MDarzins 1909722 - A4022 CA Assignment

by Martin Andrew Darzins

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1 ABSTRACT

The adage of 'measure twice, cut once', can be aptly applied to determining system build specifications, as a sound understanding of the essential characteristics and concepts are required, before rushing in.

The activities undertaken to complete scenarios 1 & 2, will clearly show how important the role of compatibility checking plays in specifying system components, as if the parts are incompatible you are at best not being cost effective or at worst not specifying an operational system.

2 ACKNOWLEDGEMENTS

The author acknowledges the substance from the UWTSD Moodle module course Computer Architecture content.

2.1 Exchange Rate

When specifying the various recommended components for these builds, it became apparent that limited stock was available from within the UK, and subsequently little (or no) pricing details were available.

Therefore, for the purposes of meeting the GBP £'s cost limitations set, the majority of components have been sourced from abroad (USA), priced in US Dollars and have been converted in UK GBP's using the exchange rate of 0.72, as of 31st March 2021.

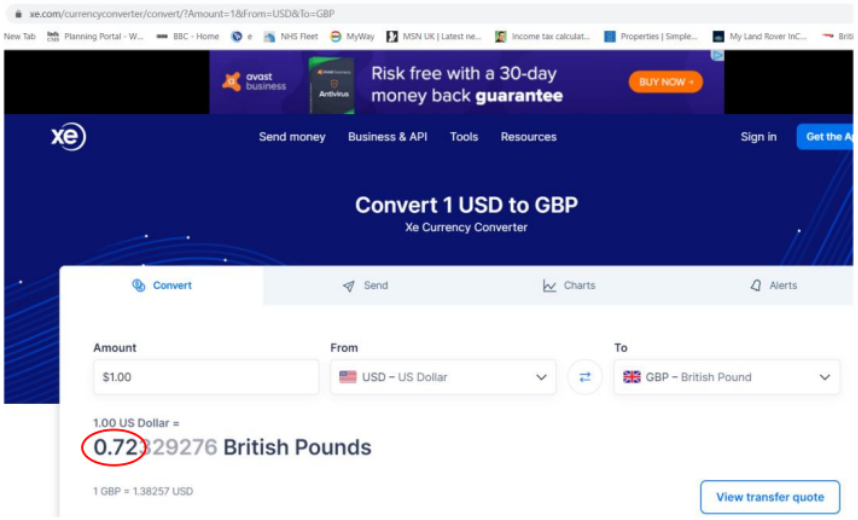


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4 INTRODUCTION

4.1 Aims

The aim of this report is to demonstrate a sound understanding of the essential characteristics and concepts of computer systems and components, in relation to the 2(two) set scenarios.

4.2 Objectives

The report will detail term definitions, component features, costs, retailers, and comparisons between various desktop PC components, culminating in a recommended shopping list of components to enable the build.

5 SCENARIO 1 : LOW-COST DESKTOP

5.1 Background

Required to design a suitable desktop PC for an elderly person to use, who may have age related health issues regarding sight/hearing/mobility etc.

5.1.1 Small Form Factor (SFF)

Form factor is important for a computer system connection compatibility, referring to the size, shape, and physical specifications of hardware/components. Typically, a SFF PC will take less space than traditional cases, with added advantages of lower power consumption, potentially enabling greater operational efficiency. With a standard-size desktop being 40-45 litres in volume, a typical SFF will be less than 25 litres, offering greater portability options for an elderly person. However, SFF component selection, installation, cooling, and cable management are more complex **[1].**

5.1.2 Compatibility

The *pcpartpicker* website compatibility checker verified selected components were fully compatible, with earlier versions highlighting insufficient internal/external bays and/or component sizes requiring change before full system compatibility achieved.

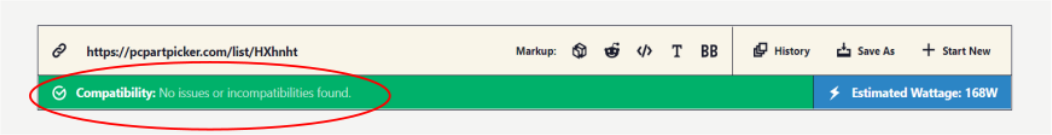


Figure 2: Compatibility (pcpartpicker.com)

5.2 Component Cost Summary & Justifications

Desktop pc components are more readily available to buy and upgrade than laptops, as a result, they have a significantly longer life, as processor, graphics card, and motherboards can be replaced individually. The low-cost desktop pc specification, for an elderly person, will include the following:

5.2.1 Chosen Component Costs

See Appendix 10.1 for detailed individual component quotes.

Component	Reference	UK Retailer	Price (£'s)	US ($'s)	USA Retailer	Quote REF
Case mATX	In Win BL631.300TBL MicroATX Slim Case w/300 W Power Supply			41.30	mmemoryExpress	1
Case Fan	Corsair AF140L 67.43 CFM 140 mm Fan			4.99	Corsair	2
Fan Controller	Kingwin FPX-001 Fan Controller			15.19	Amazon	3
Power Supply	included in Case			0.00		
Power Cable	C2G 5 Metre UK Power Cable IEC320C13 to BS1363 Kettle Lead Power Cord 88516	Amazon	6.69			4
Motherboard	Gigabyte GA-B75M-D3H Micro ATX LGA1155 Motherboard			96.00	newegg	5
I/O Shield	included in Motherboard			0.00		
Processor (CPU)	Intel Core i3-3250 3.5 GHz Dual-Core Processor			54.97	Amazon	6
GPU	included in CPU			0.00		
CPU Cooler	Cooler Master Hyper 212 EVO 82.9 CFM Sleeve Bearing CPU Cooler			39.76	Amazon	7
Thermal Paste	Arctic Silver Alumina Premium Ceramic Polysynthetic 1.75 g Thermal Paste			4.69	eBay	8
Memory (RAM)	Patriot Viper 3 16 GB (2 x 8 GB) DDR3-1866 CL10 Memory			70.99	newegg	9
Heatsink	included in RAM			0.00		
Non Voltaile Storage	Kingston A400 120 GB 2.5" Solid State Drive	Amazon	20.88			10
Optical Drive	Lite-On iHAS124-14 DVD/CD Writer			24.24	Amazon	11
Sound Card	Asus Xonar SE 24-bit 192 kHz Sound Card			39.99	B&H	12
Wi-Fi Adapter	TP-Link TL-WN725N USB 2.0 802.11a/b/g/n Wi-Fi Adapter	eBuyer	4.89			13
Monitor	Asus VE278H 27.0" 1920x1080 Monitor			159.00	B&H	14
Monitor Cables	Pearstone HDA-106 High-Speed HDMI Cable with Ethernet (Black, 6')			12.95	B&H	15
Keyboard	AZIO Large Print Tri-Color Illuminated Keyboard Wired Ergonomic Keyboard			29.99	B&H	16
Mouse	Rosewill RWM-001 Wireless Optical Mouse			9.99	newegg	17
Headset	Rosewill Audiowave H9000 Headset			21.21	Amazon	18
Speakers	Logitech S120 2.3 W 2.0 Channel Speakers			14.99	Amazon	19
Webcam	Green Extreme T200 Webcam			29.95	Adorama	20
ESD wrist strap	LUPO Anti Static Wrist Strap ESD Grounding Adjustable Wrist Strap Band	Lupo	2.99			21
			35.45	670.20		0.72 XR
					482.54	
					35.45	
			Total	GBP £'s	517.99	

Figure 3: Scenario 1 - Component Costs

5.2.2 Case, Power Supply Unit (PSU) and Fan

Selection: ***In Win BL631.300TBL micro ATX slim case c/w 300-Watt Power Supply***

- Fulfils small form factor criteria (mATX).
- Supplies sufficient external/internal 3.5" & 5.25" bays.
- Integral 300 W power supply included.
- Meets low cost/budget requirements.
- Similarly equipped/priced alternatives did not meet the SFF needs.
- Total estimated Wattage of **168 Watts**, catered for **[2].**



Figure 4: mATX Case (in-win.com)



Figure 5: Wattage (pcpartpicker.com)

5.2.3 Case Fan

Selection: ***Corsair AF140L 67.43 CFM 140 mm Fan***

- Good airflow of 67.43 cfm.
- Reasonably large 140mm fan.
- 1000 rpm.
- PWM controllable.
- Low-cost alternatives did not meet the cfm needs **[3].**



Figure 6: Case fan (corsair.com)

5.2.4 Fan Controller

Selection: ***Kingwin FPX-001 Fan Controller***



- Manages up to 4 fans.
- Best priced low-cost controller in range.
- Allows for future cooling/expansion requirements.

Figure 7: Fan controller (kingwin.com)

5.2.5 Power Cable

Selection: ***C2G 5 Metre UK Power Cable IEC320C13 to BS1363***

- UK (kettle style) plug.
- Sufficient length for positioning desktop safely.



Figure 8: Power cable (amazon.co.uk)

5.2.6 Motherboard

Typical sizes are:



Figure 9: Typical layouts (techguided.com)

Selection: ***Gigabyte GA-B75M-D3H Micro ATX LGA1155 Motherboard***

- micro-ATX motherboard compares well in price to the standard and mini ATX boards.
- Ideal for single graphics processing unit (GPU) builds.
- Aesthetics and overclocking facilities not required for this User.
- Has 4 PCI-E slots sufficient for required external devices **[4].**
- Capable of Scalable Link Interfaces (SLI) capable.
- I/O shield supplied.
- Has onboard 1 x 1000 Mb/s Ethernet, sufficient for Skype **[5].**



Figure 10: Motherboard (gigabyte.com)

- Compatible, mATX Intel B75 chipset and LGA 1155 socket/CPU, with 6 x SATA slots.
- Sufficient DDR3 memory with 4 x memory slots expandable up to a maximum 32MB, for Users immediate and caters for potential future enhancements.
- Other competitively priced boards did not match all compatibility or DDR3 speed requirements.

5.2.7 Central Processing Unit (CPU)

Selection: ***Intel Core i3-3250 3.5 GHz Dual-Core Processor***

- Dual core CPU with associated clock speeds, threads and cache are sufficient for User needs **[6].**
- LGA 1155 compatible.
- Supports SMT for faster speeds.
- Low TDP requiring less cooling.
- Built in CPU cooler.
- Low number of transistors (22nm) helps avoid overheating **[7].**
- Has integrated HD graphics card.
- Other price comparable CPU's did not have suitable integrated graphics or SMT capabilities.



Figure 11: CPU (intel.com)

Selection***: Arctic Silver Arctic Alumina Premium Ceramic Polysynthetic 1.75 g Thermal Paste***



- Improves heat coupling between different components.
- Drains away waste heat generated by electrical resistance.
- Low cost.

Figure 12: Thermal paste (articsilver.com)

5.2.8 CPU Cooler

Selection: ***Cooler Master Hyper 212 EVO 82.9 CFM Sleeve Bearing CPU Cooler***

- Sleeve bearing additional cooling fan.
- Better cfm 82.9.
- Wide rpm range 600 – 2000.
- LGA 1155 compatible.
- Low noise factor (9- 36dB).
- Highly rated by customers, good value for money.



Figure 13: CPU cooler (coolermaster.com)

5.2.9 Random Access Memory (RAM)

Selected: ***Patriot Viper 3 16 GB (2 x 8 GB) DDR3-1866 CL10 Memory***

- Better than average clock speed of 1866 GHz.
- Increased RAM of 16Gb allows for expansion, at negligible extra cost **[8].**
- Low CAS latency enables faster RAM **[9].**
- Compatible SFF.
- Incorporates heatsink/spreader to reduce overheating.
- Above combinations provide good performance required for overseas calls and low cost.



Figure 14: RAM (pangoly.com)

5.2.10 Non-Volatile Storage

Selected: ***Kingston A400 120 GB 2.5" Solid State Drive***



- Without heavy User usage/data storage traffic etc, SSD is the faster choice than HDD.
- Speed rather than storage capacities is the better option for this User.
- SDD's are smaller sized and fits better into SFF (mATX) cases.
- Shorter wait time for User **[10]**.
- Option to transition to m.2 for faster video, in future.
- Large 120Gb storage sufficient for User needs.
- Little cost difference between equivalent HDD storage at this level.
- Highly rated manufacturer.

Figure 15: Non-Volatile Storage (kingston.com)

5.2.11 Optical Drive

Selected: ***Lite-On iHAS124-14 DVD/CD Writer***

- Allows optional DVD/CD/Blue ray usage.
- Minimum cost item allowing User greater flexibility.
- Half sized form suitable for mATX cases.
- Reasonable speed (24x) for low cost.



Figure 16: Optical drive (liteonodd.com)

5.2.12 Sound Card

Selected: ***Asus Xonar SE 24-bit 192 kHz Sound Card***



- Adding a sound card gives greater surround sound (5.1 channel) options.
- Greater sound quality and clarity over integrated audio processor.
- Will benefit aged User in Skype/movie use, especially if headphones utilised (amplified).
- High SNR ratio.

Figure 17: Sound card (asus.com)

5.2.13 Wi-Fi Adapter

Selected: ***TP-Link TL-WN725N USB 2.0 802.11a/b/g/n Wi-Fi Adapter***

- Adds wireless capabilities.
- Low-cost offering User extra options re: internet accessibility and with speeds of up to 150Mbps.
- Ideal for smooth video streaming and voice streaming with oversea relatives.
- Supports Wi-Fi Multimedia (WMM) for better streaming of real-time data such as Video, Music, Video Chat.



Figure 18: Wi-Fi Adapter (tp-link.com)

5.2.14 Monitor

Selection: ***Asus VE278H 27.0" 1920x1080 Monitor***

- Full HD high resolution (1920 x 1080) with built in speakers.
- Large 27" screen due to Users failing eyesight.
- Both HGMI and VGA interfaces.
- Offering desktop multimedia entertainment via true-to-life LED pictures.
- High spend item because main User interface.
- Incorporates a 2ms (milliseconds) response time (G2G) pixel transition.
- Backlight luminance adjustment for improved video playback.



Figure 19: Monitor (asus.com)

5.2.15 HDMI cable

Selection: ***Pearstone HDA-106 High-Speed HDMI Cable with Ethernet***

- HDMI cable incorporates ethernet capabilities.
- Longer length assists in monitor/desktop placement.
- Ideal for video, audio, and data streams via the single HDMI cable, whilst supporting 4K resolution with compatible devices.



Figure 20: HDMI cable (pearstone.com)

5.2.16 Keyboard

Selection: ***AZIO Large Print Tricolour Illuminated Keyboard Wired Ergonomic Keyboard***

- Full sized keyboard with extra-large print key type.
- Ergonomic and illuminated layout to help reduce eyestrain.



Figure 21: Keyboard (aziocorp.globalstore.com)

5.2.17 Mouse

Selection: ***Rosewill RWM-001 Wireless Optical Mouse***

- Either hand, optical tracking operation.
- Reasonable 1200 dots per linear inch (DPI).
- Less sensitive mouse more suitable for elderly User.
- Long battery life and wireless features.
- Sweat-resistant and comfort contoured to suit many mouse grip-styles **[11]**.



Figure 22: Mouse (rosewll.com)

5.2.18 Headphones

Selection: ***Rosewill Audiowave H9000 Headset***

- Wireless.
- Full sized circumoral fit.
- Noise cancelling to aid User experience.
- Improved audio content and hearing protection **[12].**



Figure 23: Headphones (rosewill.com)

5.2.19 Speakers

Selection: ***Logitech S120 2.3 W 2.0 Channel Speakers***

- Introduction to basic surround sound.
- Small, space-saving, slim sized, lightweight.
- Simple set-up.
- 2.3 W stereo sound.

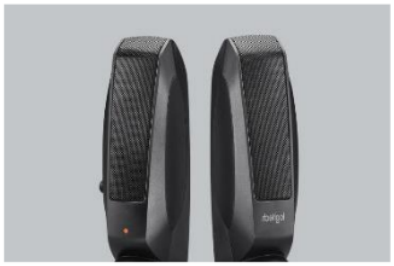


Figure 24: Speakers (logitech.com)

5.2.20 Webcam

Selected: ***Green Extreme T200 Webcam***



- High speed auto focus 1080p widescreen webcam.
- Takes advantage of full HD monitor.
- Built-in microphone.
- 30 FPS suitable for video streaming.
- Easy operation for elderly.

Figure 25: Webcam (photographytalk.com)

5.2.21 Anti-Static Wrist Strap

Selection: ***LUPO Anti-Static Wrist Strap ESD Grounding Adjustable Wrist Strap Band***

- Grounding cord if User decides to upgrade internal system components.
- Protects both User and components, during any upgrading.
- Low cost item.



Figure 26: Anti-Static Wrist Strap (lupostore.co.uk)

6 SCENARIO 2 : VIDEO PRODUCTION & EDITING SYSTEM UNIT & MONITOR

6.1 Background

Specification required for a 4K video production/editing system unit and monitor, that permits a recent graduate, to become self-employed and start-up their own Company.

6.1.1 System Unit

The system unit primarily houses devices that perform operations and includes the motherboard, CPU, RAM, and other components, in a case. Peripheral devices, monitor, keyboard, and mouse are separate from the system unit, but when combined, are known as a workstation. The assignment requires system unit and monitor, optional peripheral items are detailed, but not included within the cost limit of £ 2,500 **[13].**



Figure 27: System unit (computerhope.com)

6.1.2 Software Determined System Hardware

- Adobe Premiere Pro

  Of the popular video editing software packages available; Adobe Premiere Pro/After Effects, DaVinci Resolve, Vegas Pro and Lightworks, Adobe has been selected to base the system unit specification around, from which the minimum requirements for 4K editing have been established.

  - CPU – 6th generation +.
  - OS – Windows 10 (64 bit).
  - RAM – 32 GB + 8 GB (for Virtual Reality).
  - 10 Gigabit ethernet
  - GPU – 4 GB and on recommended listing.
  - Scalable Link Interface (SLI) supported
  - Storage – SSD for app installation cache + additional storage for media.
  - Monitor – 1920 x 1080 resolution.
  - Sound – ASIO (Audio Stream Input/Output) compatible.
  - Network Storage - 10 Gigabit ethernet connection **[14].**

- Operating System
    - Microsoft Windows 10 Pro Full 32/64 bit (7th generation +)
    - Meets Adobe Pro requirements.
    - Full word/data processing capabilities for new start-up Company.

