

Victorian Certificate of Education
Year

SUPERVISOR TO ATTACH PROCESSING LABEL HERE

STUDENT NUMBER

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APPLIED COMPUTING: DATA ANALYTICS

Written examination

Day Date

Reading time: *.* to *.* (15 minutes)

Writing time: *.* to *.* (2 hours)

QUESTION AND ANSWER BOOK

Structure of book

Section	Number of questions	Number of questions to be answered	Number of marks
A	20	20	20
B	4	4	20
C	13	13	60
			Total 100

- Students are permitted to bring into the examination room: pens, pencils, highlighters, erasers, sharpeners and rulers.
- Students are NOT permitted to bring into the examination room: blank sheets of paper and/or correction fluid/tape.
- No calculator is allowed in this examination.

Materials supplied

- Question and answer book of 27 pages
- Detachable insert containing a case study for Section C in the centrefold
- Answer sheet for multiple-choice questions

Instructions

- Detach the insert from the centre of this book during reading time.
- Write your **student number** in the space provided above on this page.
- Check that your **name** and **student number** as printed on your answer sheet for multiple-choice questions are correct, **and** sign your name in the space provided to verify this.
- All written responses must be in English.

At the end of the examination

- Place the answer sheet for multiple-choice questions inside the front cover of this book.
- You may keep the detached insert.

Students are NOT permitted to bring mobile phones and/or any other unauthorised electronic devices into the examination room.

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SECTION A – Multiple-choice questions**Instructions for Section A**

Answer **all** questions in pencil on the answer sheet provided for multiple-choice questions.

Choose the response that is **correct** or that **best answers** the question.

A correct answer scores 1; an incorrect answer scores 0.

Marks will **not** be deducted for incorrect answers.

No marks will be given if more than one answer is completed for any question.

Question 1

The most appropriate design tool for producing an infographic is

- A. an IPO chart.
- B. a storyboard.
- C. a layout diagram.
- D. a data dictionary.

Question 2

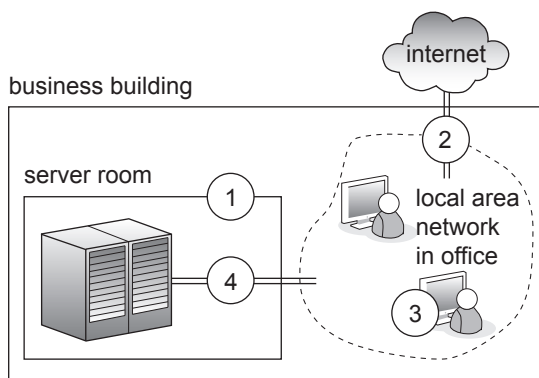
An online shoe store wants to provide an educational infographic for customers on its existing website. It will include information on shoe-related topics, such as selecting the right type of shoe, fun-run training tips and information on foot and leg injuries, written by a physiotherapist and a podiatrist. Customers will be able to post comments or ask questions related to the topics covered.

Which one of the following would be used to evaluate the effectiveness of the infographic?

- A. observing customers two weeks after the infographic is published
- B. surveying customers online three months after the infographic is published
- C. interviewing the physiotherapist three to six weeks after the infographic is published
- D. entering dummy data into the 'post a comment' section to find out if comments can be submitted

Question 3

The diagram below shows the main security controls that an organisation has in place to protect its data and information.



The most likely security control placed at the point labelled '2' is

- A. a firewall.
- B. a shredder.
- C. a biometric scanner.
- D. audit trail software.

