# KS3 Computing – Knowledge Organiser

## KS3 COMPUTING: Year 8 Autumn Term Unit 1 Digital Citizenship

Henlow Church of England Academy

## Overview

### KEY WORDS

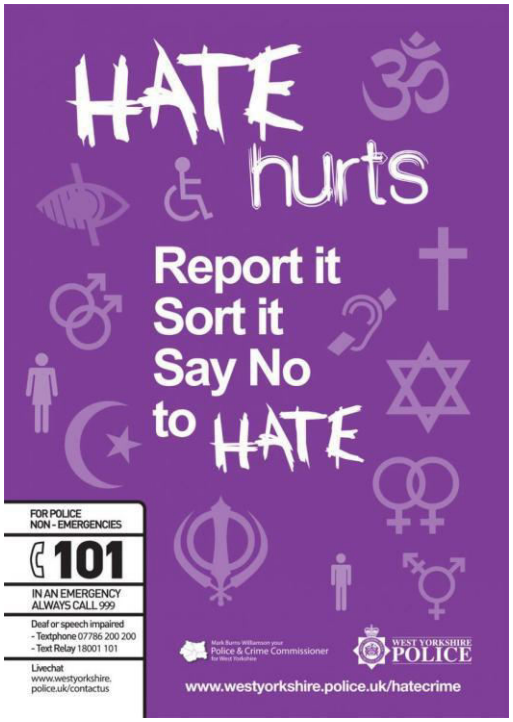
| | |
|---|---|
| Hate Speech | A verbal attack targeting someone because of a group they belong to—e.g., their race, gender, religion, ability, sexual orientation, etc. |
| Consequences | Dealing with the result of an action |
| Digital Footprint | A **digital footprint** is a trail of data you create while using the Internet. It includes the websites you visit, emails you send, and information you submit to online services |
| Screen Time | How much time we are on our devices |
| Addictive | Not having control over the need for something |
| Xenophobia | The fear or distrust of someone or something that is foreign or unknown |
| Extremism | The holding of extreme political or religious views |
| Counter Speech | Messages that challenge or debunk extremism and stereotypes |
| Freedom of speech | The right to state one's opinions and ideas without being stopped or punished. |
| Active use | Contributing online via posts, comments, or other forms of communication and expression |
| Passive use | Scrolling through online content without reacting to the content |

### Software and resources that will be used:

- Schoology
- Internet Explorer/Chrome
- Microsoft Word/Powerpoint

### Key Learning that will take place in this unit

- Understand issues surrounding hate speech
- Well being online
- Methods of protection




### Screen Time/Addiction

People are becoming more and more addicted to mobile phones. Whether it is adults or children, whether at the time of dinner or at the parties, the problem of mobile addiction has become more and more serious. More people simply don't realize that they spend a lot of time every day on their apps and games.





### Hate Speech

Abusive or threatening speech or writing that expresses prejudice against a particular group, especially on the basis of race, religion, or sexual orientation.

### Digital Footprint

A **digital footprint** is a trail of data you create while using the Internet. It includes the websites you visit, emails you send, and information you submit to online services

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### Freedom of Speech

Social media has given a voice to the many. Sometimes for the good of humanity, but sadly more often than we like, it has given a voice to the many bad around the world.

Freedom of speech is often cited by many who view controversial viewpoints. The question is should freedom of speech be regulated?

### Xenophobia vs Racism

*Xenophobia* is "fear and hatred of strangers or foreigners or of anything that is strange or foreign." *Racism* has a slightly broader range of meanings, including "a belief that race is the primary determinant of human traits and capacities and that racial differences produce an inherent superiority of a particular race," and "a political or social system founded on racism." It should be noted that the meanings of these two words are sufficiently different that a person (or thing, such as a policy) may very easily be both *racist* and *xenophobic*.



### Extremism

**Is having different ideas always so bad? Civilised discussions and constructive inputs, no matter how unusual, should always be encouraged.**

After all, even Gandhi was once considered an extremist!

Yet sometimes people see fit to use violence to make their voices heard.

# KS3 Computing – Knowledge Organiser

## KS3 COMPUTING: Year 8 Autumn Term Unit 1 Digital Citizenship

### Being an Active user

Regardless of whom you are, what your views are, we should always strive to be kind and considerate to one another. We never truly understand or appreciate the battles that someone else is facing behind the scenes.

This is Chadwick Boseman, the star of the Marvel's Black Panther. Sadly Chadwick died recently cancer, something that was kept a secret from so many. Being an active user, someone who comments, likes, etc we have a responsibility. Before his death, he was trolled and teased due to his weightloss. We know now, he was battling cancer all these years. Better to be kind always, don't you think?


### Useful Links

GCSE Bitesize

https://www.bbc.co.uk/programmes/topics/Digital_citizen

### Test Yourself

1. **What is Xenophobia?**
2. **What is an Internet Troll?**
3. **Should we have Freedom of Speech online?**
4. **What does it mean to have a digital footprint?**

### At Home

Ask each member of your family to check their screen time of their various social media apps. Who has the highest screen time? Discuss this as a family and what impact it has on each other's lives.

# KS3 Computing – Knowledge Organiser

## KS3 COMPUTING: Year 8 Autumn Term Unit 2 Data Representation

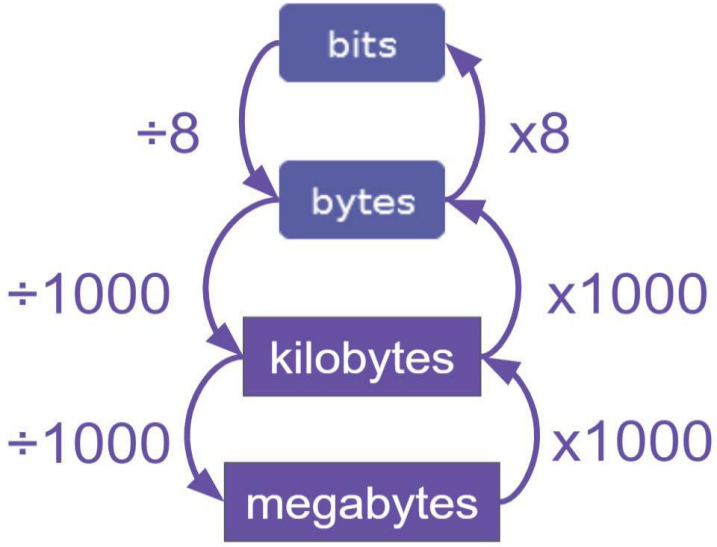
# Overview:

| | | |
|---|---|---|
| 1 | Binary | A number system that contains two symbols, 0 and 1. Also known as base 2 |
| 2 | Denary | The number system most commonly used by people. It contains 10 unique digits 0 to 9. Also known as decimal or base 10 |
| 3 | Hexadecimal | A number system that contains sixteen symbols, 0-9 and A-F. Also known as base 16 |
| 4 | Place value / placeholder | The value of the place, or position, of a digit in a number |
| 5 | Character set | A mapping of keyboard characters to numbers used to represent those keyboard characters in a computer system |
| 6 | ASCII | American Standard Code for Information Interchange. A 7-bit character set for representing English keyboard characters. |
| 7 | Pixel | The smallest identifiable area of an image or computer screen |
| 8 | Bit | A single symbol in a binary number. Either 1 or 0 |
| 9 | Bit pattern | Any sequence or more than one bit |
| 10 | Nibble | A bit pattern which is four bits long |
| 11 | Byte | A bit pattern with which is eight bits long |
| 12 | Kilobyte | 1000 bytes |
| 13 | Megabyte | 1000 kilobytes |
| 14 | Resolution | The number of pixels in an image |
| 15 | Colour depth | The number of bits used to store each pixel |
| 16 | Bitmap | A digital image made up of a grid of pixels |
| 17 | Vector graphic | A digital image made up of lines and shapes described using mathematics |
| 18 | Compression | Reducing the amount of storage needed to represent a file |
| 19 | Lossy compression | Information is lost during the compression of a file |
| 20 | Lossless compression | No information is lost during the compression of the file |
| 21 | MIDI | Musical Instrument Digital Interface. A way to connect devices that make and control sound |
| 22 | Metadata | Data that provides information about other data. For example, the file size of an image is considered part of the image metadata |

### *How to convert between units of data*

In binary, 8 bits (individual 1s and 0s) make up a byte. The prefixes kilo-, mega-, giga-, tera-, … are used to express increasingly large quantities of bytes.

