



# OCR – H446 – Computer Science

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# What do we learn in A Level CS?

## Computer Systems (01)

140 marks

2 hours and 30 minutes written paper (40%)

(no calculators allowed)

- The characteristics of contemporary processors, input, output and storage devices
- Software and software development
  - Exchanging data
- Data types, data structures and algorithms
  - Legal, moral, cultural and ethical issues

## Algorithms and programming (02\*)

140 marks

2 hours and 30 minutes written paper (40%)

(no calculators allowed)

- Elements of computational thinking
  - Problem solving and programming
- Algorithms to solve problems and standard algorithms

## Programming project (03\*) 70 marks (20%)

Non-exam assessment

- Analysis of the problem
- Design of the solution
- Developing the solution
  - Evaluation

**We follow the OCR H446 Specification.**

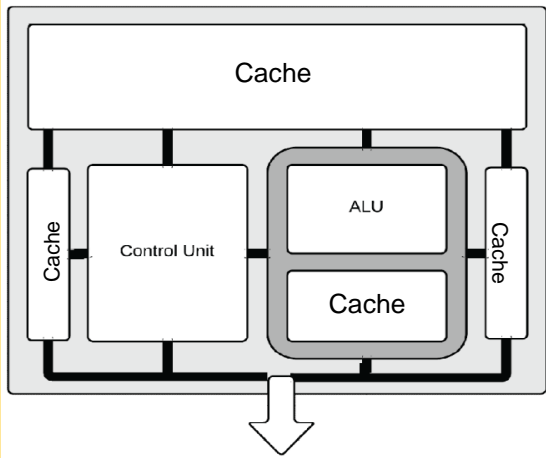
What is the purpose of the CPU?

CPU

How does the following affect CPU speed?

| Factor          | How does it affect CPU speed? |
|-----------------|-------------------------------|
| Clock Speed     |                               |
| Number of Cores |                               |
| Cache Size      |                               |

Explain what the different parts of the CPU do



| Part of CPU  | What it Does |
|--------------|--------------|
| Cache        |              |
| ALU          |              |
| Control Unit |              |

Embedded Systems

Match the different registers to a description of what they do. You can draw lines between them using the tools.

| Register                           |
|------------------------------------|
| Accumulator (ACC)                  |
| Program Counter (PC)               |
| Current Instruction Register (CIR) |
| Memory Address Register (MAR)      |

| Description   |
|---|
| This stores the memory address of the next instruction. At each fetch-execute cycle it will be incremented (1 is added to it) |
| Results from the ALU are temporarily stored here until they are written to memory   |
| The current instruction is stored in this register.   |
| The stores the data that was read from or written to memory   |

1.1 System Architecture

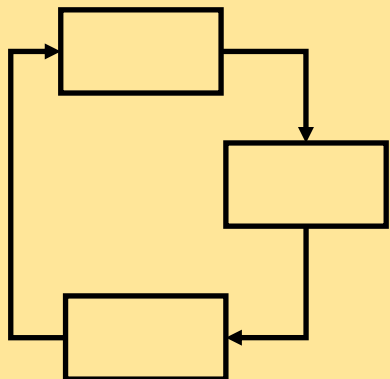
| System          | Description | Examples |
|-----------------|-------------|----------|
| General Purpose |             |          |
| Embedded        |             |          |

Decide which of the following are benefits or drawbacks of embedded systems

| Statement   | Benefit (a) | Drawback (a) |
|---|-------------|--------------|
| They do not need an operating system as they are completing simple tasks                          |             |              |
| They can only perform a limited number of functions   |             |              |
| Cheap to produce as they require less processor power   |             |              |
| They are difficult to upgrade due to their limited storage and processing power                   |             |              |
| They can be small in size so are good for small devices   |             |              |
| The hardware used to create them is often far more rugged and can be used in a range of scenarios |             |              |

Von Neumann

Label the diagram, with decode, execute and fetch



| Stage   | What happens |
|---------|--------------|
| Fetch   |              |
| Decode  |              |
| Execute |              |

Answer the following about **Virtual Memory**:

|  |  |
|--|--|
| <b>What is it?</b>   |  |
| <b>When it is used?</b>                                      |  |
| <b>What happens to the processing speed when it is used?</b> |  |
| <b>Why does the processing speed change?</b>                 |  |

| Storage Type | Advantages | Disadvantages | Example of Storage |
|--------------|------------|---------------|--------------------|
| Optical      |            |               |                    |
| Magnetic     |            |               |                    |
| Flash        |            |               |                    |

**Storage Devices**

**1.2 Memory & Storage**

Explain how ROM is used to boot a computer when it is turned on.

Calculate the amount of storage required for each of the questions below. Use the multiplier of 1000 rather than 1024.

| File Type                                 | Size   |
|---|--------|
| 1 page word processed file with no images | 0.2Mb  |
| Postcard sized photograph                 | 3.5 Mb |
| 3 minute MP3 music file                   | 7 Mb   |
| 1 minute compressed video file            | 45 Mb  |

**Calculating File Size**

| Features of RAM | Features of ROM |
|-----------------|-----------------|
| 1.              | 1.              |
| 2.              | 2.              |
| 3.              | 3.              |

| Question  | Answer (including working) |
|---|----------------------------|
| 100, 15 minutes videos to be streamed over the internet |                            |
| 56 student essays, each two pages with no images        |                            |
| 450 postcard sized photographs                          |                            |
| An album of 10 music tracks, 5 minutes each             |                            |

For each scenario choose a suitable storage device and justify your choice.

| <b>Scenario 1:</b> A school needs to back-up its data every evening | <b>Scenario 2:</b> A media student needs to store a video they have made to distribute to their friends |
|---|---|
|   |   |

# Units

Rearrange the following names into order with the largest at the top and smallest at the bottom:

|          |  |
|----------|--|
| Gigabyte |  |
| Byte     |  |
| Megabyte |  |
| Nibble   |  |
| Terabyte |  |
| Bit      |  |
| Kilobyte |  |

Biggest number of bytes

Smallest number of bytes

How many bytes are there in the following:

a) 1 KB \_\_\_\_\_ bytes

b) 3 MB \_\_\_\_\_ bytes

c) 5 GB \_\_\_\_\_ bytes

|   |   |   |   |   |
|---|---|---|---|---|
|   | 1 | 0 | 1 | 0 |
| + | 0 | 1 | 1 | 0 |
|   |   |   |   |   |

|   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|
|   | 0 | 1 | 1 | 1 | 0 | 0 |
| + | 1 | 1 | 0 | 1 | 0 | 1 |
|   |   |   |   |   |   |   |

|   |   |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|---|---|
|   | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 0 |
| + | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 1 |
|   |   |   |   |   |   |   |   |   |

|   |   |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|---|---|
|   | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 1 |
| + | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 1 |
|   |   |   |   |   |   |   |   |   |

Complete the following binary addition and explain the problem with the answer:

|   |   |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|---|---|
|   | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| + | 1 | 1 | 0 | 1 | 0 | 1 | 0 | 1 |
|   |   |   |   |   |   |   |   |   |

# Binary Addition

What problem has occurred? What does this mean?