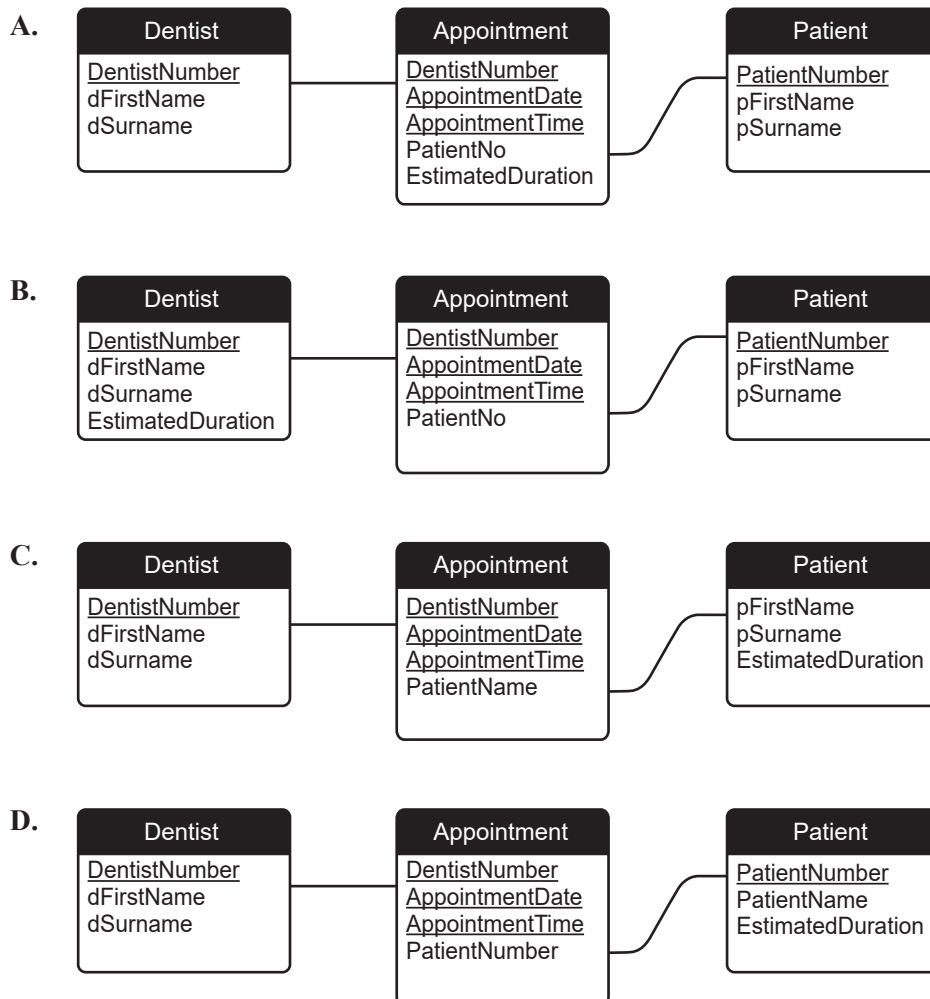
Question 4

A dental clinic has been storing its appointment details in a spreadsheet. An extract from the spreadsheet is shown below. The business would like to develop some data visualisations that show appointment durations, popular times for appointments and the busiest times of the year for appointments.

Dentist number	Dentist name	Patient number	Patient name	Appointment date and time	Estimated duration
S0001	John Smith	P0001	Lyle Richards	14/01/2020 9:30	20 minutes
S0001	John Smith	P0002	Betsy Taylor	20/01/2020 10:15	20 minutes
S0002	Mary Tanner	P0003	Delia Torres	27/01/2020 11:30	30 minutes
S0002	Mary Tanner	P0104	Elsie Ferguson	28/01/2020 11:30	1.5 hours
S0002	Mary Tanner	P0104	Elsie Ferguson	11/02/2020 12:30	2.0 hours
S0001	John Smith	P0005	Kristen Haynes	1/03/2020 14:00	20 minutes

Before the business develops some data visualisations, it would like to import its data into a relational database.

Which one of the following diagrams shows the data in third normal form?



Question 5

Which one of the following best represents the scope of a software solution?

- A. the development of an evaluation strategy
- B. a description of the boundaries of a solution
- C. a description of the quality attributes of a solution
- D. the conditions to be considered when designing a solution

Question 6

Australian postcodes are made up of four digits and there are currently more than 3000 postcodes in use. A basketball manager is collecting primary data through a survey about how many people play basketball around Australia, and where and why. The manager is in the process of entering the postcodes into database software.

