Government of **Western Australia**
School Curriculum and Standards Authority

SAMPLE ASSESSMENT TASKS

COMPUTER SCIENCE
ATAR YEAR 11

Acknowledgement of Country

Kaya. The School Curriculum and Standards Authority (the Authority) acknowledges that our offices are on Whadjuk Noongar boodjar and that we deliver our services on the country of many traditional custodians and language groups throughout Western Australia. The Authority acknowledges the traditional custodians throughout Western Australia and their continuing connection to land, waters and community. We offer our respect to Elders past and present.

Sample assessment task

Computer Science – ATAR Year 11

Task 1 – Unit 1

Assessment type: Project

Conditions:

Time for the task:

- Part 1: 3 weeks for the completion of the investigation and design of the project

- Part 2: 4 weeks for the development and evaluation of the project

Task weighting: 20 % of the school mark for this pair of units

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Introduction

Use the software development framework, design and create an interactive game or puzzle using Python. Some classic game examples include:

- a card game (e.g., BlackJack or Uno)

- a board game (e.g., Snakes and Ladders or Connect 4)

- a puzzle game (e.g., 2048).

To successfully develop your game, you will need to make use of:

- variables and constants using appropriate naming conventions and data types

- data structures including one-dimensional arrays

- a variety of control structures, including sequence, selection and iteration

- a modular approach using functions and parameter passing.

Your final project needs to be complex enough to demonstrate your understanding of software development. If you are unsure if your idea for a game will meet the requirements, make sure you consult your teacher.

Task Requirements

Part 1

Investigate

- Break down the steps required to produce your software project and develop a timeline for when each of these steps needs to be completed.

- Problem outline
  - Write a brief outline of the purpose game and its objectives.

- Problem description
  - Write a detailed description of the game that includes:
    - the objective of the game
    - the rules of the game
    - how the game is played
    - how the scoring system works
    - how the winner is decided
    - any other more advanced play techniques/strategies.

- Write a detailed list of requirements for your game or puzzle based on the problem description that you have written. Suitably classify these requirements.

Design

- Using pseudocode, write an algorithm showing the core logic for the game to show how the game works. Note: this algorithm will not resemble your final, fully functioning code. It should simply demonstrate how the core logic for the game works.

- Test your algorithms using trace tables and appropriate test data.

Part 2

Develop

- Using a modular approach, create your program using Python. Ensure you use good programming practices as indicated in the syllabus.

- Develop a test plan for your program to ensure that it is fully tested and documented. Your test plan should include appropriate test data, type and range checks. You should document this test plan in a table outlining the input, the expected output and what actually happened.

Evaluate

- Reflect on the success of your system and how well it meets the system requirements. To perform your user acceptance testing, you should:
  - consider how well your program meets the requirements you developed in Part 1
  - consider what aspects of your program could be improved and the quality of the user experience. You might want to get your peers to test your program and give feedback.

- document any known bugs and/or limitations with your program and explain how they impact the performance of the system
  Note: as part of your evaluation, you should consider any changes that you have made to your design and justify these changes.

- Reflect on the process you followed to develop your system and how you could improve this process. Some aspects you should consider include:
  - what worked well?
  - what didn't work well?
  - what would you do differently next time?

- Document the sources you used to get information about how to develop your system, including all websites and textbooks.

Submission Requirements

Part 1

For Part 1, you are to produce a **single, well formatted PDF** document. This document should include:

- a cover page

- suitable headings to make each section clear

- headers and footers

- appropriate terminology, explanations and written expression

- diagrams created using appropriate software

This file should be named **YourSurname_Project1Part1.**

Part 2

For Part 2, you are to produce:

- a single, well formatted PDF document that includes all changes to the design and your evaluation. This document should be named **YourSurname_Project1Part2Documentation** and should include:
  - a cover page
  - suitable headings to make each section clear
  - headers and footers
  - appropriate terminology, explanations and written expression
  - diagrams created using appropriate software (if appropriate)

- a single folder that includes your entire project, including any images and/or sound files that are required to run your program. This folder should be **compressed to a zip file** and named **YourSurname_Project1Program**

Marking Criteria

Part 1 (40% of the total assessment task)

Marking key for sample assessment task Part 1

Description	Marks
Development Schedule	
Breaks down the project planning into a series of meaningful steps and a realistic timeline for completing each step has been included	2
Breaks down the project into a limited series of steps with some attempt at showing a timeline.	1
Subtotal	**/2**
Problem Outline	
Accurately outlines of the purpose of the game.	1
Subtotal	**/1**
Problem Description	
Provides a clear and detailed explanation of the game, its rules and objectives and how it is played, with reference to scoring and determining a winner, and advanced gaming techniques/strategies.	5
Clearly explains of the game, its rules and objectives and how it is played, with reference to scoring and/or advanced gaming techniques.	4
Describes the game, its rules and objectives and how it is played, with reference to some scoring and/or advanced gaming techniques.	3
Gives a limited description of game with some reference to game play.	2
Gives a limited description of game that is unclear and/or incomplete.	1
Subtotal	**/5**
Requirements	
Provides a clear and detailed list of requirements that fully meet the needs of the problem description. Suitably classifies requirements.	4
Completes a list of requirements that meet the needs of the problem description. Classifies requirements.	3
Provides a list of requirements that mostly meet the needs of the problem description. Partially classifies requirements.	2
Provides an incomplete list of requirements that meet some of the needs of the problem description. Makes a limited attempt at classifying requirements	1
Subtotal	**/4**