Why does data need to be in binary format to be understood by a computer?

Complete the table below turning denary numbers in hexadecimal.

|   |   |    |    |    |    |    |    |
|---|---|----|----|----|----|----|----|
| 0 | 1 | 2  | 3  | 4  | 5  | 6  | 7  |
|   |   |    |    |    |    |    |    |
| 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
|   |   |    |    |    |    |    |    |

# 1.2 Memory & Storage

# Binary Conversion

| Binary   | Denary | Denary | Binary |
|----------|--------|--------|--------|
| 101100   |        | 9      |        |
| 101011   |        | 25     |        |
| 1101     |        | 32     |        |
| 11101110 |        | 98     |        |
| 00010111 |        | 143    |        |
| 10101010 |        | 178    |        |
| 11111110 |        | 211    |        |

| Denary | Hexadecimal |
|--------|-------------|
| 15     |             |
| 30     |             |
| 55     |             |
| 88     |             |
| 101    |             |
| 240    |             |

| Hexadecimal | Denary |
|-------------|--------|
| 1A          |        |
| 3B          |        |
| 27          |        |
| 7C          |        |
| AB          |        |

# Denary to Hexadecimal

## Binary to Hexadecimal

| Binary   | Hexadecimal | Hexadecimal | Binary |
|----------|-------------|-------------|--------|
| 00011000 |             | 1A          |        |
| 01100110 |             | 24          |        |
| 11001111 |             | 5F          |        |
| 11111011 |             | AB          |        |
| 11101011 |             | F2          |        |
| 01010101 |             | 67          |        |

Give 2 reasons why a computer programmer would prefer to write a number in hexadecimal rather than binary?

How do binary codes represent characters? What are the two most common forms of character representation in binary?

## Characters

What is a character set?

Why is ASCII not always a suitable method of representation characters? How is this overcome?

## 1.2 Memory & Storage

How many colours can be represented with the following bits:

| Number of Bits | Number of Colours |
|----------------|-------------------|
| 1              |                   |
| 2              |                   |
| 6              |                   |
| 8              |                   |

## Sound

|             | Description |
|-------------|-------------|
| Amplitude   |             |
| Bit Rate    |             |
| Sample Rate |             |

How does the sample rate and/or bit rate affect file size?

## Images

|                  | Description |
|------------------|-------------|
| Resolution       |             |
| Colour/Bit Depth |             |
| Pixel            |             |

What does metadata for an image store?

If you increase the resolution or bit depth of an image, what happens to the file size? Why?

## Compression

For each of the file types below decide which file type matches which description.

**ZIP   MP3   PDF   JPEG   MPEG**

| File Type | Description  |
|-----------|--|
|           | Storing still images using lossy compression   |
|           | Representing documents in the same way no matter what software is being used to display them |
|           | Representing digital audio using lossy compression   |
|           | Representing videos and movie films using lossy compression                                  |
|           | A compressed collection of files   |

Describe the difference between lossless and lossy compression methods

## 1.2 Memory & Storage

| Denary | Hexadecimal | Hexadecimal | Denary |
|--------|-------------|-------------|--------|
| 45     |             | F0          |        |
| 76     |             | 45          |        |
| 104    |             | 78          |        |
| 167    |             | EE          |        |
| 192    |             | A6          |        |

| Denary | Binary | Binary   | Denary |
|--------|--------|----------|--------|
| 67     |        | 01101101 |        |
| 106    |        | 1110011  |        |
| 185    |        | 01010101 |        |
| 209    |        | 11110011 |        |
| 226    |        | 11011011 |        |

| Binary   | Shift   | Answer |
|----------|---------|--------|
| 01001010 | Left 2  |        |
| 01101011 | Right 1 |        |
| 10110110 | Left 1  |        |
| 01011010 | Right 3 |        |
| 01110111 | Left 3  |        |

What issue can occur when you perform a binary shift right?

## Binary Shifts

| Compression Method | Description/How it works | Example of Use |
|--------------------|--------------------------|----------------|
| Lossy              |                          |                |
| Lossless           |                          |                |

# Hosting & The Cloud

# Transmission Media

What is web hosting?

What is cloud storage?

| Reason   | Adv of Web Hosting? |
|--|---------------------|
| More people are likely to view your website  |                     |
| A backup server will ensure that if your website goes down it will be restored immediately |                     |
| You have to have technical knowledge to host the website as well as making it              |                     |
| You do not need to worry about your bandwidth at home being used up                        |                     |
| You are insured against data loss should your website be hacked                            |                     |

| Statement about Cloud Storage   | Advantage | Disadvantage |
|---|-----------|--------------|
| No need to pay IT staff to manage the hardware                                      |           |              |
| You depend on the hosts for security and backups                                    |           |              |
| Need a connection to the internet to be able to access files                        |           |              |
| You can access the same files from any device with an internet connection           |           |              |
| Cloud software will be updated automatically  |           |              |
| You may have to pay a subscription for cloud storage                                |           |              |
| Not always clear who owns the intellectual property for content stored in the cloud |           |              |

Compare the use of wired and wireless in the following areas.

