2

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COMMON ASSESSMENT TASK

Level 2 Digital Technologies and Hangarau Matihiko 2020

91898 Demonstrate understanding of a computer science concept

Credits: Three

Achievement Criteria		
Achievement	**Achievement with Merit**	**Achievement with Excellence**
Demonstrate understanding of a computer science concept.	Demonstrate in-depth understanding of a computer science concept.	Demonstrate comprehensive understanding of a computer science concept.

Type your School Code and 9-digit National Student Number (NSN) into the header at the top of this page. (If your NSN has 10 digits, omit the leading zero.)

Answer all parts of the assessment task in this document.

Your answer should be presented in 12pt Arial font, within the expanding text boxes, and may only include information you produce during this examination session.

You should aim to write between **800–1500 words** in total.

Save your finished work as a PDF file with the file name used in the header at the top of this page ("SchoolCode-YourNSN-91898.pdf").

By saving your work at the end of the examination, you are declaring that this work is your own. NZQA may sample your work to ensure that this is the case.

You must not access the Internet or use any printed or other resources except for this assessment.

Achievement

03

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INSTRUCTIONS

Read all parts of the assessment task before you begin.

Select ONE of the following computer science concepts:

- error control
- encryption
- artificial intelligence.

Type your chosen computer science concept in the space below:

Error control

Begin your answers on page 3.

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ASSESSMENT TASK

(a) Describe at least two examples in which your chosen computer science concept is either **used**, **implemented** or **occurs** in current digital technologies.

My chosen computer science concept is error control. This computer science branch deals with finding errors, preventing them from happening and if the error has already happened, it must be solved and fixed. These errors can be because of the user, the hardware or the software. The three types of errors are: Human errors, where the error happened because of the user. Data Decay, when data decays over time and becomes invalid after a certain time period. And Data Transmission, this is when errors occur during the transmission of data causing errors to occur. Error control is essential to stop all these errors from occurring.

Two examples of error control occurring in computer science, is the GTIN-13 Protocol, utilized in the barcodes found in shops such as supermarkets. This is to prevent incorrect scanning of items.

Another example is the Lunn Algorithm, utilized in credit cards, specifically when used online. This is to prevent credit card scams from occurring.

(b) **Opportunities** include providing a solution, improving functionality and solving a known issue / risk.

Select ONE of the following two options:

- How **is** your chosen computer science concept **currently** applied to address an opportunity?
- How **could** your chosen computer science concept be applied to address an opportunity?

Copy and paste your chosen option in the space below:

How **is** your chosen computer science concept **currently** applied to address an opportunity?

Answer the question about your selected option in the space below:

An opportunity found in computer science is the use of check digits. Check digits are a common form of error control that is utilized all over the world. The two most common examples of check digits are the GTIN-13 Protocol, which is used in barcodes to confirm that it is the right product. As well as the Lunn Algorithm, which utilizes check digits to confirm whether or not credit cards are real. Both examples effectively take advantage of check digits to prevent errors from occurring. The check digit is the final digit of the set of numbers that is seen on both the credit cards and the barcodes. An equation is used to identify if the check digit lines up with the rest of the numbers. This confirm whether the barcode holds the right number, or the credit card is real or not. This improves functionality as it is a quick and easy way to confirm whether the barcode or card is real, without having to manually check every time. Check digits also supply solutions and solve the risk of entering a fake credit card or wrong barcode. If the check digit does not line up, it will be denied. This is a simple and easy fix to the problem.

(c) **Mechanisms**

(i) Explain the use of an **algorithm** or **technique** used in your chosen computer science concept.

For example, you could explain:

- how the Luhn algorithm works
- the purpose of private / public keys or password hashing
- why an artificial intelligence might be considered as intelligent.

The Lunn algorithm is an important algorithm that occurs in computer science. Credit Cards are very important in today's society. Nearly everyone has a credit or debit card linked to their bank account. This makes it easy to purchase goods and services online with these cards. However, this can lead to people wanting to take advantage of these cards with malicious intent. This could mean creating, supplying and using fake credit cards to get access of. This is where the Lunn algorithm is used. On each credit card there are four sets of four numbers on the front of the card, these numbers represent the credit card number. The final digit is known as the check digit. This check digit is part of the computer science concept of error control as an algorithm. The way Lunn algorithm works, is that it uses the check digit of the card to identify whether the card is real or fake. The sum of the previous fifteen digits should equate to a number in which the check digit can perfectly be added or subtracted to create a whole number. E.G. the first fifteen numbers equate to '36', the check digit must be '4' as it adds up to the first fifteen digits to create a whole number. Online sites use this check digit to confirm whether a credit card is real or fake, as real credit cards always have a correct check digit. Our teacher got us to do this exercise in class to confirm whether in works, with our own debit cards and I can confirm it works. This error control algorithm is necessary to make sure that fake credit cards do not be used on sites to scam them out of money.