6.1.3 Acceleration

To improve main CPU and GPU accelerations, graphics card will have a compute unified device architecture (CUDA) platform, enabling serial applications to be run on the CPU and parallel portions to the GPU. CUDA capable GPU's have hundreds of cores, collectively running thousands of threads. Parallel running without using the system memory bus and treating these as separate devices with their own memory, allows simultaneous computations without conflict **[15].**

6.1.4 Fast Rendering

Rendering is the process in which the movie/slideshow is generated from all material assembled in the project. Render times are CPU, GPU, project, and RAM dependent, with faster CPU/GPU's, rendering will complete faster. GPU's with more onboard memory will render graphics faster and more efficiently. CPU's can utilise dozens of cores to process tasks sequentially, whereas GPU's with thousands of smaller cores, can handle multiple tasks simultaneously. GPU's with own memory, increases overall performance and speed up rendering, easing the strain on the CPU by independently taking up this rendering work from the CPU. GPU render engines are 50 to 100 times faster than conventional CPU renderers, hence why CUDA type GPU's will be selected.

Whilst RAM does not directly affect rendering speed, being able to allocate extra resources into RAM frees up CPU and GPU resources to render more efficiently. Greater RAM applied to such resources results in noticeable performance increases in rendering speed **[16].**

6.1.5 Memory Card Input

With 4K video editing data being presented via fast memory cards, and not all card readers supporting all types of memory card, a dedicated XQD format capable memory card reader will be selected. Characteristically for high-definition camcorders and high-definition cameras, this superfast XQD ultra-high speed (UHS) format communicates over the PCIe channel and has a higher transfer rate than typical flash memory cards.

6.1.6 SPDIF Ports

Sony/Philips Digital Interface (SPDIF) ports are a digital audio transfer format interface/connection. Offering improved sound quality by transferring audio from one device to another without the need to first convert to an analogue signal, which degrades audio quality. The existing speakers, headphones, and surround sound system, with SPDIF inputs, will be catered for via Motherboard and sound card selections, ensuring adequate number of ports are available for existing and future equipment **[17].**

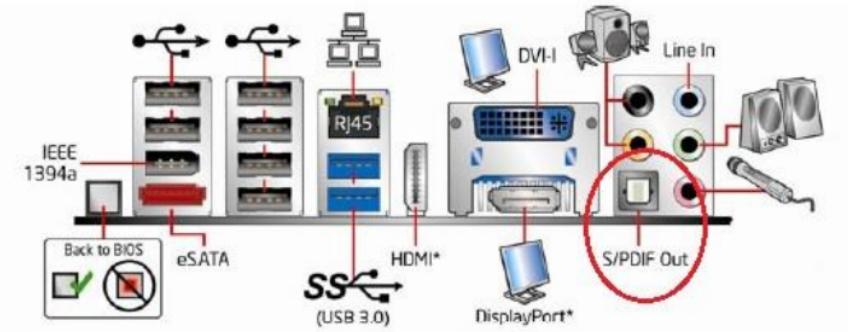


Figure 28: SPDIF Ports (Intel.com)

6.1.7 Internal Storage Drives

Different internal storage types are available; HDD's are the slowest and read and save Data at circa 100MByte/s, SSD's will similar capabilities but at approx. 500MByte/s and Non-Volatile Memory Express (NVMe) SSD's able to read and write sequential Data with speeds much higher (circa 7000MBytes/s+). HDD's and SSD's are connected by a SATA plug onto the motherboard via a SATA Cable, NVMe SSD's are plugged directly into the Motherboard, no cables. As speed is essential, NVMe SSD storage type will be nominated, ensuring that it is supported by a motherboard with appropriate m.2 slots available **[18].**

6.1.8 Network Attached Storage (NAS)

The NAS unit is initially required to make 16TB storage available, expandable by 8TB drives to 56TB.

Based on RAID 5 option selection, an 8 bay NAS enclosure is required, as 1 bay/drive will be utilised for redundancy/protection duties.

Selected: ***Synology DS1821+ DiskStation 8-Bay Network Attached NAS Storage Enclosure w/ 2 x M.2 NVMe SSD Slots (4GB RAM) – No Drives***

Cost from broadbandbuyer.com is £ 910.08 ($ 1,264.00).



Figure 29: NAS (synology.com)

Initial drive set-up will require 3 x 8TB HDD's to avail 16TB storage via the RAID 5 option chosen.

Selection: ***Synology HAT5300-8T 8TB SATA Hard Drive for NAS w/ 7200RPM 6Gb/s 256MB Cache***

Cost from broadbandbuyer.com is £ 242.18 each ($ 1,009.08 total).

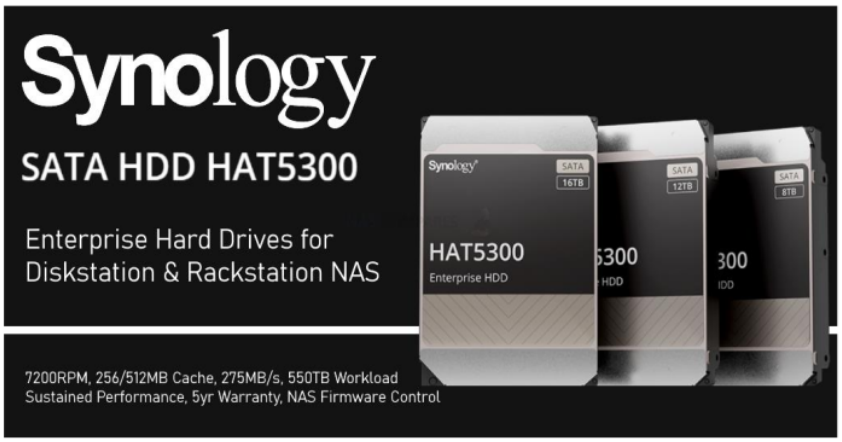


Figure 30: HDD's for NAS unit (synology.com)

6.1.9 Redundant Array of Inexpensive/Independent Disks (RAID)

RAID 0 is not recommended, as no protection is given, with failures being restored via other additional back-up sources.

RAID 1 only requires 2 x drives but of these two 8TB drives, one is mirrored providing protection, only giving 8TG of available storage and is again not recommended.

RAID 6 has a 2-drive redundancy and a minimum of 4 drive initial requirement, so is expensive and not recommended, this would require extra bay (>8 bays) capacity to make 56TB storage available.

RAID 10 should not be considered, as apart from initially requiring a 4-drive set-up, only half the drive capacities will be available, therefore for 56TB to be made available, 14 (8TB) drives/bays would be required making it very expensive.

Therefore, for this requirement, RAID 5 is the most efficient storage, offering beneficial longer-term redundancy protection, as it will strip data from across multiple disks should one fail, ensuring full data integrity. As one drive will be dedicated to this function, initially at least 3 HDD's will be required (3 x 8TB) to provide (2 x 8TB) 16TB of available storage.

This RAID 5 mechanism is recommended for the 8 bay, 8TB drive, NAS enclosure above.

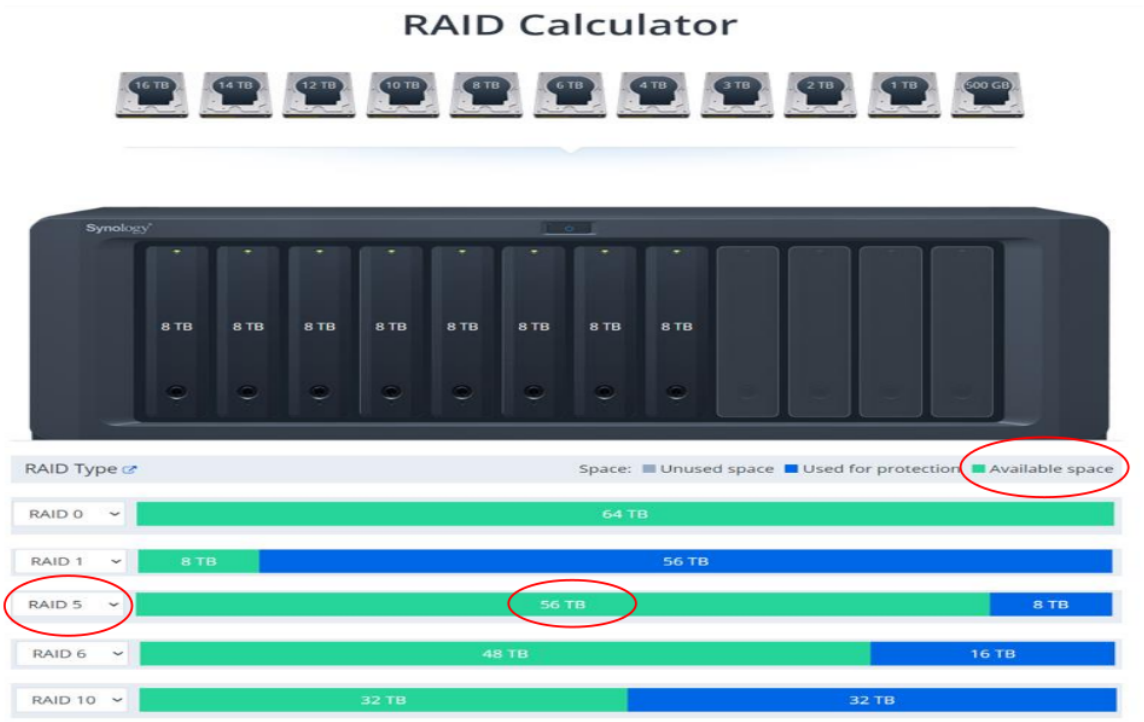


Figure 31: RAID (synology.com)

6.1.10 Performance & Access (System to NAS)

IOPS (Input/Output Operations per Second) measures performance of various storage devices, such as HDD's, which are enhanced by 10 Gigabit Ethernet. This NAS unit offers 113,000 IOPS for 4K random read operations, 92.47 download for 1GbE SMB - Windows File Transfer (1MB file x 3000) and 76.08 for uploads.



Figure 32: NAS Performance IOPS (synology.com)

The data stored within external storage (NAS) enclosures are independently connected to and accessed via the local area network (LAN) thru ethernet cable or Wi-Fi, with their own internet protocol (IP) address, as opposed to a direct connection to the system unit. Data from a centralised location makes it directly accessible to a number of authorised people/devices, useful in business environments.

Enclosure is formatted with standard data transfer protocols, routing requests and sending data between devices via a central server (ethernet switch). NAS enclosures are configured and managed with browser-based capability, requiring a CPU and an OS to function **[19].**

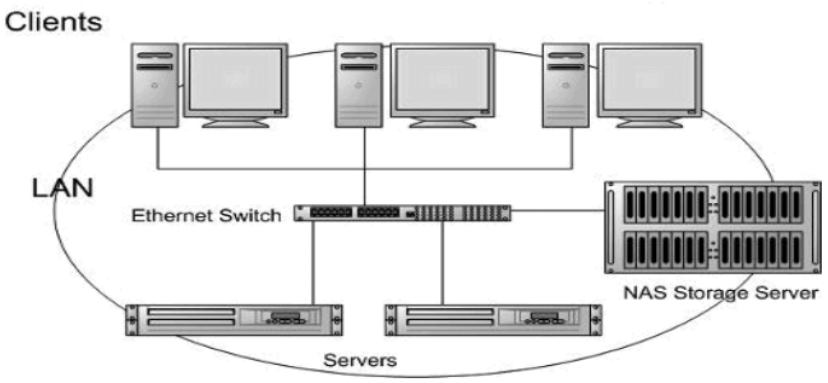


Figure 33: NAS Access (techtarget.com)

6.1.11 Compatibility

Utilising the *pcpartpicker* website, Adobe Premier Pro and Operating system prerequisites, the components selected are fully compatible with the 4K editing criteria set. System unit capabilities were maximised whilst keeping within the budget of circa £ 2,500.

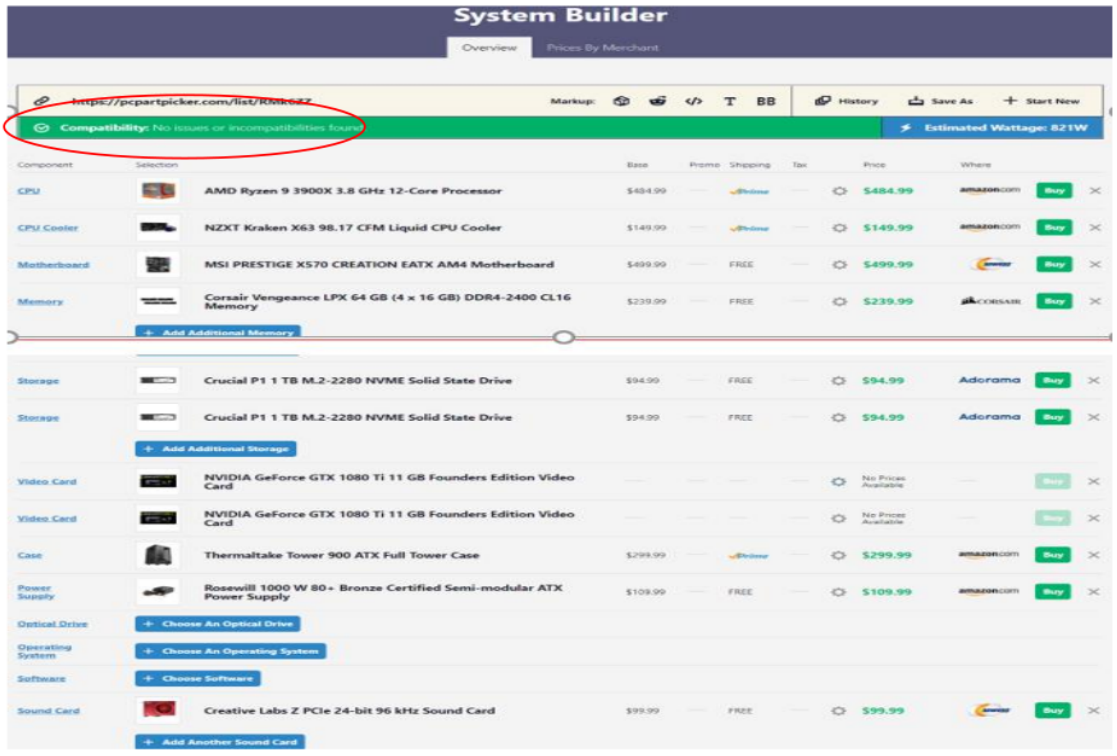


Figure 34: Component Compatibility - Scenario 2 (pcpartpicker.com)

6.2 Component Cost Summary & Justifications

6.2.1 Chosen Component Costs

Total cost equates to £ 2,543.57 with individual component quotation details contained within Appendix section 10.2.

Components	Reference	USA Retailer	US ($'s)	Quote Ref		
Case	Thermaltake Tower 900 ATX Full Tower Case	Newegg	269.99	1		
Case Fans	ARCTIC P14 PST 72.8 CFM 140 mm Fans 5-Pack	Newegg	45.99	2		
Fan Controller	Aerocool F6XT Fan Controller	Artic Cool	24.67	3		
Power Supply	Rosewill 1000 W 80+ Bronze Certified Semi-modular ATX Power Supply	Newegg	119.99	4		
Internal Connectors & AC Power Cable	*included*	Newegg	0.00			
Motherboard	MSI Prestige X570 Creations EATX AM4 Motherboard	Newegg	499.99	5		
Central Processor Unit (CPU)	AMD Ryzen 9 3900X 3.8 GHz 12-Core Processor	Newegg	484.99	6		
CPU Cooler	NZXT Kraken X63 98.17 CFM Liquid CPU Cooler	B & H	149.99	7		
Graphics Processing Unit - 1	NVIDIA GeForce GTX 1080 Ti 11 GB Founders Edition Video Card	MicroMarket	305.00	8		
Graphics Processing Unit - 2	NVIDIA GeForce GTX 1080 Ti 11 GB Founders Edition Video Card	MicroMarket	305.00			
Sound Card	Creative Labs Z PCIe 24-bit 96 kHz Sound Card	Newegg	99.99	9		
Card Reader	Sony MRW-E90/BC2	Amazon	109.77	10		
Memory (RAM)	Corsair Vengeance LPX 64 GB (4 x 16 GB) DDR4-2400 CL16 Memory	Corsair	239.99	11		
Heatsink/spreader	*included*	Corsair	0.00			
Non Volatile Storage - SSD 1	Crucial P1 1 TB M.2-2280 NVME Solid State Drive	B & H	104.99	12		
Non Volatile Storage - SSD 2	Crucial P1 1 TB M.2-2280 NVME Solid State Drive	B & H	104.99			
Monitor	BenQ PD3200U 32.0" 3840x2160 60 Hz Monitor	B & H	667.39	13	Total USD $'s	3,532.73
HDMI & Power Cables	*included*	B & H	0.00		0.72	
			3,532.73		Total GBP £'s	2,543.57
Miscellaneous - Optional Items						
Keyboard	Premiere Pro CC - PC ASTRA Backlit Keyboard	B & H	129.90	14		
Mouse	Logitech MX Master 3 Wireless Laser Mouse	WalMart	89.99	15		
UPS	CyberPower CP1500AVRLCD UPS	Newegg	154.95	16		
Operating System	Microsoft Windows 10 Pro Full 32/64-bit	Newegg	189.00	17	Total USD $'s	2,906.92
Video Editing Software	Adobe Premier Pro (All Apps) - *monthly charge*	Adobe	70.00	18	0.72	
NAS	Synology DS1821+ DiskStation 8-Bay Network Attached NAS Storage Enclosure w/ 2 x M.2 NVMe SSD Slots (4GB RAM) – No Drives (£ 910.08)	broadbandbuyer	1,264.00	19		
HDD (3x 8TB drives)	Synology HAT5300-8T 8TB SATA Hard Drive for NAS w/ 7200RPM 6Gb/s 256MB Cache (£ 242.18 each)	broadbandbuyer	1,009.08	20		
			2,906.92		Total GBP £'s	2,092.98

Figure 35: Scenario 2 - Component Costs

6.2.2 Case

Selection: ***Thermaltake Tower 900 ATX Full Tower Case***

- Motherboard form factor (ATX) compliant.
- Sufficient External/Internal (5.25”, 3.5”, 2.5”) bays and expansion slots.
- Enables custom cooling systems.
- 5mm tempered glass protection.
- Size caters for selected internals.



Figure 36: Case (thermaltake.com)

6.2.3 Case Fans

Selection: ***ARCTIC P14 PST 72.8 CFM 140 mm Fans 5-Pack***



- Multi-pack 140mm fans.
- Incorporates PWM 4-pin connection.
- Low noise level 22.5 dB.
- Good cfm of 72.8 with rpm range 200 to 1700.

Figure 37: Case Fans (artic.de)

6.2.4 Fan Controller

Selection: ***Aerocool F6XT Fan Controller***

- Controls 6 fans.
- 12 Watts per channel
- PWM compatible.
- Adjustable speeds (L/M/H)



Figure 38: Fan Controller (aerocool.io)

6.2.5 PSU

Selection: ***Rosewill 1000 W 80+ Bronze Certified Semi-modular ATX Power Supply***



- Certified 80+ bronze efficiency rated.
- 1000 W sufficient for system requirement of 821 W.
- Sufficient EPS, PCI-E, SATA, and 4-pin connections.
- Semi-modular.