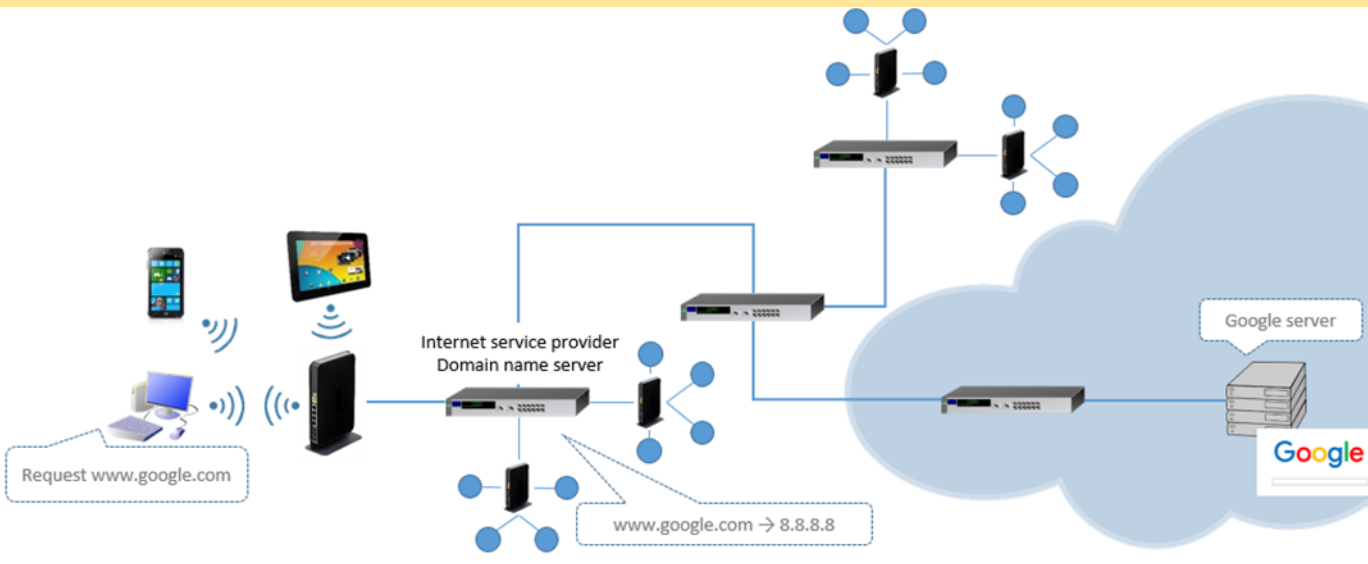
|              | Wired | Wireless |
|--------------|-------|----------|
| Bandwidth    |       |          |
| Installation |       |          |
| Cost         |       |          |
| Security     |       |          |
| Interference |       |          |
| Mobility     |       |          |

## DNS

## 1.3 Computer networks, connections and protocols

## Network Performance

Annotate the diagram below to explain how DNS works. (use a text box)



| Factor affecting network performance | Explanation of how it can affect network performance |
|--------------------------------------|--|
| Number of Users                      |  |
| Transmission Media                   |  |
| Latency                              |  |
| Bandwidth                            |  |
| Error Rate                           |  |



## IP & MAC Addresses

| Keyword     | Description |
|-------------|-------------|
| IP address  |             |
| MAC address |             |
| Packet      |             |
| Protocols   |             |

Explain the difference between an IP address and a MAC address

## Wired Methods

| Cable Type | Description / used for? |
|------------|-------------------------|
| Ethernet   |                         |
| Coaxial    |                         |
| Fibre      |                         |

## 1.3 Computer networks, connections and protocols

## Network Topologies

## Protocols

| Protocol     | Description, what is it used for? |
|--------------|-----------------------------------|
| TCP/IP       |                                   |
| HTTP / HTTPS |                                   |
| FTP          |                                   |
| POP3         |                                   |
| IMAP         |                                   |
| SMTP         |                                   |

| Star Topology |                |
|---------------|----------------|
| Advantages:   | Disadvantages: |
|               |                |

| Mesh Topology |                |
|---------------|----------------|
| Advantages:   | Disadvantages: |
|               |                |

# Wi-Fi

| Keyword  | Description |
|----------|-------------|
| Channels |             |
| Bands    |             |

| Wireless Networks |               |
|-------------------|---------------|
| Advantages        | Disadvantages |
|                   |               |

What are layers?

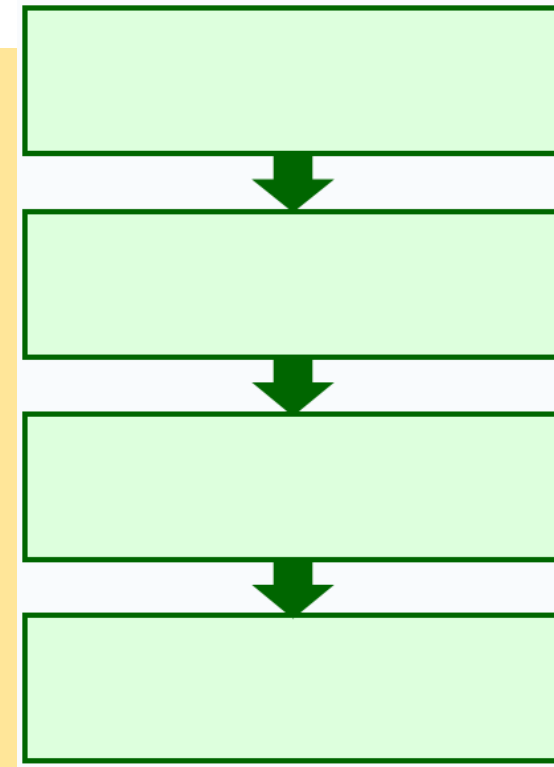
Explain 2 advantages of using network layers.

1.

2.

# Layers

Label the diagram to show the different network layers.



## 1.3 Computer networks, connections and protocols

| Layer Name        | Description | Protocol Examples |
|-------------------|-------------|-------------------|
| Application Layer |             |                   |
| Transport Layer   |             |                   |
| Network Layer     |             |                   |
| Data Link Layer   |             |                   |

## Forms of Attack

## 1.4 Network Security

| Form of Attack                  | What is it? | How do you prevent it? |
|---------------------------------|-------------|------------------------|
| Malware                         |             |                        |
| Phishing                        |             |                        |
| Social Engineering              |             |                        |
| Brute Force Attacks             |             |                        |
| Denial of Service Attacks (DOS) |             |                        |
| Data Interception & Theft       |             |                        |
| SQL Injection                   |             |                        |

| Prevention Method     |
|-----------------------|
| Penetration Testing   |
| Network Forensics     |
| Network Policies      |
| Anti-Malware Software |
| Firewalls             |
| User Access Levels    |
| Encryption            |
| Password              |

| Description   |
|---|
| This is an investigation to find out why an attack happened. To be able to do this the network needs to capture data packets.     |
| This is designed to prevent malicious software from damaging a computer and/or its files  |
| This is used to scramble data as it is sent over a network to make sure it cannot be intercepted and understood.                  |
| People deliberately try to hack into a network so that any weaknesses can be identified and corrected.                            |
| This prevents unauthorized access to a network. It monitors what goes in and out of a network                                     |
| A good one of these will prevent vulnerabilities. It will include regular testing and establish clear access levels and passwords |
| These help prevent unauthorized access. There is normally a minimum length and they must contain certain types of characters.     |
| This sets who can access a network and what they can access. It controls who can see confidential files                           |

Preventing Vulnerabilities

**Operating System**

| Interface Type   | How they work? |
|------------------|----------------|
| Command Line     |                |
| GUI              |                |
| Natural Language |                |

