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91908 SESSION B, 16–20 OCTOBER

NZQA | Mana Tohu Mātauranga o Aotearoa
New Zealand Qualifications Authority

COMMON ASSESSMENT TASK

Level 3 Digital Technologies and Hangarau Matihiko 2023

91908 Analyse an area of computer science

Credits: Three

Achievement	Achievement with Merit	Achievement with Excellence
Analyse an area of computer science.	Analyse, in depth, an area of computer science.	Critically analyse an area of computer science.

Type your School Code and 9-digit National Student Number (NSN) into the space below. (If your NSN has 10 digits, omit the leading zero.) It should look like "123-123456789-91908".

SchoolCode-YourNSN-91908

There are three questions in this document. **Choose ONE question to answer.**

Make sure you have the PDF of Resource Booklet 91908R.

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

Your answers should be presented in 10pt Verdana font, within the expanding text boxes, and may include only information you produce during this assessment session. Internet access is not permitted.

Save your finished work as a PDF file with the file name used in the header at the top of this page ("SchoolCode-YourNSN-91908.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 this is the case.

INSTRUCTIONS

There are three questions in this assessment, on the topics of:

- Computer Graphics (page 3)
- Big Data (page 11)
- Network Communication Protocols (page 16).

Choose ONE question to answer.

Make sure you have the Resource Booklet 91908R.

Read all parts of your chosen question before you begin.

EITHER: **QUESTION ONE: Computer Graphics**

This question includes references to **Resources A and B** on pages 2 and 3 of the resource booklet.

(a) (i) What is the difference between raster graphics and vector graphics? Refer to **Resource A** on page 2 of the resource booklet in your answer.

(ii) Use your understanding of computer science to explain how 3D graphics rendering differs from 2D graphics rendering. Use examples from **Resource A** on page 2 of the resource booklet to support your answer.

Choose a relevant algorithm or mechanism of computer graphics to answer part (b).

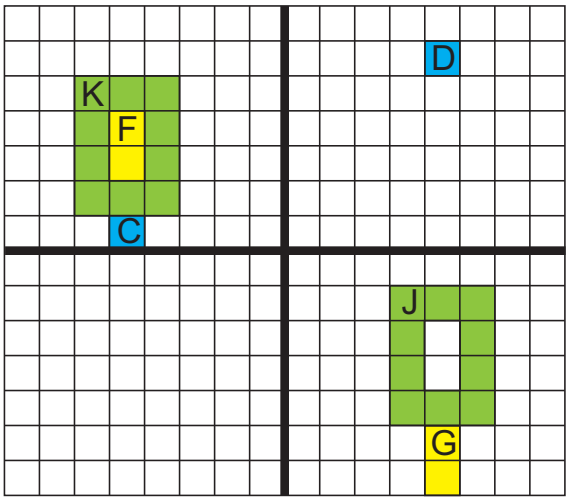
You might consider:

- transformations
- shading algorithms
- rendering algorithms.

Algorithm / mechanism:

(b) Explain how your chosen algorithm or mechanism can be used for the effective generation, manipulation, and /or representation of 3D graphics. You can refer to the case study in **Resource A** on page 2 of the resource booklet, or something you have studied in class to support your answer.

Translation, scaling, and rotation can all be performed on a single shape. Consider the graphic below.



The origin (0,0) is at the centre of the diagram.

(c) What values would you use to translate the shapes on the grid above? Enter the translation matrices needed in the boxes below for points K, F, and C.

Point K → J	
X	
Y	

Point F → G	
X	
Y	

Point C → D	
X	
Y	

(d) Explain the differences between scaling and translation in computer graphics.

Computer graphics are increasingly used all around us and have the potential to impact people in many different ways.

(e) Choose ONE of the scenarios below that use computer graphics:

- animation
- virtual reality.

Choice (copy and paste below)

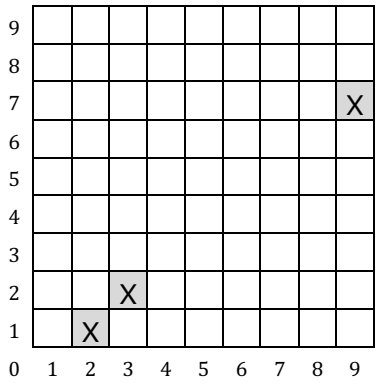
Discuss how ONE of the computer graphics concepts from the list below could be used in your chosen scenario and explain its impacts on people. You may use examples from other contexts to support your answer.