1 kilobyte = 1000 bytes
1 megabytes = 1000 kilobytes
1 gigabyte = 1000 megabytes
1 terabyte = 1000 gigabytes



# KS3 Computing – Knowledge Organiser

## KS3 COMPUTING: Year 8 Autumn Term Unit 2 Data Representation

### Numbers - Binary compared to decimal:

The decimal system uses different characters 0 – 9 to represent numbers, laid out in units, 10s, 100s etc. We know that 156 is the same as 1x100 + 5x10 + 6x1 or:

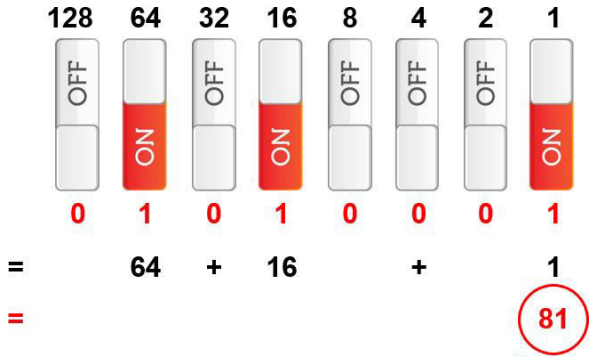
| 100 | 10 | 1 (unit) |
|---|---|---|
| 1 | 5 | 6 |

Binary uses a similar different system, rather than 100, 10s etc as shown in the table below. 1 = yes or true and 0 = no or false.

156 in binary:

| 128 | 64 | 32 | 16 | 8 | 4 | 2 | 1 |
|---|---|---|---|---|---|---|---|
| 1 | 0 | 0 | 1 | 1 | 1 | 0 | 0 |

128+ 16+8+4 = 156



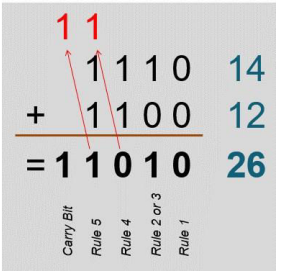

### Addition in binary:

When adding binary numbers there are similarities with the rules used when adding integers…

#### The rules of binary addition

Work right to left and apply these simple rules:

1. 0 + 0 = 0
2. 0 + 1 = 1
3. 1 + 0 = 1
4. 1 + 1 = 0 *Carry 1*
5. 1 + 1 + 1 = 1 *Carry 1*




0100001001101001011011100110000101110010011
1001011000000110110001101111011011101101011
0111001101100000011010000110000101110010011
0100011000000010110001100000011010000111010
0110000001101000011010110110111001100000011
0100

### Characters in binary (American Standard code for Information Interchange ASCII):

ASCII is used in nearly all computers. There is a binary code for every character on the computer keyboard as shown in the table below.

| Decimal | Binary | Character | Decimal | Binary | Character | Decimal | Binary | Character |
|---|---|---|---|---|---|---|---|---|
| 32 | 00100000 | space | 64 | 01000000 | @ | 96 | 01100000 | ` |
| 33 | 00100001 | ! | 65 | 01000001 | A | 97 | 01100001 | a |
| 34 | 00100010 | " | 66 | 01000010 | B | 98 | 01100010 | b |
| 35 | 00100011 | £ | 67 | 01000011 | C | 99 | 01100011 | c |
| 36 | 00100100 | $ | 68 | 01000100 | D | 100 | 01100100 | d |
| 37 | 00100101 | % | 69 | 01000101 | E | 101 | 01100101 | e |
| 38 | 00100110 | & | 70 | 01000110 | F | 102 | 01100110 | f |
| 39 | 00100111 | ' | 71 | 01000111 | G | 103 | 01100111 | g |
| 40 | 00101000 | ( | 72 | 01001000 | H | 104 | 01101000 | h |
| 41 | 00101001 | ) | 73 | 01001001 | I | 105 | 01101001 | i |
| 42 | 00101010 | * | 74 | 01001010 | J | 106 | 01101010 | j |
| 43 | 00101011 | + | 75 | 01001011 | K | 107 | 01101011 | k |
| 44 | 00101100 | , | 76 | 01001100 | L | 108 | 01101100 | l |

Originally only 7 bits were used but this limited the number of characters that were available.

**Note:**
The character '5' on the keyboard is not the same as the number 5 (think strings and integers coved in the python unit)

### At home:

Use the useful links – select 'tests', test your knowledge.

Find the ASCII table online – can you decode the coded message? (hint: split it into blocks of 8 bits)

Can you find the processor speed of the devices you use at home?

### Useful links:

**BBC Bitesize: Hardware and software**
https://www.bbc.co.uk/bitesize/guides/zcxgr82/revision/1
**BBC Bitesize: The CPU and the fetch-execute cycle**
https://www.bbc.co.uk/bitesize/guides/zws8d2p/revision/1
**BBC Bitesize: Binary**
https://www.bbc.co.uk/bitesize/guides/z26rcdm/revision/1
**BBC Bitesize: Technology through time**
https://www.bbc.co.uk/bitesize/guides/z4p4jxs/revision/1
**YouTube: Fetch-decode-execute cycle explained**
https://www.youtube.com/watch?v=Z5JC9Ve1sfI

### Test yourself?

1. What is an input device? List as many as you can.
2. What is an output device? List as many as you can
3. What is a storage device? List as many as you can
4. What is hardware?
5. What is software?
6. What is ROM?
7. What is RAM?
8. What is a single binary digit known as?
9. Write the numbers 1 – 10 in binary code
10. Write the lower case alphabet in binary code

# KS3 Computing – Knowledge Organiser

## KS3 COMPUTING: Year 9 Autumn Term Unit 1Data Representation

**Lossy compression**

Lossy compression is typically used on data such as images and video. This is because some data about an image of video is lost, although it will reduce the quality of the image or video the viewer can still see/view the image.

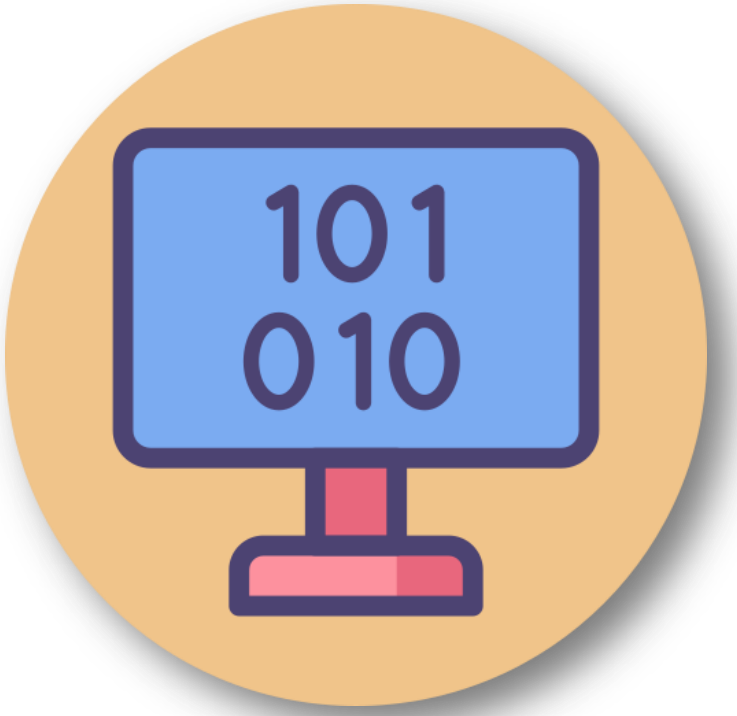
**Lossless compression**

Lossless compression is used when it is critical that, when the data is uncompressed, the original data can be reconstructed. This type of compression is often used to compress text so that all the letters in the text can be reconstructed and the text can be understood.