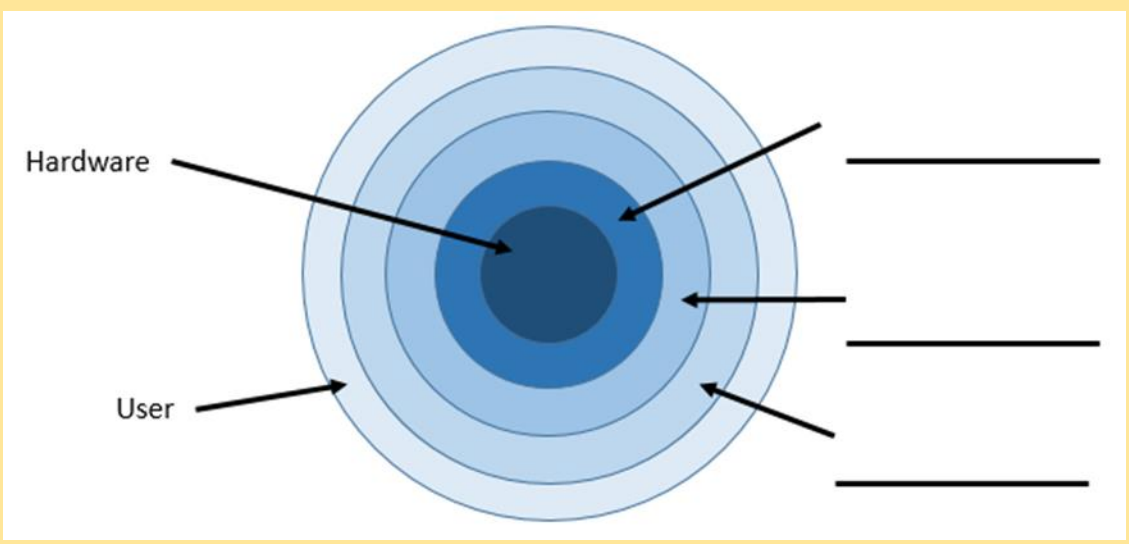
|                             | How do operating systems deal with: |
|-----------------------------|-------------------------------------|
| Memory Management           |                                     |
| Computer Security           |                                     |
| File Systems (Folders etc.) |                                     |
| Handling peripherals        |                                     |

| Utility Software | How it works? |
|------------------|---------------|
| Defragmentation  |               |
| Encryption       |               |
| Compression      |               |

**1.5 Systems Software**

**Utility Software**

**Types of Software**



|             | Advantages   | Disadvantages  |
|-------------|--|--|
| Proprietary | <ol style="list-style-type: none"> <li>1.</li> <li>2.</li> </ol> | <ol style="list-style-type: none"> <li>1.</li> <li>2.</li> </ol> |
| Open Source | <ol style="list-style-type: none"> <li>1.</li> <li>2.</li> </ol> | <ol style="list-style-type: none"> <li>1.</li> <li>2.</li> </ol> |

**Environmental Issues**

| Environmental Problem  | Ways to Reduce the Problem |
|--|----------------------------|
| E-Waste—old unused computer equipment                        |                            |
| Pollution— in the creation and disposing of computer systems |                            |
| Energy—all computers use electricity                         |                            |

| Type of Software | What is it? |
|------------------|-------------|
| Proprietary      |             |
| Open Source      |             |

|             | Advantages | Disadvantages |
|-------------|------------|---------------|
| Proprietary | 1.<br>2.   | 1.<br>2.      |
| Open Source | 1.<br>2.   | 1.<br>2.      |

What is the key difference between CDPA and Creative Commons Licencing

| Act   | Description          |
|---|----------------------|
| Data Protection Act                                 |                      |
| Name 4 of the principles of the Data Protection Act | 1.<br>2.<br>3.<br>4. |

What is the Copyright Designs and Patents Act?

What is the difference between a Copyright and a Patent?

**Legislation**

| Act  | Description    |
|--|----------------|
| Computer Misuse Act                          |                |
| What are the three key offences in this act? | 1.<br>2.<br>3. |

Why is enforcing Copyright becoming more difficult?

**1.6 Ethical, Legal, Cultural, Environmental Issues**

**Types of Software**

| Types of Licence    | What is it? | Types of Licence | What is it? |
|---------------------|-------------|------------------|-------------|
| Attribution         |             | Share a like     |             |
| No derivative works |             | Non-commercial   |             |

# Algorithms

What is an algorithm

What are the two methods of creating an algorithm?

- 1.
- 2.

Complete the following table about flowcharts

| Symbol       | Shape | Description |
|--------------|-------|-------------|
| Start/Stop   |       |             |
| Input/Output |       |             |
| Process      |       |             |
| Decision     |       |             |

Read the following algorithms, write what the outputs would be for each based on the inputs.

```

IF username = "smithp" THEN
  IF password = "awer" THEN
    OUTPUT "Logged in"
  ELSE
    OUTPUT "Incorrect password"
ELSE
  OUTPUT "Incorrect username"
END IF
  
```

| Username | Password | Output |
|----------|----------|--------|
| Smithp   | Awer     |        |
| Smithp   | Blogs    |        |
| Jonest   | awer     |        |

```

INPUT a
INPUT b
IF a > b AND
  (a < 20 OR b >= 13) THEN
  OUTPUT "A"
ELSE
  OUTPUT "B"
  IF b = a THEN
    OUTPUT "C"
  END IF
END IF
  
```

| A  | B  | Output(s) |
|----|----|-----------|
| 5  | 3  |           |
| 6  | 6  |           |
| 20 | 12 |           |
| 22 | 13 |           |

