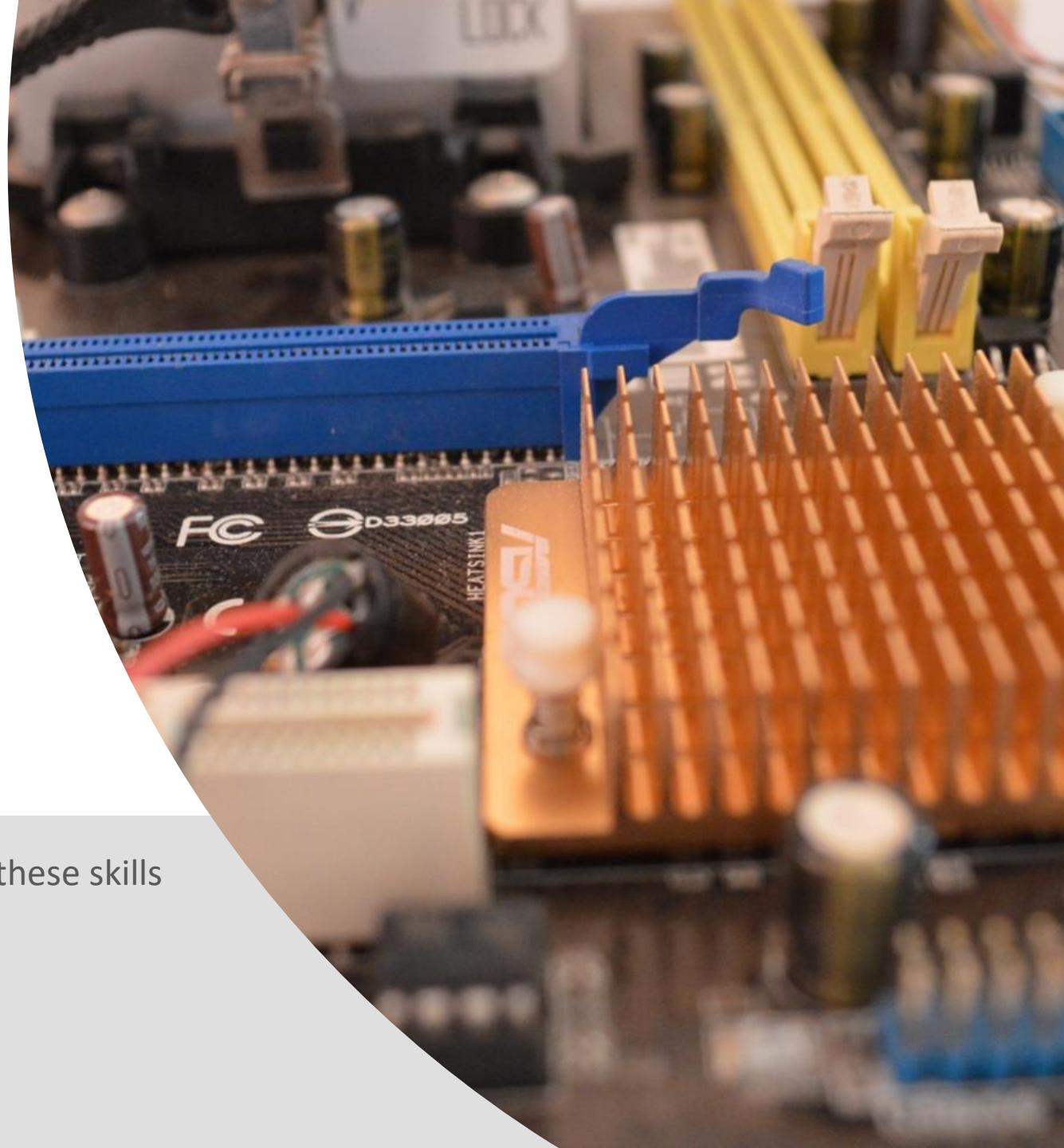# Computer Science Transition workbook

- The topic of **Computer Science** is at the heart of the modern world

- Studying it can make you extremely sought after in todays job market

- The transition from GCSE to A level is significant, this includes:
    - An increased emphasis on **technical content**
    - An increased emphasis **independent research**

This workbook is designed to allow you to practice some of these skills and build on your existing knowledge.