Figure 39: PSU (rosewill.com)

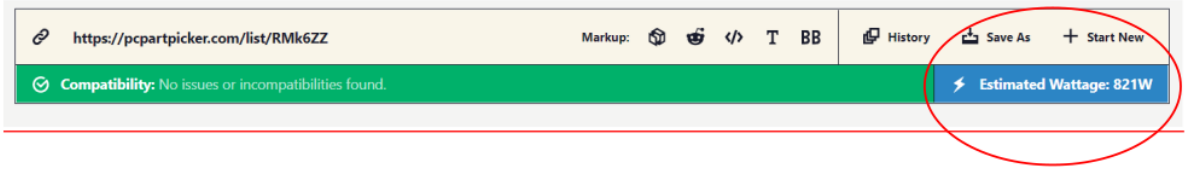


Figure 40: System Estimated Wattage (pcpartpicker.com)

6.2.6 Motherboard

Selection: ***MSI Prestige X570 Creations EATX AM4 Motherboard***

- Compatible form factor (EATX) and supports NVMe required for SSD's.
- DDR4, 4 slot memory expandable to 128GB with Memory speeds 1866 – 4600.
- SLI and Crossfire capable also supports RAID.
- Sufficient PCI-E, m.2, SATA slots and USB, SPDIF ports.
- Wi-Fi 6 networking with 1000 Mbit/s & 10 Gbit/s Onboard ethernet.



Figure 41: Motherboard (msi.com)

6.2.7 CPU

Selection: ***AMD Ryzen 9 3900X 3.8 GHz 12-Core Processor***



Figure 42: CPU (pcmag.com)

- Excellent Cinebench R15 ranking making rendering faster.
- Includes integrated CPU cooling.
- 12 cores, 24 threads with clock speeds 3.8 GHz to 4.6 GHz boost and supports PCI-E 4.0.
- Large L1-3 cache and includes SMT.
- Fully compatible and exceeds Adobe Premiere Pro requirements.
- Good value for money.

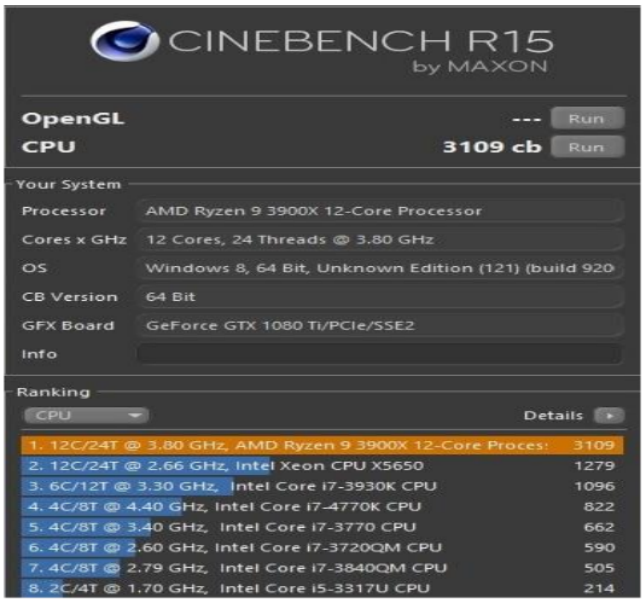


Figure 43: Cinebench R15 Ranking (wepc.com)

6.2.8 CPU Cooling

Selection: ***NZXT Kraken X63 98.17 CFM Liquid CPU Cooler***

- AM4 socket compatible with CPU.
- Water-cooled, low noise (21-38 Db) additional cooling added.
- 4-pin PWM connection.
- High cfm of 98.17.
- Rpm range 200 – 2000.
- Stays within PSU capacity.



Figure 44: CPU cooler (nzxt.com)

6.2.9 GPU

Selection: ***NVIDIA GeForce GTX 1080 Ti 11 GB Founders Edition Video Card (x 2)***

- 2 x GPU's gives greater rendering performance, higher resolution, improved quality graphics and increased frame rates.
- Adobe Premiere Pro compatible.
- Large 11GB memory.
- To utilise SLI GPU's need to be the same.
- Clock speeds 1480-1582 MHz, with memory clock 11,000 MHz.
- Integrated cooling with PCI-E interfaces and HDMI and display ports.



Figure 45: GPU (carousell.sg)

6.2.10 Sound Card

Selection: ***Creative Labs Z PCIe 24-bit 96 kHz Sound Card***



- Meets all SPDIF / AISO requirements.
- Excellent 116 dB SNR.
- 24-bit / 192kHz digital audio output.
- High fidelity multi-channel 5.1 surround capability.
- PCI-E interface.

Figure 46: Sound Card (creative.com)

6.2.11 Card Reader

Selection: ***Sony MRW-E90/BC2***

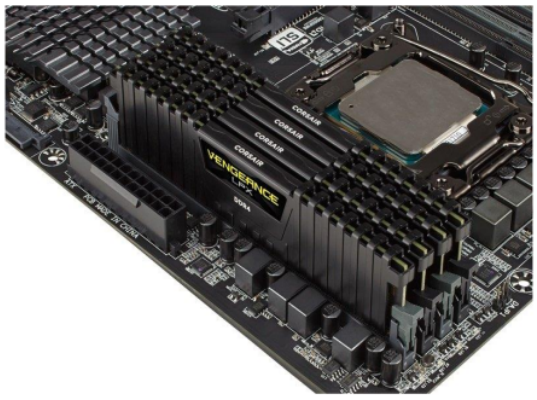
- XQD designed for high resolution professional cameras/videos.
- High read/write speeds with large storage capacities.
- 440 MB/s speed performance.
- USB 3.0/3.1 interface connection.
- Higher transfer rate than typical flash memory.
- Transfers multiple heavy image files faster than analogue.
- Supports card formats: XQD, SD, SDXC and SDHC in UHS I - II.



Figure 47: Card Reader (sony.co.uk)

6.2.12 RAM

Selection: ***Corsair Vengeance LPX 64 GB (4 x 16 GB) DDR4-2400 CL16 Memory***



- Exceeds minimum Adobe Premiere Pro requirements and allows for business expansion.
- Optimised for AMD Ryzen CPU's.
- Incorporates heat spreader management.
- Designed for high performance overclocking.
- DDR4 offers higher frequencies, greater bandwidth, and lower power consumption than DDR3.
- Speed 2400 MHz.

Figure 48: RAM (corsair.com)

6.2.13 Non-Volatile Storage

Selection: ***Crucial P1 1 TB M.2-2280 NVME Solid State Drive (x 2)***

- Fast access to data is the key to video editing.
- 2 x NVMe SSD's offer faster, more sustained, and consistent data transfer and access.
- Motherboard supported NVMe via PCI-E and m.2, delivers fast sequential read/write speeds.

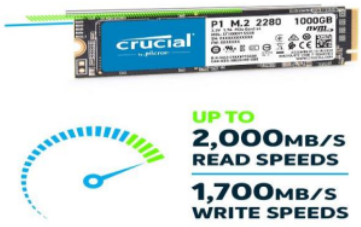


Figure 49: SSD (crucial.com)

6.2.14 Monitor

Selection: ***BenQ PD3200U 32.0" 3840x2160 60 Hz Monitor***

- Large screen 32" dual view monitor for professional usage.
- Incorporates in-plane switching (IPS) for greater colour accuracy and consistency.
- 4K UHD, 100% RGB colour (3840 x 2160) resolution ideal for video editing.
- 4ms GTG with 60 Hz refresh rate.
- Darkroom, CAD/CAM, and animation display modes.



Figure 50: Monitor (benq.eu)

6.2.15 Keyboard

Selection: ***Premiere Pro CC - PC ASTRA Backlit Keyboard***

- Specifically designed for Adobe Premiere Pro use.
- Windows 10 compatible.
- Full key (104 key) board.
- Colour-coded labelled short-cut keys with graphical commands.

  Scissor-switch and backlit keys.



Figure 51: Keyboard (logickeyboard.com)

6.2.16 Mouse

Selection: ***Logitech MX Master 3 Wireless Laser Mouse***

- Extensive and versatile button controls.
- Laser sensor 4000dpi offers excellent pointer precision required for image and video editing.
- Ergonomic (Right hand) only.
- Wireless 2.4 GHz connection.
- Pre-set shortcuts available for Premiere Pro usage.



Figure 52: Mouse (logitech.com)

6.2.17 Uninterruptible Power Supply (UPS)

Selection: *CyberPower CP1500AVRLCD UPS*

- Provides 900W battery back-up power.
- Surge (coaxial) and ethernet line protection to equipment.
- Offers connected equipment insurance, useful for business enterprise.
- 12 outlets adequate for current set-up.



Figure 53: UPS (cyberpowersystems.com)

7 CONCLUSION

The systems specified for each scenario fully meet their respective User needs, component compatibility requirements, budget limitations and all Adobe Premiere Pro and OS criteria. Optional components detailed would be recommended especially the UPS unit, to protect the new business hardware. Future changes to User requirements (scope creep) are catered for via memory and cooling requirements. However, as technology progresses and the need for greater quality, speed, accessibility, and accuracy increase, it is likely that future base systems will incorporate 2 x CPU's as standard build **[20].**

Total Word count: 3,341 *(excluding Title page, sections 1 - 3, 8 – 10, and screenshot titles)*

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8.1 Images

Courtesy of:

Figure	
1	Xe.com
2	Pcpartpicker.com
3	*Own spreadsheet*
4	In-win.com
5	Pcpartpicker.com
6	Corsair.com
7	Kingwill.com
8	Amazon.co.uk
9	Techguided.com
10	Gigabyte.com
11	Ark.intel.com
12	Articsilver.com
13	Coolermaster.com
14	Pangoly.com
15	Kingston.com
16	Liteonodd.com
17	Asus.com
18	Tp-link.com
19	Asus.com
20	Pearstone.com
21	Aziocorp.com
22	Rosewill.com
23	Rosewill.com
24	Logitech.com
25	Photographytalk.com
26	Lupostore.co.uk
27	Computerhope.com
28	Intel.com
29	Synology.com
30	Synology.com
31	Synology.com
32	Synology.com
33	Techtarget.com
34	Pcpartpicker.com
35	*Own spreadsheet*
36	Themaltake.com
37	Artic.de
38	Aerocool.io
39	Rosewill.com
40	Pcpartpicker.com
41	MSI.com
42	Pcmag.com
43	Wepc.com
44	Nzxt.com
45	Carousell.sg
46	Creative.com
47	Sony.co.uk
48	Corsair.com
49	Crucial.com
50	Benq.eu
51	Logickeyboard.com
52	Logitech.com
53	Cyberpowersystems.com

8.2 Abbreviations

ASIO	Audio stream input/output
CAD	Computer aided design
CAM	Computer aided manufacturing
CAS	Column address strobe/signal
CFM	Cubic feet per minute
CPU	Central processing unit
CUDA	Compute unified device architecture
DDR	Double data rate
DPI	Dots per linear inch
DIMM	Dual in-line memory module
ECC	Error correction code
G2G	Grey-to-grey
GPU	Graphics processing unit
HDD	Hard disk drive
HDMI	High-definition multimedia interface
I/O	Input/Output
IOPS	Input/output operations per second
IP	Internet protocol
IPS	In-plane switching
LAN	Local area network
LGA	Land grid array
mATX	Micro advanced technology extended.
NAS	Network attached storage,
NVMe	Non-volatile memory express
ODD	Optical disk drive
PC	Personal computer
PCI-E	Peripheral component interconnect express
PSU	Power Supply Unit
PWM	Pulse width modulation
RAID	Redundant array of inexpensive/independent disks
RAM	Random access memory
RPM	Revolutions per minute
SATA	Serial Advanced Technology Attachment,
SDRAM	Synchronous dynamic random-access memory
SFF	Small form factor
SLI	Scalable link interfaces
SMT	Simultaneous multi-threading
SNR	Signal to noise
SPDIF	Sony/Phillips digital interface
SSD	Solid state drive
TDP	Thermal design power
TKL	Tenkeyless
UHD	Ultra high definition
UHS	Ultra-high speed
UPS	Uninterruptible power supply
VGA	Video graphics array
W	Watts
WMM	Wi-fi multimedia

9 REPORT PLANNING METHODOLOGY

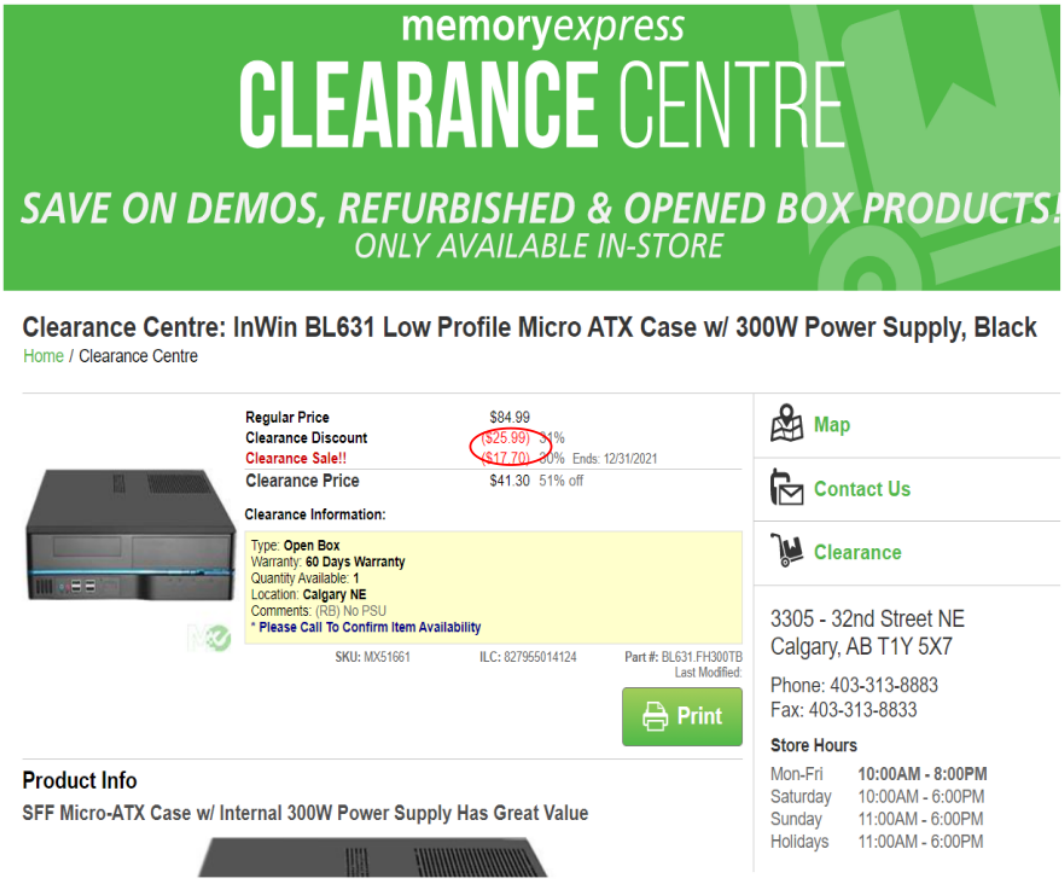
This **Computer Architecture and Operating System** report assignment was completed by adhering to the following practices:

- Read and understand the report brief.
- Make plan (Gantt chart) including time management – planning/research most time consuming, catering for other exams.
- Create report format and style – using Moodle template example.
- Follow structure of:
    - Title Page
    - Abstract/Acknowledgements
    - Introduction
    - Main Body
    - Conclusion
    - References
    - Appendices
- Define the problem and purpose of the report – decide assignment title, aims & objectives.
- Define audience – Lecturer/Tutor (**Gareth Jones**).
- Brainstorm (Mindmaps) and Determine ideas to include.
- Research and gather information (Library, internet etc).
- Collect, sort, evaluate, organise material.
- Complete references (as you go) during all research phases.
- Analyse research materials.
- Prepare outline drafts.
- Write the report, check word count, spelling, and grammar.
- Submit draft to Turnitin for review/check.
- Identify and incorporate changes into final redraft.
- Submit final report via Turnitin as final submission, before deadline of **26th April 2021**.