If lossy compression was used on a text file containing a program, the program would no longer work because characters would be removed by the compression algorithm.

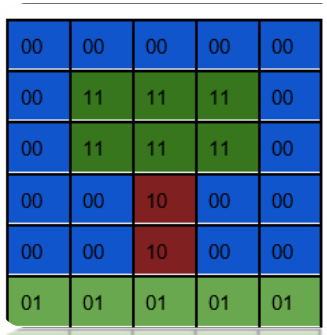
This is what a Python program might look like if you tried to apply lossy compression to it

```
plnets  ['Jpir', 'Sturn'
         'Uns', 'Nptne', 'Vnus',
         'Mas', 'Mry', 'Eah']
sies 110, 95, 00, 30, 95, 5, 8, 10]
fr i n rage(le(plnets)):
    prit(planes[i], sizei]| % the se f Eth.")
```




### Bitmap images

Bitmap images use a grid of pixels, each with an assigned colour, to represent an image.



# KS3 Computing – Knowledge Organiser

## KS3 COMPUTING: Year 8 Spring Term Unit 3 Networks

Henlow Church of England Academy

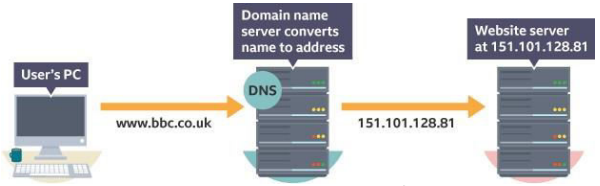
## Overview

**Software and resources that will be used:**

- Internet Explore/ Google Chrome
- Microsoft Office
- Google Classroom

**Key Learning that will take place in this unit**

- Understanding how the internet works
- Understand the use of Networks
- Be able to describe different types of networks
- Identify different types of networks.




### KEY WORDS

| | |
|---|---|
| Internet | A collection of inter connected networks and devices that communicate and send data between each other |
| DNS | Domain Name Server. Remembering www.google.co.uk is easier than remembering **173.194.34.95. Converts from number to address** |
| IP Address | Like every front door in the world, every computer in the world has a separate, unique address |
| URL | Uniform Resource Locator. A URL is a web address. All web addresses are unique |
| HTTP | **HyperText Transfer Protocol.** A protocol is a set of rules<br>HTTP defines the rules used by web browsers and servers to exchange information |
| Data Packets | Data transmitted over the Internet is broken down into smaller chunks or packets to be sent |
| Bandwidth | The amount of data that can be carried at a time |
| WAN | Wide Area Network: Cover a large geographical area (eg Bank, Hospitals) |
| LAN | Cover a small geographical area (a home network or a school) |
| NIC | Network Interface Card. Can be wired or wireless, Needed to connect to Internet |
| Buffering | The delay whilst the internet downloads data needed (usually during streaming) |

### IP Address to Domain Name Server to Uniform Resource Locator

When we type in www.google.co.uk we are typing in the **URL (Uniform Resource Locator)** – this is easy to remember!

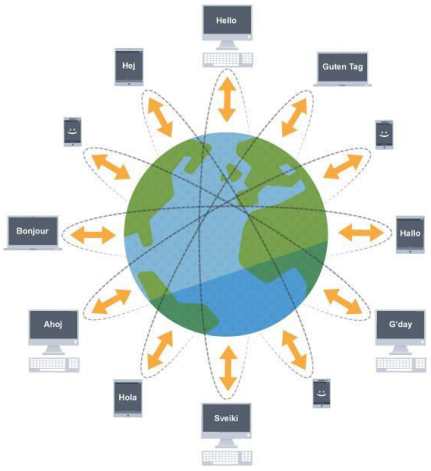
What we are actually connecting to, is Google's **IP Address** where the website is stored and this is a series of numbers, **173.194.34.95** – harder to remember!

The system that converts the IP Address (**173.194.34.95)** to www.google.co.uk is known as the Domain Name Server

## What is a network?

A network is two or more computers (or other electronic devices) that are **connected together**, usually by cables or Wi-Fi.

Some computer networks will have a server. A server is a powerful computer that often acts as a central hub for services in a network, eg emails, internet access and file storage. Each computer connected to a server is called a client.

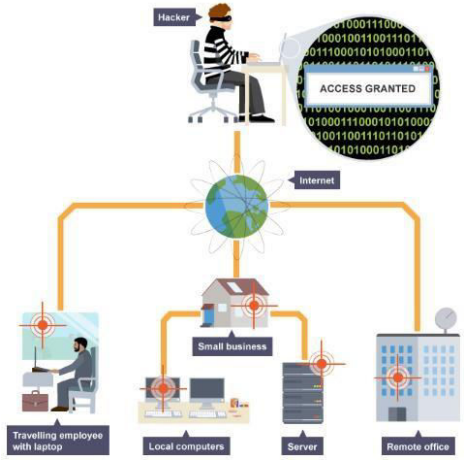



## What problems can occur with a network?

If we connect computers or devices together in a network we can expose ourselves to some problems.

If the network breaks, this can make a number of tasks it is used for quite difficult. For example, it might not be possible to share photographs and opinions with friends.

If computers and devices are networked together, we can expose ourselves to hackers and viruses. Most viruses are spread over a network and most hackers use a network to access other people's computers. Without a network connection, a hacker would have to physically get to your computer.



# KS3 Computing – Knowledge Organiser

## KS3 COMPUTING: Year 8 Spring Term Unit 3 Networks

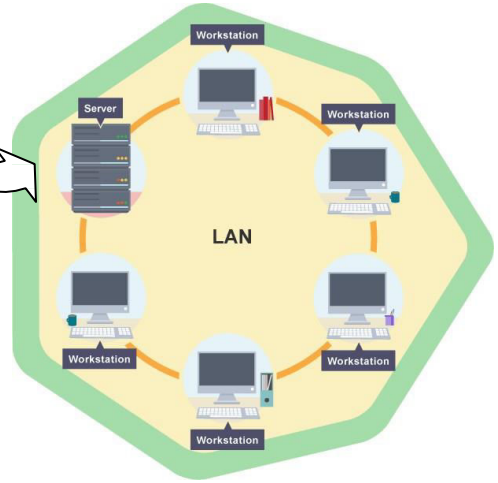
**Types of Networks**

There are two main types of networks: **LAN** and **WAN**

### Local area network (LAN)

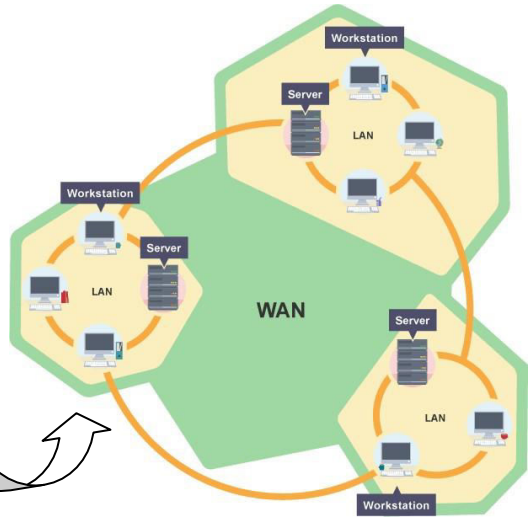
A **local area network** is when computers or devices are connected together over a **small geographical area**, such as within a home, a building or one site. A LAN can be created to share data or hardware such as a printer, or to share an internet connection.