## Flowcharts

## 2.1 Algorithms

```

INPUT a
INPUT b
WHILE a <= b AND b < 20
  a = a + b
  OUTPUT a
END WHILE
OUTPUT "END"
  
```

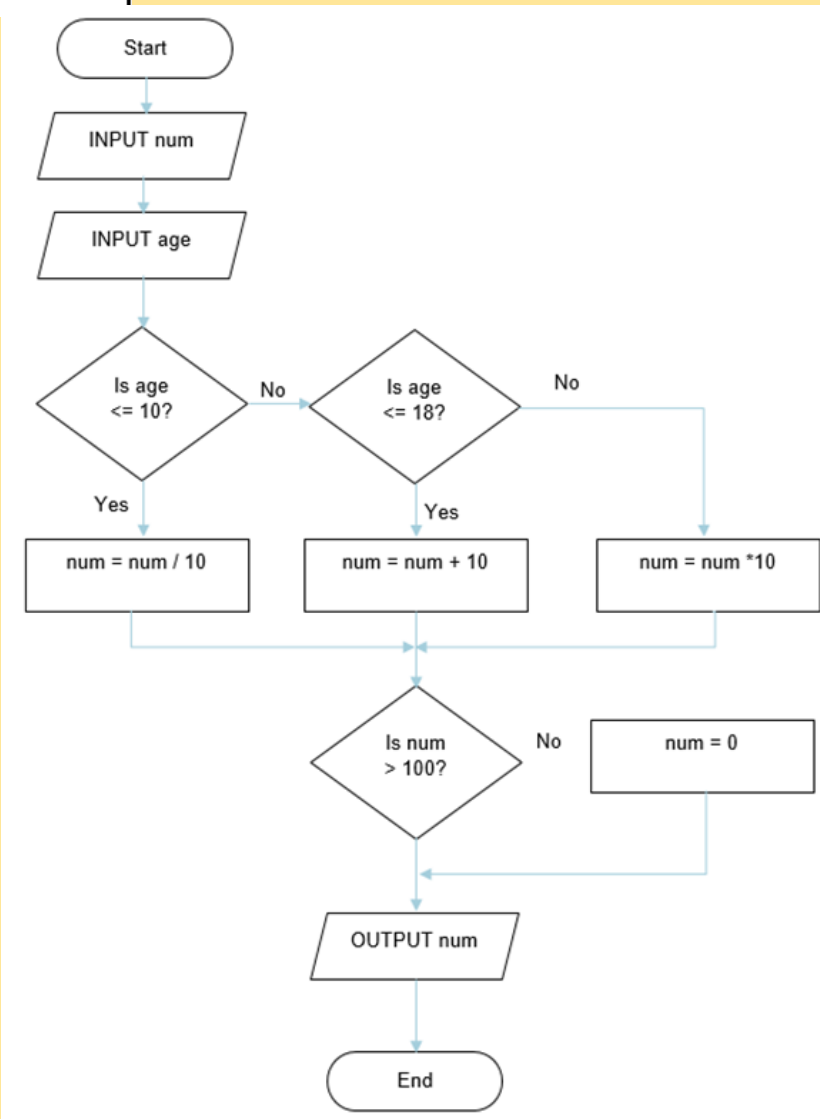
| A  | B  | Output |
|----|----|--------|
| 23 | 23 |        |
| 12 | 12 |        |
| 12 | 13 |        |
| 13 | 12 |        |

```

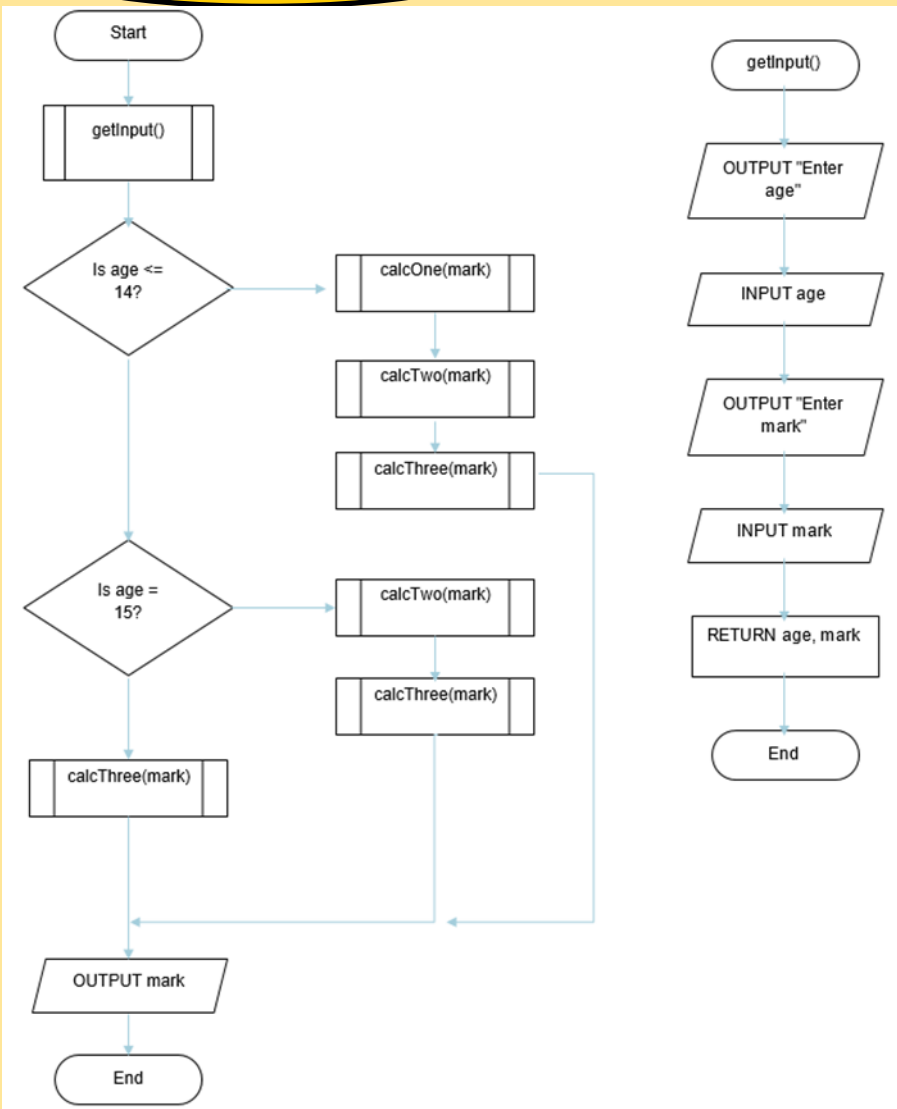
INPUT a
INPUT b
FOR i = a TO b
  OUTPUT i * b
NEXT i
  
```

| A  | B  | Output |
|----|----|--------|
| 1  | 5  |        |
| 3  | 3  |        |
| -5 | -3 |        |

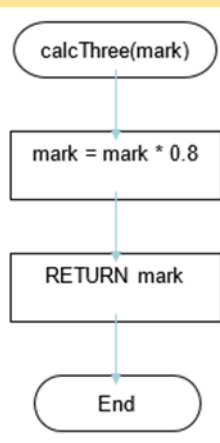
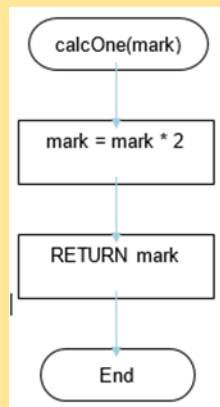
| num | age | Output |
|-----|-----|--------|
| 4   | 9   |        |
| 3   | 7   |        |
| 6   | 13  |        |
| 15  | 20  |        |
| 21  | 30  |        |