Description	Marks
Algorithms	
Provides a completed algorithm in pseudocode that provides a reasonable representation of the core game logic, using correct symbols and/or syntax.	5
Provides a completed algorithm in pseudocode that provides a representation of the core game logic, using correct symbols and/or syntax.	4
Provides a mostly complete algorithm in pseudocode that provides a partial representation of the core game logic, with symbols and/or syntax that is mostly correct.	3
Provides an algorithm with an partial solution to playing the game, with some errors in syntax, logic and/or symbols being used	2
Provides a partially correct algorithm and/or uses incorrect symbols/syntax.	1
Subtotal	**/5**
Develops an accurate algorithm that contains no logic errors, and demonstrates the use of a range of control structures	3
Develops an accurate algorithm that may contain minor logic errors, and uses a range of control structures.	2
Develops an algorithm that contains logic errors, and uses a minimal range of control structures.	1
Subtotal	**/3**
Trace Tables	
Completes comprehensive algorithm logic testing using appropriate test data in trace table provided	3
Partially tests algorithm using trace table using appropriate test data	2
Partially tests algorithm with trace table, using incorrect format and/or incomplete test data.	1
Subtotal	**/3**
Total Part 1	**/23**

Part 2 (60% of the total assessment task)

Marking key for sample assessment task Part 2

Description	Marks
Use of programming structures	
Makes consistent and appropriate use of a variety of control structures. Uses data types appropriately, including effective use of arrays, constants, variables, selection and iteration.	5
Makes appropriate use of a variety of control structures, including selection and iteration. Mostly uses data types appropriately with constants and variables.	4
Makes use of a variety of control structures, although may not use most appropriate structures at times. Attempts to make appropriate use of a variety of data types for variables, including some use of arrays.	3
Attempts to use a variety of control structures such as selection and/or iteration. Makes limited use of data types with variables and some attempt at using arrays appropriately.	2
Makes minimal use of selection and iteration in code, with inappropriate use of different data types. Provides arrays that are not used, or are used inappropriately, and do not serve required purpose.	1
Subtotal	**/5**
Good programming practice	
Appropriately structures code, making effective use of modularisation and parameter passing with appropriate naming conventions and use of white space.	5
Mostly structures code appropriately, making use of modularisation and parameter passing with use of appropriate naming conventions and white space.	4
Creates simplistic code using modularisation with some use of parameter passing. Mostly uses appropriate naming conventions with some use of white space.	3
Attempts to make code and use of modularisation with limited consideration of parameters. Uses some naming conventions used, although these may be inconsistent.	2
Produces poorly structured code that makes minimal or no use of modularisation. Uses naming conventions throughout the code are inconsistent and/or not meaningful.	1
Subtotal	**/5**
Uses accurate and useful comments throughout the code to explain the purpose of modules where necessary.	3
Uses comments that help make code readable.	2
Makes limited use of comments throughout code.	1
Subtotal	**/3**

Description	Marks
Functionality	
Develops an effective and efficient program with minimal bugs.	4
Develops an effective program, but may contain some bugs.	3
Develops a program with a significant number of bugs.	2
Partially completes program implementing minimal system requirements.	1
Subtotal	**/4**
Test Plan	
Completes a detailed test plan and documents testing of the program. Considers all possible inputs and game scenarios.	5
Completes a test plan and documents testing of the program. Considers possible inputs and game scenarios.	4
Completes test plan and documents testing of the program. Considers some possible inputs and game scenarios.	3
Completes and documents a partial test plan. Considers limited inputs and game scenarios.	2
Develops a minimal test plan and/or provides minimal documentation of program testing.	1
Subtotal	**/5**
User Acceptance Testing	
Demonstrates a detailed evaluation of how the program meets the requirements identified in Part 1, including discussion of the user experience.	5
Evaluates how the program meets the system requirements , with discussion of the user experience.	4
Completes a partial evaluation of how the program meets the requirements, with a superficial discussion of the user experience.	3
Completes a limited evaluation of how the program meets the system requirements.	2
Completes a superficial evaluation of the program and how it meets the system requirements.	1
Subtotal	**/5**
Provides a detailed discussion of how the final product could be improved and documents any bugs and/or limitations.	5
Describes bugs and/or limitations with reference to how the final product could be improved.	4
Identifies bugs and/or limitations, without reference to their impact on the final product.	3
Attempts to identify bugs and/or limitations, with no or limited discussion.	2
Subtotal	**/4**

Description	Marks
Retrospective	
Completes a detailed evaluation of the development process and suggests future impacts.	3
Completes an evaluation of the development process that was used including some suggested future impacts.	2
Completes a minimal evaluation of the development process with superficial comments on development process used and suggested future impacts.	1
Subtotal	**3**
Total Part 2	**/34**
Total	**/57**

Sample assessment task

Computer Science – ATAR Year 11

Task 3 – Unit 1

Assessment type: Theory test: Network Communications and programming

Conditions
Time for the task: 60 minutes in class

Task weighting: 10% of the school mark for this pair of units

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1. Describe the purpose of the DoD TCP/IP model. (2 marks)

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2. List **one (1)** key protocol for each layer of the DoD TCP/IP model. (4 marks)

Application	
Transport	
Internet	
Network	

3. Describe **three (3)** key differences between IPv4 and IPv6.   (6 marks)

    i.   _____

          _____

          _____

    ii.   _____

          _____

          _____

    iii. _____

          _____

          _____

4. Explain the role of IP addresses in relation to network communications.   (3 marks)

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5. List three factors that affect network performance.   (3 marks)

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    _____

    _____

6. Describe a risk of unauthorised access to a network.   (2 marks)

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7. Fibre optic cables are available in either single-mode or multi-mode. Outline one characteristic of each mode. (2 Marks)

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8. Describe the function of a router and identify which layer of the TCP/IP model routers operate on. (3 Marks)

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9. Data collisions can affect network performance. Outline a way of reducing data collisions in a small network. (2 Marks)

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10. Explain the role of a firewall and an operating system in contributing to securing a network.   (6 marks)

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11. GoodValue Supermarket Corporation provides a network to its physical warehouse, main office and online virtual customers.