A computer that is not connected to a network is called a **standalone computer**



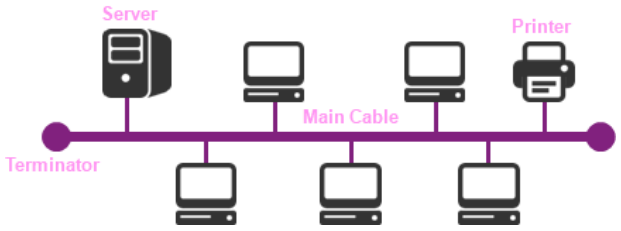

### Wide area network (WAN)

A **wide area network** is when computers or devices are connected together over a **large geographical area**. For example, a company with an office in London and another in Beijing would use a WAN to allow the employees to share one network. Some companies will connect a number of LANs in different areas together to create a WAN. The biggest WAN we know is the internet.

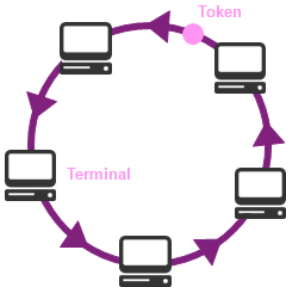



Within this, there are then 3 subtypes of networks which are shown below

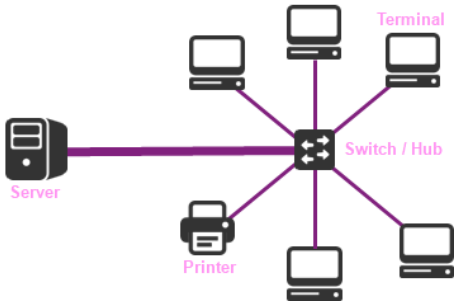
### Bus network




### Ring network




### Star network



# KS3 Computing – Knowledge Organiser

## KS3 COMPUTING: Year 8 Spring Term Unit 3 Networks

### Data Packets

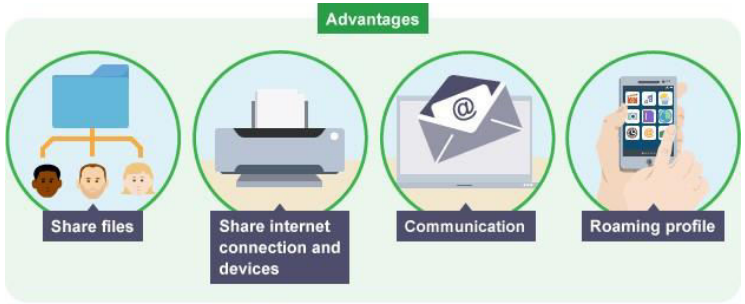
The main purpose of networking is to share data between computers. A file has to be broken up into small chunks of data known as data packets in order to be transmitted over a network. The data is then re-built once it reaches the destination computer. Networking hardware is required to connect computers and manage how data packets are communicated. Protocols are used to control how data is transmitted across networks.

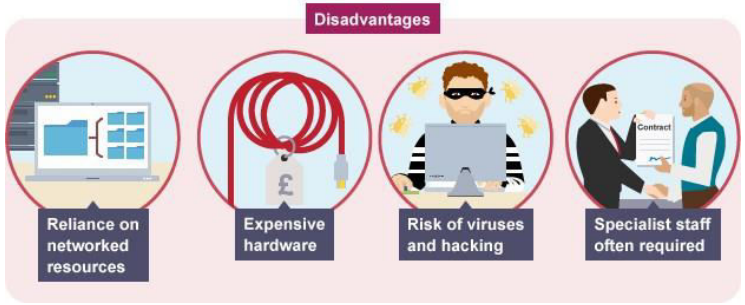
### Client-server networks

This type of network separates computers into one of two classifications - servers and clients.

A server is a computer that manages and stores files, or one that provides services to other computers on the network. They control the network and allow other computers to share and communicate. In effect, they serve other computers. Typical servers include:

- file servers - hold and maintain user files
- applications servers - allow programs to be run over a network
- web servers - hold and share web pages
- print servers - manage printing across a network




### Peer-to-peer networks

In a peer-to-peer (P2P) network, all computers have equal status - no computer has control over the network. There are no servers or clients. Instead, each computer is known as a peer. Peers store their own files, which can be accessed by other peers on the network. Therefore, a peer is both a client and a server.

P2P networks are best suited to smaller organisations that have fewer computers, or where fewer computers need access to the same data.

### Useful Links

**BBC Bitesize**

Emails: https://www.bbc.co.uk/bitesize/guides/zghfr82/revision/1

File and Folder Management: https://www.bbc.co.uk/bitesize/guides/z9n9q6f/revision/2

Spam Emails and Phishing: https://www.bbc.co.uk/bitesize/guides/zrtrd2p/revision/2

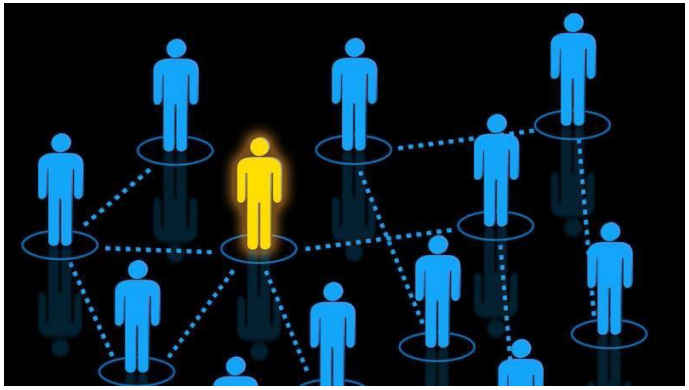
### At Home

How many different email addresses do you use?

Find out how members of your family use emails

If you have a family laptop or pc, check if your home files are organised, if not, sit with your parents and help them organise files and folders

Log into your school email account from the school website



# KS3 Computing – Knowledge Organiser

## KS3 COMPUTING: Year 8 Spring Term Unit 4 Cyber Crime and Security

**Overview:**

| KEY WORDS: | |
|---|---|
| Advanced fee fraud | An email scam; the promise of a large sum of money in return of a small advance fee. |
| Copyright | The law that protects creative works, such as films or music, from being copied. |
| Cybercrime | Also known as computer crime – a criminal act committed using an internet connected device. |
| Data harvesting | Gathering data about others using information online, such as GPS data. Often done illegally or with the view to commit illegal acts, such as commit identity fraud. |
| GDPR | General data protection regulations, formally known as the data protection Act. The rules about who can hold information on you and what this information can be. |
| Hacking | Accessing information not owned without permission of the owner. |
| Logic bomb | A type of malware; A program that tells the computer to perform an operation at a certain time, such as wipe all the data. |
| Malware | Malicious software; a program that has been downloaded, without the device owners consent. |
| Phishing | An email scam; tricks the user into handing over security information, such as bank account log-in details. |
| Plagiarism | Copying someone else's work and presenting it as you own. |
| Ransomware | A type of malware; denies access to the data/operating system/network until a ransom is paid, essentially holds the user to ransom. |
| Shoulder surfing | Spying on a person (usually over their shoulder) when they are logging in to gain passwords or other security information for that person's accounts. |
| Trojan | An email scam; distracts the user with something, such as a funny video while embedding malware on the device. |
| Virus generating | An email scam; an email that may appear to come from a genuine contact asking for money, it may contain a link, can allow a similar email to be sent from your email account to all of your contacts. |

**Key Learning that will take place in this unit:**

- Understand what is meant by 'Cybercrime', the types of cyber crime and how to avoid becoming a victim.
- Learn the different types of email scams, how to recognise them and how to protect yourself from being a victim,
- Learn the different types of malware, how to protect your device from becoming infected and how to recognise the signs your device may have been infected,
- Understand what is contained in the Computer Misuse Act 1990 and why it is important,
- Learn what hackers do, how and why they may do it,
- Understand how to keep yourself safe from harm working with and working on devices, such as computers, including ensuring that your data is appropriately stored.

