








Computer Science and IT

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<p>HALF TERM 1: Online Threats and Prevention Methods</p> <p>KQ1 - What are the threats posed to a network?</p> <p><u>(a) Malware</u></p>		<p>Articles detailing occasions where the security of a network/website has been breached and the consequences.</p>
<p>-Malicious software designed to harm the computer/user. -Designed to access/delete/modify files. -Scareware - informs you your computer is infected with damaging viruses – tricking you to pay to fix.</p>		<p>Explanation of the threats that are posed to the network of a home user and how the threats can be reduced.</p>
<p>-Ransomware - locks your files, encrypting them – forced to pay money for the decryption key. Encryption – scrambling files so that they cannot be read without a key. -Spyware - monitors users – e.g. key presses and sends to hacker. Hackers can get access to passwords etc.</p>		<p>Explanation justification of the method used to prevent each threat, through peer discussion.</p>
<p>-Viruses – Activated when a user opens infected file. -Worms - self replicate through a network. -Trojans - malware disguised as legitimate software. Don't replicate, but users install by believing it is a real piece of software.</p>		<p>Links to PSHE – staying safe on the internet</p>
<p><u>(b) Brute-force attack</u> -Used to gain information by 'cracking' passwords -They do this by trial and error -Use of automated software which tests thousands of common passwords – using combinations of letters, numbers and common words/passwords.</p> <p><u>(c) Denial of service attacks</u> -Hackers try to stop users from accessing part of a network or website. - A website/network is flooded with useless data/traffic remotely, making it slow or inaccessible -A distributed denial-of-service (DDoS) - Occurs when multiple systems flood the targeted system. A DDoS attack uses more than one machine - dubbed zombies or bots – which have been infected with malware by the attacker who will use it them launch a DDoS attack. The network of zombie machines is sometimes known as a Botnet.</p> <p><u>(d) Phishing</u> -A form of attack via email/telephone/text message. -An email/text/phone call is received pretending to be a large company e.g. a bank etc., which people believe to be genuine. -The email/text/phone call is made to look real so that a person enters/gives their information/password, which is then used.</p>		<p>Homework: (All homeworks are revision-based, unless otherwise stated)</p> <p>Week 1: KQ1 - Threats knowledge from knowledge organiser.</p> <p>Week 3: KQ2 – Prevention methods knowledge from knowledge organiser.</p> <p>Week 5: Encryption activities worksheet based around KQ3 knowledge from knowledge organiser.</p>
<p>KQ2 - How can threats posed to a network be reduced?</p> <p><u>(a) Anti-malware software</u> -Reduces the risk of malware -Designed to detect and delete malware that may have been installed. -Allow users to scan their computer and 'quarantine' or delete files that are infected.</p> <p><u>(b) Firewalls</u> – reduces the risk of DoS attack -Can be a physical device or piece of software that will block unexpected connections/data coming in to a network/to a computer -Allows you to accept or decline connections that are being made -Can also detect and block your computer from connecting to the internet without you being aware.</p>		



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-Most operating systems have a firewall built in
(c) Strong Passwords – reduces the risk of brute force attack

-A weak password makes it easy for someone to try to guess login details – brute force attack.

-A strong password has a mix of upper and lower case letters, numbers and special characters

-Having a limited amount of login attempts would help prevent a brute force attack.

-Other methods: biometrics e.g. finger print, facial recognition / picture passcode.

(d) Education/Training

-Look for, poor grammar, spelling mistakes, dodgy looking email addresses or links to website which are not the genuine domain e.g. email@natwestbank.com not email@natwest.com.

-Covering passwords/pin codes when entering them.

-Not writing passwords down/not telling passwords to others.

-Strong passwords reduce the threat of someone looking over your shoulder as they are hard to follow/remember.

KQ3 - How can data be protected from unauthorised access?

(a) Data interception and theft -Intercepting data packets as they are transferred between two devices, to capture data/information that is being sent over a network/the internet.