- transformations (e.g. translation, scaling, rotation)
- shading algorithms
- rendering algorithms

(f) (i) Using either of the algorithms in **Resource B** on page 3 of the resource booklet, calculate the points that would be plotted in order to draw a line between (2,1) and (9,7).

Points plotted	P	x co-ordinate	y co-ordinate
1	5	2	1
2	3	3	2
3			
4			
5			
6			
7			
8		9	7

(ii) Fill in the pixels at the points you calculated in (f) (i).
The start and end points, and one other point, have been plotted for you.



The field of computer graphics is closely linked with other areas within computer science, and advancements in one area often drive advancements in others. Computer graphics is evolving due to the effect of:

- virtual and augmented reality
- large data sets
- real-time ray tracing.

(g) Explain how computer graphics are evolving and how you think they will continue to change and impact people in both beneficial and adverse ways.

In your answer:

- refer to the information in the box above; and
- discuss how areas of computer science may overlap and the possible implications that may arise.
- You may also use examples you have studied this year to further support your answer.

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OR: **QUESTION TWO: Big Data**

This question includes references to **Resources C and D** on pages 4 to 6 of the resource booklet.

(a) What are the 3 V's of big data?
Provide an example of each from the case study in **Resource C** on page 4 of the resource booklet.

(b) (i) What are some of the challenges of analysing *X (formerly known as Twitter)* data?
Refer to the 3 V's and **Resource C** on page 4 of the resource booklet in your answer.

(ii) Explain how these challenges can be addressed.

(c) What are the potential ethical concerns that *X* might need to consider when using big data to make predictions or recommendations?

Refer to **Resource D** on pages 5 and 6 of the resource booklet to answer parts (d) to (f).

(d) (i) What is the difference between structured and unstructured data from *X*?

(ii) How do these differences impact the methods used to process and analyse the data?

(e) (i) How can techniques such as artificial intelligence or machine learning be applied to large datasets to uncover patterns and insights?

(ii) What are some possible challenges and considerations in using artificial intelligence or machine learning on big data from *X*?

(f) How could *X* process and analyse data in different types and formats (such as numbers and text stored in databases) and images, videos, and social media posts?

Potential uses of big data:

- Fraud detection in banking – one of the most common-use cases of big data is in fraud detection.
- Personalised marketing in retail – retail companies use big data to gain insights into customer behaviour and preferences.
- Traffic and transportation management – smart cities use big data to optimise traffic flow and transportation management.

(g) What are the current and future implications of big data?

In your answer:

- discuss the positive and negative implications
- consider the potential effects of these implications on people
- refer to the prompts above, or use an example you have studied this year to further support your answer.

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OR: **QUESTION THREE: Network Communication Protocols**

This question includes references to **Resources E and F** on pages 7 and 8 of the resource booklet.

(a) What is the internet protocol suite, and what is the purpose of the four abstraction layers (link, internet, transport, and application)? Refer to **Resource E** on page 7 of the resource booklet to support your answer.

(b) Which TWO layers and protocols are the most relevant for delivering video content reliably?
Refer to **Resource E** on page 7 of the resource booklet to support your answer.

Layer 1:

Protocol 1:

Justify your choice.

Layer 2:

Protocol 2:

Justify your choice.

(c) Refer to the code snippets in **Resource F** on pages 7 and 8 of the resource booklet. Which is most likely UDP, and which is most likely TCP?

Resource F (i):

Resource F (ii):

Justify your choice.

(d) (i) What is a TCP handshake?

(ii) Explain the exchange of messages that occurs during the handshake.

(e) (i) What is a TCP checksum?

(ii) How can the TCP checksum protect against data corruption or tampering?

(f) (i) What is the internet relay chat protocol (IRC) used for?

(ii) Explain TWO examples where the protocol could be used.

The Internet of Things (IoT) refers to the growing network of connected devices, sensors, and systems that collect and share data over the internet. These devices can be found in a wide range of settings, including homes, businesses, and public spaces, and can be used for a variety of purposes.

These devices can be controlled and monitored remotely, and communicate with other devices using Network Control Protocols (NCP) to create a network of connected "things".

NCP handles tasks such as security and network monitoring and device and data management.

Examples of IoT devices include: smart thermostats, smartwatches, smart locks, connected cars, connected appliances, smart city infrastructure, industrial IoT devices, health monitoring devices, and many more.

(g) (i) How are network control protocols used to manage and control the communication with Internet of Things (IoT) networks?

(ii) What are some impacts that the use of these protocols could have on people? Consider both positive and negative impacts in your response.