**Software and resources that will be used:**

- Google Classroom

**Passwords:**

The most commonly used passwords are 'password' or 'Password1'.

Always include at least 1 uppercase letter, 1 lowercase letter, 1 number AND a special character:

*pa$$WorD_2070

Don't include personal information

Make it at least 8 characters long

Weak passwords are one of the most common weaknesses exploited by hackers!

**Cybercrime:**

Cybercrime, sometimes called computer crime, is a crime committed using the internet and any internet enabled device including smartphones

Cyber crime fact file

- Cyber crime makes more money for criminals than drug trafficking
- Around the world someone's identity is stolen online every 2 seconds
- It takes just 4 minutes from connecting to the internet for an unprotected device to become infected.

**Hackers:**

A hacker is (as defined in the Computer Misuse Act, 1990) someone who looks at or modifies another users' data without permission.

**Why do hackers hack?:**

- For money
- For information
- For political reasons
- For revenge
- For the thrill of the challenge
- To cause chaos and mischief

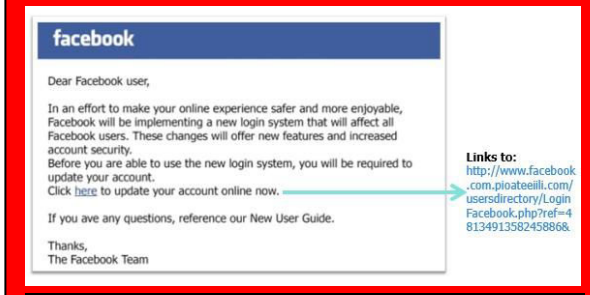
# KS3 Computing – Knowledge Organiser

## KS3 COMPUTING: Year 8 Spring Term Unit 4 Cyber Crime and Security

**Email scams**

- **Phishing**
  - Tricks you into handing over sensitive details, such as security log-in details.
  - Appears to be from a genuine company, such as PayPal, eBay or Amazon.
- **Virus-generated**
  - Opening it can generate a similar email to be sent to all your email contacts. Can contain a forged link, can contain a please for cash.
- **Advanced fee fraud**
  - Usually accompanied by a long, emotional plea, promises a large sum of money in return for a small advanced fee.
- **Trojan horse/ malware**
  - Offers you something tempting to look at – like a funny video – and installs malware on your device

Example phishing email:




Phishers will send out thousands of emails, there is on average a 5% response rate.

Following the link will take you to a fake website where your log-in details will be recorded – it could allow access to all your other accounts if you use the same password.

Example Trojan horse email:

Will install malware that may record your keystrokes, provide access to your files or send spam to all your contacts


**Malware:**

Malware means **Mal**icious soft**ware**. Malware can be accidentally downloaded, usually as a virus via a vulnerability in the network or intentionally added by a hacker.

**Logic bombs:**

Used by disgruntled employees or blackmailers – executes a destructive sequence, set to detonate at a certain time.

**Ransomware:**

Denies access to the network or computers until a ransom is paid.

Famously the NHS was victim to a ransomware attack in 2017.

**Avoid becoming a victim of malware or email scams:**

Malware

- Avoid clicking on everything, e.g. offers that seem too good to be true (on both websites and email)
- Don't visit illegal sites, such as those that let you download copyright material
- Make sure your browser is configured to always ask before running files and downloading automatically
- Keep your browser software up-to-date
- Install up-to-date antivirus and anti-spyware software

Email scams

- Use a SPAM filter to prevent common scams ever reaching your inbox
- Be suspicious! If you aren't completely certain it's genuine, NEVER click any links or download attachments.

# KS3 Computing – Knowledge Organiser

## KS3 COMPUTING: Year 8 Spring Term Unit 4 Cyber Crime and Security

**Data protection:**

Knows your rights about your information. Certain companies and organisations are permitted to hold data on you but:


- The data must be accurate and up to date
- You have a right to see what data is held about you
- The data must be protected from unauthorised access

AND

- It can only be kept for as long it is relevant (the company can't keep your details forever)

**Copyright and plagarism:**

**Copyright** © protects the rights of an author/creator of creative work. It means that someone else's work cannot be copied without permission.

**Plagarism** is using someone else's creative work as if it is yours.

**Copyrighted material** online can be music, films or pictures. Sharing or downloading these illegally (without paying the owner of the copyright) is a copyright infringement. However, there are many sites, like amazon music or iTunes, where downloading music is legal because the owner has been paid.

**But what is the problem with downloading music?**

It is estimated that the illegal downloading of films, TV programmes and music could mean the loss of 30,000 British jobs

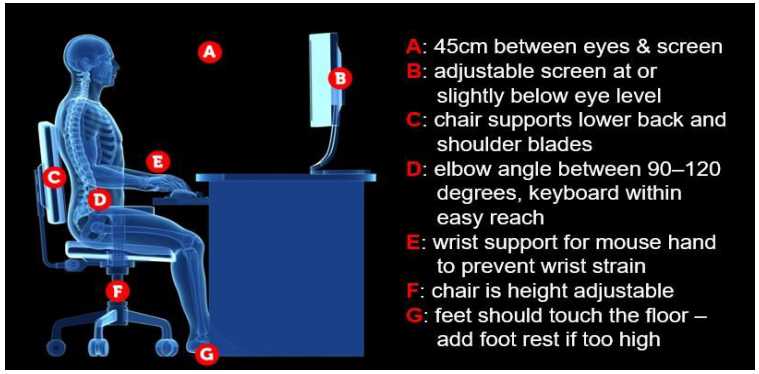
**At home:**

Check your security and privacy settings, are they secure? What can a stranger see on your social media? Could they recreate/copy your identity?

Check - Is your home work station damaging you back?

**Health & Safety:**

Are you sitting comfortably? Take a break every 15 minutes, even if it just looking off into the distance.




**Useful links:**

**BBC Bitesize: Cybercrime**
https://www.bbc.co.uk/bitesize/guides/zycm97h/revision/7

**BBC Bitesize: Hacking**
https://www.bbc.co.uk/bitesize/guides/zbgg4qt/revision/8

**BBC Bitesize: Viruses and malware**
https://www.bbc.co.uk/bitesize/topics/zd92fg8/articles/zcmbgk7

**Safety online:**

Keeping your identity safe

If criminals can access your information, they can steal your identity… but where can they get this information from? Social media!

Before you post, think who can see it and what information does this tell me about me?

Even a photo can disclose your location, even if there is nothing obvious, they are all embedded with location information that is shared if you don't turn it off.

If you wouldn't tell them in real life why tell them online?

**Test yourself?**

1. Write the definition of 'GDPR'
2. What are the 4 most commonly used email scams?
3. What does 'malware' mean?
4. Give two examples of malware
5. What is a hacker?
6. What is a common weakness hackers exploit?
7. How do you protect yourself from becoming a victim of cybercrime?
8. How do you protect your data online?