# Flowcharts



| age | mark | Output |
|-----|------|--------|
| 13  | 50   |        |
| 14  | 25   |        |
| 15  | 60   |        |
| 16  | 100  |        |
| 17  | 20   |        |

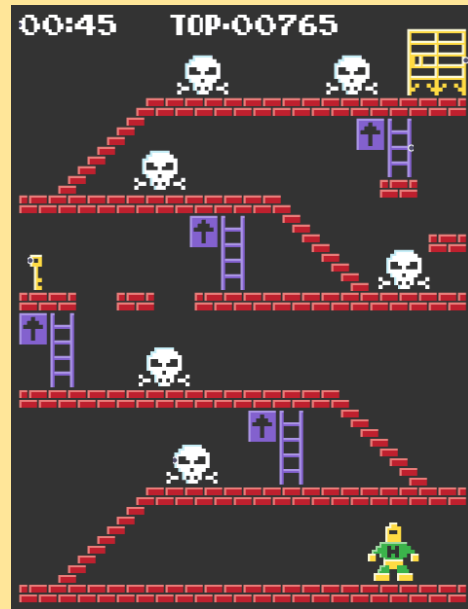


| Cornerstone         | Description | Why is it important? |
|---------------------|-------------|----------------------|
| Decomposition       |             |                      |
| Pattern Recognition |             |                      |
| Abstraction         |             |                      |
| Algorithms          |             |                      |

## 2.1 Algorithms

Look at the arcade game to the right. Abstract the key components from the game and explain how each of them could operate.

| Component | How they could work                            |
|-----------|--|
| Good Guy  | Move left and right, kick to fight the baddies |
|           |  |
|           |  |
|           |  |
|           |  |



| Searching Algorithm | How it Works? |
|---------------------|---------------|
| Linear Search       |               |
| Binary Search       |               |

## Searching Algorithms

Perform a linear search on the following values.

**NOTE:** Each time you discard a value, you should represent this on a new line (write out the list again)

Find the number 15 from the following list:

**3 5 8 14 15 17 19 24**

Fine the word elephant from the following list:

**Aardvark cheetah elephant fox gorilla hippo**

Perform a binary search on the following values.

**NOTE:** Each time you discard values, you should represent this on a new line (write out the list again)

Find the number 26 from the following list:

**3 5 8 14 15 17 19 24 26 30**

Fine the name Sally from the following list:

**Ben Claire Edward Harry Libby Miranda Peter Robert Sally Tim Willow**

Perform a insertion sort on the following values.

**NOTE:** Each time you check an item you should create a new list. You should show the sorted and unsorted list after each check.

Perform a insertion sort on the following values: **9 5 4 15 3 8 11 2**

## 2.1 Algorithms

### Sorting Algorithm

### How it Works?

Bubble Sort

Insertion Sort

Merge Sort

Perform a bubble sort on the following values.

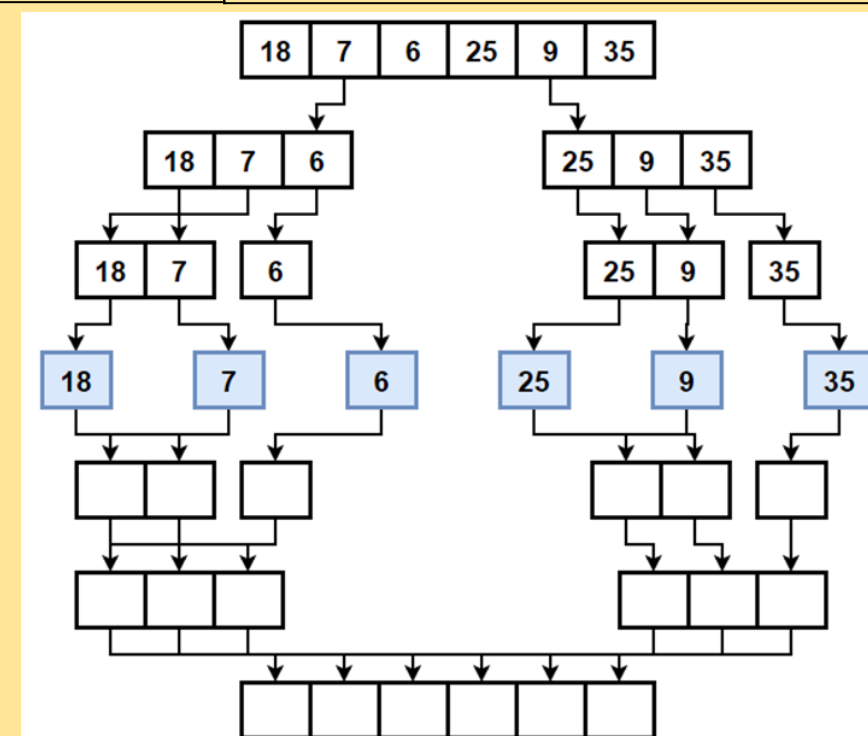
**NOTE:** Each time you complete a pass, you should represent this on a new line

Sort the following list: **8 5 6 9 12 3**

Sort the following list: **17 92 61 44 84 32 78 52**

Perform a merge sort on the following values.

**NOTE:** You should show the stages of separation and how the values are sorted when combined back together.





## Handling Data

What is a variable?

What is a constant?

Complete the table naming the different data types. Identify the data type described and provide an example for each.

| Data type | Description   | Example of use |
|-----------|---|----------------|
|           | TRUE or FALSE   |                |
|           | Single alpha character                                      |                |
|           | Whole number values, positive or negative, no decimal point |                |
|           | A combination of alpha characters                           |                |
|           | Numbers with a decimal point                                |                |

What is an array?

For the array below, complete the following calculations, in this example number(1) is 7.

|           |          |           |           |          |          |
|-----------|----------|-----------|-----------|----------|----------|
| <b>15</b> | <b>7</b> | <b>12</b> | <b>17</b> | <b>4</b> | <b>9</b> |
|-----------|----------|-----------|-----------|----------|----------|

| Calculation                     | Answer |
|---------------------------------|--------|
| Number[5] - number[1]           |        |
| Number[0] + number[3]           |        |
| Number[4] / number[2]           |        |
| Number[4] * number[5]           |        |
| (Number[3]-number[1])*number[5] |        |

Name the different variable and constant in this program.

```

Output "Welcome"
Input name
Output "Hello" + name
Input radius
Pi = 3.141592654
Area = 2 * Pi * radius
Output area
    
```

Variable \_\_\_\_\_

Constant \_\_\_\_\_

Answer the following questions in the table below using the string letters.