(ii) Explain the **protocol** or **procedure** used in your chosen computer science concept.

For example, you could explain:

- how an organisation ensures the protection of data by using encryption
- how barcodes are used, and errors identified
- how an artificial intelligence system is used to achieve a purpose.

In supermarkets many computer science-based systems can be found. An important example is the scanning system, in which the barcode of the item is scanned, and the computer detects this item and adds it to the order immediately. This saves lots of time of unnecessary adding up totals. However, this leaves this system open for multiple errors to occur. If the scanner incorrectly reads the wrong item, it could lose money for the customer, which could lead to a downward spiral of the customer suing the company. To prevent this error from occurring, the GTIN-13 Protocol is employed. The black and white lines are one part of the barcode that is scanned, but to support this, the numbers are also scanned with it. Each set of numbers represents a different product and a check digit at the end is used to prevent errors. This check digit is an essential part of error control. This check digit system is similar to the Lunn algorithm. An equation occurs in which the last digit must equal the sum of all the digits before it. This confirms that the barcode is real and confirms the product the barcode represents. The check digit makes sure that no errors have been made when confirming the products. If an error is found the barcode will not scan to stop this error from happening.

(d) **Impacts**

Select ONE of the following impacts:

- Ethical issues
- Human factors.

Copy and paste your chosen impact in the space below:

Human Factors

Explain how this impact relates to your chosen computer science concept.

Human Factors are very impactful in error control. The human factor that relates to my computer science concept of error control, is **human errors.** Human errors are all errors that put the user to blame, because he or she entered in wrong digits or did not check etc.… Correcting Human errors is a vital part of error control. Because humans aren't perfect, it is easy for us to make common mistakes. Human Error control in computer science is taking note of these errors and attempting to stop them from happening. There needs to be systems in place that can identify the errors and prevent them from happening. Preventing human errors is far more important than fixing them, because it is far better to solve the error before it happens. Examples of human error control could be implementing a check system. This might be at the end of an online order, so the person can check themselves to make sure they made no mistakes. This prints out all the orders just before the final payment to make sure that nothing is wrong. Another example are the Minimum or maximum values that are also used in online orders, so the user doesn't order to little or too much of an item. These two examples are just two of many different human error control protocols that are used to prevent people from making small or large errors.

(e) Comprehensively explain the key problems or issues related to your chosen computer science concept.
This can include showing links between and expanding on your answers to parts (a)–(d).

Error control is an essential concept of computer science. Without error control, many more errors will occur without them being found, solved or prevented. Errors can range from minor inconveniences to major catastrophic blows to the economy or even loss of life. Every day major life changing errors are prevented without people even knowing because of error control. Therefore, error control is absolutely necessary, even in the most minor of things. A simple error at a farm, for example buying the wrong fertilizer for grass, could lead to dead crops, which leads to dead animals, which could eventually lead to people starving. Every single error has repercussions, which is why is error control must be applied.

One real life example was during the space race. When NASA was transmitting data for the spaceship, a data transmission error occurred. This caused the wrong data to be used for the blast off calculations. While this may seem trivial, launching a spaceship requires the most precise calculations possible. This caused a fault in the spaceship launch test, which lead to the ship failing and crashing. NASA and the USA government who funded NASA lost billions of dollars because of this failure. They also got a bad name for themselves, so they lost popularity. This was all because of a simple data transmission error. If error control had been implemented, this error could have been found and prevented from happening.

Another real-life example occurred at a bank in Sweden. A man wanted to take out a loan of $100,000 for a deposit on a house. The worker made a human error when typing out the total. He added one extra zero, so the man accidentally took out a loan of $1,000,000. This is a massive $900,000 difference, ten times more than the man originally asked for. This is a human error, as seen before. The man decided to sue the bank, causing the bank to lose all that extra money. If human error control had been implemented, this would not have happened. Maybe a check feature to make sure the total is correct, or a double check feature is the amount exceeds a certain maximum. Maximum values could have been used, or a second opinion, where another worker has to check.

Overall Error control is an essential concept of computer science. Without error control, many would go unnoticed in the world of technology creating pandemonium.

Achievement Exemplar 2020

Subject	Digital Technologies	Standard	91898	Total score	03

	Grade score	Annotation
	A3	*Computer science concept: Error control* In part (a) the candidate gave several good examples of where error control is found. In part (b) the example of credit card validation was given, with an explanation of how this ensures a potentially valid number. The candidate did not overstate by incorrectly suggesting that this plays a key role in preventing fraud. In part (c) the candidate discussed the maths involved in the Luhn algorithm. It is not an expectation that a fully worked example is given, just that the candidate understands the concept. With the second mechanism the importance of correctly reading bar codes was discussed. A good answer was given that was sufficiently different from the other mechanism answer not to be repetitive. In parts (d) and (e) more detail and depth of understanding was needed, and answers need to be related to error control.