# KS3 Computing – Knowledge Organiser

## KS3 COMPUTING: Year 8 Summer Term Unit 5 Computer Components

**Overview:**

**KEY WORDS:**

| | |
|---|---|
| ASCII | American Standard Code for Information Interchange |
| Binary | A numeric system that only uses 2 digits, 0 and 1 |
| CD-R | CD-Recordable. A CD/DVD that data can be saved to |
| CD-ROM | A read only CD/DVD/Blue-ray |
| CD-RW | CD-Rewritable. A Cd/DVD that data can be saved to then then reused |
| CPU | Central Processing Unit |
| Denary system | Also known as the decimal system |
| Hardware | A computing object you can touch, such as a keyboard or a printer |
| Input device | A piece of computing hardware that can be used to enter data into a computer, such as a keyboard or a mouse |
| Output device | A piece of computing hardware that displays or outputs data, such as a monitor or a speaker |
| RAM | Random Access Memory |
| RFID | Radio frequency ID |
| ROM | Read Only Memory |
| Software | A computer program (a computing object that you cannot touch) such as Microsoft Word, Internet explorer or Scratch |
| Storage device | A piece of computing hardware that is used to permanently record or store data, such as a hard drive or a CD |

**Key Learning that will take place in this unit:**

- The elements of a computer, including hardware, software, Input devices, output devices and storage devices.
- The processes of the Central Processing Unit.
- The different storage devices, the advantages and disadvantages of these.
- Basic binary.
- Future technologies and the impact these may have on our lives.

**Software and resources that will be used:**

- Schoology

Not just PCs (personal computers) but all computerised devices such as smart phones, the tills in the supermarkets, ATMs etc.

**Hardware/Software:**

**Hardware** is something that you can touch, such as a keyboard, the mouse, a printer or a CD but **Software** you cannot touch, it is the programs that run on the computer, such as Microsoft windows.

**Data storage:**

Stored data can be measured in bits, a bit is a very small amount of data, like the letter 'a'. There are 8 bits in 1 byte.

**Data units:**

| | Bytes |
|---|---|
| Kilobyte | 1,000 |
| Megabyte | 1,000,000 |
| Gigabyte | 1,000,000,000 |
| Terabyte | 1,000,000,000,000 |

**Data translated:**

Kilobyte = about 14 lines of text
Megabyte = A good size novel
Gigabyte = About 300 MP3s or 40 minutes of a movie
Terabyte = About 1,000 copies of the Encyclopaedia Britannica.

**Software** is stored as data.

**Input/Output/ storage devices:**

**Hardware** is further defined as an input device, an output device or a storage device.

An **Input** device, such as the keyboard, enters data.

An **Output** device, such as the speakers outputs the data.

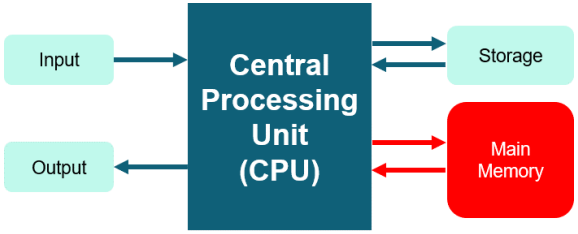
A **storage** device such as a CD-ROM or a USB memory stick, holds the data.

# KS3 Computing – Knowledge Organiser

## KS3 COMPUTING: Year 8 Summer Term Unit 5 Computer Components

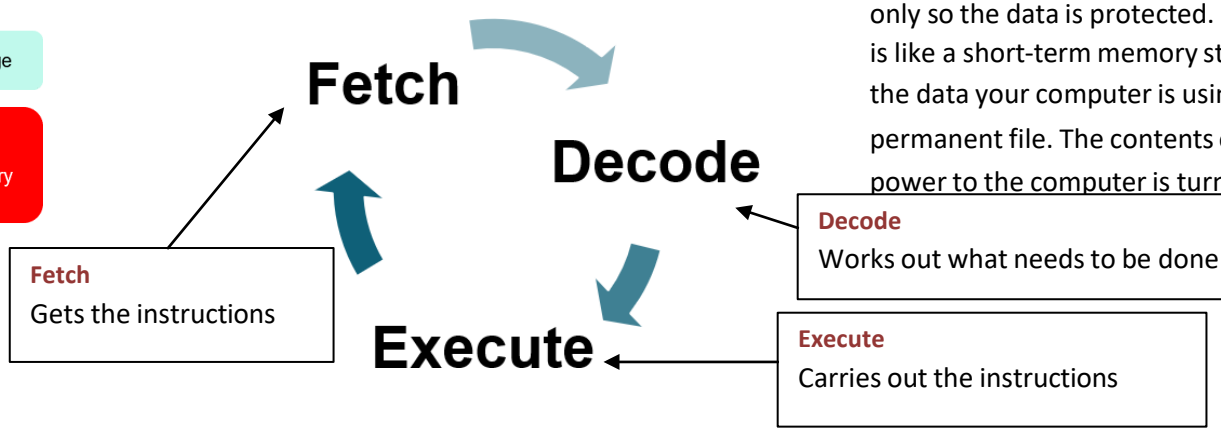
**The CPU (Central Processing Unit):**

The CPU is the part of the computer that carries out the instructions of the computer program, using the fetch-decode- execute cycle, it is like the brain of the computer.




The speed the CPU carries out each FDE (fetch-execute- decode) is measured in Hertz (Hz).

1 cycle per second = 1 Hz (1 instruction carried out per second)




**Fetch**
Gets the instructions

**Decode**
Works out what needs to be done

**Execute**
Carries out the instructions

**Computer memory – RAM and ROM:**

There are two different types of memory **ROM (Read only memory)** which hold data such as the software. It is read only so the data is protected. **RAM (Random Access Memory)** is like a short-term memory storage. It temporarily stores the data your computer is using but doesn't save it to a permanent file. The contents of RAM are lost as soon as the power to the computer is turned off.

**Emerging technologies:**

Moore's Law states that the number of transistors in integrated circuit boards doubles every two years. This means that we need less devices to perform more tasks.

### The effect of changing technologies

- Connectivity
- Convenience
- Creativity & Design
- Globalisation & Collaboration
- Potential & Innovation
- Research & Discovery

Emerging technologies include:

- Driverless cars
- Advanced robotic capabilities
- Advances in medicine
- Advances in space exploration
- And…. ?

If Moore's law is correct and continues at the same pace it would mean that a 32Gb memory card, in 10 years, can be replaced by a 1Tb memory card.

**Processing speeds now compared to processing speeds historically:**

The guidance computer on the Apollo 11 mission had a processing speed of 0.043 MHz (1MHz = 1,000,000 cycles per second).
An iPhone 6 has a processing speed of 1.4 GHz. (1GHz = 1,000,000,000 cycles per second)

# KS3 Computing – Knowledge Organiser

## KS3 COMPUTING: Year 8 Summer Term Unit 6 Introduction to Python

Henlow Church of England Academy

**Introduction:** In this unit, you will learn how to write computer programs in Python that include a variety of common techniques and features. These will include: printing to the screen, user-input, variables, using different datatypes, doing some maths using BIDMAS, using Python if-elif-else statements and comparing values, and looping through code using Python while loops. You will also learn how to change data types using 'casting', and will become familiar with different types of errors and how to correct them.