(b) Encryption – reduces the risk of data interception

-The process of disguising a message so that it cannot be understood by anyone but its intended recipient.

-The data is scrambled so that it cannot be read.

-A key is needed to decrypt a message and get it back to plain text.

-A Caesar cipher is a simple method of encryption.

-The cipher works by moving each letter in the alphabet along by a certain number of places.

-The key would be the number that the letters have been moved along by.

-Most communications sent via the internet are encrypted: purchases made online are encrypted to try to prevent theft of credit card details, documents, such as a spreadsheet emailed to colleagues, satellite TV transmissions are encrypted to prevent users who are not subscribed from watching TV shows.

Rail Fence cipher – Rail fence of size 2 (2 lines).

-Rewrite the message on two lines dropping every second letter:

```
  H   l   o   t   e   e  
    e   l   _   h   r
```

-Close up the gaps and write the second line immediately after the first: Hloteeel_hr.

-Link to Alan Turing/Enigma Machine






Key Words

- Malware
 - Malicious
 - Scareware
 - Ransomware



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<ul style="list-style-type: none"> ○ Spyware ○ Virus ○ Worm ○ Replicate ○ Trojan ○ Disguised ○ Legitimate ● Brute-force <ul style="list-style-type: none"> ○ Cracking ○ Password ● Data Interception <ul style="list-style-type: none"> ○ Packet ● Denial of service <ul style="list-style-type: none"> ○ Flooded ○ Distributed ○ Botnet ● Social engineering <ul style="list-style-type: none"> ○ Manipulating ○ Phishing ○ Shouldering ● Anti-malware ● Firewalls ● Operating system ● Strong Password ● Biometrics ● Encryption <ul style="list-style-type: none"> ○ Decrypt ○ Cipher ○ Caesar cipher ○ Rail Fence cipher 		
<p>HALF TERM 2: Data Manipulation/Modelling</p> <p>KQ1 – How do you format data using Microsoft Excel? (a) <u>When should Microsoft Excel be used</u> – purpose, when Excel should be used, types of documents created in Excel. (b) <u>Microsoft Excel Tools</u> – cells, rows, columns, alignment, format painter, cell formatting, number formatting, changing decimal places, use of percentages, sort, merging cells, wrapping text.</p> <p>KQ2 – How do you perform calculations using Microsoft Excel? (a) <u>Formulas:</u> Using +, -, /, *</p> <p>KQ3 – How do you perform data modelling using Microsoft Excel? (a) <u>Functions</u> Sum, max, min, average, if, count, countif, concatenate.</p> <p>KQ4 – How do you present information using Microsoft Excel? (a) <u>Presenting Data</u> Using graphics: bar, column, line.</p> <p>KQ5 – How do you work collaboratively online? (a) <u>What is SharePoint</u> – purpose, how can SharePoint be used. (b) <u>Working collaboratively using SharePoint</u> – editing documents collaboratively using Excel.</p>	    	<p>Reading of a case study to enable students complete a data manipulation/modelling activity</p> <p>Explanation of the findings from a data modelling activity – explanation of profit/loss etc.</p> <p>Peer discussion of the findings from a data modelling activity – explanation of profit/loss etc.</p> <p>Links to business studies and mathematics – formulas/functions.</p> <p>Homework: (All homeworks are revision-based, unless otherwise stated)</p> <p>Week 1: Practice using formulas to perform calculations</p>