Please complete by your first lesson back in September.

Miss Ordu

Emerging computer technology

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 cards
- 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

Independent research task

Emerging computer technology – answer

② Systems architecture task

Looking under the hood of the processor

The CPU "Central Processing Unit" is the central core of any computer system. You will study what it contains and how it works it in depth at A Level.
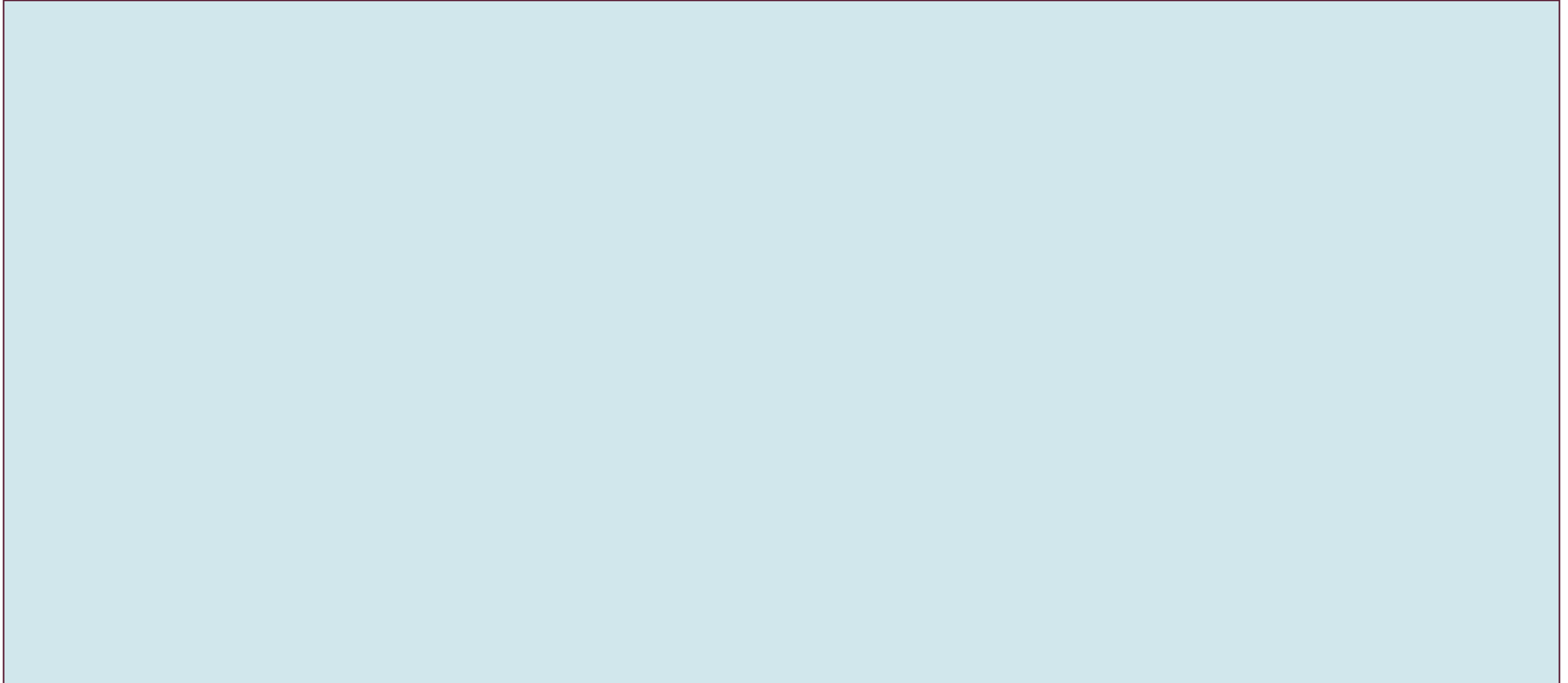
1. Start by watching the following 3 videos from Craig 'n' Dave (chosen from OCR exam board)
    1. **OCR:** https://student.craigndave.org/videos/ocr-alevel-slr01-alu-cu-registers-and-buses
    2. **OCR:** https://student.craigndave.org/videos/ocr-alevel-slr01-fetch-decode-execute-cycle
    3. **OCR:** https://student.craigndave.org/videos/ocr-alevel-slr01-performance-of-the-cpu

