QUALIFY FOR THE FUTURE WORLD
KIA NOHO TAKATŪ KI TŌ ĀMUA AO!

Level 2 Digital Technologies and Hangarau Matihiko

Common Assessment Task, 2019

91898 Demonstrate understanding of a computer science concept

Credits: Three

INSTRUCTIONS

Follow the instructions and answer the question below to demonstrate understanding of a computer science concept.

You should aim to write between 800 and 1500 words.

Only work directly keyed by you into your computer or device may be used in your assessment response.

You may not use hard-copy or online course resources, or notes of any type, to complete this assessment.

By saving your work at the end of this assessment session, you are verifying that this work is your own. NZQA may digitally sample your work to test authenticity.

Save your work using the filename format:
four digit schoolcode-yourNSN-91898.pdf. For example, 0001-123456789-91898.pdf

Your supervisor will tell you your school code and where to save this file.

Please use a nine-digit NSN with no leading zero.

The filename must be written in the document header.

Please check the filename is correct before saving.

Choose ONE of the following computer science concepts:

- computer security
- encryption
- error control
- complexity and tractability
- artificial intelligence.

Follow the instructions and answer the questions to write a report that demonstrates a comprehensive understanding of the computer science concept.

QUESTION ONE

What is the computer science concept?

Error control

QUESTION TWO

Choose ONE of the following three options to answer:

How is the concept used?

OR

How is the concept implemented?

OR

How does it occur?

How is the concept used?

The concept is used to detect and repair any errors in data. The type of data that can be protected by this method includes data on hard disks, data that is being transmitted across networks, wired and wireless. It can also be used to prevent human error when entering credit card numbers, bank accounts or ISBN book numbers. The concept of error control is designed to ensure that data is correct and if there are any errors in the data, these can be detected to prevent further problems, such as valuable information being incorrect or lost, and decisions being made based on false data. It can also be used to prevent human error when entering codes, such as credit details or bank account numbers, online.

> **Achievement**
> The candidate explains how the concept has been used.

QUESTION THREE

How has the concept been (or could it be) applied to address an opportunity?

One example is the use of barcodes on products in shops and supermarkets. When a barcode is scanned, the price is automatically calculated and added to the amount the customer must pay. This is a very quick and efficient way to move people through a long line at checkout in a busy supermarket.

Another benefit is that barcode scanning will also update stock levels in real time. This is fine when the barcodes are being read clearly by the scanner, but what happens if they are damaged and the scanner cannot read them clearly? How can they be entered manually if a barcode just has lines on it?

This is where error-control coding provides a manual backup to an automated process. Each barcode has a global trade item number or GTIN. This number is printed on each barcode for situations where the bar code cannot be read by a scanner. In this case, the GTIN number can be entered manually. But what happens if the person on the checkout enters the number incorrectly? This would have two effects and could mean the customer is charged more or less for a product and if the wrong product is entered as sold, then the stock levels would also be incorrect.

> **Achievement**
> The candidate explains how the concept has been applied to address an opportunity.

The best way to prevent this problem and ensure both the sale date and stock-level data are correct is by a method of error-control coding known as check digits. A check digit is added to the end of a GTIN number and is calculated using all the other numbers. In the case of a GTIN number that is written at the bottom of a barcode, there are 13 numbers and the 13th is calculated using the first 12 numbers. This means that if any of the numbers are entered incorrectly, the check number will be incorrect, and the error will be spotted by the computer system. Error-control coding will identify an error and prevent incorrect data being entered. This could save businesses thousands of dollars, as it ensures all sales are recorded correctly and stock levels are up to date.

QUESTION FOUR

Which mechanisms shape the concept?

The algorithm used to create GTIN numbers works like this:
Using the first 12 numbers in the GTIN, multiply every second digit by 3 and every other digit by 1. These numbers are then all added up to make the total or sum. The check sum digit is found by working out a number that you would have to add to the sum to make it a multiple of 10. For example, if the total is 117 then the check digit would be 3. This can also be known as a 'parity bit' or an extra bit if data that can be used to check if the original data is correct.

QUESTION FIVE

Explain how the concept relates to at least one of the following:
- ethical issues
- social impact
- sustainability
- human factors
- future proofing.

Ethical issues:

Error-control coding can ensure data is accurate and correct, but it can also prevent fraud. Without some form of error-control coding, people could potentially 'guess', credit numbers and use them to purchase goods illegally online. Thus, advanced error-control systems not only prevent errors, but can also be a form of internet security for financial transactions.

Social impact:

The use of error-control coding systems means people will feel more secure using credit cards and online banking, as they know there is less room for error when making purchases and entering data online. For business owners, it can provide more accurate and reliable data and reduce costs.

Human factors:

One of the key benefits of error-control coding is to eliminate errors by humans. When entering data, humans can potentially type incorrect numbers or type numbers in the wrong sequence. An error-control algorithm that creates a check sum or parity bit drastically reduces the chances of human error. It is important to note it will never be 100% accurate.