    The main office network comprises of a web server, wireless access points, laptops, desktop PC, firewall, a switch and a router. The main office and the warehouse are connected via the internet. The warehouse requires a modem to complete this connection. As yet, no devices are installed in the warehouse; this needs to be rectified to allow for wireless tablets to be used in the warehouse. The warehouse will require a secure connection with minimal data collisions. Numerous network devices are required to achieve this.

    Using Cisco conventions, draw a network diagram containing both the warehouse connections and the main office for GoodValue Supermarket Corporation. Label all transmission media and devices when appropriate.   (17 marks)

12. A local cricket team would like an algorithm written that adds the runs of the 11 players and provides the total number of runs. Write an algorithm using pseudocode for this requirement.

(7 marks)

Begin

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End

13. Write an algorithm to calculate the average age in years of 40 students at an after-school club (5 marks)

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14. Below is a Module to test which number is the largest. Based on this algorithm, complete desk checking (trace table) with the numbers **2, 3, 6, 5, 7, 1000**. (6 marks)

Module DisplayLargestNumber
Largest = 0
Input (Number)
Repeat
If Number > Largest then
Largest = Number
End If
Input (Number)
Until (Number>999)
Output ('The largest number is,' +Largest)
End Module

Largest	Number	Number > Largest	Largest = Number	Number	Number > 999	Output

Total = 68 marks

Task 3 Unit 1 Marking key

1. Describe the purpose of the DoD TCP/IP model.

Description	Marks
Describes the purpose of the DoD TCP/IP model.	2
States the purpose of DoD TCP/IP.	1
Total	**2**

Answer could include, but is not limited to:
- standardised communication protocol for networking
- specify how data is transferred from one device to another
- allows for long distance communications.

2. List **one (1)** key protocol for each layer of the DoD TCP/IP model.

Description	Marks
One mark per each correct protocol	1–4 (1 mark for each key protocol)
Total	**4**

Answer could include, but is not limited to:

Application	SMTP, FTP, HTTP, DHCP, DNS, PING
Transport	TCP & UDP
Internet	IPV6, IPv4, ARP
Network	Ethernet

3. Describe **three (3)** key differences between IPv4 and IPv6.

Description	Marks
For each key difference:	
Describes a key difference between IPv4 and IPv6	2
Identifies a key difference between IPv4 and IPv6	1
Total	**6**

Answer could include, but is not limited to:
- IPv6 provides a larger number of address possibilities IPv4 has a limited amount of addresses
- IPv4 uses a 32-bit address for its Internet addresses. IPv6 uses a 128-bit Internet addresses.
- IPv6 uses both letters and numbers IPv4 only uses numbers
- IPv6 doesn't have checksum fields while IPv4 does have checksum fields
- IPv6 binary bits are separated by colons (:) and IPv4 uses dots(.)
- IPv6 is Hexadecimal while IPv4 is dot decimal notation.

4. Explain the role of IP addresses in relation to network communications.

Description	Marks
Explains the role of IP addresses in relation to network communications.	3
Gives a limited explanation of the role of IP addresses in relation to network communications.	2
Makes superficial comment/s about IP addresses.	1
Total	**3**

Answer could include, but is not limited to:
- IP addresses are used to identify device so that data packets can be sent and received by a device
- Devices will not receive data if an IP address is incorrectly set
- IP addresses can be assigned statically or dynamically
- IP addresses identify the host or device on a network.

5. List three factors that affect network performance

Description	Marks
Correctly lists three factors that affect network performance.	1–3 (1 mark for each factor)
Total	**3**

Answer could include, but is not limited to:
- bandwidth
- network design
- data collisions
- excess broadcast traffic.

6. Describe a risk of unauthorised access to a network

Description	Marks
Describes a risk of not preventing unauthorised access to a network	2
Identifies a risk of not preventing unauthorised access to a network	1
Total	**2**

Answer could include, but is not limited to:
- Unauthorised access to a network can lead to the loss of data, the creation of a backdoor, installation of malicious software and can lead to destruction of the network.

7. Fibre optic cables are available in either single-mode or multi-mode. Outline one characteristic of each mode.

Description	Marks
Outlines a characteristic of single-mode.	1
Outlines a characteristic of multi-mode.	1
Total	**2**

Answer could include, but is not limited to:
- single-mode allows for faster data transmission and bandwidth
- multi-mode has higher attenuation and is less expensive

8. Describe the function of a router and identify which layer of the TCP/IP model routers operate on.

Description	Marks
Describes the function of a router.	2
Identifies the function of a router.	1
Subtotal	**2**
Correctly identifies the internet layer.	1
Subtotal	**1**
Total	**3**

Answer could include, but is not limited to:
- The function of the router include connecting two networks whilst managing and directing network traffic.

9. Data collisions can affect network performance. Outline a way of reducing data collisions in a small network.

Description	Marks
Outlines a way of reducing data collisions.	2
Identifies a way of reducing data collisions.	1
Total	**2**

Answer could include, but is not limited to:
- Network design can reduce data collisions. Designing the network into smaller segments and placing and using networking devices effectively will both aid in the reduction of data collisions. CSMA/CD can be used for collision detection if a collision occurs. CSMA/CA is used in wireless networks to avoid collisions.