Which one of the following is a suitable verification technique for ensuring a valid postcode has been entered each time a postcode entry is made?

- A. a type check
- B. a range check
- C. an existence check
- D. a proofreading check

Question 7

Which one of the following is the most appropriate list of criteria for checking the integrity of data?

- A. timeliness, authenticity, correctness, accuracy
- B. timeliness, accountability, relevance, accuracy
- C. timeliness, authenticity, reasonableness, referencing
- D. correctness, accountability, relevance, reasonableness

Question 8

A design principle that relates to the usability of a dynamic data visualisation is

- A. alignment.
- B. ease of use.
- C. validation.
- D. balance.

Question 9

A query in a relational database involves

- A. displaying records in a form.
- B. presenting a summary of data.
- C. sorting records into alphabetical order.
- D. extracting data from two or more tables.

Question 10

David runs a small trucking business. Details of each trip, as shown in the example below, are kept in a logbook in each vehicle. David wants to develop a data visualisation for his employees, displaying how the trucks are used.

Vehicle	Begin	End	Distance	Fuel
small truck B40	Melbourne 13 425 km	Adelaide 14 145 km	720 km	diesel 75 L

Locations, overall distance and fuel-use data are to be stored in a table in a relational database before being used in the data visualisation.

Which set of field names would support the most efficient use of the database?

- A. Fuel, L, Distance, Begin, End
- B. FuelType, Litres, Distance, Begin, End
- C. Type, Fuel, Distance, BeginLocation, EndLocation
- D. FuelType, Litres, Distance, BeginLocation, EndLocation

Question 11

Wesley runs an online cooking school. He has noticed that his feedback forms on recipes are inconsistent – some ask for a rating out of five and others a rating out of 10. When a chart is created, very few recipes rate higher than five, even though there are many positive comments about them in the feedback boxes.

This problem is most likely the result of

- A. a lack of evaluation.
- B. diminished data integrity.
- C. ineffective security strategies.
- D. the design documentation being incomplete.

Question 12

Information created to educate a target audience about career options should be

- A. age appropriate and gender inclusive.
- B. appropriate for all ages and gender exclusive.
- C. suitable for adults only and culturally exclusive.
- D. suitable for young people only and culturally inclusive.

Question 13

Which one of the following factors would be the most likely to influence the integrity of data when referencing the source of a data set?