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<p>Keywords</p> <ul style="list-style-type: none"> • Excel • Formula • Function <ul style="list-style-type: none"> ○ MIN ○ MAX ○ AVERAGE ○ IF ○ COUNT ○ COUNTIF ○ CONCATENATE • Graph <ul style="list-style-type: none"> ○ Bar ○ Column ○ Lie ○ Pie • Alignment • Formatting • Percentage • Merging • Format painter • Wrapping text • SharePoint • Collaborate 		<p>Week 3: Practice using functions to perform calculations</p> <p>Week 5: KQ5 Graphs knowledge from knowledge organiser</p>
<p>HALF TERM 3: Computer Programming using Python</p> <p>KQ1 – How do you input/output data in python?</p> <p><u>(a) Print command</u> -Use of the print command to output text and numbers</p> <p><u>(b) Input command</u> -Use of the input command to input text and numbers -Storing an input as a variable</p> <p><u>(c) Variables</u> -A memory location where a piece of data is stored. -Assigning values to a variable -Concatenation of variables.</p> <p><u>(d) Casting</u> -Converting a variable from one data type to another. -str(), int()</p> <p><u>(e) Data Types</u> String, integer, real, Boolean.</p> <p>KQ2 – How is selection performed in Python?</p> <p><u>(a) IF Statements</u> -Structuring an if statements using if, else and elif -if statements using ==, >, <, including len()</p> <p>KQ5 – How can random numbers be generated in Python?</p> <p><u>(a) Random Numbers</u> -import random -random.randint(0,9)</p> <p>KQ4 – What is string manipulation in Python?</p> <p><u>(a) Manipulating strings</u> -len() -word.upper() -word.lower() -("Hello World"[3:7]) or variablename[3:7]</p> <p>Key Words</p> <ul style="list-style-type: none"> • Syntax 		<p>Reading of guides for how to use the Python programming language to create programs.</p>
		<p>Written explanation of a Python program that has been created</p>
		<p>Peer explanation/discussion of code that has been created.</p>
		<p>Links to Languages/English – Syntax. How the language is written.</p>
		<p>Homework: (All homeworks are revision-based, unless otherwise stated)</p> <p>Week 1: KQ1 Inputs/Ouputs knowledge from knowledge organiser.</p> <p>Week 3: KQ2 Selection knowledge from knowledge organiser. Using selection written activities.</p> <p>Week 5: KQ3 String Manipulation knowledge from knowledge organiser.</p>



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<ul style="list-style-type: none"> • Command • Radius • Diameter • Angles • Axis 		
<p>HALF TERM 4: Python programming using Turtle Graphics</p> <p>KQ1 - How do you move Tracy using Python? -The interface structure used within codehs.com -Syntax - the rules that define the structure of the language. <u>(a) Commands</u> -forward() -circle() - radius</p>		Reading of guides for how to use the Python programming language to create programs.
<p>KQ2 - How do you control when Tracy draws using Python? -Coordinates/pixels are used within the drawing space in Turtle graphics <u>(a) Commands</u> -penup() -pendown() -backward()</p>		Written explanation of a Python program that has been created
<p>KQ3 - How do you change the direction of Tracy using Python? -Using angles to draw shapes. <u>(a) Commands</u> -left() -right()</p>		Peer explanation/discussion of code that has been created.
<p>KQ4 – How do you repeat commands using Python? -The concept of for loops – A loop that repeated a definite number of times/the number of times that it is programmed to. -Used to change the flow of the program e.g. repeat certain instructions before moving to execute the next instructions. <u>(a) Commands</u> -for i in range(x,y): Advantages: -Shorten code / Makes code more efficient -Makes code easier to read.</p>		Links to Languages/English – Syntax. How the language is written.
<p>KQ5 - How do you change the position of Tracy using python? <u>(a) Commands</u> -left() -right() -setposition(x,y) -speed()</p> <p>KQ6 - How can you make your programming code easier to follow? <u>(a) Comments</u> -Written in English, ignored by the computer. -Describe the code so that it can be understood by you/others # comments here (Single line comment) " " " Comments here (Multi-line comment) " " " <u>(b) Naming Conventions</u> -Descriptive names -Underscores replace spaces</p>		<p>Homework: (All homeworks are revision-based, unless otherwise stated)</p> <p>Week 1: Practice using commands from KQ1 and 2 from knowledge organiser. Knowledge from KQ1 and KQ2 from knowledge organiser.</p> <p>Week 3: Practice using commands from KQ4 and 5 from knowledge organiser. Knowledge from KQ4 and KQ5 from knowledge organiser.</p> <p>Week 5: Practice using commands from KQ6 Commands and KQ7 Functions from knowledge organiser. Knowledge from KQ6 and KQ7 from knowledge organiser.</p>