10. Explain the role of a firewall and an operating system in contributing to securing a network.

Description	Marks
For both explanations:	
Explains the rolel of firewall/operating systems in securing a network	3
Describes the role of firewall/operating systems in securing a network	2
Identifies the role of firewall/operating systems in securing a network	1
Total	**6**

Answer could include, but is not limited to:
- Firewalls help secure networks by creating a barrier for unauthorised access via only allowing access to know or approved IP addresses and blocking unauthorised IP addresses. Firewalls reduce the likelihood of intrusion by malicious third parties.
- Operating systems can be used in networks to help secure the network by including Authentication, Authorisation and Accounting of accounts and privileges of the users. Operating systems are responsible for security updates and patches to help reduce threats to a network.

11. Using Cisco conventions, draw a network diagram containing both the warehouse connections and the main office for GoodValue Supermarket Corporation. Label all transmission media and devices where appropriate.

Description	Marks
Draws a network diagram that features following devices correctly sequenced/placed:	
• internet connection	1
• firewalls (1 mark per correctly placed firewall)	2
• modem	1
• routers (1 mark per correctly placed router)	2
• switches (1 mark per correctly placed switch)	2
• wireless access points (1 mark per correctly placed access point)	2
• printer	1
• laptop	1
• tablet/mobile device	1
• desktop	1
• correct placement of UTP copper cables (cat 5 or cat 6)	1
• correct placement of fibre optic cables	1
• correct use of CISCO conventions	1
Total	**17**

Description	
Answer could include, but is not limited to:	
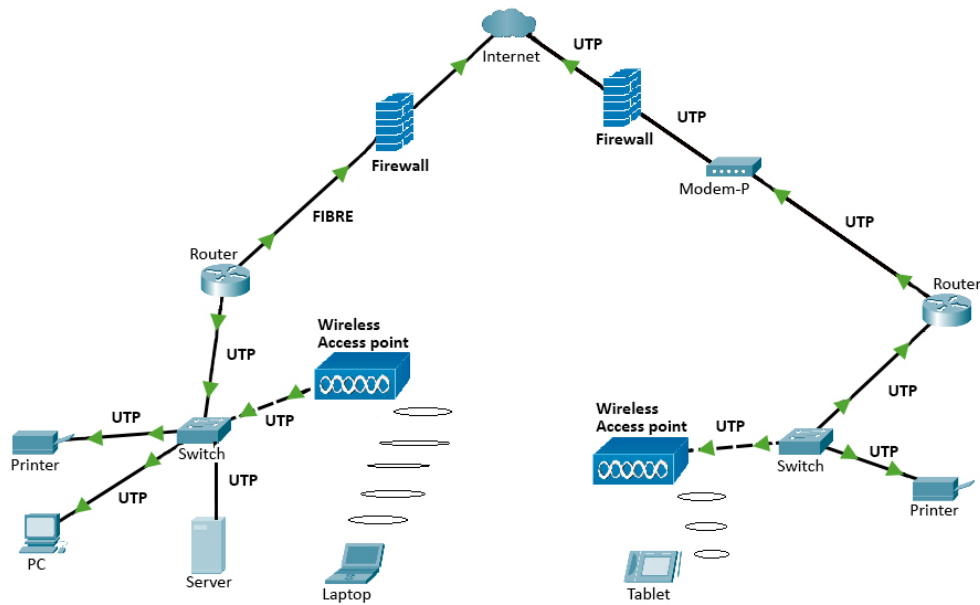
Note: students may choose to place the firewall after the router. This is also an acceptable answer.

12. A local cricket team would like an algorithm written that adds the runs of the 11 players and provides the total number of runs. Write an algorithm using pseudocode for this requirement.

Description	Marks
Total = 0	1
Player = 0 or 1	1
Repeat until structure	1
Input new_score (name can vary)	1
Calculation of total	1
Count of player	1
Output total	1
Total	**7**

Answer could include, but is not limited to:

```
Begin
total = 0
     player = 1
          Repeat
               Read (new_score)
               total = total + new_score
               player = player + 1
          until player > 11
     Output (total)
End
```

13. Write an algorithm to calculate the average age in years of 40 students stored in an array at an after-school club.

Description	Marks
Begin/End	1
Declare total variable	1
For loop (iteration) with end	1
Do total = total + age[n]	1
Print value	1
Total	**5**

Answer could include, but is not limited to:

```
Begin
    Int total = 0
    For n in 0 to 39
        Do total = total + age[n]
    Endfor
    Print total/40
End
```

14. Complete desk checking (trace table) below with the numbers 2, 3, 6, 5, 7, 1000   (6 marks)

Description	Marks
One mark per correct line	1–6
Total	**6**

Answer could include, but is not limited to:

Largest	Number	Number > Largest	Largest = Number	Number	Number > 999	Output
0	2					
		T	2	3	F	
		T	3	6	F	
		T	6	5	F	
		F		7	F	
		T	7	1000	T	The largest number is 7

					Total	**/68**

Sample assessment task

Year 11 ATAR Computer science

Task 7 – Part A

Assessment type: Practical test

Conditions

Time for the task: Single lesson for Part A and Part B

Task weighting: 5% of the school mark for this pair of units

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Normalise and create an ERD from unnormalised data   **(49 marks)**

Scenario

Perth Art Gallery buys and sells original artwork to Australian and international customers. Customers register their interest via their email address to keep in contact with the gallery, so they can receive updates about new artwork and then possibly buy artwork. The artwork the gallery deals in exclusive pieces of art that have a minimum price of $10,000 and a maximum of price of $10,000,000.