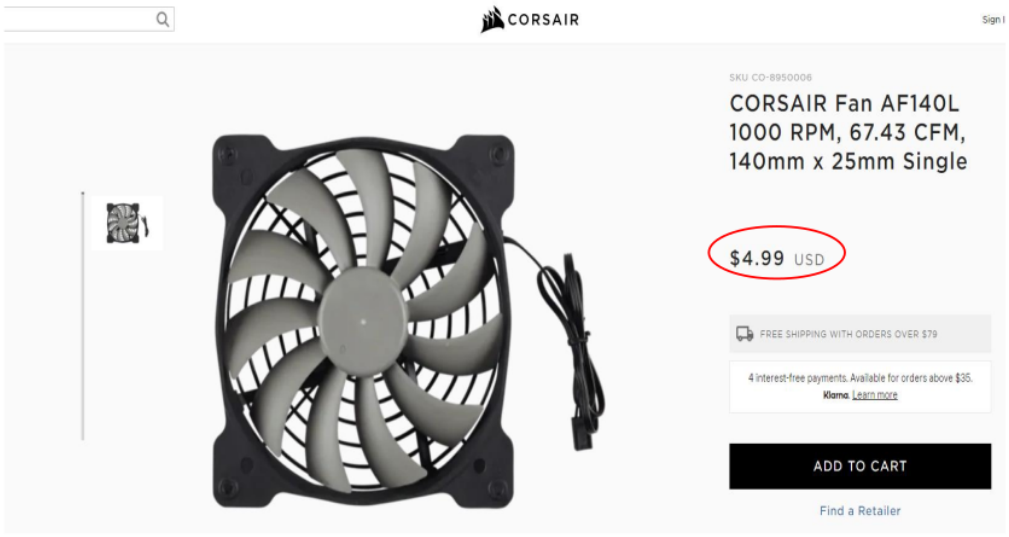
10 APPENDIX

10.1 Scenario 1 - Individual Component Quotes

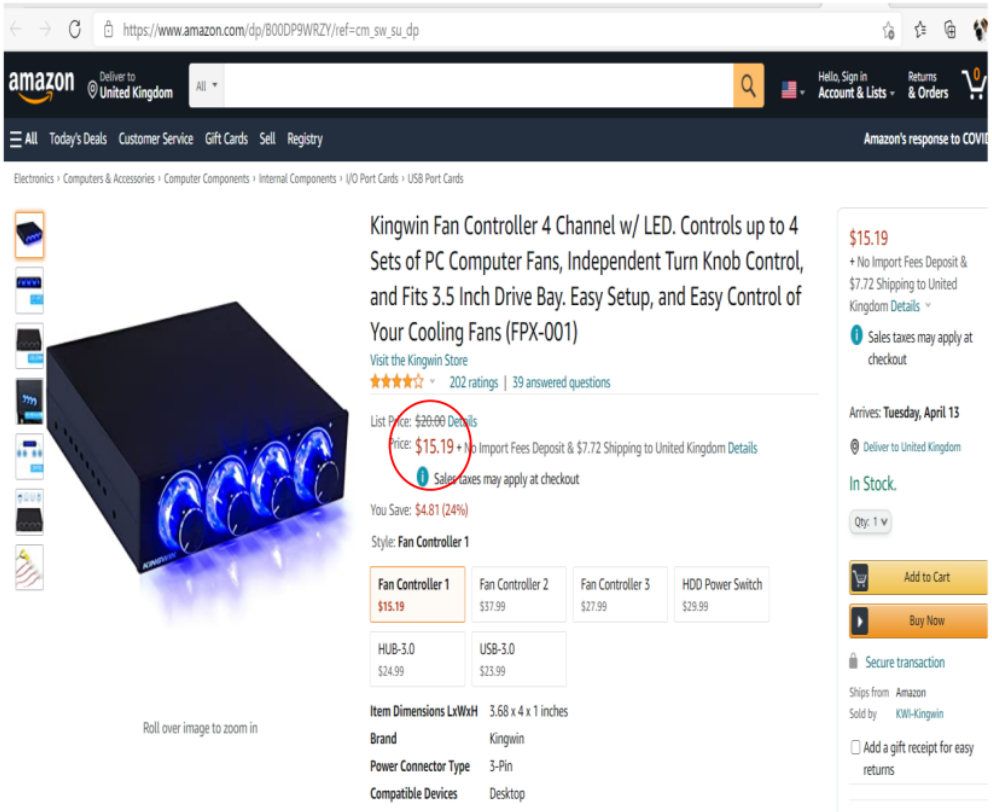
10.1.1 Case - $ 26.99



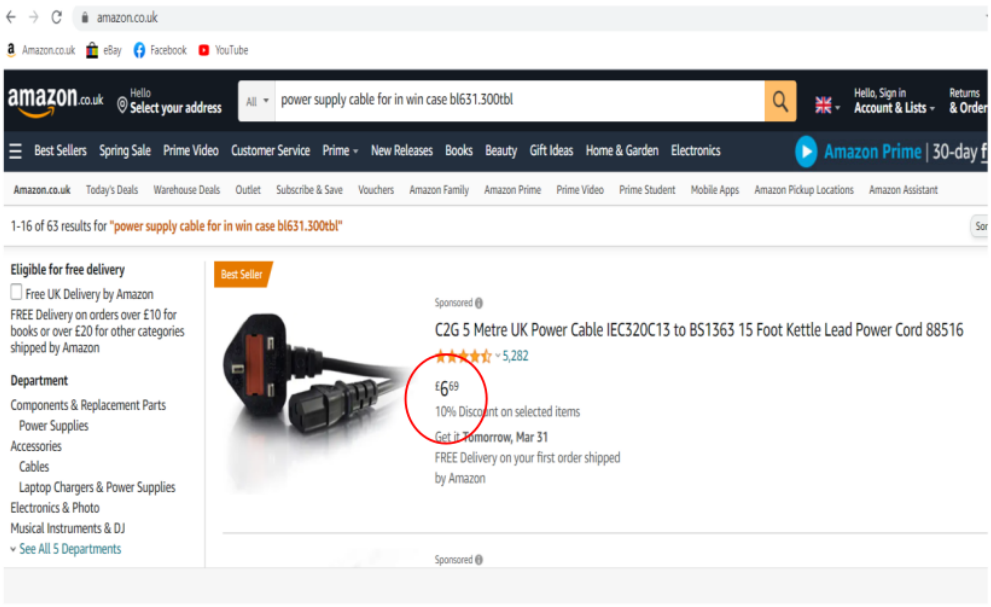
10.1.2 Case fan - $ 4.99



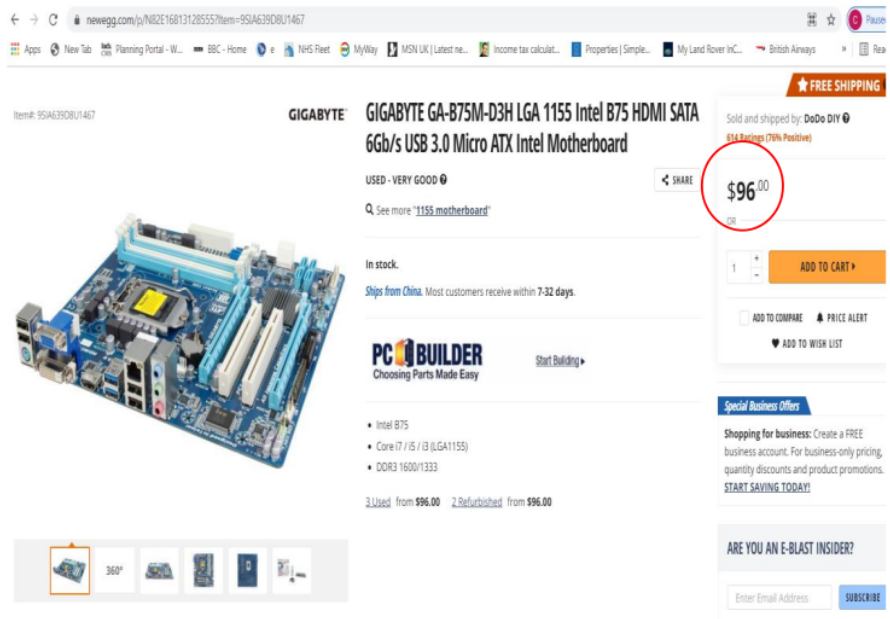
10.1.3 Fan controller - $ 15.19



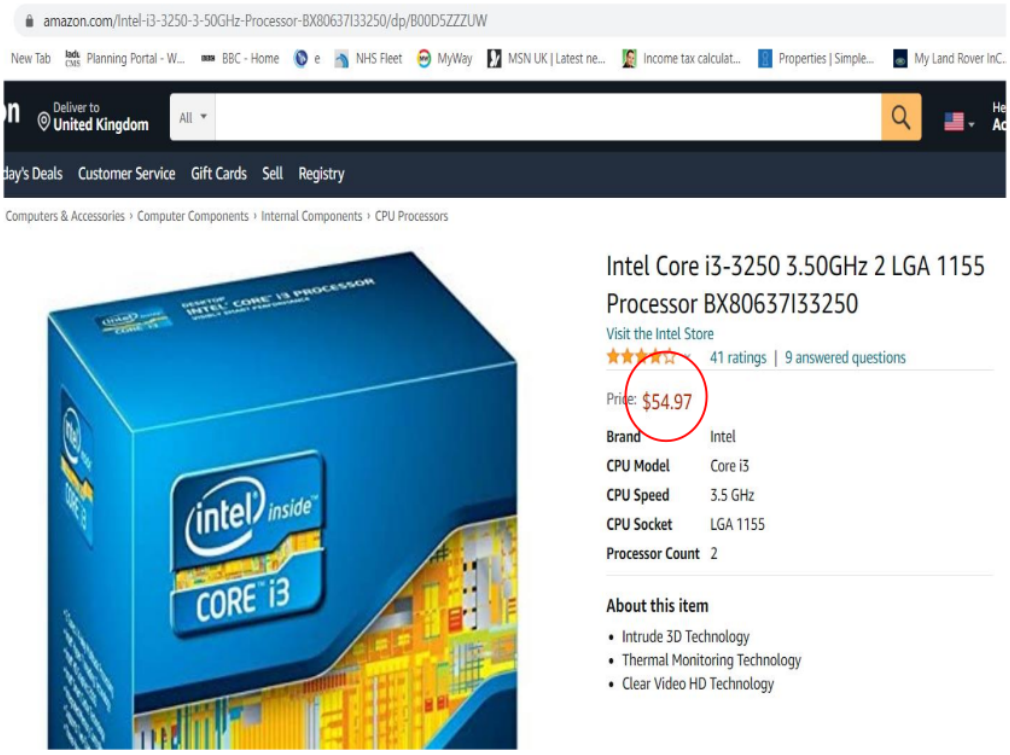
10.1.4 Cable - £ 6.69



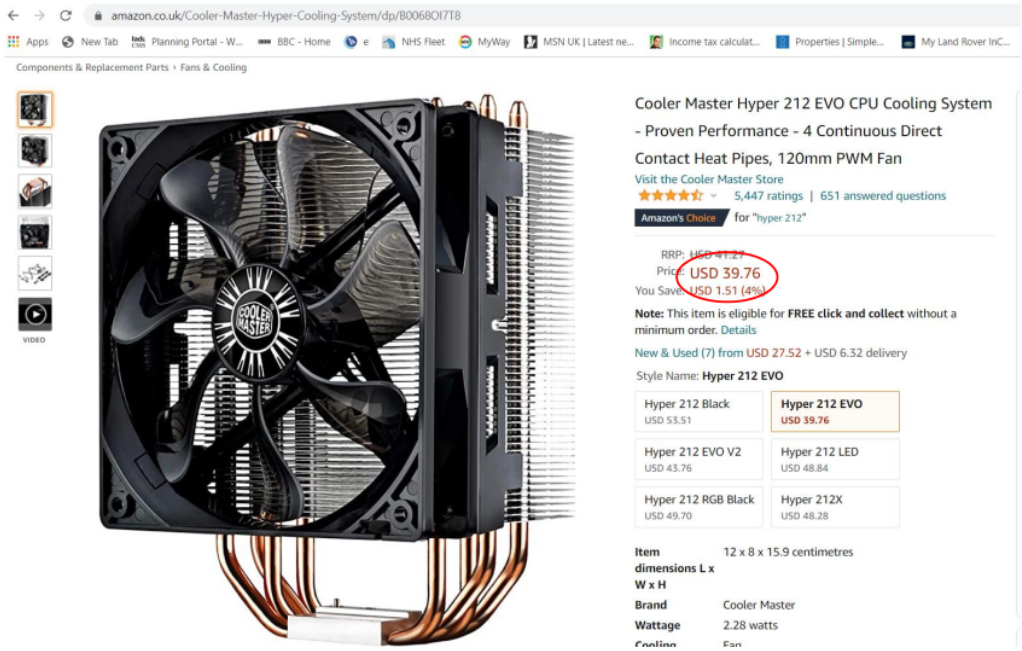
10.1.5 Motherboard - $ 96.00



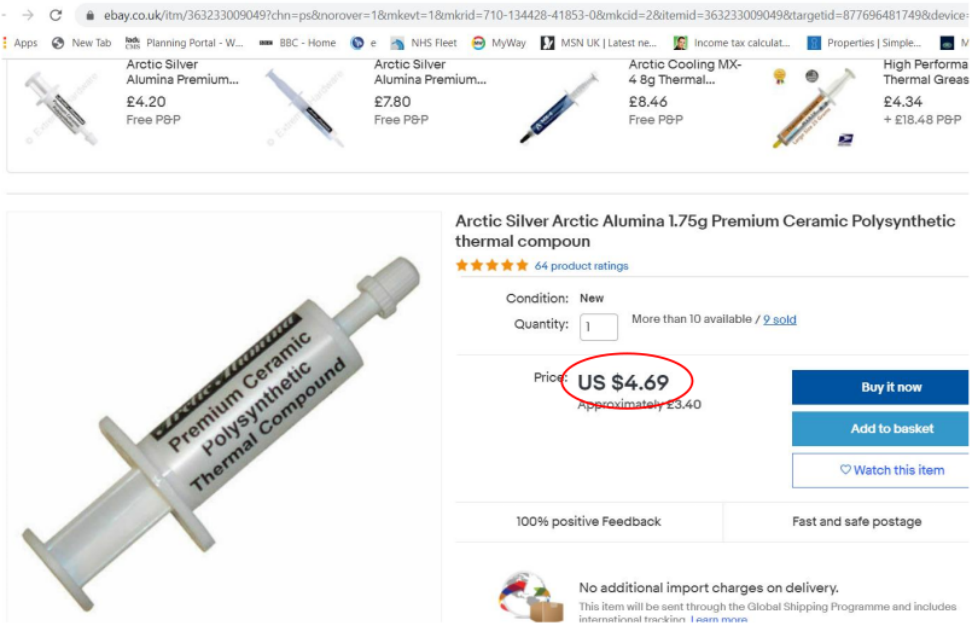
10.1.6 CPU - $ 54.97



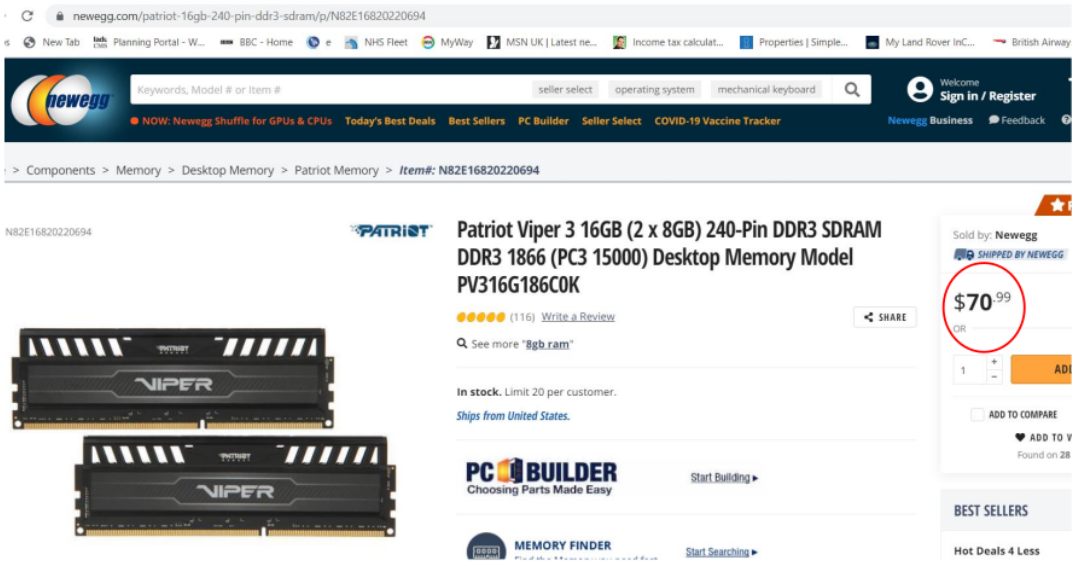
10.1.7 CPU Cooler - $ 39.76



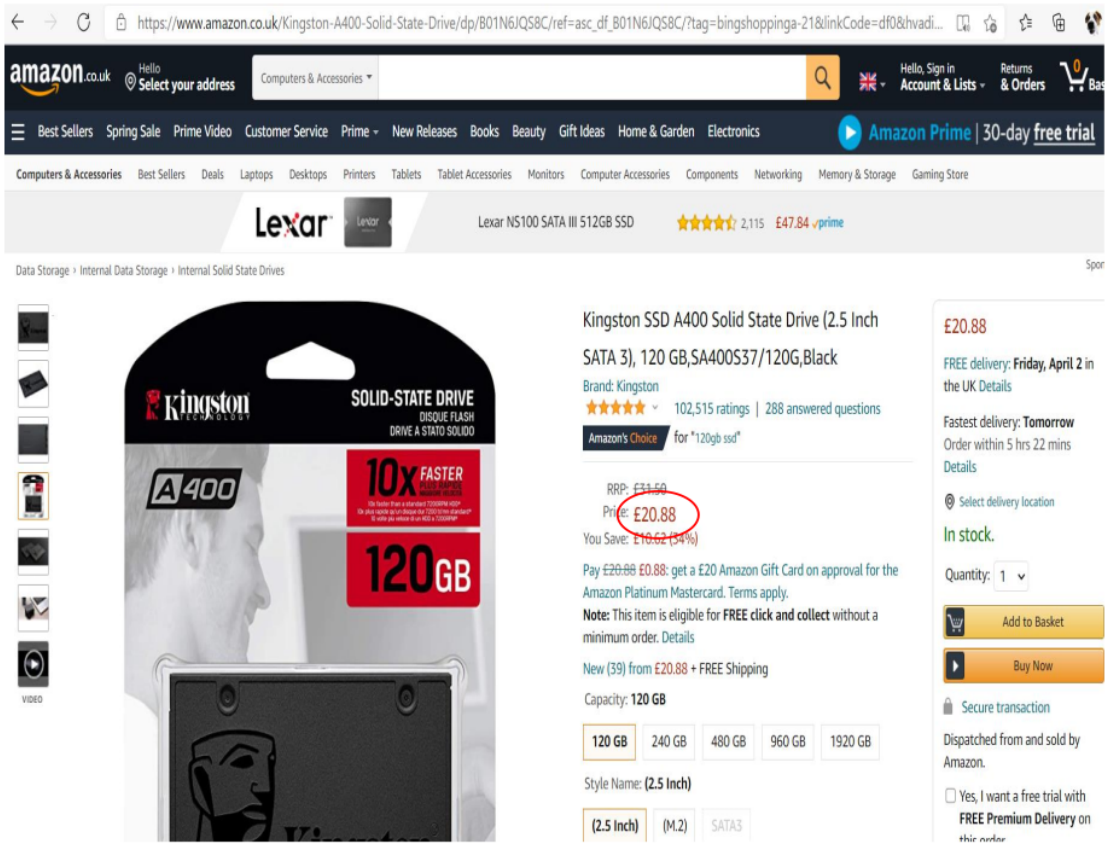