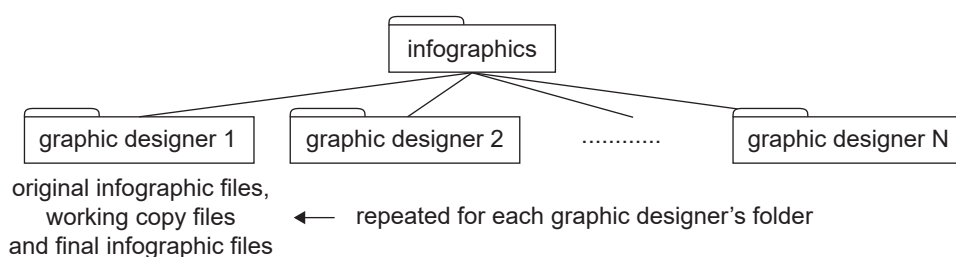
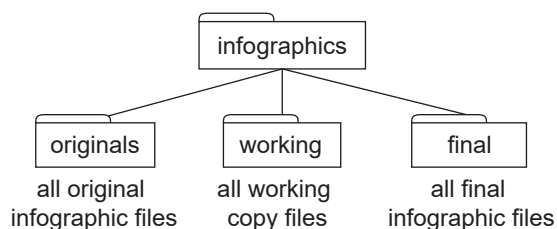
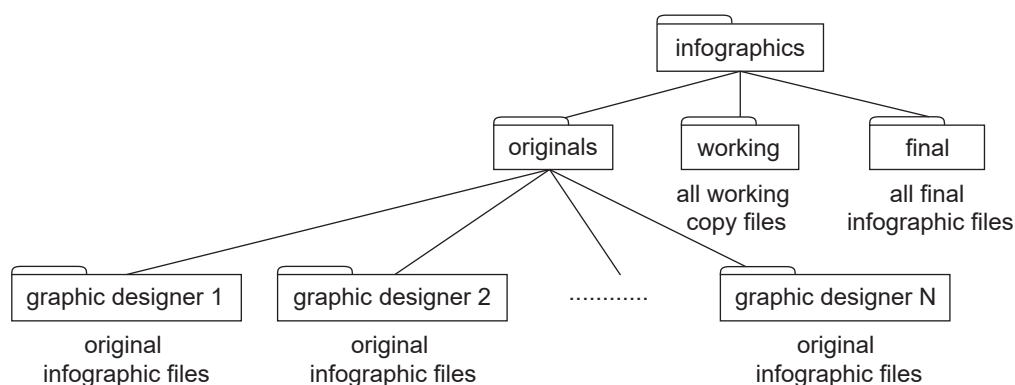
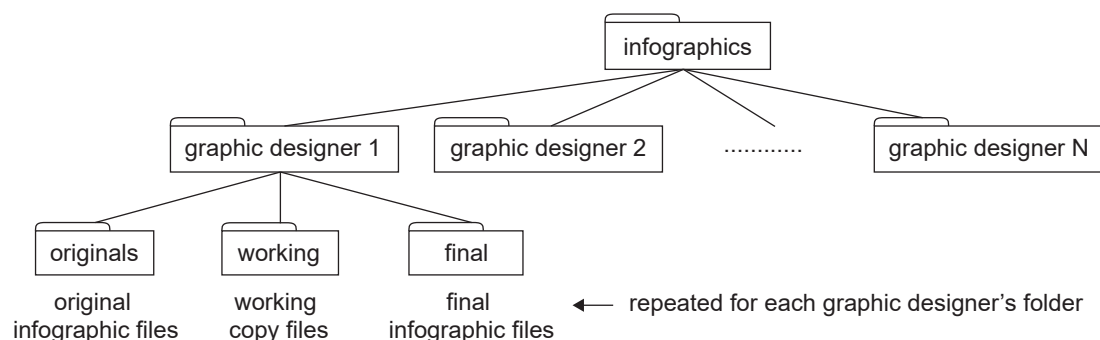
- A. accuracy
- B. timeliness
- C. authenticity
- D. reasonableness

Question 14

The project manager working with a group of graphic designers is setting up a folder structure for a new project, based on the following conditions:

- Several graphic designers will be sending original infographics to the project manager over the next three months. At the end of the project, each graphic designer's full set of original infographics will need to be easily identified. The originals will never be manipulated but they will need to be archived at the end of the project.
- When an infographic needs to be manipulated, the project manager will make a copy of the original and then the copy will be manipulated as required. There may be many different versions saved. These will require daily backup.
- The final infographics that are approved for use will need to be sent as a batch to the infographic creation team. They will also need to be archived at the end of the project.

Which one of the following folder structures will most efficiently meet these storage, backup and archiving needs?

A.**B.****C.****D.**

Question 15

Bentwood Softball Club needs to ensure that all umpires are registered to umpire games in Victoria. To do this, the club needs to record detailed personal information regarding each umpire's skill set. Recently, the club undertook an online survey of all 35 umpires as a way of documenting all their skills. The club plans to develop data visualisations around these skill sets.

The most secure way for Bentwood Softball Club to store the data from the survey is on

- A. a DVD kept in the trophy case in the club's boardroom.
- B. the 'members only' social media page on the club's website.
- C. the hard drive of the club secretary's computer in the club's office.
- D. a laptop with restricted access kept in a locked case in the club's safe.

Question 16

A Victorian school is creating a series of dynamic data visualisations to showcase its student population over the last few years. These will be displayed at an information night at the start of the school year. The dynamic data visualisations will include information about students' subjects, their extra-curricular activities, where students live and yearly enrolments.

What would be one example of the non-functional requirements of these dynamic data visualisations?