The data recorded is currently stored in a single spreadsheet. A snapshot of their data is provided.

Perth Art Gallery Customers and Sales

Customer name	Address	Phone number	Email	ArtID	Art Title	Type	ArtistID	Artist	Nationality	DoB	Date Deceased	Date Art Acquired	Acquisition Cost	Date Sold To Customer	Asking Price	Sales Price
				11	Blue Ranges	Painting	8	Albert Namatjira	Australian	1902-07-28	1595-08-08	2022-07-07	$22,000.00		$30,000.00	
James Brown	34 Handy Avenue, Perth, WA 6000, Australia	0895959595	james@brown.com	1	Luxembourg Gardens	Painting	1	Henri Matisse	French	1869-12-31	1954-11-03	2019-05-15	$120,000.00	2021-12-12	$150,000.00	$145,000.00
Andrew Watson	36 Dwyer Avenue, Murdoch, WA 6000, Australia	0895959494	andrew@watson.com	4	Coquelicots, La promenade - Poppies	Painting	4	Claude Monet	French	1840-11-14	1926-12-05	2020-02-25	$130,000.00	2021-06-02	$160,000.00	$155,000.00
Carine King	1 Altern Road, Gosnells, WA 6110, Australia	0895959292	carine.king@gmail.com	2	For the Love of God	Sculpture	6	Damien Hirst	English	1965-06-07		2017-02-15	$1,120,000.00	2021-08-12	$1,150,000.00	$1,145,000.00
Jean Ferguson	55 Wembley Way, Wembley, WA 6014, Australia	0895959191	234543@optus.net.au	5	Self-Portrait in a Striped T-shirt	Painting	1	Henri Matisse	French	1869-12-31	1954-11-03	2020-07-06	$250,000.00	2022-02-06	$280,000.00	$280,000.00
Lee Kwai	88 Forsyth Street, Adelaide, SA 5000, Australia	0411105566	kwai.lee@telstra.net.au													
Mary Saveley	1 Winston Street, Murdoch, WA 6150, Australia	0410564879	saveley@gmail.com													
Eric Young	65 Verti Avenue, Sydney, NSW 2000, Australia	0432656989	eric.young@wa.com													
Keith Franco	32 Albert Road, Willetton, WA 6155, Australia	0456895649	4ilkj234@yahoo.com													
Wendy Victorino	The Cottage, Innaloo, WA 6018, Australia	0895644598	thecottage@gmail.com	6	Woman with Mustard Pot	Painting	2	Pablo Picasso	Spanish	1881-10-25	1973-04-08	2019-09-14	$150,000.00	2020-08-25	$180,000.00	$185,000.00
Julie Bertrand	106 Lidora Drive, Wellington WA 5012, New Zealand	65499879	bertrandj@gmail.com	7	The Persistence of Memory	Painting	3	Salvador Dali	Spanish	1904-05-11	1989-01-23	2020-11-12	$650,000.00	2020-12-05	$780,000.00	$775,000.00
Michael Frick	4565 Long Avenue, Subiaco, WA 6008 Australia	0895959090	mike@frick.com	3	Impression, Sunrise	Painting	4	Claude Monet	French	1840-11-14	1926-12-05	2018-06-25	$2,145,000.00	2020-10-14	$3,145,000.00	$3,145,000.00
Mory Kentary	43 Baden Avenue, Perth, WA 6000, Australia	0894566548	mory@gmail.com													
Anne Roulet	43 Olive Road, London, E5 6JP, England	0209654874	anne.roulet@gmail.com	8	The Hay Wain	Painting	5	John Constable	English	1776-06-11	1837-03-31	2015-05-23	$4,120,000.00	2018-12-02	$4,150,000.00	$4,145,000.00
James Brown	34 Handy Avenue, Perth, WA 6000, Australia	0895959595	james@brown.com	3	Impression, Sunrise	Painting	4	Claude Monet	French	1840-11-14	1926-12-05	2021-01-22	$400,000.00	2021-01-22	$550,000.00	$555,000.00
				9	The Starry Night	Painting	7	Vincent van Gogh	Dutch	1853-03-30	1890-07-29	2022-05-09	$1,650,000.00		$1,780,000.00	
				10	Van Gogh self-portrait	Painting	7	Vincent van Gogh	Dutch	1853-03-30	1890-07-29	2021-12-12	$1,850,000.00		$2,780,000.00	

1a. Normalise the data to 3NF and represent all entities, attributes and keys using relational notation.   (11 marks)

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1b. Explain the steps you took to take the unnormalised data to 1NF.   (3 marks)

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1c. Explain the steps you took to take the 1NF data to 2NF.   (3 marks)

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1d. Explain the steps you took to take the 2NF data to 3NF.   (3 marks)

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2. Create an entity relationship diagram (ERD) using crow's foot notation showing all entities, relationships, cardinalities and keys. Note: do not include non-key attributes.   (7 marks)

3. Complete a data dictionary for the table containing the sales of the artwork including at least **four (4)** unique constraints. Note: the gallery wants to allow customers in future to use their email address to login. (11 marks)

Name	Datatype	Size	Description	Constraint

4. Create your database   (11 marks)

Use SQL to create a database based on your ERD. Ensure the relationships are established and all your attributes are correct with appropriate datatypes and sizes. You do not need to include any non-key attributes.