10.1.8 Thermal Paste - $ 4.69



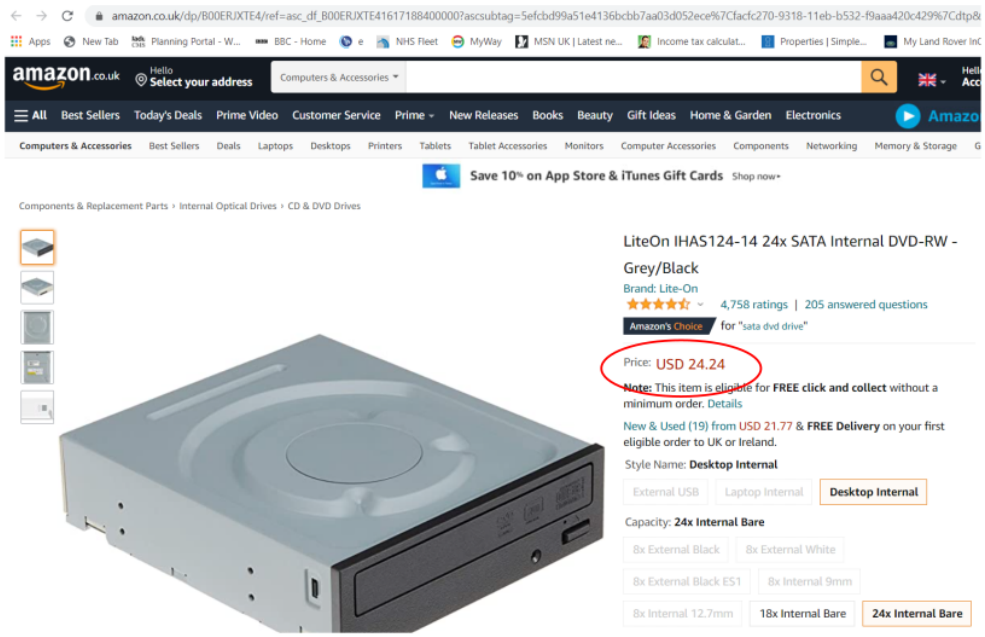
10.1.9 RAM - $ 70.99



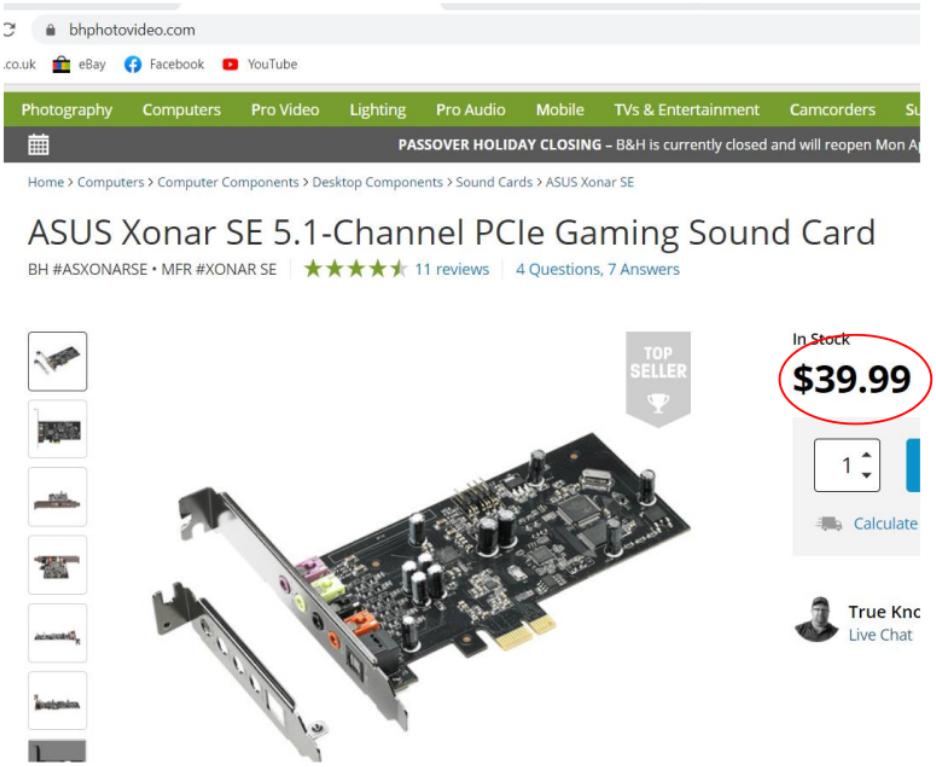
10.1.10 Non-Volatile Storage - £ 20.88



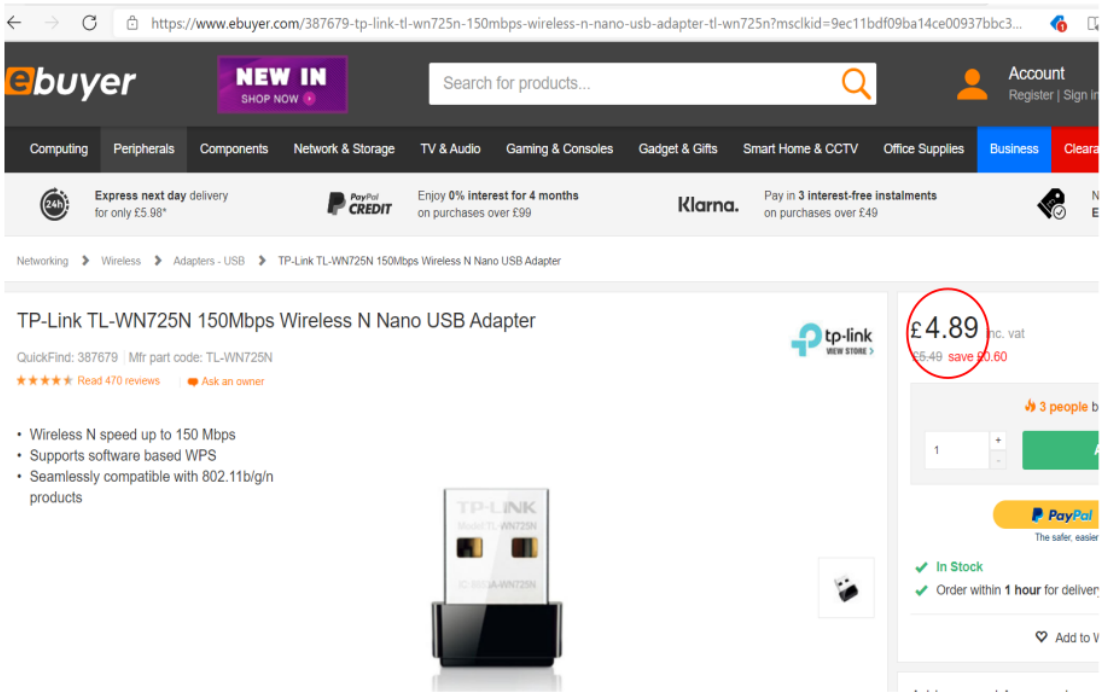
10.1.11 Optical Drive - $ 24.24



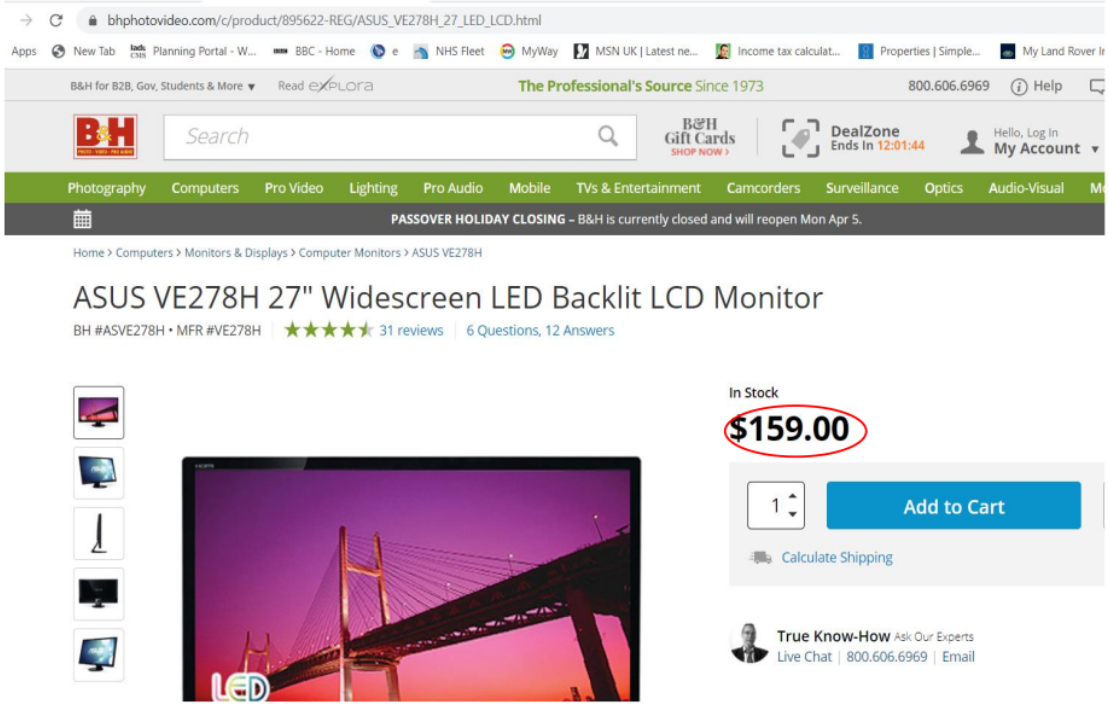
10.1.12 Sound Card - $ 39.99



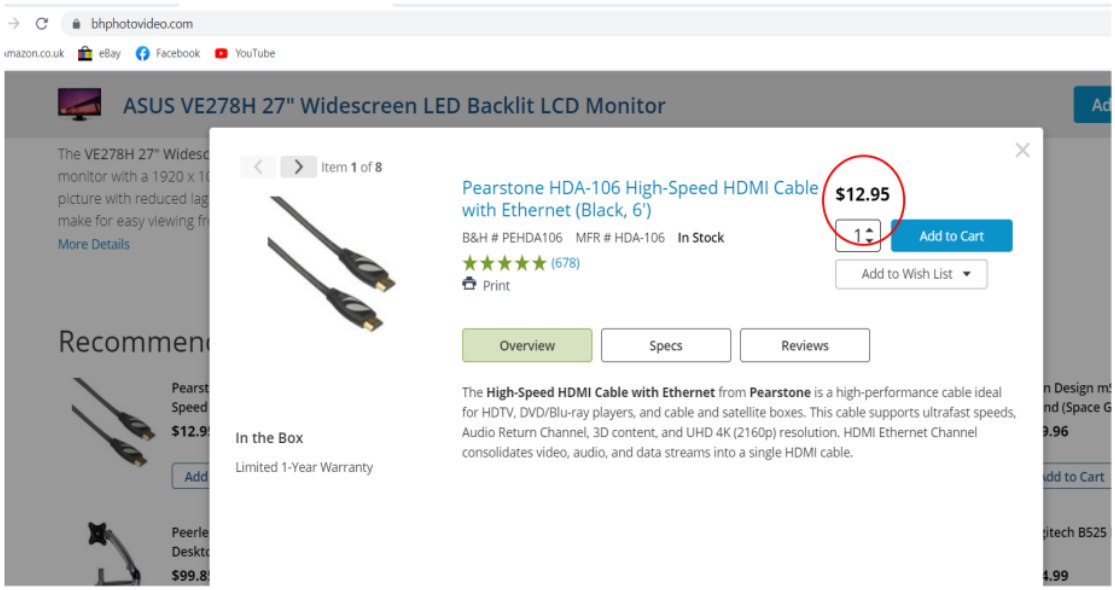
10.1.13 Wi-Fi Adapter - £ 4.89



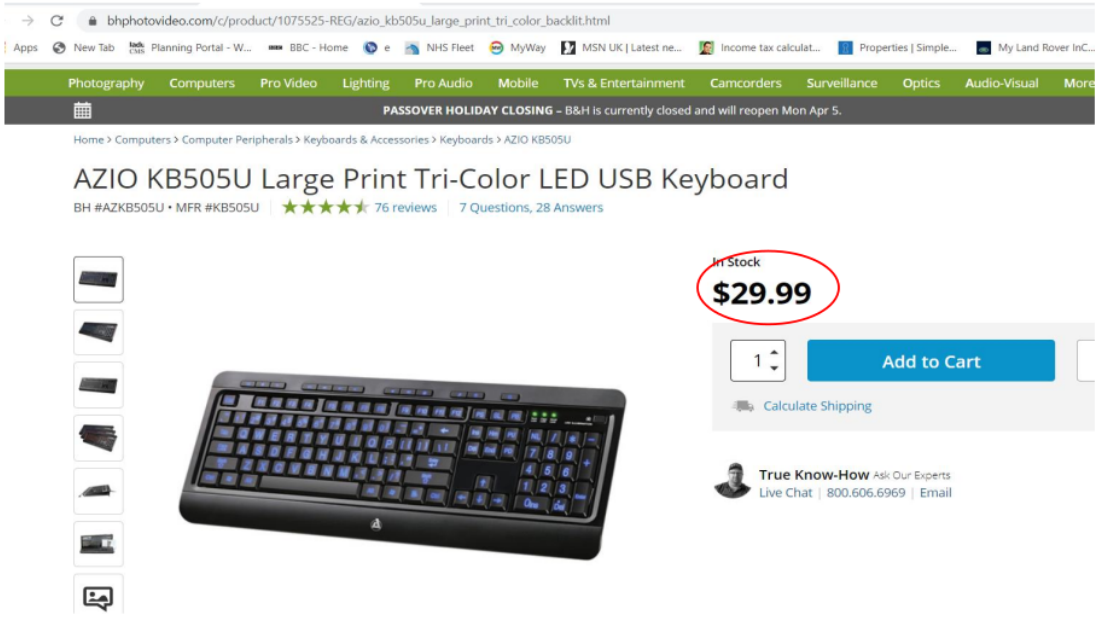
10.1.14 Monitor - $ 159.00



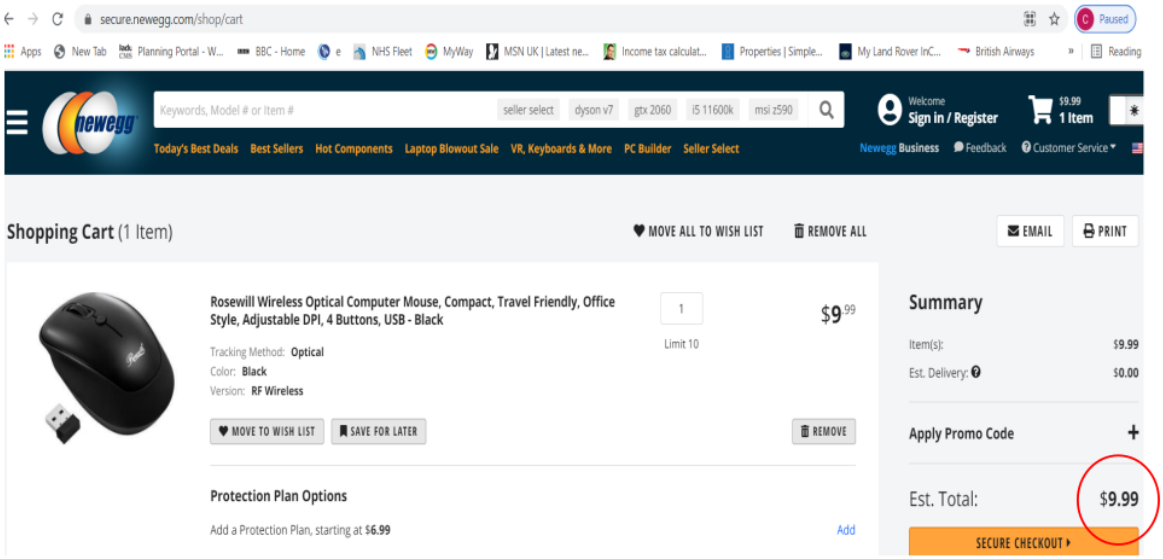
10.1.15 HDMI Cable - $ 12.95



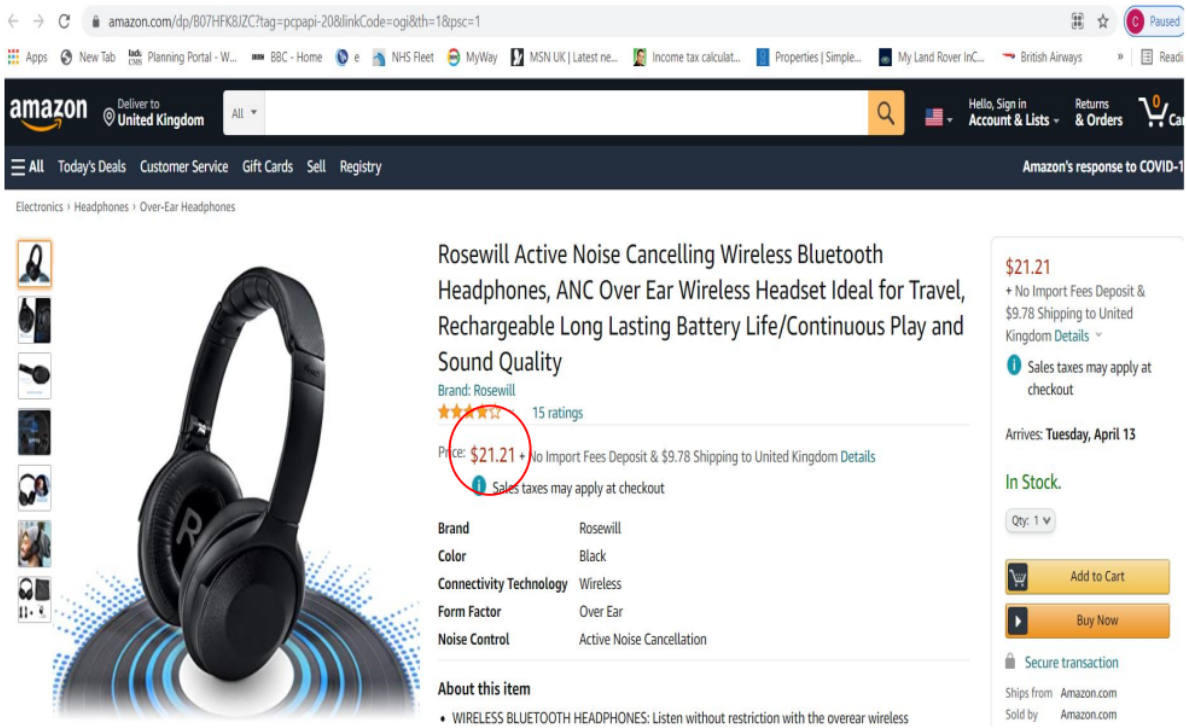
10.1.16 Keyboard - $ 29.99