**letters = "ghjghgsdsfjkdnwqeiumnsaseasbmuiolqwer"**

| Code  | Output |
|---|--------|
| letters.length  |        |
| letters.substring(3,3)                                |        |
| letters.substring(0,3)+" "+films.substring(6,4)       |        |
| letters.substring(25,8).upper                         |        |
| letters.substring(10,6)+letters.substring(22,3).lower |        |

| Field Name       | Data Type | Field Name    | Data Type |
|------------------|-----------|---------------|-----------|
| Telephone Number |           | Supplier Name |           |
| Product Cost     |           | Postcode      |           |
| Free Delivery?   |           | Delivery Date |           |

## 2.2 Programming Fundamentals

| Data Type | Description |
|-----------|-------------|
| String    |             |
| Integer   |             |
| Real      |             |
| Character |             |
| Boolean   |             |

## Arrays

The array below is called distanceRun. Answer the questions below.

|        |   | Days of the week |    |    |    |    |    |    |
|--------|---|------------------|----|----|----|----|----|----|
|        |   | 0                | 1  | 2  | 3  | 4  | 5  | 6  |
| Runner | 0 | 9                | 10 | 8  | 12 | 0  | 6  | 9  |
|        | 1 | 10               | 12 | 15 | 15 | 0  | 0  | 10 |
|        | 2 | 15               | 14 | 13 | 16 | 0  | 8  | 9  |
|        | 3 | 6                | 8  | 9  | 10 | 12 | 12 | 0  |

| Calculation  | Answer |
|--|--------|
| distanceRun[1,2] + distanceRun[2,1]                  |        |
| distanceRun[3,5]*distanceRun[1,5]                    |        |
| distanceRun[0,2] - distanceRun[2,3]                  |        |
| distanceRun[1,3]/(distanceRun[1,2]-distanceRun[0,1]) |        |
| distanceRun[1,6] * distanceRun[1,0]                  |        |

tblEmployees

| EmployeeID | Surname   | Forename | Street            | City        | Sex(M/F) | Years in Employment | Salary (£) |
|------------|-----------|----------|-------------------|-------------|----------|---------------------|------------|
| 1          | Carrillo  | Abraham  | 3792 Etiam St.    | Birmingham  | M        | 4                   | 26000      |
| 2          | Holland   | Sarah    | 991 Erods Rd.     | Colchester  | F        | 6                   | 52000      |
| 3          | Hernandez | Blossom  | 172-934 Ac Street | Birmingham  | F        | 8                   | 87000      |
| 4          | Mcleod    | Amaya    | 570-1940 Cras St. | Birmingham  | F        | 4                   | 43089      |
| 5          | Vincent   | Audra    | 6449 Duis Rd.     | Birmingham  | F        | 1                   | 78967      |
| 6          | Vega      | Lucian   | 3594 Amet St.     | Worcester   | M        | 3                   | 34566      |
| 7          | Cohen     | Jessica  | 2015 Ante St.     | Liverpool   | F        | 4                   | 36755      |
| 8          | Gordon    | Micah    | 6419 Gravida Av.  | Southampton | M        | 3                   | 56787      |

| Construct  | Description |
|------------|-------------|
| Selection  |             |
| Sequencing |             |
| Iteration  |             |

What EmployeeID's would result from running the following queries:

|  |  |
|--|--|
| SELECT EmployeeID FROM tblEmployees WHERE Sex=M  |  |
| SELECT EmployeeID FROM tblEmployees WHERE Sex=M AND Years in Employment > 3            |  |
| SELECT EmployeeID FROM tblEmployees WHERE Years in Employment < 4 AND Salary > 35000   |  |
| SELECT EmployeeID FROM tblEmployees WHERE City = Birmingham OR Years in Employment = 4 |  |
| SELECT EmployeeID FROM tblEmployees WHERE NOT(City = Birmingham)                       |  |

| Symbol | What is means? |
|--------|----------------|
| =      |                |
| !=     |                |
| >      |                |
| <      |                |
| >=     |                |
| <=     |                |

## 2.2 Programming Fundamentals

What is the difference between a procedure and a function?

What is a parameter?

List two benefits of using subroutines in your programming.

- 1.
- 2.

Write the search criteria to find all female employees who live in Birmingham

Write the search criteria to find employees who have been employed for 2 years or more and have salaries more than £50000.

Write the pseudocode to define a function called VAT that passes a parameter called total.

## Validation

## Errors

| Validation Type | Description |
|-----------------|-------------|
| Length Check    |             |
| Type Check      |             |
| Range Check     |             |
| Presence Check  |             |
| Lookup Check    |             |
| Format Check    |             |
| Check Digit     |             |

| Error Type   | Description |
|--------------|-------------|
| Syntax Error |             |
| Logic Error  |             |

### 2.3 Producing Robust Programs

```

INPUT mark
IF mark >=0 OR mark <= 20 THEN
    Percent = mark * 100 / 20
    OUTPUT percent
ELSE
    OUTPUT "Invalid Mark"
END IF
    
```

Complete the test table for the program

| Type of Test  | Input Data | Expected Output |
|---------------|------------|-----------------|
|               | -1         | "Invalid Mark"  |
|               | 0          | 0               |
|               | 15         | 75              |
|               | Ten        | Error           |
| Valid Extreme |            | 100             |

| Code:  | Type of error: | What is the problem? |
|--|----------------|----------------------|
| Print("Hello world)  |                |                      |
| Name = input("Enter name")<br>Print("Hi" + "name")           |                |                      |
| IF password = "apple" THEN<br>Print("Correct")               |                |                      |
| i = 10<br>WHILE i <> 10<br>print(i)<br>i = i - 1<br>ENDWHILE |                |                      |

| Field            | Validation Type? How? |
|------------------|-----------------------|
| Surname          |                       |
| Telephone Number |                       |
| Date of Birth    |                       |

| Type of Test | Description |
|--------------|-------------|
| Valid        |             |
| Invalid      |             |
| Extreme      |             |
| Out of Range |             |
| Null Value   |             |

## Authentication

## Maintainability

Explain how the following listed below can help improve maintainability

| Authentication Method      | Description |
|----------------------------|-------------|
| Passwords                  |             |
| Random Character Selection |             |
| Two-Factor Authentication  |             |
| Biometrics                 |             |

| Maintainability | Explanation |
|-----------------|-------------|
| Comments        |             |
| Indentation     |             |
| Variable Names  |             |

## 2.3 Producing Robust Programs

```
s = 0
l=3
if l> 0 then
print("Playing game")
l = l-1
endif
print("Game Over")
```

Explain what input sanitisation is.