- A. display totals only
- B. validate all input data
- C. be displayed in a PowerPoint presentation
- D. only use data from the years 2019 to 2020

Question 17

Quantitative data includes data that is

- A. numeric only.
- B. character only.
- C. character and numeric.
- D. character and Boolean.

Question 18

A design tool is selected to represent a table in a record. The table includes the table name, field names, data types and descriptions.

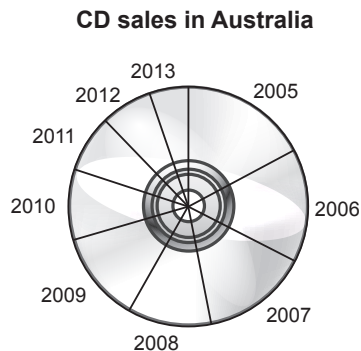
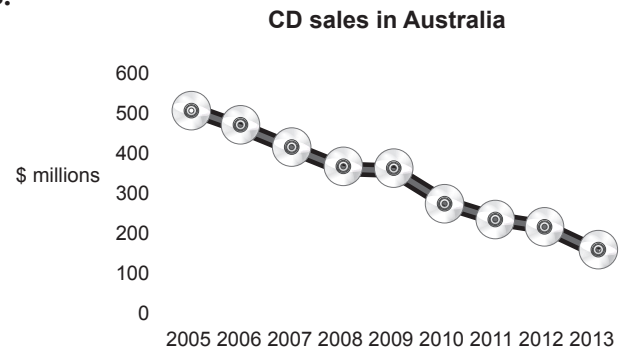
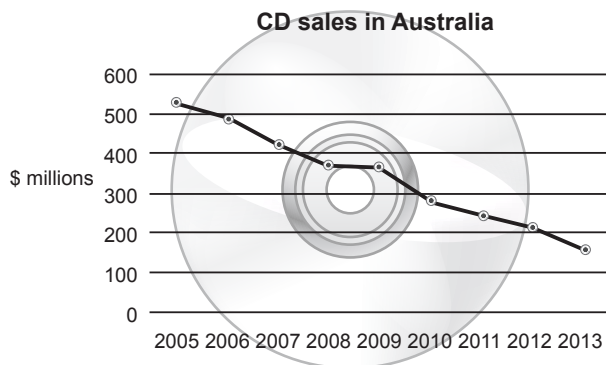
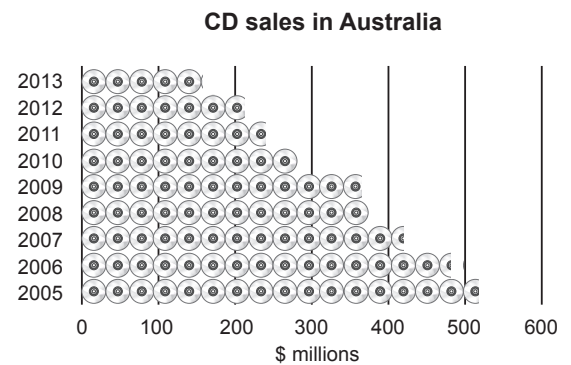
This design tool is an example of

- A. an IPO chart.
- B. a Gantt chart.
- C. a storyboard.
- D. a data dictionary.

Question 19

Janet has been investigating the decline in sales of music CDs from 2005 to 2013. She would like to create a chart, for inclusion in an infographic, that clearly shows the decline in sales over this period.

Which one of the following is the best chart to use in Janet's infographic?

A.**B.****C.****D.****Question 20**

Samantha needs to acquire data and save this data to her mobile phone in order to use it. She needs to access wi-fi to do this.

Which one of the following combinations of digital system components would Samantha need to use?

- A.** a wi-fi connection to input the data and a screen to view the data
- B.** a wi-fi connection to receive the data and a screen to view the data
- C.** a wi-fi connection to input the data and device memory to store the data
- D.** a wi-fi connection to receive the data and device memory to store the data

SECTION B – Short-answer questions**Instructions for Section B**

Answer **all** questions in the spaces provided.