Task 7 Part A Marking key

1a – Normalise the data to 3NF and represent all entities, attributes and keys using relational notation. (11 marks)

Description	Mark
Relational Notation	
Appropriately named entities	1–4
All entities have an appropriately named Primary Key	1–4
Correctly identifies foreign keys	1–3
Total	**11**

Example answer:

ARTIST (ArtistID PK, LastName, FirstName, Nationality, DateOfBirth, DateDeceased)

ARTWORK (ArtworkID PK, ArtistID FK, Title, ArtType, Description)

CUSTOMER (CustomerID PK, LastName, FirstName, Street, City, State, PostCode, Country, PhoneNumber, Email)

SALE (SaleID PK, CustomerID FK, ArtworkID FK, DateAcquired, AcquisitionCost, DateSold, AskingPrice, SalePrice)

Accept any other relevant answers

1b – Explain the steps you took to take the unnormalised data to 1NF. (3 marks)

Description	Mark
1NF	
Explains the process of 1NF	2
Makes a statement about 1NF	1
Subtotal	**2**
Provides an example from supplied data.	1
Subtotal	**1**
Total	**3**

Example answer:
First normal form rules require attributes to be single values (atomic), attributes must have unique names, values of a given attribute must be the same data type, no records can be identical (unique).
The customer name is not atomic, this has been separated into two attributes, firstname and lastname.

Accept any other relevant answers.

1c – Explain the steps you took to take the 1NF data to 2NF.   (3 marks)

Description	Mark
2NF	
Explains the process from 1NF to 2NF	2
Makes a statement about 2NF	1
Subtotal	**2**
Provides an example from sample data.	1
Subtotal	**1**
Total	**3**
Example answer: Data is in 1NF and there should be no partial dependencies of any column on the primary key. Accept any other relevant answers	

1d – Explain the steps you took to take the 2NF data to 3NF.   (3 marks)

Description	Mark
3NF	
Explains the process from 2NF to 3NF.	2
Makes a statement about 3NF.	1
Subtotal	**2**
Provides an example from sample data.	1
Subtotal	1
Total	**3**
Example answer: Data is in 2NF and all non-primary attributes are dependent on the primary key (no transitive dependencies). Accept any other relevant answers.	

2 – Create an entity relationship diagram (ERD) using crow's feet notation showing all entities, relationships, cardinalities and keys. Note: do not include non-key attributes.   (7 marks)

Description	Mark
ERD	
Correctly identifies cardinalities (1 mark per cardinality).	1–3
Identifies all primary keys identified.	1
Identifies All foreign keys identified.	1
Identifies all correct attributes.	1
Uses correct notation for crow's foot.	1
Total	**7**

Note: follow through marks given as per normalised relational notation in Part 1a.
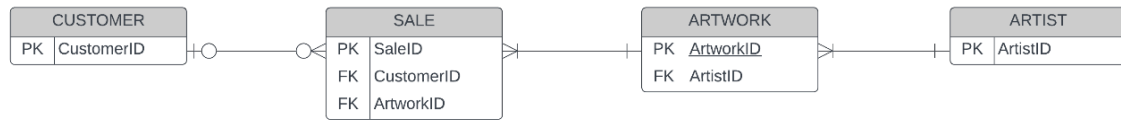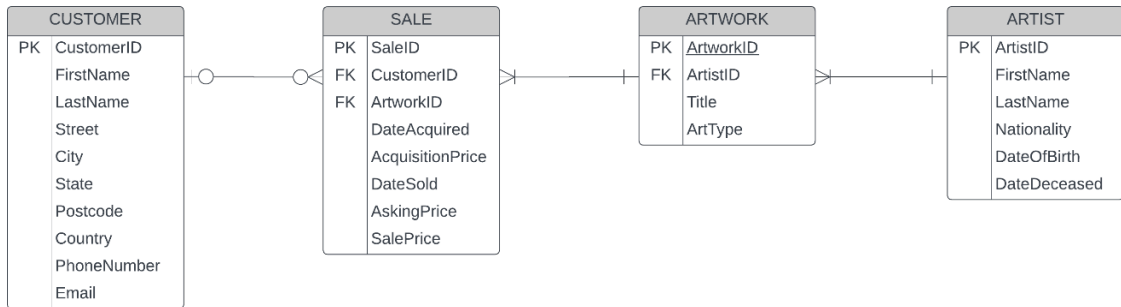
CUSTOMER	
PK	CustomerID

SALE	
PK	SaleID
FK	CustomerID
FK	ArtworkID

ARTWORK	
PK	ArtworkID
FK	ArtistID

ARTIST	
PK	ArtistID

Table with all attributes provided to answer any student questions.

CUSTOMER	
PK	CustomerID
	FirstName
	LastName
	Street
	City
	State
	Postcode
	Country
	PhoneNumber
	Email

SALE	
PK	SaleID
FK	CustomerID
FK	ArtworkID
	DateAcquired
	AcquisitionPrice
	DateSold
	AskingPrice
	SalePrice

ARTWORK	
PK	ArtworkID
FK	ArtistID
	Title
	ArtType

ARTIST	
PK	ArtistID
	FirstName
	LastName
	Nationality
	DateOfBirth
	DateDeceased

Accept any other relevant answers

Question 3 – Complete a data dictionary for the table containing the sales data including at least **four (4)** unique constraints. (11 marks)

Note: the gallery wants to allow customers in future to use their email address to login.