Rewrite the code to the right so it is in a more maintainable format

Explain how you have made your re-written code more maintainable.

| Input             | How could you sanitise the input? |
|-------------------|-----------------------------------|
| Dav3              |                                   |
| Sarah@#gmail.com  |                                   |
| claire swainworth |                                   |
| £546.56.67        |                                   |
| O1982 560635      |                                   |

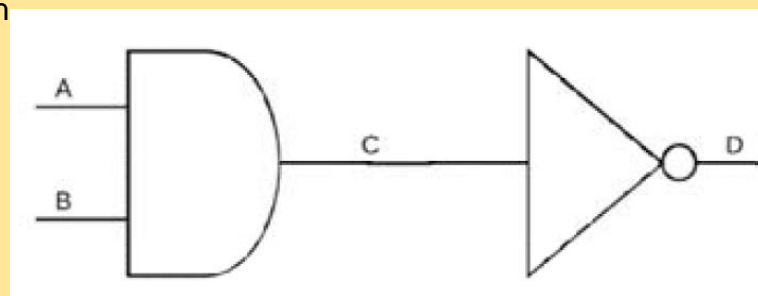
Complete the tables below for all the logic gates (description, drawing & truth table):

|                 |   |   |
|-----------------|---|---|
| <b>NOT gate</b> |   |   |
| Description:    |   |   |
| Find an image:  | A | B |
|                 |   |   |
|                 |   |   |

|                 |   |   |   |
|-----------------|---|---|---|
| <b>AND gate</b> |   |   |   |
| Description:    |   |   |   |
| Find an image:  | A | B | C |
|                 |   |   |   |
|                 |   |   |   |
|                 |   |   |   |
|                 |   |   |   |

|                |   |   |   |
|----------------|---|---|---|
| <b>OR gate</b> |   |   |   |
| Description:   |   |   |   |
| Find an image  | A | B | C |
|                |   |   |   |
|                |   |   |   |
|                |   |   |   |
|                |   |   |   |

**2.4  
Computational  
Logic**



Complete the following truth table for the diagram below.

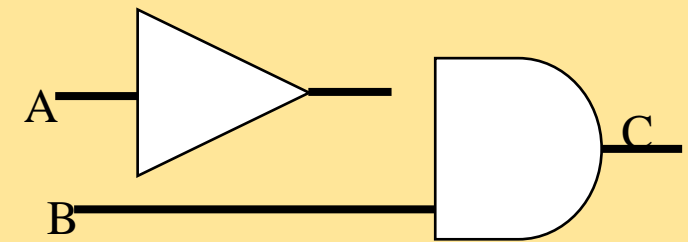
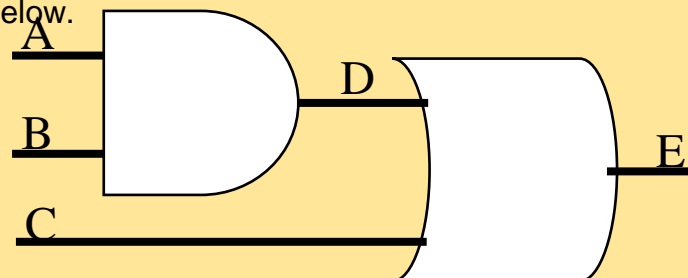
| A | B | C | D |
|---|---|---|---|
| 0 |   | 0 |   |
|   | 1 |   |   |
|   | 0 |   |   |
|   |   | 1 |   |

Draw a logic circuit for the following expression.  
 $C = \neg (A \vee B)$  (you can use <https://logic.ly/demo/>)



| A | B | C | D | E |
|---|---|---|---|---|
|   | 0 | 0 |   |   |
|   | 0 |   |   | 1 |
| 0 | 1 |   |   |   |
|   | 1 | 1 |   |   |
| 1 |   | 0 |   |   |
|   | 0 | 1 |   |   |
| 1 |   | 0 |   |   |
| 1 | 1 | 1 |   | 1 |

Complete the following truth table for the diagram below.



| A | B | C |
|---|---|---|
|   |   |   |
|   |   |   |
|   |   |   |
|   |   |   |

| Question            | Answer |
|---------------------|--------|
| $(12 + 9) / 3$      |        |
| $(24-8)*8$          |        |
| $12*(9+7)$          |        |
| $(6+(6*5))/4$       |        |
| $17 \text{ MOD } 2$ |        |
| $52 \text{ DIV } 6$ |        |
| $6^3$               |        |
| $65 \text{ MOD } 7$ |        |
| $43 \text{ DIV } 9$ |        |

## Programming Languages

| Type                      | Description |
|---------------------------|-------------|
| Machine Code              |             |
| Low Level / Assembly Code |             |
| High Level Code           |             |

## Types of Translator

| Translator  | Description |
|-------------|-------------|
| Compiler    |             |
| Interpreter |             |

Explain why translators are needed to convert high level code to machine code?

## 2.5 Translators & Languages

## IDEs

| Statement  | True/False |
|--|------------|
| Machine code is easy to understand by humans   |            |
| An example of a high level language is Visual Basic  |            |
| 2 <sup>nd</sup> generation code is easier to understand by humans than 3 <sup>rd</sup> generation code |            |
| Each CPU has its own assembly language, therefore it may not run on every CPU                          |            |
| Each instruction in assembly language can carry out more than one CPU operation                        |            |
| High level languages can be used with different CPUs and still work                                    |            |
| High level language code is known as object code.  |            |
| CPUs can understand low and high level languages in their current format.                              |            |
| Assembly code is known as 1 <sup>st</sup> generation code  |            |

| Tool                 | Description |
|----------------------|-------------|
| Source Code Editor   |             |
| Error Diagnostics    |             |
| Run-time environment |             |
| Auto-documentation   |             |

# Preparation Checklist

- ✓ Completed subject task (We will ask to see this in the second week of lessons.)
- ✓ Read up on the specification: [OCR A Level Computer Science H446 Specification](#)
- ✓ Practiced some programming, you could use the below to help you:
  - ✓ [BSD Online | Code During Class](#)
  - ✓ [Python Tutorial \(w3schools.com\)](#)
  - ✓ [Trinket: An Hour of Python](#)
- ✓ Emailed Mrs Khalifa ([fkhalifa@st-pauls.leicester.sch.uk](mailto:fkhalifa@st-pauls.leicester.sch.uk)) with any questions/concerns.
- ✓ Had a well-rested Summer, ready to learn and excel at your A Levels 😊

# Super Curricular Resources – things you could do to get a head start

- Watch the GCSE Craig’N’Dave Videos to refresh your knowledge: [GCSE \(J277\): OCR Specification Order – YouTube](#)
- Watch the first few A Level Craig’N’Dave videos to get an understanding of content: [A level: OCR Specification Order - YouTube](#)