## Overview

| | |
|---|---|
| **Algorithm** | An algorithm is set of instructions or rules that need to be followed in order to perform calculations or to solve a problem. |
| **Sequence** | The set of instructions or rules that an algorithm uses have to be in the right order. We call instructions in the correct logical order a 'sequence'. |
| **Assign** | When we set a variable to a given value – like my_var = 3 – we say that we are "assigning the value of 3 to the variable my_var." We try not to say 'equals' ! |
| **Data type** | A data type is used to identify data that has common characteristics and purpose. For example, text and numbers are different data types because they are used for different purposes. Python has four data types: string (text), integers (whole numbers), floats ( decimal numbers) and Boolean (either a 'true' value or a 'false' value). |
| **Variable** | A variable is a name given to an item of data so that the data can be stored in memory while your Python program is running. Variables enable you to input data from the keyboard and to change the data however you need to. |
| **Casting** | When we want to change the data types of a value (or the value assigned to a variable), we use casting. Python provides us with the code to do this. So for example, this code changes 43 from a string data type to an integer: **int("43")** |
| **Syntax Error** | A syntax error is a mistake in your Python program that prevents it from running (executing). Syntax errors are like spelling and grammar errors. There are also other types of error besides a syntax error: logic error and runtime error. |
| **Input and output** | With Python, we can print text and numbers to the screen, and we can also ask the user to input text or numbers using the keyboard. |
| **Pseudocode** | Pseudocode is instructions that are written in English (or a language of individual choice). Pseudocode is used to plan-out the correct sequence of instructions and to clarify the key features you may also need to use to make your program work correctly – such as loops and selection statements. |
| **Condition/ Selection** | A condition or selection statement is the name given to Python's if-elif-else statement that is used to decide which path a program will take. If a condition is 'true' then Python will choose to run specific lines of code, but if false Python will choose to run different lines of code. |
| **Loops** | Python loops allow you to keep revisiting previous lines of code until a certain condition is false. We can do this to use Python to count from one number to another, and then stop. We can also use loops to keep asking the user for input from the keyboard until the user enters particular text (such as 'quit') or a number (such as zero). |

## Key Learning that will take place in this unit

- To know how to use Python to print text and numbers to the screen.
- To be able to ask the user for input using the keyboard.
- To know the different data types: string, integer, float and Boolean, and how these are used.
- To be able to correct basic syntax errors and program 'bugs'.
- To know how to use variables and to understand their purpose.
- To understand some of the rules (conventions) for naming variables.
- To understand the concept of a sequence of instructions (algorithm).
- To be able to change the data type of variables using 'casting'.
- To be able to do arithmetic in Python using operators and BIDMAS.
- To know how to use selection (Python if.. elif.. else) statements .
- To know what pseudocode is and why it is useful.
- To know three different types or error: syntax, logic and runtime.
- To know how to write selection (Python loop) statements.
- To understand how Python can be used to search for data.

operators for arithmetic

| Operator | Meaning | Example |
|---|---|---|
| + | Addition | 4+7 ⟶ 11 |
| - | Subtraction | 12-5 ⟶ 7 |
| * | Multiplication | 6*6 ⟶ 36 |
| / | Division | 30 / 5 ⟶ 6 |

## Python data types

**integer**
A whole number

```
File  Edit  Format
print(3 + 2)
5
>>>
```

**float**
A decimal number

```
File  Edit  Format  Ru
print(3.95 * 2.34)
9.243
>>>
```

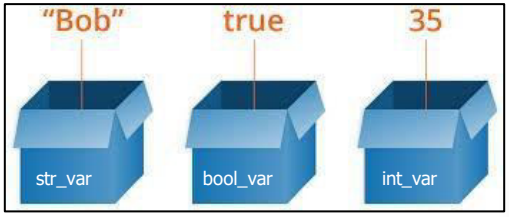
**string**
A character or text

```
File  Edit  Format  Run
print("hello world")
hello world
>>>
```

**Boolean**
A True or False value

```
File  Edit  Forma
print(True)
print(False)
True
False
>>>
```

## Using Python variables




```
# variables are like values stored in boxes until they are needed.
# the name of the variable is the name of the box.
# these values can change and can be put back in the same boxes as well.

str_var = "Bob"
bool_var = True
int_var = 35

int_var = int_var + 100
print(int_var)

print(str_var + "bidy " + "Bob")
```

```
==========
135
Bobbidy Bob
>>>
```

## Casting to different data types

We often need to change a data type using casting. For example, if text contains numbers and we want to use it to do maths, we need to change the data type from a string to an integer or a float. Data input from the keyboard is an example of this because the data input is always a string data type and never numbers until we use casting to convert it to an integer or a float.

### Sleep calculator

- Extend the problem to find the total number of hours spent sleeping in a month
- Assume an average of 4.35 weeks per month

```
hourspernight = input("How many hours per night do you sleep? ")
hoursperweek = float(hourspernight) * 7
print ("You sleep",hoursperweek,"hours per week")
hourspermonth = hoursperweek * 4.35
print ("You sleep",hourspermonth,"hours per month")
```

Casting from string to a float – so we can do maths!

# KS3 Computing – Knowledge Organiser

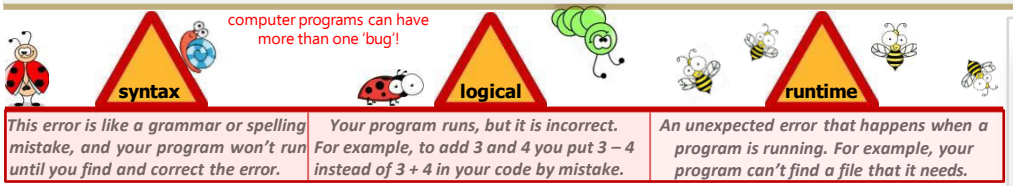
## KS3 COMPUTING: Year 8 Summer Term Unit 6 Introduction to Python

Henlow Church of England Academy

### TEST YOURSELF

1. What is a data type?
2. What can we do with data that is an integer or float data type that we cannot do with data of a string data type?
3. Explain why we use variables in our computer programs. What would we *not be able to do* if variables had never been invented?
4. Write a line of Python code to show how you would use casting to change a float data type to a string data type.
5. Give an example of where you have made a syntax error in your code. What was the error and how did you correct it?
6. Why do you think we don't use the symbol 'x' to multiply numbers together in Python?

**Selection and Comparison, Pseudocode and Errors:** In this unit you will learn how to make selections using Python's *if..elif..else* statements. You will also learn how to compare numbers using special symbols – as you do in maths when you ask the question is 3 > 4 or is 2<=1. You will learn how two write and to use pseudocode to plan algorithms, and you will learn about the three types of programming errors: syntax errors, logical errors and runtime errors.




colon space...colon space...colon space...colon space.. **INDENTATION** colon space...colon space...colon space...colon space..

not indented
***indented***
not indented
***indented***
not indented

When you use *selection* in Python, you a colon goes at the end of the *if, elif or else line* and indent the next lines by 2 or more spaces. 2 is ok, 4 is common.

```
if my_age < 18:
    print("too young to vote")
else:
    print("time to vote!")
```


Python selection: 'if..elif..else'

**If statements**

```
my_house = 95

if my_house >=100:
    print("You've walked too far..")

if my_house < 100:
    print("You're in the right place..")

# this isn't the best code. We like to combine
# selection into single blocks if we can .....
```

**using if .. else..**

```
my_house = 95

if my_house >=100:
    print("You've walked too far..")
else:
    print("You're in the right place..")

# this is better. There is less code and it
# is more logical to express the condition
```

**using if.. elif.. else..**

```
my_house = 95

if my_house >=110:
    print("You've walked too far..")
elif my_house < 110 and my_house >= 70:
    print("You're in the right place..")
else:
    print("I think you may be lost!")

# if.. elif.. else can cater for lots of
# possibilities!
```

**Comparison operators**

| Operator | Meaning | Example | Evaluates to |
|---|---|---|---|
| == | equal to | 7==7 | True |
| != | not equal to | 6!=7 | True |
| > | Greater than | 7>6 | True |
| < | Less than | 5<8 | True |
| >= | Greater than or equal to | 6>=8 | False |
| <= | Less than or equal to | 7<=7 | True |

```
print( 7==7 )  # does 7 equal 7 ? True!

my_age = 34
if my_age <= 50:
    print("True!")

if "hello" != "world":
    print("Nope.. 2 diffrent words!")
```

```
True
True!
Nope.. 2 diffrent words!
>>>
```