Data dictionary	Mark
All correct attributes identified	1
ArtworkID Foreign key is an integer datatype	1
All other datatypes appropriate	1
Size of prices 7 or 7,2	1
Size of dates 10	1
Descriptions meaningful	1
Constraint: SalesID set as Primary Key or Unique	1
Constraint: CustomerID not required and foreign key	1
Constraint: ArtworkID required and foreign key	1
Constraint: All date attributes include format (in description or constraint)	1
Constraint: All price attributes > 10000 and < 10000000	1
Total	**11**

Example answer:

Name	Datatype	Size	Description	Constraint
SalesID	Integer or Text	10	Unique identifier of sale.	Primary key or Unique Auto incremented or Required
CustomerID	Integer or Text	10	Unique identifier for customer	Not required Foreign key
ArtworkID	Integer	10	Unique identifier for artwork.	Required Foreign key
DateAcquired	Date	10	Date artwork was purchased by gallery	Required Format: YYYY-MM-DD
AcquisitionPrice	Float	7,2	Cost of artwork to the gallery	Required > 100000 and < 10000000
DateSold	Date	10	Date artwork sold to customer	Not required Format: YYYY-MM-DD
AskingPrice	Float	7,2	Advertised price of artwork	Required > 100000 and < 10000000
SalePrice	Float	7,2	Price artwork sold for	Not required > 100000 and < 1000000

Accept any other relevant answers

Question 4– Create your database   (11 marks)

Use SQL to create a database based on your ERD. Ensure the relationships are established and all your attributes are correct with appropriate datatypes and sizes. You do not need to include any non-key attributes.

Description	Mark
Database	
Creates tables,	1–4
Creates primary keys with datatypes.	1–4
Creates relationships using foreign keys.	1–3
Total	**11**

Sample Answer:

CREATE TABLE Artist (
ArtistID INTEGER PRIMARY KEY AUTOINCREMENT
);

CREATE TABLE Artwork (
ArtworkID INTEGER PRIMARY KEY AUTOINCREMENT,
ArtistID INTEGER NOT NULL,
FOREIGN KEY(ArtistID) REFERENCES Artist(ArtistID)
);

CREATE TABLE Customer (
CustomerID INTEGER PRIMARY KEY AUTOINCREMENT
);

CREATE TABLE Sale (
SaleID INTEGER PRIMARY KEY AUTOINCREMENT,
CustomerID INTEGER NULL,
ArtworkID INTEGER NOT NULL,
FOREIGN KEY(ArtworkID) references Artwork(ArtworkID),
FOREIGN KEY(CustomerID) references Customer(CustomerID)
);

Accept any other relevant answers.

Sample assessment task

Year 11 ATAR Computer Science

Task 7 – Part B

Assessment type: Practical test

Time for the task: Single lesson for Part A and Part B

Task weighting: 5% of the school mark for this pair of units

_____

Write SQL queries   **(46 marks)**

Scenario

Perth Art Gallery buys and sells original artwork to Australian and international customers. Customers register their interest via their email address to keep in contact with the gallery, so they can receive updates about new artwork and then possibly buy artwork. The artwork the gallery deals in exclusive pieces of art that have a minimum price of $10,000 and a maximum of price of $10,000,000.

You can open the provided SQLite database file using https://sqliteonline.com/

The schema (database structure) provides indications about how you should write your SQL.

Normalisation:

Customer (CustomerID, LastName, FirstName, Street, City, State, PostCode, Country, PhoneNumber, Email)

Sale (SaleID, DateAcquired, AcquisitionPrice, DateSold, AskingPrice, SalesPrice, CustomerID FK, ArtworkID FK)

Artwork (ArtworkID, Title, ArtType, Description, ArtistID FK)

Artist (ArtistID, LastName, FirstName, Nationality, DateOfBirth, DateDeceased)

You must create queries to run against the data to find answers to the questions below.

Question 1 **(3 marks)**

Show all the customer details for people who live in Western Australia.

Question 2 **(2 marks)**

Identify how many artists are in the database.

Question 3 **(3 marks)**

Identify how many sales have been made.

Question 4 **(2 marks)**

Based on the schema of the Artist table, describe why an American artist cannot to be inserted.

Complete SQL queries to extract or modify the following information.

Question 5 **(5 marks)**

Display the full name of the customer and title of the artwork for SaleID 1.

Question 6 **(3 marks)**

Display the name of the artist who is still alive (do not use the ArtistID primary key identifier).

Question 7 **(5 marks)**

Display the full name of the artist and the titles of Claude Monet's artwork in alphabetical order of artwork titles.

Question 8 **(4 marks)**

Display the price and title of the most expensive sale.

Question 9 **(3 marks)**

Display the total profit from all art that has been sold.

Question 10 **(5 marks)**

Display the titles of all artwork sold in 2020.

Question 11 **(2 marks)**

Add the following customer:

Sally Jenkins,153 Westerly Avenue, Perth, WA, 6000, Australia, sally@jenkins.com, 08 9595 6491.

Question 12 **(5 marks)**

Today, Sally Jenkins buys the Blue Ranges painting for $30,000.00. Update the data accordingly.

Question 13 **(2 marks)**

Eric Young has requested his data be removed from the gallery's database. Delete this record.

Task 7 Part B Marking key

Question 1   **(3 marks)**

Show all the customer details for people who live in Western Australia.

Description	Marks
SELECT *	1
FROM Customer	1
WHEREState = 'WA';	1
Total	**3**
Sample output:	

CustomerID	LastName	FirstName	Street	City	State	Postcode	Country	PhoneNumber	Email
1	Brown	James	34 Handy Avenue	Perth	WA	6000	Australia	089595959	James@brown.com
2	Watson	Andrew	36 Dwyer Avenue	Murdoch	WA	6150	Australia	0895959494	andrew@watson.com
3	King	Carine	1 Altern Road	Gosnells	WA	6110	Australia	0895959292	carine.king@gmail.com
4	Ferguson	Jean	55 Wembley Way	Wembley	WA	6014	Australia	0895959191	234543@optus.net.au
6	Saveley	Mary	1 Winston Street	Murdoch	WA	6150	Australia	0410564879	saveley@gmail.com
8	Franco	Keith	32 Albert Road	Willetton	WA	6155	Australia	0456895649	4ilkj234@yahoo.com
9	Victorino	Wendy	The Cottage	Innaloo	WA	6018	Australia	0895644598	thecottage@gmail.com
11	Frick	Michael	4565 Long Avenue	Subiaco	WA	6008	Australia	0895959090	frick@frick.com
12	Kentary	Mory	43 Baden Avenue	Perth	WA	6000	Australia	0894566548	mory@gmail.com

Question 2 **(2 marks)**

Identify how many artists are in the database.