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<p>-Only lowercase letters -Cannot start with a number</p> <p>KQ7 - How can commands be grouped using Python?</p> <p><u>(a) Use of Functions</u></p> <p>-Functions group sets of commands together. -They are then 'called' using one line of code. -They shorten the code/make parts of the program reusable. -You can 'call' (run) a function as many times as you want to.</p> <p><u>(b) Commands</u></p> <p>-def name_of_function() -name_of_function()</p> <p>Key Words</p> <ul style="list-style-type: none"> • Syntax • Command • Radius • Diameter • Angles • Axis • Iteration • Convention • Comments • Functions • Calling • Reusable 		
<p>HALF TERM 5: Hardware / Software / Networks</p> <p>KQ1 - What is a computer system?</p> <p><u>(a) Computer Systems</u></p> <p>-The functions of a computer system: Input data, Process data, Store data, Output data. -Input/output devices – keyboard, mouse, buttons, touch screen, microphone, screen, printer, speakers, etc. -Central Processing Unit - Process instructions/data inside the computer. -Processing – this can be performing calculations, searching, sorting or making decisions. -Examples of a computer system – microwave, smart phone, smart watch, smart TV, PS4 etc.</p> <p>KQ2 – How do computers process data/instructions?</p> <p><u>(a) Fetch-Decode-Execute Cycle –</u></p> <p>-The RAM stores instructions that need to be processed / data that the CPU is currently using. -CPU fetches data/instructions from the RAM. -Fetch: The instructions are fetched from the RAM and taken to the CPU. -Decode: The CPU decodes the instruction to determine what needs to be done. -Execute: The instruction is performed by the CPU.</p> <p>KQ3 - How can the performance of a CPU be affected?</p> <p><u>(a) Number of cores:</u></p>	<p></p> <p></p> <p></p> <p></p> <p></p>	<p>Technical information relating to how computers communicate/some of the main networking components.</p> <p>An explanation of the computer components contained within a chosen device at home/networking devices which they own/use.</p> <p>Discussion of the need for/use of networks and the benefits connecting devices to a network.</p> <p>Homework: (All homeworks are revision-based, unless otherwise stated)</p> <p>Week 1: KQ2 processing and KQ3 CPU knowledge from knowledge organiser.</p> <p>Week 3: KQ4 software knowledge from knowledge organiser.</p> <p>Week 5: KQ5 networks knowledge from knowledge organiser.</p>



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- The number of processors in the CPU.
- Each processor can perform an instruction simultaneously.
- Multiple instructions being performed simultaneously can improve CPU performance.

(b) Clock Speed:

- The number of instructions that the CPU can process per second
- 1 hertz = 1 instruction, 1 megahertz = 1 million instructions, 1 gigahertz = 1 billion instructions
- Higher clock speed can improve CPU performance.

KQ4 – What role does software have in a computer system?

(a) Operating Systems

- The software that manages and allows us to interact with the hardware.
- User interface: Provides us with an interface through which we interact with the computer.
- Manages processing: Manages the order in which data is processed by the CPU.
- Manages memory: Manages the process of loading/storing data in the RAM.
- Manages peripherals: Manages communication with any devices that are connected to the computer.

(b) Utilities

- Pieces of software which have a specific task, which usually to maintain your computer/ make it perform better.
- Anti-virus/malware, Backup, Compression, Encryption, File management

(c) Applications

- Allows/help the user to complete the task (often producing something)
- Word processor, graphic editing, spreadsheet, presentation etc.
- Software applications are often referred to as 'apps', particularly when referring to smart devices.