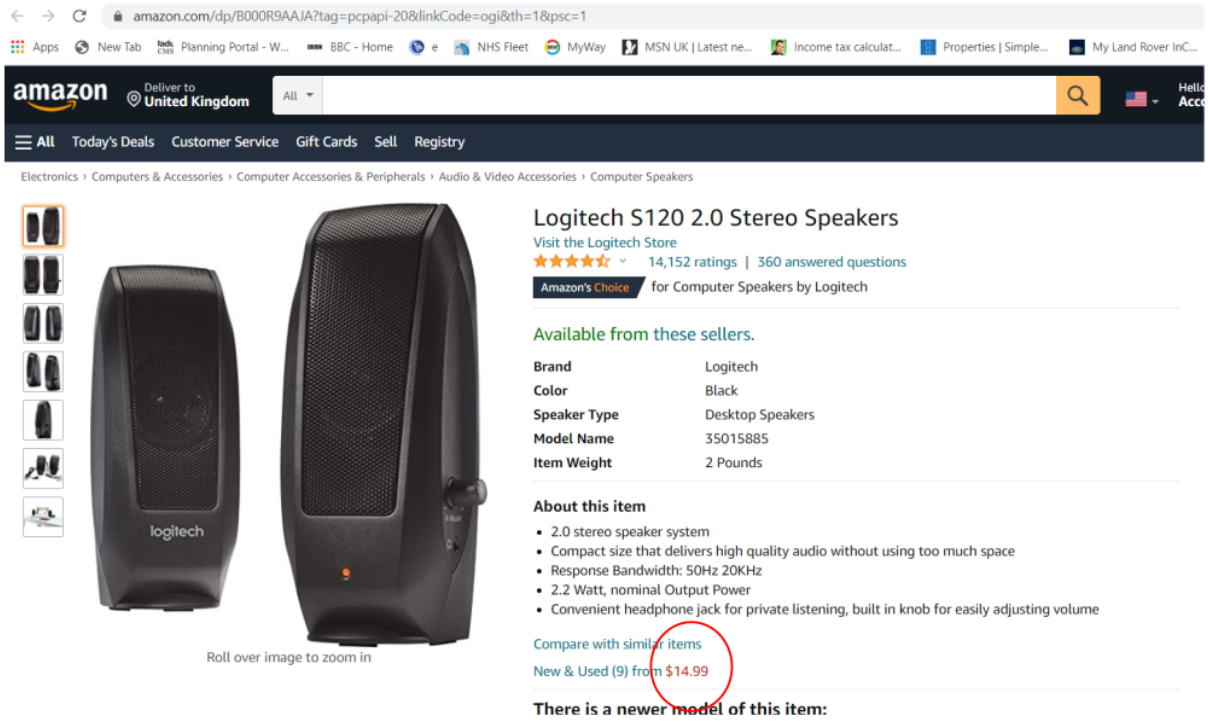
10.1.17 Mouse - $ 9.99



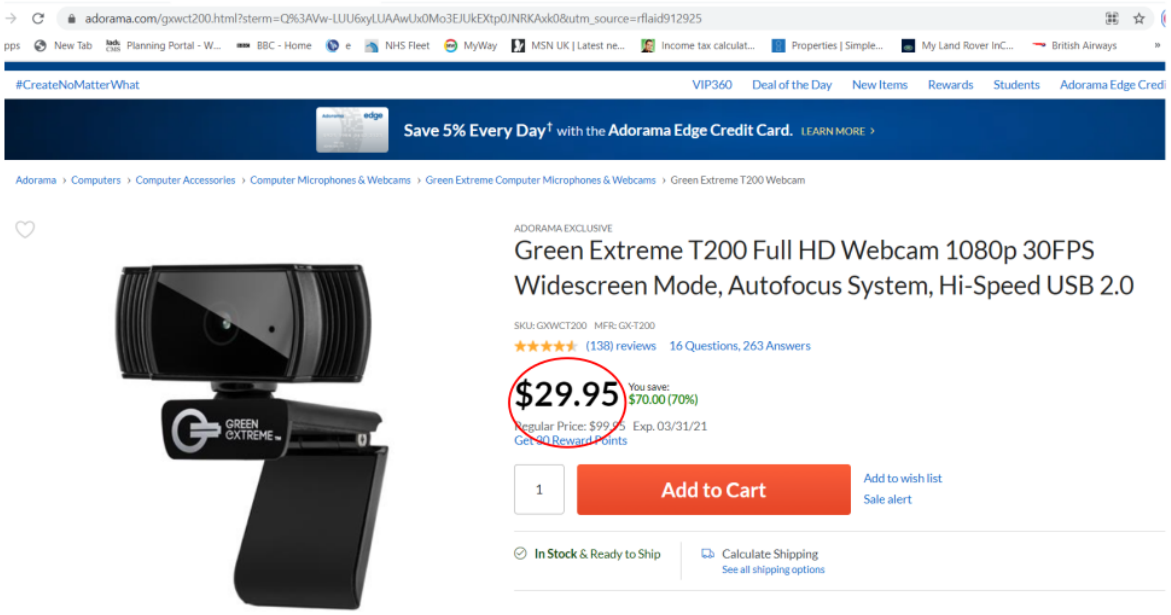
10.1.18 Headset - $ 21.21



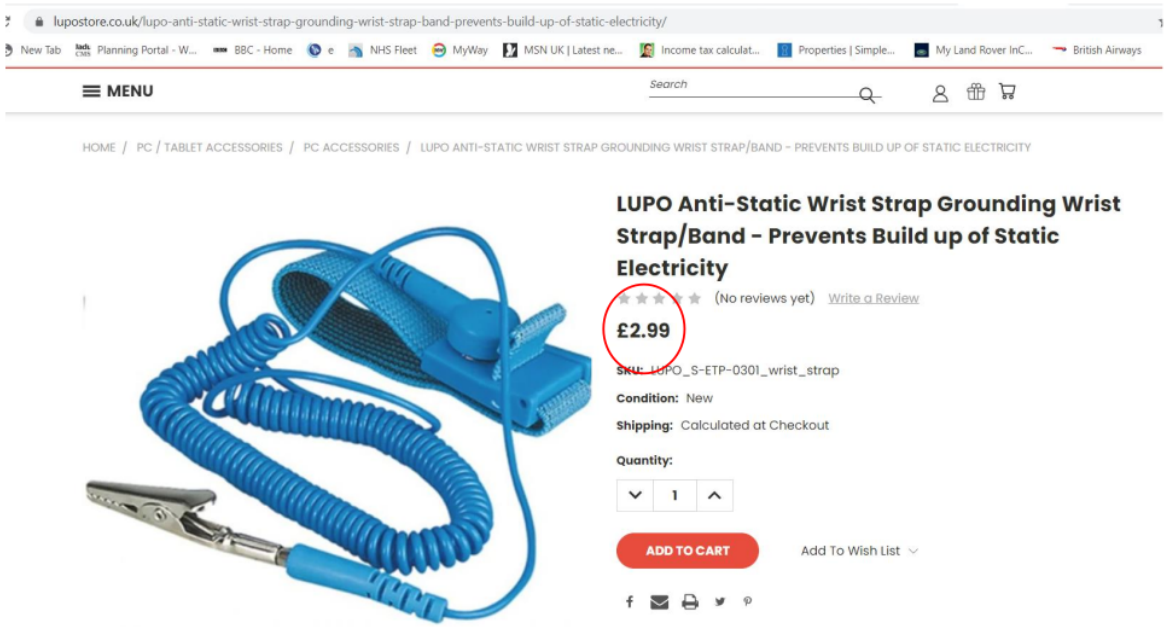
10.1.19 Speakers - $ 14.99



10.1.20 Webcam - $ 29.95

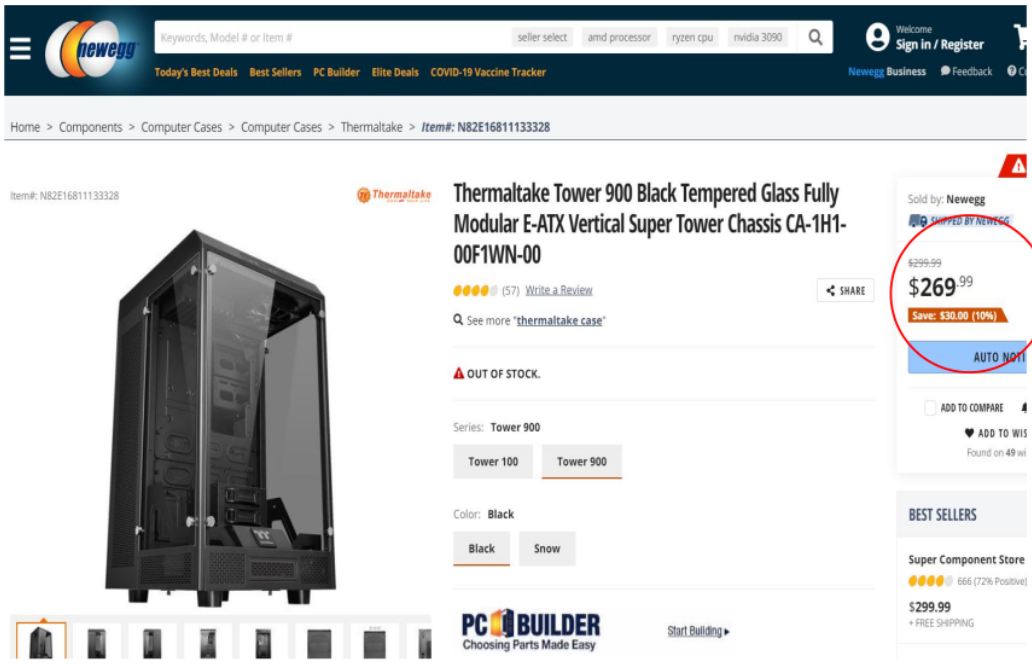


10.1.21 Anti-Static Wrist Band - £ 2.99

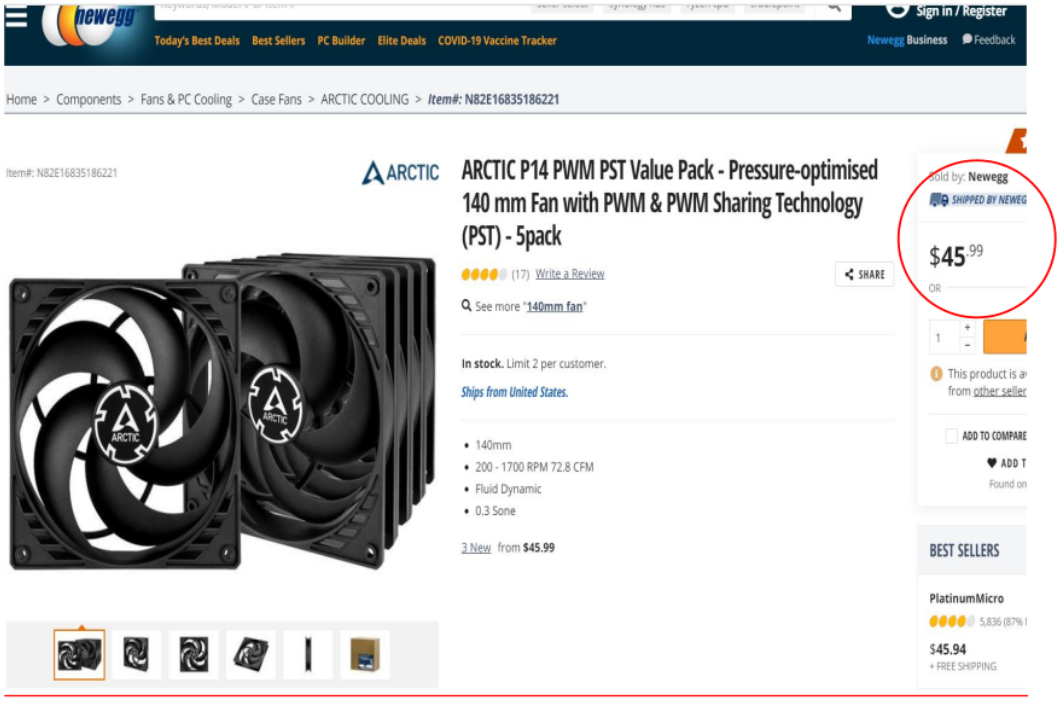


10.2 Scenario 2 – Individual Component Quotes

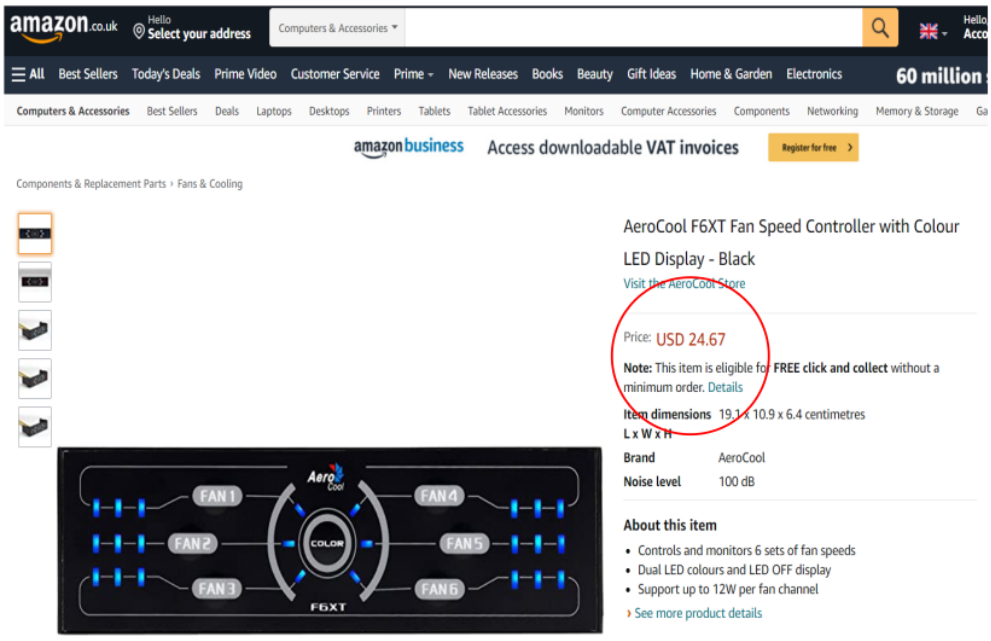
10.2.1 Case - $ 269.99



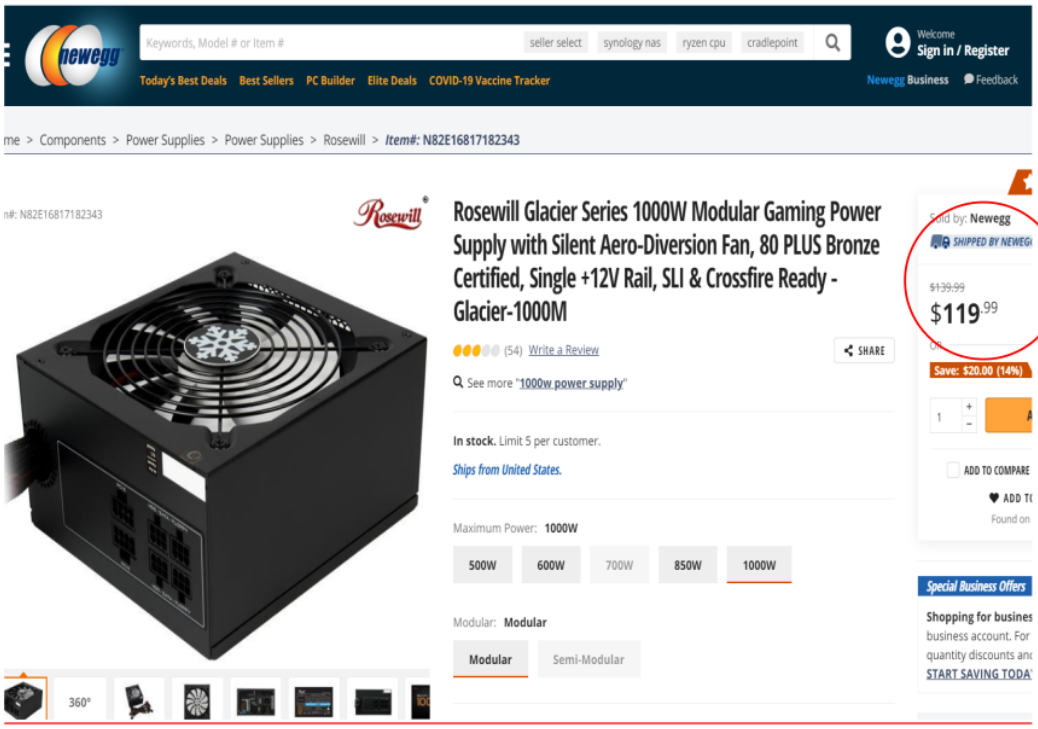
10.2.2 Case Fans - $ 45.99



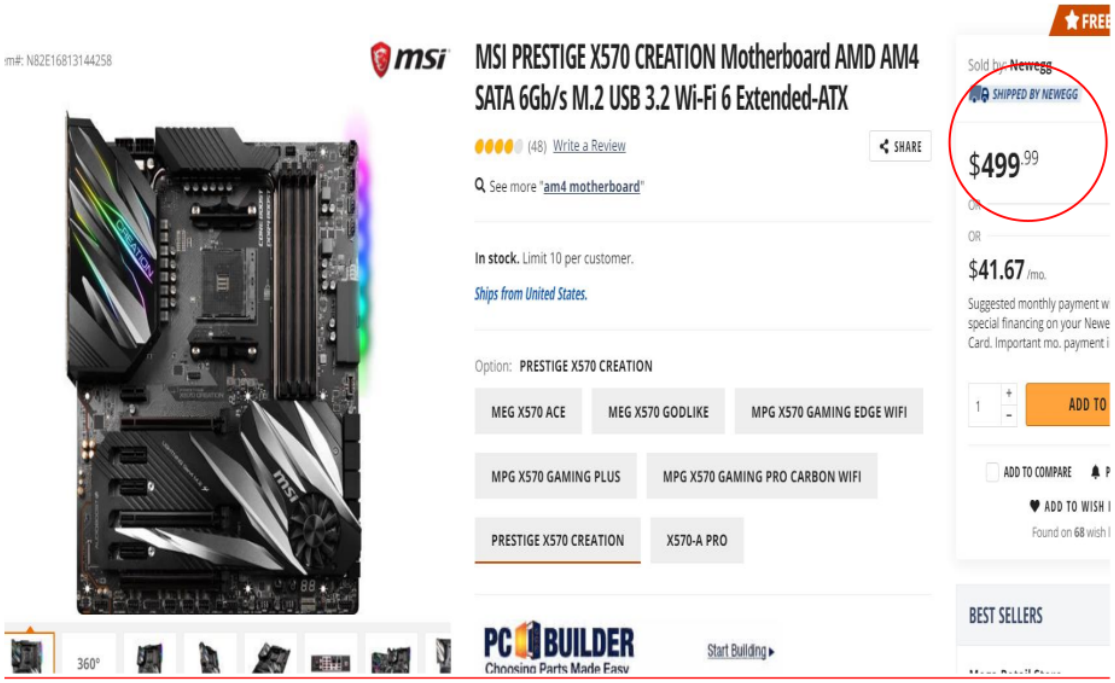
10.2.3 Fan Controller - $ 24.67