Description	Marks
SELECT COUNT(ArtistID)	1
FROM Artist	1
Total	**2**
Sample output:	
COUNT(ArtistID) 7	

Question 3 **(3 marks)**

Identify how many sales have been made.

Description	Marks
SELECT COUNT(SaleID)	1
FROM Sale	1
WHERE DateSold IS NOT NULL;	1
Total	**3**
Sample output:	
COUNT(Sale.SaleID) 9	

Question 4 **(2 marks)**

Based on the schema of the artist table, describe why an American artist cannot to be inserted.

Description	Marks
Describes why a constraint limits what data can be added.	1
Identifies the Artist constraint does not have American in line 10 as a nationality value option.	1
Total	**2**
Example answer: A constraint ensures the data follows rules for inserting attributes. The schema contains a Nationality constraint which does not include 'American'.	
Accept any other relevant answer.	

Question 5 **(5 marks)**

Display the full name of the customer and title of the artwork for SaleID 1.

Description	Marks
SELECT Customer.FirstName, Customer.LastName, Artwork.Title	1
FROM Customer, Sale, Artwork	1
WHERE Customer.CustomerID = Sale.CustomerID AND Sale.ArtID = Artwork.ArtworkID AND Sale.SaleID = 1; (1 mark for each join and 1 mark for SaleID	3
Total	5

Output:

Customer Name   Title
Carine King   Coquelicots, La promenade - Poppies

Question 6 **(3 marks)**

Display the name of the artist who is still alive (do not use the ArtistID primary key identifier).

Description	Marks
SELECT FirstName, LastName	1
FROM Artist	1
WHERE DateDeceased IS NULL;	1
Total	3

Output:

FirstName   LastName
Damien   Hirst

Question 7 **(5 marks)**

Display the full name of the artist and the titles of Claude Monet's artwork in alphabetical order of artwork titles.

Description	Marks
SELECT Artist.FirstName, Artist.LastName, Artwork.Title	1
FROM Artist, Artwork	1
WHERE Artwork.ArtistID = Artist.ArtistID And Artist.LastName = 'Monet'	2
ORDER BY Artwork.Title ASC;	1
Total	5

Output:

FirstName   LastName   Title
Claude   Monet   Coquelicots, La promenade - Poppies
Claude   Monet   Impression, Sunrise

Question 8 (4 marks)

Display the price and title of the most expensive sale.

Description	Marks
SELECT MAX(Sale.SalesPrice), Artwork.Title (1 mark for MAX() and one mark for Artwork.Title)	2
FROM Sale, Artwork	1
WHERE Sale.ArtworkID = Artwork.ArtworkID;	1
Total	**4**

Output:

MAX(Sale.SalesPrice)	Title
4145000	Coquelicots, La promenade - Poppies

Question 9 (3 marks)

Display the total profit from all art that has been sold.

Description	Marks
SELECT SUM(Sale.SalesPrice - AcquisitionPrice)	1
FROM Sale	1
WHERE Sale.DateSold IS NOT NULL;	1
Total	**3**

Output:

Total Profit
1325000

Question 10 (5 marks)

Display the titles of all artwork sold in 2020.

Description	Marks
SELECT Artwork.Title	1
FROM Artwork, Sale	1
WHERE Artwork.ArtworkID = Sale.ArtworkID AND DateSold >= 20200101 AND DateSold < 20210101; (1 mark for join and 2 marks for greater than and less than dates)	3
Total	**5**

Output:

Title
Impression, Sunrise
Luxembourg Gardens

Question 11 **(2 marks)**

Add the following customer:

Sally Jenkins,153 Westerly Avenue, Perth, WA, 6000, Australia, sally@jenkins.com, 08 9595 6491.

Description	Marks
Insert syntax correct and contains all necessary attributes	1
Values syntax correct and contains all correct data	1
Total	**2**

Output:

INSERT INTO Customer (LastName, FirstName, Street, City, State, PostCode, Country, PhoneNumber, Email)

VALUES ('Jenkins', 'Sally', '153 Westerly Avenue', 'Perth', 'WA', '6000', 'Australia', '0895956491', 'sally@jenkins.com');

Question 12 **(5 marks)**

Today, Sally Jenkins buys the Blue Ranges painting for $30,000.00. Update the data accordingly.

Description	Marks
Update statement identifies Sale table	1
Set statement sets today's date, updates customer id to 14 and updates sold price to 30000.00 (1 mark for each correct element)	1–3
Where statement identifies the record either using SaleID or ArtworkID	1
Total	**5**

Output:

UPDATE Sale
SET DateSold = date('now'), CustomerId = 14, SalePrice = 30000.00
WHERE SaleId = 1;

Question 13 **(2 marks)**

Eric Young has requested his data be removed from the gallery's database. Delete this record.

Description	Marks
Delete identifies customer table and has correct syntax	1
Where statement correctly identifies CustomerId 7	1
Total	**2**

Output:

DELETE FROM Customer WHERE CustomerId = 7;

Acknowledgements