2. Produce a fully annotated diagram on a single sheet of A4 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

Systems architecture task

Looking under the hood of the processor – answer

Systems architecture task

Looking under the hood of the processor – answer

Systems architecture task

Looking under the hood of the processor – answer

Types of networks

Use the following symbols:

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:

1. Each member of the main office needs a desktop PC
2. Angela, Pam, Dwight and Oscar also use an office issued smart phone
3. The following rooms new access to WiFi:
    1. Meeting room (top right)
    2. Reception
    3. Conference Room
    4. Main office
4. 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:
    1. The circles need to have a WAP at the centre
    2. The 12.5cm diameter circles represent the maximum range of each WAP
    3. They WAP icons must be attached to a wall
    4. You must use the minimum number of WAP possible to provide the coverage needed
5. All desktop PCs use wired connections in a star network configuration
    1. The top left server room, conference room and main office need to be on one subnet with its own switch
    2. All other rooms are on a separate subnet and will require its own hardware for this
    3. The two subnets need to be appropriately connected together
6. The top left room needs to have a server placed in it and connected appropriately to the local subnet
7. The server room needs hardware to appropriately connected the LAN to "The Internet"
8. Reception needs a photocopier and it needs connecting to the local subnet
9. 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:
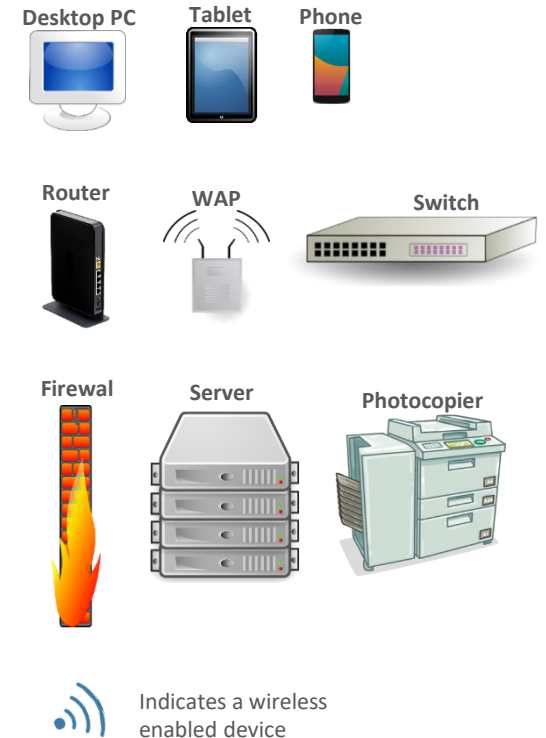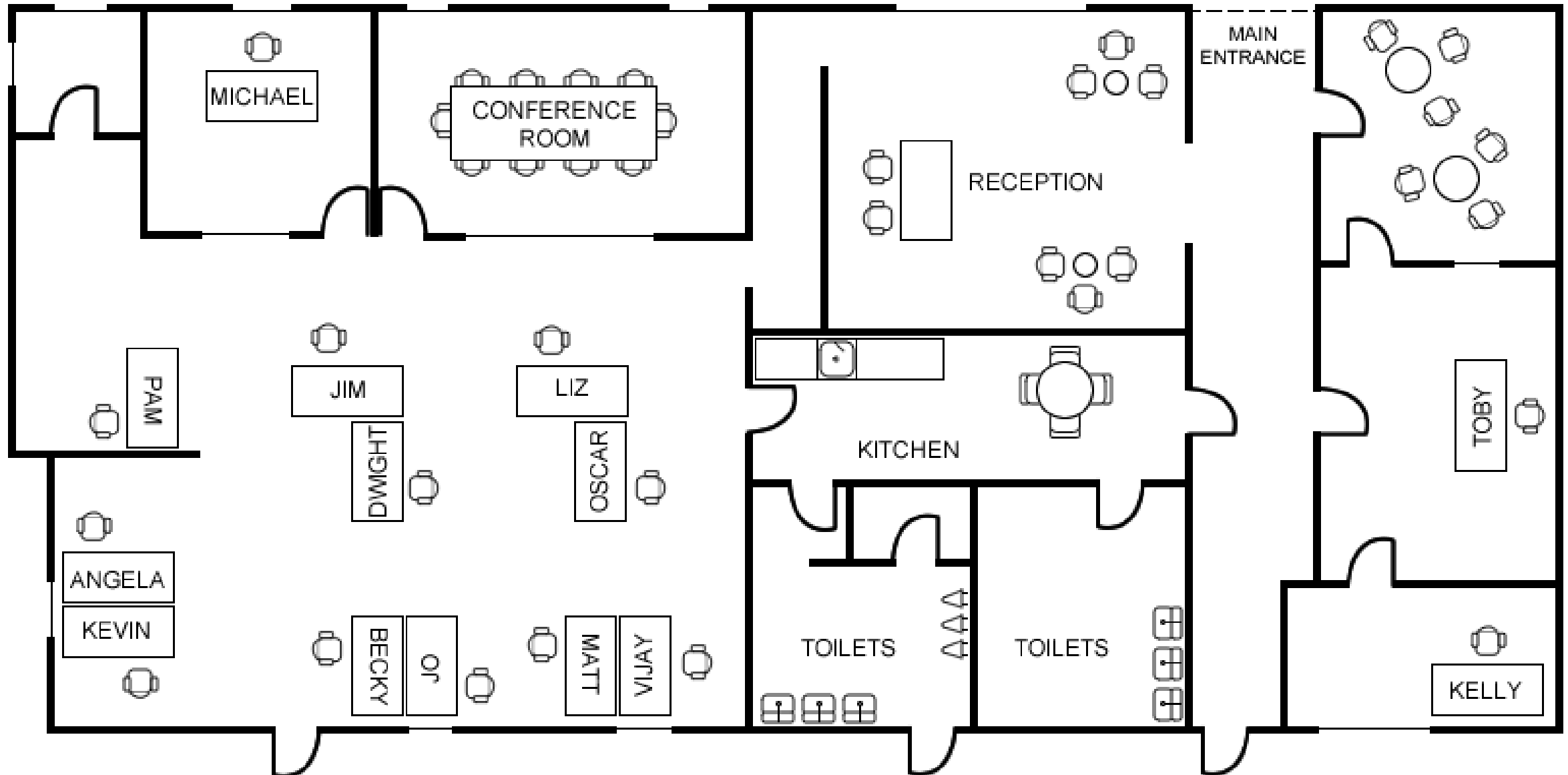
OCR: SLR 11 – Networks
https://student.craigndave.org/videos/slr-11-networks
AQA: SLR21 – Network and the Internet
https://student.craigndave.org/videos/slr21-networks-the-internet

Types of networks

Algorithms: from theory to practice

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"

Linear search programming task

Algorithms: from theory to practice

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:

Create a game on Pygame

Coding – Graphical User Interface

6. Use Pygame to create a game. Pygame uses graphical user interface. Example: Pong game (more than 2 paddles), space invaders, Pacman, Minecraft, Super Mario…

Your game can be anything from Level 1 to Level 3. You should consider the following for your game:

• Is it multiplayer?
• Is it competitive enough?
• Is it fun and engaging?

Bring a copy of this code on a USB to play with class members. You will be working through lots of challenges in class relating to these games so please make sure you thoroughly understand the code. Hint: Do not use AI.