*this is how Booleans can be used..*

```
bool_var = ( 3 < 4 )   # this is true..
print(bool_var)        # 3 is less than 4 !
```

```
True
>>>
```

**Pseudocode** is used to plan an algorithm with the correct sequence of instructions before writing the code in Python. There is no syntax. You can use ordinary English to plan your algorithm if you want.

```
if unlock button pressed then
    display PIN unlock screen
    input PIN
    if correct PIN entered then
        unlock phone
    else display "Try again"
    endif
else display lock screen
endif
```

**Pseudocode: saying 'becomes'**

Although pseudocode doesn't have a specific syntax, and can be written in English, you may see the arrow symbol <- when a variable is being assigned a value. In programming, it's quite useful to use the word 'becomes' rather than 'equals' because in programming we are not really expressing equality like we do in maths.

| In maths.. | ..we would say: |
|---|---|
| 5 = 3 + 4 | *five 'equals' three plus four.* |
| **In pseudocode..** | **..we would say:** |
| my_var <- 3 + 4 | *my_var **'becomes'** three plus four.* |
| lives <- lives - 1 | *lives **'becomes'** the old value of lives minus 1.* |

```
#GhostHunter
if ghost catches man then
   lives ← lives - 1
endif
if lives = 0 then
   display "Game Over!"
else
   display "Arghhh!"
endif
```

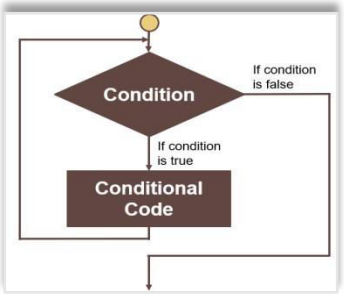
**AT HOME. (Parents/carers may be able to help with this.)**

Write a computer program in Python that asks the user to input two numbers. Your program should determine which number is the smallest and print a message like "You input 23 and 45. 23 is the smallest number". Once you have this working, ***challenge yourself*** to extend your program to ask the user for *three numbers.* Can you write a Python program to find the smallest of these three numbers, and print out a similar message?

# KS3 Computing – Knowledge Organiser

## KS3 COMPUTING: Year 8 Summer Term Unit 6 Introduction to Python

**Loops and Searches:** This unit extends your knowledge about conditions. You will learn how to express a Python loop as a flowchart, write loops in Python - for example to count until a particular number is reached. We will use pseudocode to plan an algorithm and you will learn how to place an if-else-statements inside loops as well. We then compare two very common search algorithms: the linear search and the binary search.




A Python loop allows us to revisit previous lines of code and repeat them until some condition we have set becomes false. Without loops, we would have to write the same lines of code over and over again!

For a condition to change from true to false, something must change while the loop is running. Maybe we are counting from 1 to 10 and we reach 10. The condition would be: *while counter != 10* ( is True ).
Once *counter* becomes the value of 10, the condition is no longer true; it is false and so the loop stops. The change in the loop happens when we specify *counter <- counter + 1.* Without this line of code, the loop would continue forever!

### 'While loop' pseudocode

'Nagging' Example

```
print "Mum, can I have an ice cream?"
input answer
while answer is "No"
    print "Please can I have an ice cream?"
    input answer
end while loop
print "Thank you!"
```

This block of code is the while loop

```
# a nagging example!
answer = input("Mum, can I have some ice cream please? ")

while answer == "no":
    answer = input("Mum, can I have some ice cream please? ")

print("Thanks Mum!")
```


### INDENTATION

colon space...colon space...colon space...colon space..

not indented ***indented*** not indented ***indented*** not indented ***indented***

Just like using selection, we write the first line of a *while loop* with a colon at the end. The next lines are indented. 2 spaces are ok and 4 is ok because this is the same as using the TAB key to indent.

```
counter = 0

while counter != 11:
    print(counter)
    counter = counter + 1
```

colon space...colon space...colon space...colon space..

```
while counter != 11: colon
    print(counter)
    counter = counter + 1
```

4

### Examples of Python loops

```
counter = 0
while counter != 11:
    print(counter)
    counter = counter + 1
```

### Using an if.. else.. condition inside a Python loop

```
sys_password = "pe$1256"
password = input("Please enter your password >> ")
attempts = 1
logged_in = False
while attempts != 3:
    if password == sys_password:
        attempts = 3 # stops the loop
        print("password correct..")
        logged_in = True
    else:
        attempts = attempts + 1
        password = input("Please enter your password >> ")

if logged_in == False:
    print("you have been locked out")
```

### Random numbers

Python let's you generate random numbers using its random number function. Here is an example to get a random number between 1 and 20 inclusive:

```
import random

randnumber = random.randint(1, 20)
print(randnumber)
```

```
>>>
9
>>>
4
>>>
14
>>>
6
```

## Searching for data using Python loops: the linear search and the binary search

Imagine searching for the number 8 in the list below. It's the last item in the list in this example, and that's significant.

23 5 19 1 9 45 10 8

A **linear search** would start with 23 and goes through each item, one-by-one, until it finds the number 8. If number 8 were nearer the front of the list, it would be found faster.

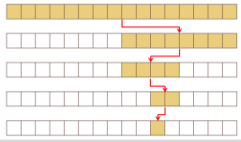
What does this tell you about how efficient a linear search is? What would make this search take even longer? What could we do to make it more efficient?

### Linear search pseudocode

```
read the first item in list
while not end of list and item not found
    read next item in list
    if item found then
        display item
    end if
end while
```

**What tactic could you use to guess a number between 1 and 100?**

If you guessed incorrectly, then you could ask if you were too high or too low, and then keep guessing higher or lower. Each guess, you get closer and closer to the correct answer until eventually you have one number left. This is how a binary search works!



Looking for the number **40** in a list 1–100

| number | max | min | mid | number is |
|---|---|---|---|---|
| 40 | 100 | 1 | 50 | lower |
| 40 | 49 | 1 | 25 | higher |
| 40 | 49 | 26 | 37 | higher |
| 40 | 49 | 38 | 43 | lower |
| 40 | 42 | 38 | 40 | found! |
| 40 | found in 5 reads! | | | |

```
max ← highest number
min ← 1
mid ← (max + min) // 2
while number <> mid
    if number < mid then
        max ← mid - 1
    else
        min ← mid + 1
    end if
    mid ← (max + min) /2
end while loop
print 'number found'
```

**A binary search** *will only work on a list that is sorted in order,* but it's still more efficient than a linear search because it always rejects the half of the list that the item will never be found in!

Binary searches are popular for searching large amounts of sorted data.

### TEST YOURSELF

1. Explain how a while loop needs a condition to change from true to false for the loop to work.
2. Explain why a linear search is not very efficient.
3. What needs to be in place before we can use a binary search on a list of data?
4. Explain the principles of a binary search.
5. Why is a binary search more efficient than a linear search?
6. If we wanted to use a while loop to count from 1 to 10 inclusive, is this condition correct or incorrect? why?

**while counter !=11:**

7. Give three examples of games, that could be written as computer programs, where you might put a random number or random numbers to good use.
8. What code syntax must you have in place for a while loop to work?

### Useful links:

https://www.bbc.co.uk/bitesize/topics/zhy39j6

https://www.w3schools.com/python/

http://introtopython.org/

https://www.tynker.com/

https://trinket.io

https://www.codecademy.com/catalog/language/python/

http://www.practicepython.org/

check IO

### AT HOME. (Parents/carers may be able to help with this)

Write a Python program that counts from -30 to 100. This will represent the temperature in degrees centigrade. You will need to Google how to convert centigrade into Fahrenheit and then print out the temperature in both centigrade and Fahrenheit. Include some code to print "zero reached" when the loop reaches -18 as it is counting up to 100.