10.2.4 Power Supply - $ 119.99



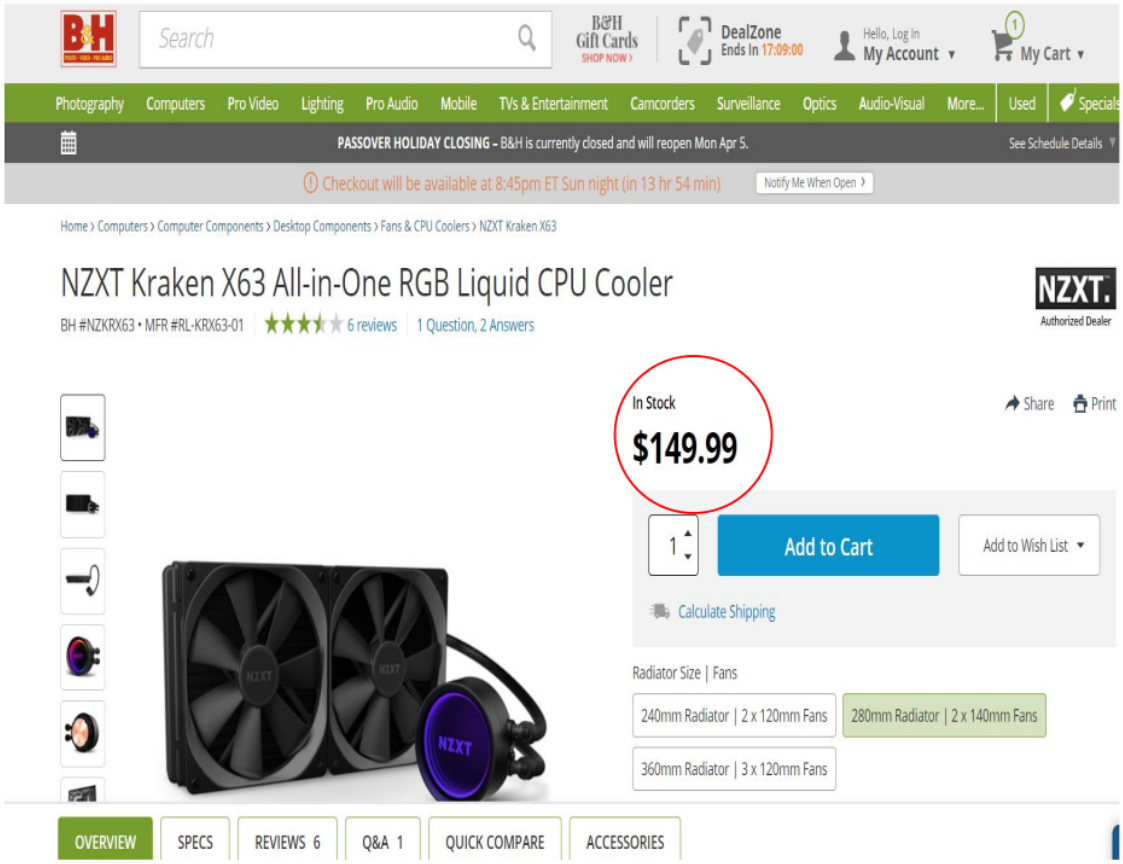
10.2.5 Motherboard - $ 499.99



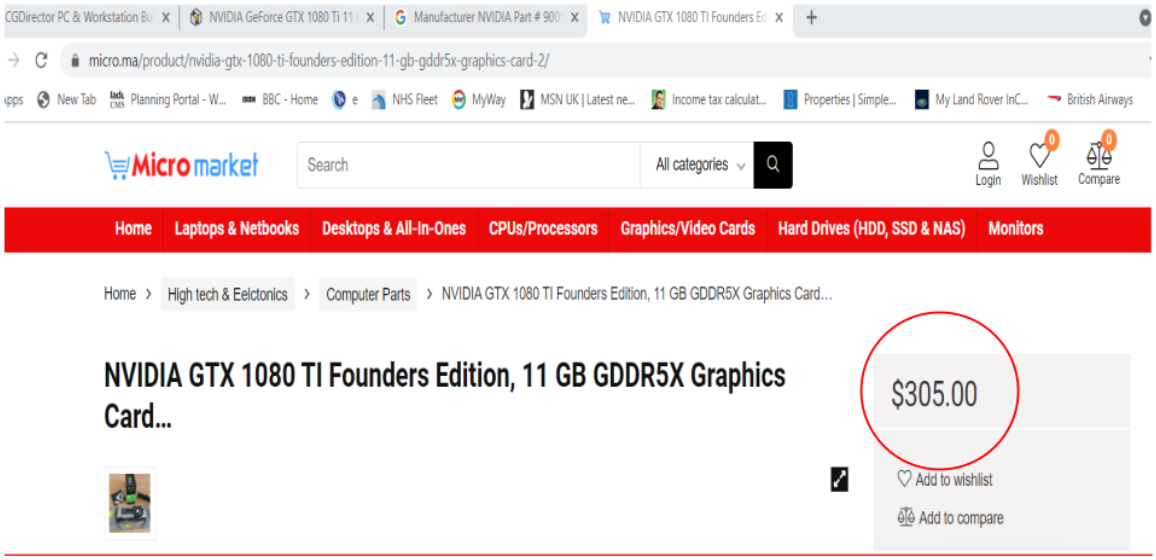
10.2.6 CPU - $ 484.99



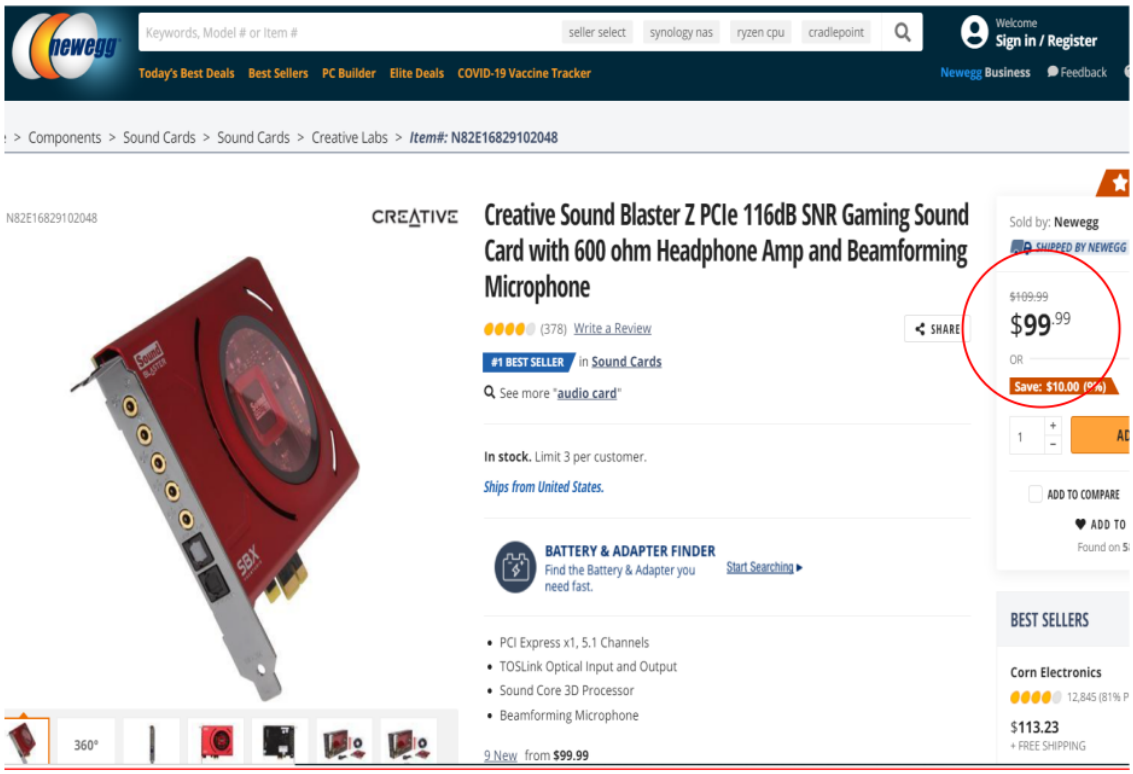
10.2.7 CPU Cooler - $ 149.99



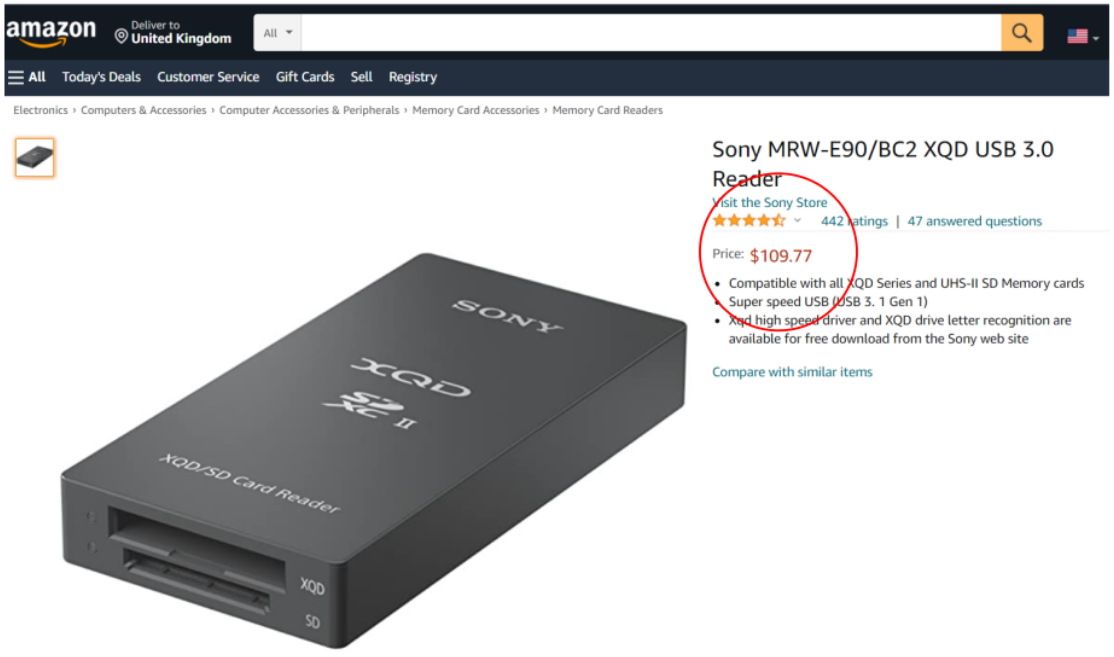
10.2.8 GPU x 2 - $ 305.00 each



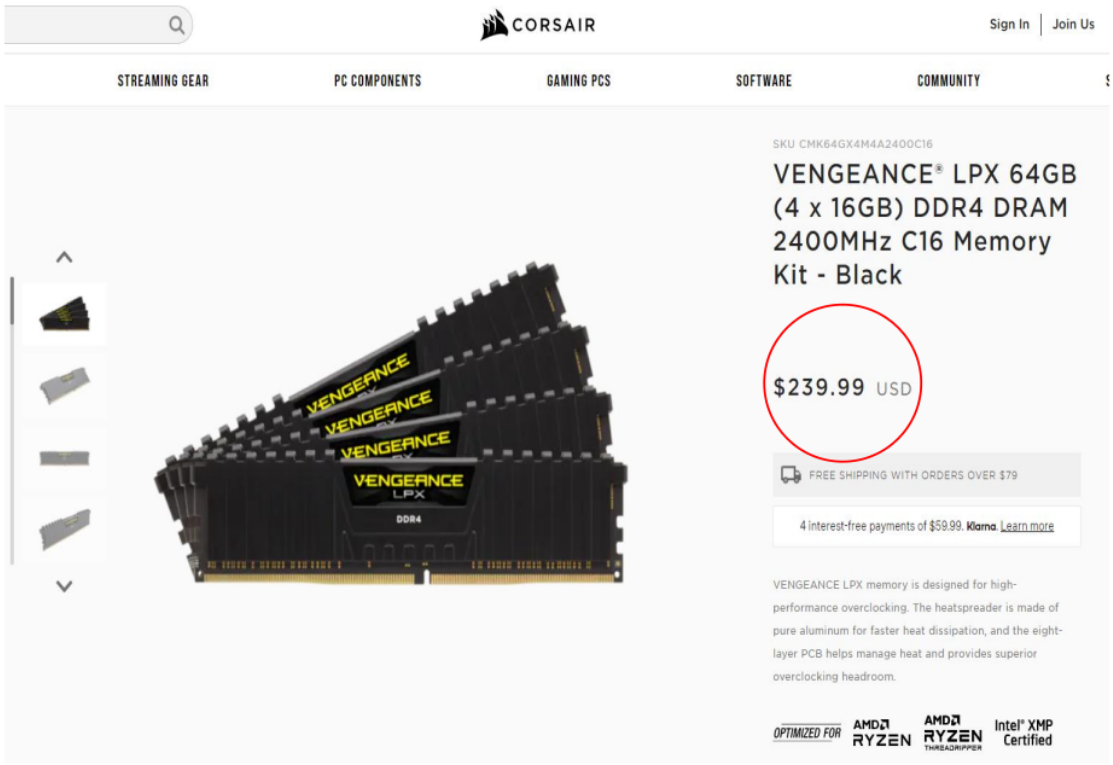
10.2.9 Sound Card - $ 99.99



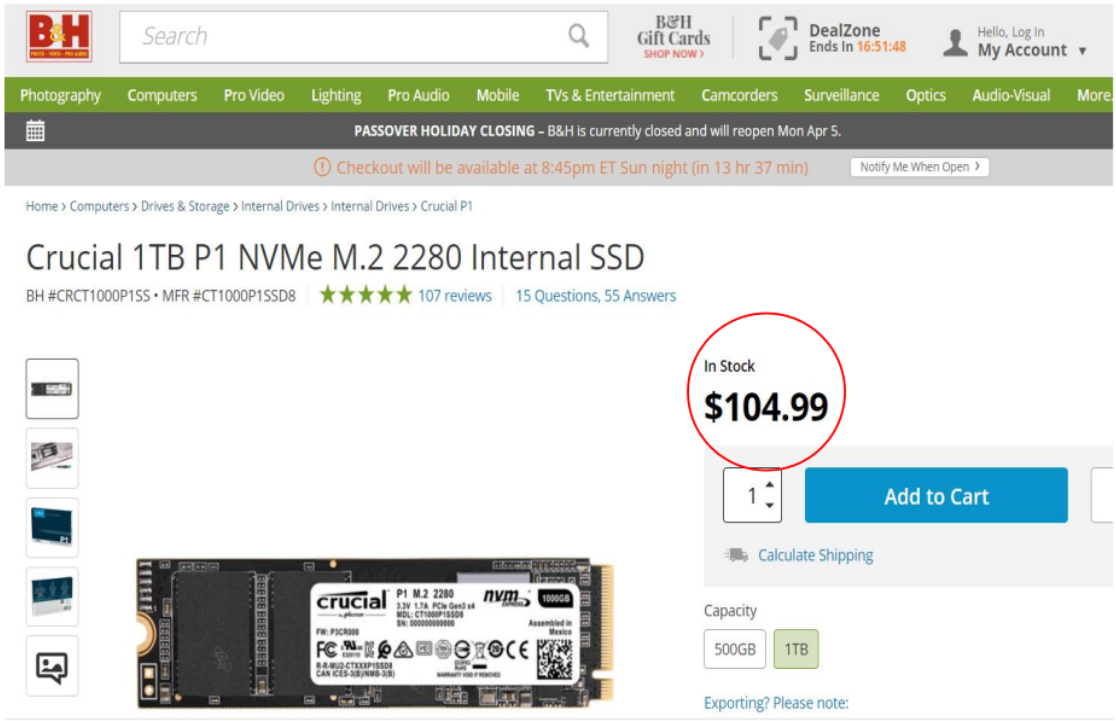
10.2.10 Card Reader - $ 109.77



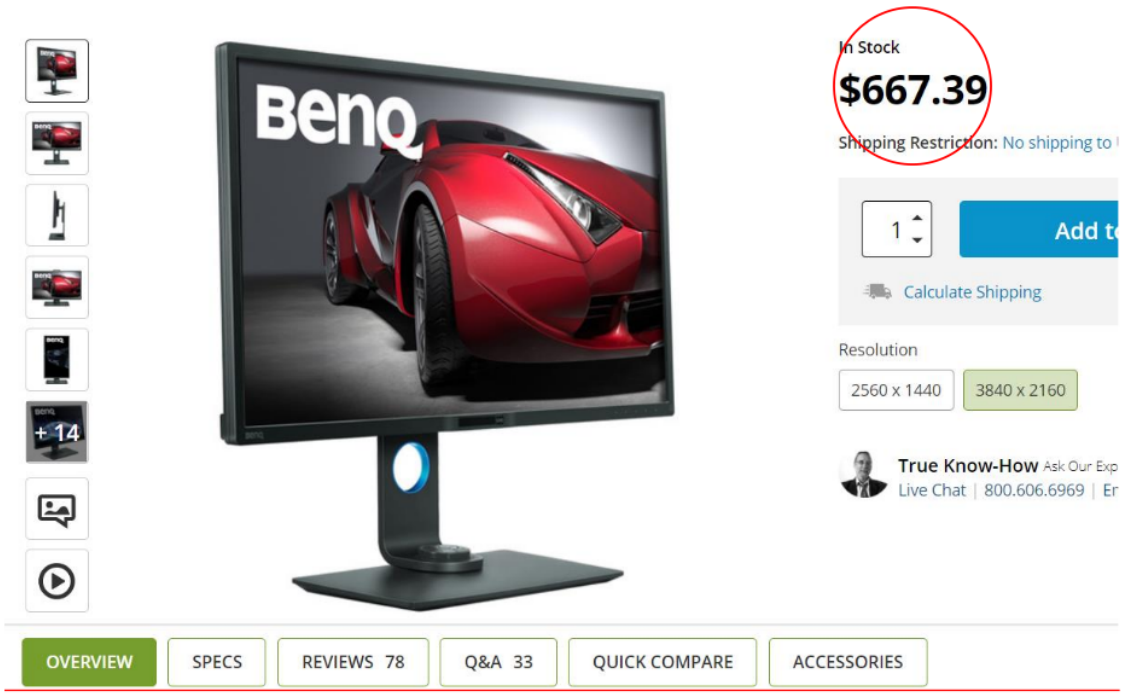
10.2.11 RAM - $ 239.99



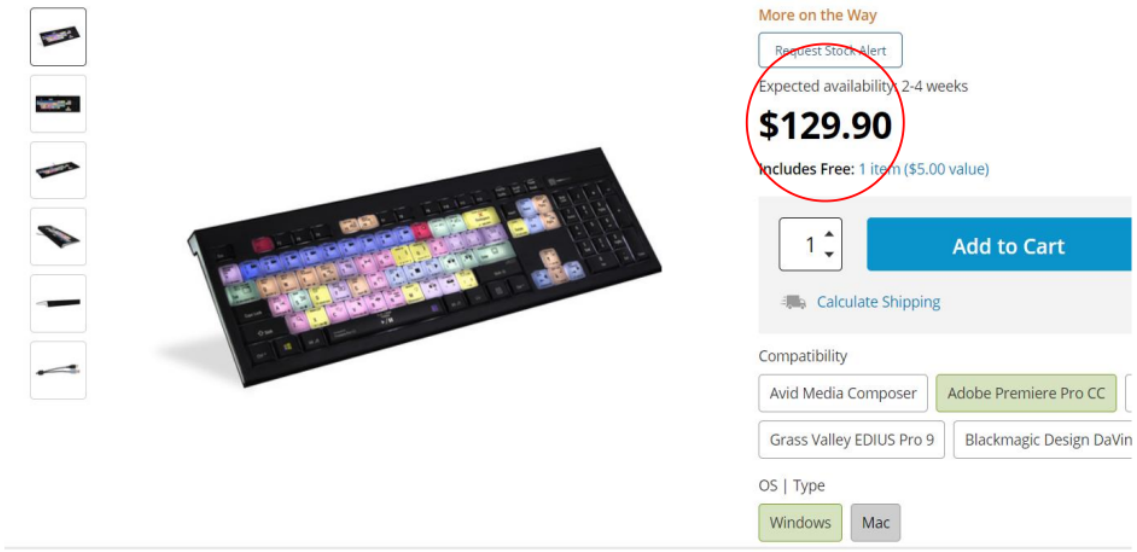
10.2.12 Non-Volatile Storage x 2 - $ 104.99 each