KQ5 – How do computers communicate?

(a) What is a network?

Network: Multiple devices that are connected together and exchange data.

(b) Benefits of networking –

- Data can be sent between computers.
- Files can be shared.
- Resources such as printers can be shared.
- Connection to the internet can be shared.

(c) Data packets –

- Data is split into packets before it is sent across a network.
- Packets are small pieces of data.
- Each packet is numbered, contains the recipients IP address and the senders IP address.
- Data is sent as packets as it helps efficiency and helps ensure each section is transmitted successfully.

KQ6 – What hardware is needed to create a network?

(a) Hardware –

- Router: Send data packets between networks, across the internet.
- Switch: Send data packets around a network between computers.



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Wireless Access Point: Transmits signals, wirelessly. Allows wireless devices to connect to a network,

(b) LAN and WAN –

LAN: A network that covers one single geographical location e.g. home, a school etc.

WAN: A network that covers multiple geographical locations. Often multiple LANs connected together.





Keywords

- Input
- Output
- Process
- Storage
- CPU
- Fetch
- Decode
- Execute
- Processor
- Clock speed
 - Hertz
 - Megahertz
 - Gigahertz
- Core
 - Dual
 - Quad
- Storage
- Memory
- Motherboard
- Graphics card
- Hard drive
- Random Access Memory
- Peripheral
- Hardware
- Software
- Application
- Utility
 - Compression
 - Encryption
- Operating system
- Interface
- Sensor
- GUI
- Command
- Menu
- Network
 - LAN
 - WAN
 - Signal
 - Geographical
 - Internet
- Network hardware
 - Switch
 - Router
 - Wireless Access Point
 - Cable
 - Wireless
 - Wired



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<p>HALF TERM 3: Binary/Boolean Logic, Computational Maths and Searching/Sorting Algorithms</p> <p>KQ1 – How can decisions be made from binary values? (a) Logic gates/circuits – -Building block of a circuit in a CPU. -Used to process electronic signals (binary) and make decisions, store etc. -AND gate – both inputs must be true to output true. -OR gate – if either input is true, the output is true. -NOT gate – inverts the input. (b) Follow Logic Diagrams – -Follow logic diagrams up to two levels, stating the output for a given input.</p>		<p>A biography of George Boole, the creator of Boolean logic.</p>
<p>KQ2 – How are the outputs of a logic diagram represented? (a) Truth Tables – -Are used to show all possible inputs and their outputs, for a given logic diagram. (b) Completing Truth Tables – -Complete a truth table for the AND, OR and NOT gates. -Complete a truth table for a logic diagram to two levels.</p>		<p>An explanation of how the concept of binary links to Boolean logic.</p>
<p>KQ3 – What other calculations does a CPU perform? (a) Exponential -How to calculate the exponential – 3^4 (b) Modulo -How to calculate the modulo – $9 \text{ MOD } 2$ (c) Quotient/Remainder Division -How to calculate the quotient – $10 \text{ DIV } 3$</p>		<p>Peer discussion/ explanation of logic circuits which students have drawn/created.</p>
<p>KQ4 – How does a CPU search/sort data? (a) Binary Search -How to search for a value in a list of values using a binary search. (b) Bubble Sort -How to sort a list of values into order using a bubble sort.</p>		<p>Links to Science – Electronic circuits Links to Maths – Mathematical operators</p>
<p>Homework: (All homeworks are revision-based, unless otherwise stated)</p> <p>Week 1: Practice following logic gates symbols and KQ1 knowledge from knowledge organiser.</p> <p>Week 3: Practice completing truth tables and KQ1 knowledge from knowledge organiser.</p> <p>Week 5: Practice demonstrating binary search and bubble sort algorithms and KQ4 knowledge from knowledge organiser.</p>	