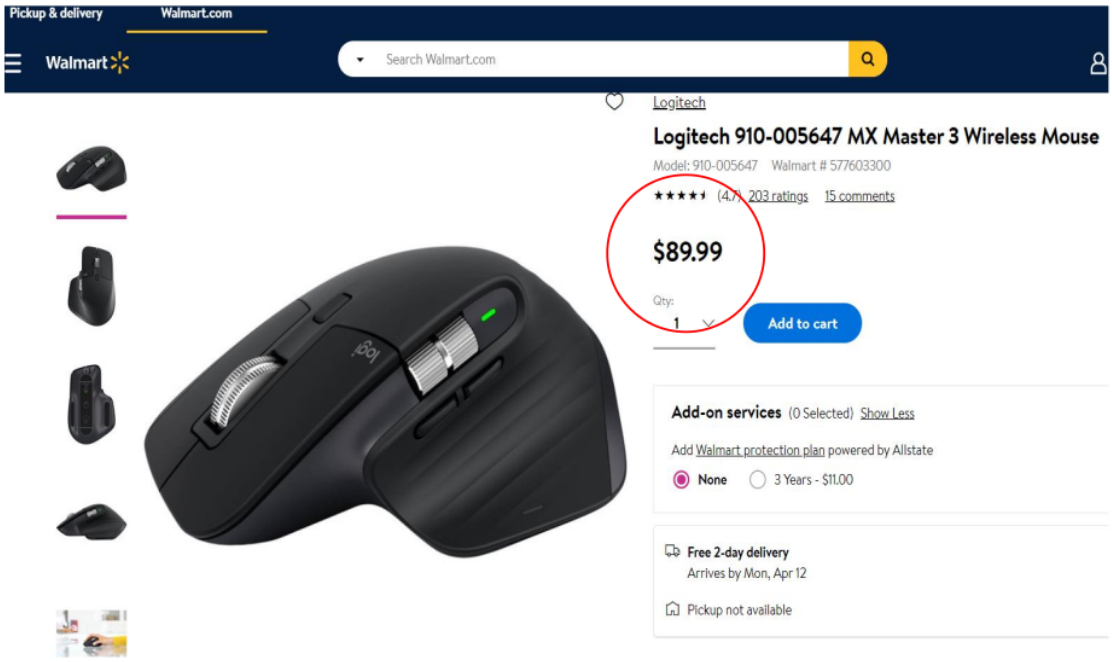
10.2.13 Monitor - $ 667.39



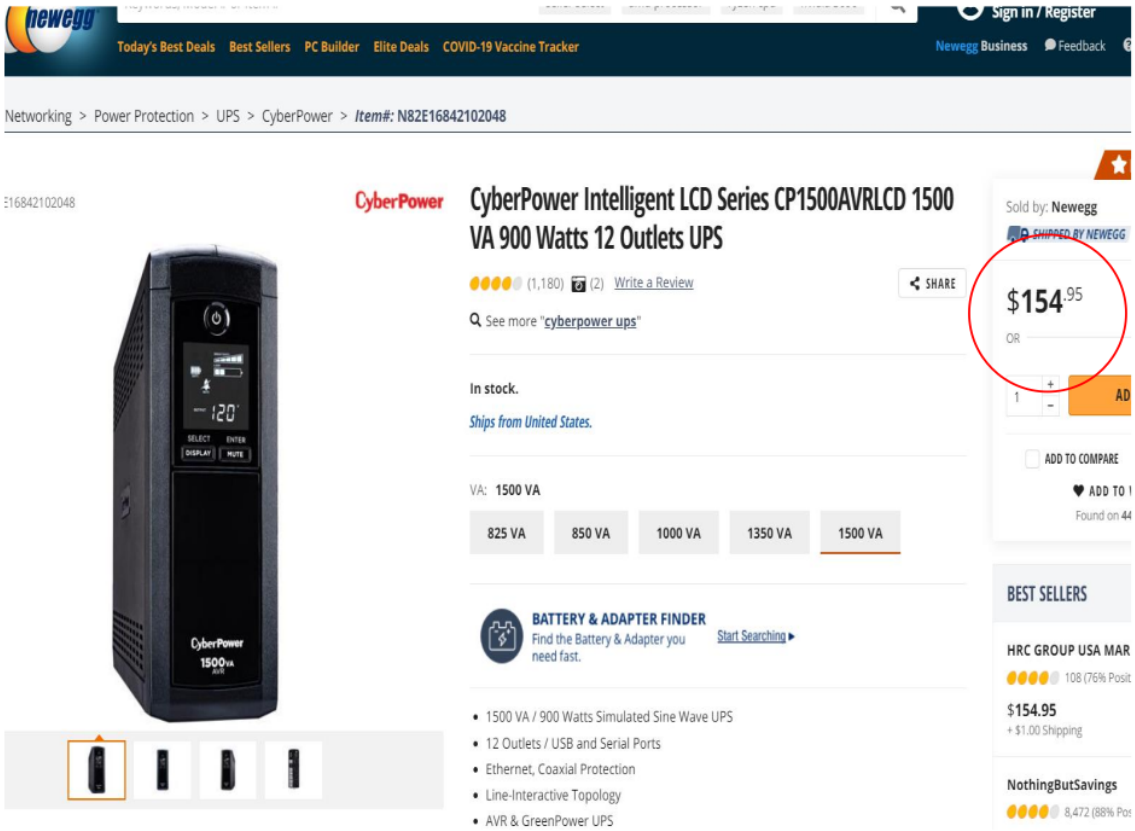
10.2.14 Keyboard - $ 129.90



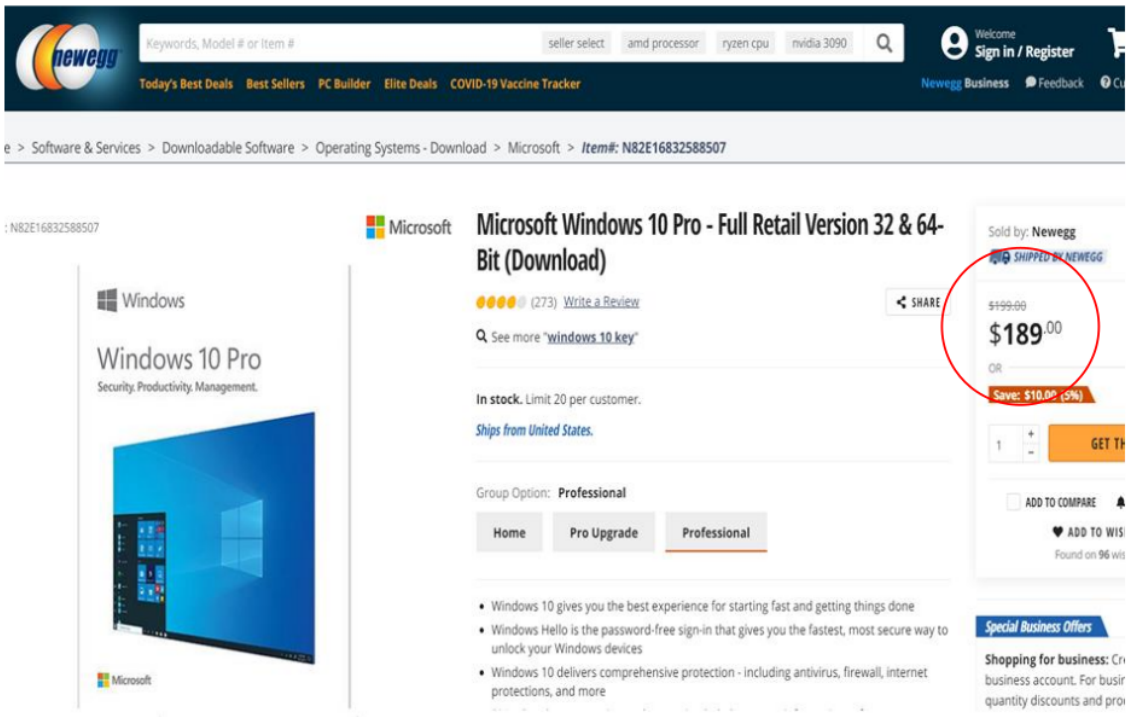
10.2.15 Mouse - $ 89.99



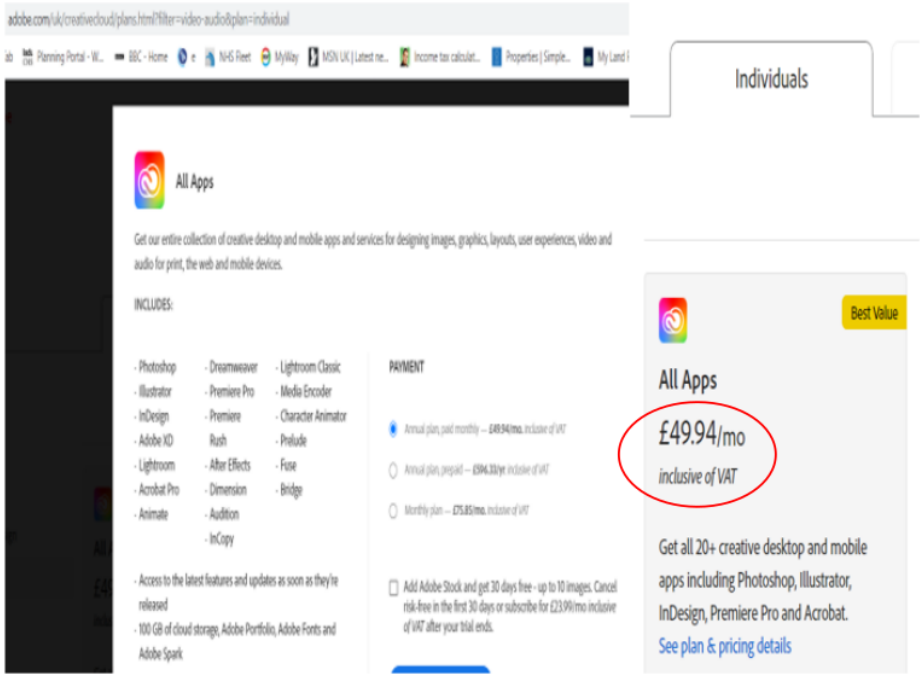
10.2.16 UPS - $ 154.95



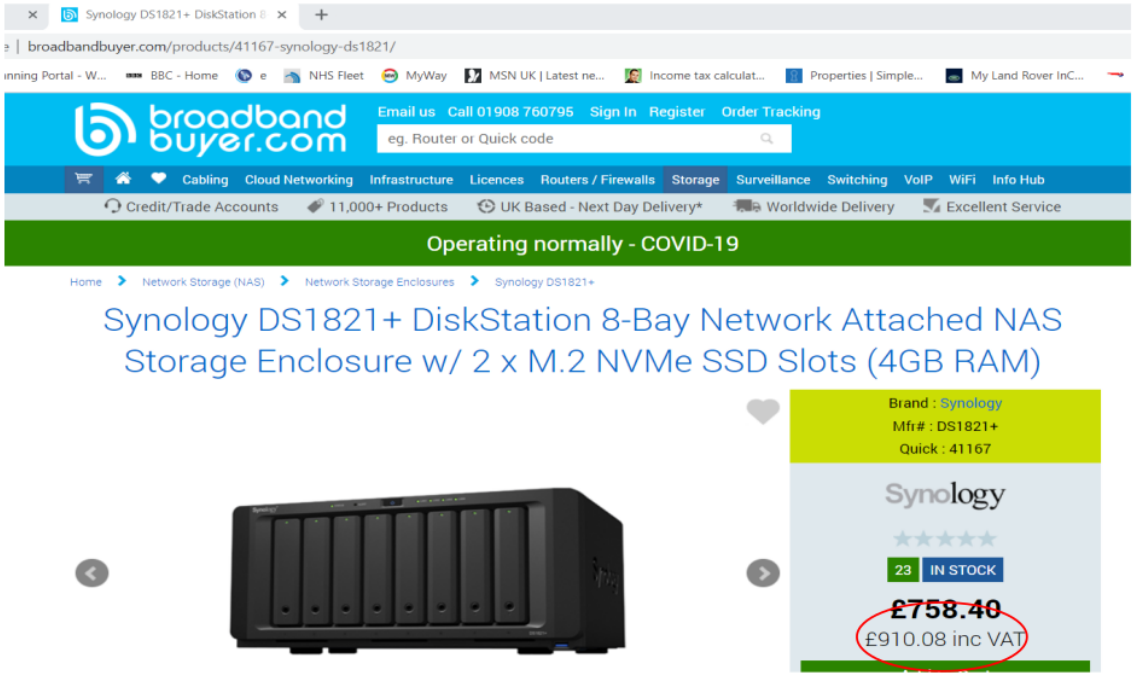
10.2.17 Operating System - $ 189.00



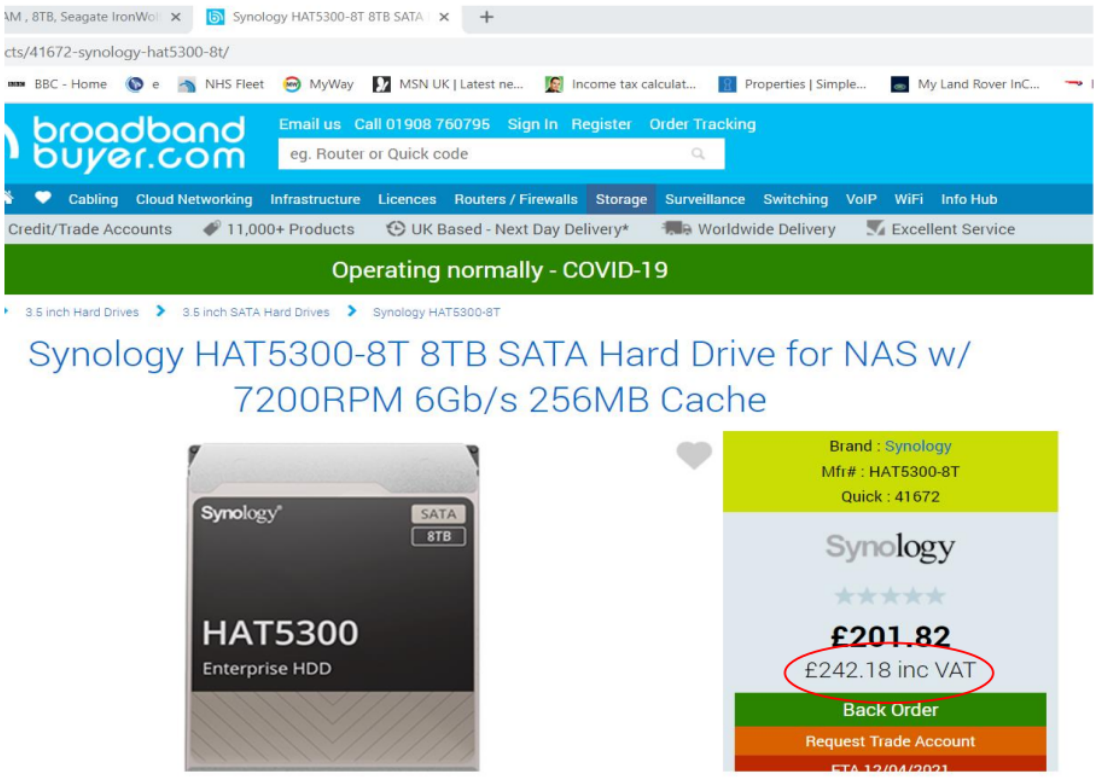
10.2.18 Video Editing Software - $ 70/month



10.2.19 NAS - $ 1,264.00



10.2.20 NAS 3 x HDD's - $ 1,009.08



MDarzins 1909722 - A4022 CA Assignment

GRADEMARK REPORT

FINAL GRADE

88/100

GENERAL COMMENTS

Instructor

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GRADING FORM: GJ_2019

MARTIN ANDREW DARZINS	**438**

ENGAGEMENT WITH LITERATURE

Superb level of targeted, relevant background reading and research sources.	**85**

KNOWLEDGE AND UNDERSTANDING



Extremely competent demonstration of knowledge of the underlying concepts and technologies used.

88

COGNITIVE AND INTELLECTUAL



Choices backed up with excellent justification as well as reliable research sources used.

85

PRACTICAL APPLICATION



Extremely appropriate systems specified with no glaring omissions or obvious errors. Spot on with the NAS solution!

90

TRANSFERABLE SKILLS



Very well laid out and presented. (probably overkill for an assignment such as this, but very well done nevertheless!)

90