Question 1 (3 marks)

Nikita is in her first year at university, where she is studying meteorology. During the second semester, she is asked to research and analyse weather patterns in order to predict the weather for the coming summer months of December, January and February.

Identify an efficient data collection technique that Nikita could use and describe how she could use it for her research into weather patterns.

Data collection technique _____

Description _____

Question 2 (4 marks)

A Physical Education teacher has collected a large number of student results for running times across the year and entered them into a spreadsheet. The data must now be entered into a database.

Describe the two validation checks that could be done on the student results for running times, as listed below, and provide an example for each.

- Range check

Description _____

Example _____

- Type check

Description _____

Example _____

Question 3 (6 marks)

Elias wants to create an infographic to inform the local community about his local amateur theatre group. In 2020 the group will celebrate 20 years of productions. Over the years the group has collected a lot of data about the number of productions and actors, audience attendances, costs, funding and ratings.

Elias would like to put this data into one spreadsheet so that he can manipulate the data before using it for an infographic.

- a.** Outline two functions that Elias could use to manipulate the data in the spreadsheet. 2 marks

Function 1 _____

Function 2 _____

- b.** Identify and describe two design principles that Elias should follow regarding the appearance of the infographic. 4 marks

Design principle 1 _____

Design principle 2 _____

Question 4 (7 marks)

An organisation stores the large amount of data and information that it has collected over the years, including client data, on a fileserver that is kept in a back office. Each night, a backup tape is made. Recently, a staff member became aware that, instead of being taken offsite, the backup tape was simply left on a cabinet in the back office where the fileserver is located. The staff member reports this incident to the head of the organisation.

- a. Outline two possible consequences for the organisation of violating the security measure of taking the backup tape offsite. 2 marks

Consequence 1 _____

Consequence 2 _____

- b. Recommend a strategy that could be used to improve the current practice of storing the backup tape as described above. Give your reasoning. 2 marks

- c. Having been alerted to the current careless data and information security practices within the organisation, the head of the organisation decides to investigate further. She discovers that the organisation has no disaster recovery plan.

Explain why the head of the organisation should be concerned about there being no disaster recovery plan. 3 marks

SECTION C – Case study**Instructions for Section C**

Please remove the insert from the centre of this book during reading time.

Use the case study provided in the insert to answer the questions in this section. Answers must apply to the case study.

Answer **all** questions in the spaces provided.

Question 1 (3 marks)

Based on the two charts on page 3 of the insert, does Sharon's research question seem like a good research question for further investigation? Justify your answer.

Question 2 (8 marks)

Sharon has identified the key tasks, time allocations and dependencies associated with her two-week investigation and she has listed these in a Gantt chart.

Sharon expects to begin the project on 3 June. She has a full day of training on the first Thursday and does not usually work on weekends. The incomplete Gantt chart is shown below.

Project: Investigation into penguin chick population decline			June																				
Task	Duration (days)	Predecessor	M 3	T 4	W 5	T 6	F 7	S 8	S 9	M 10	T 11	W 12	T 13	F 14	S 15	S 16	M 17	T 18	W 19	T 20	F 21	S 22	S 23
A Design, prepare and test online staff survey.	1	none																					
B Conduct online staff survey.	3	A																					
C Acquire secondary data.	2	A																					
D Close online staff survey.	0	B																					
E Validate and manipulate spreadsheet data.	2	C, D																					
F Generate ideas and design the online report.	1	E																					
G Develop infographic.	2	F																					
H Test and fix errors.	0.5	G																					
I Present infographic to the board.	0.5	H																					
J Finish project.	0	I																					

Keytask duration dependency milestone 

a. Complete the Gantt chart on page 14 by:

- drawing all task durations
- showing all dependencies, as indicated in the 'Predecessor' column
- marking both milestones.

5 marks

b. In the table below, tick (✓) the tasks that are on the critical path.

1 mark

A	B	C	D	E	F	G	H	I	J

c. During her investigation, Sharon encounters some unexpected events:

- There were insufficient responses to the online staff survey, so the survey remained opened for an extra day.
- Monday 10 June was a public holiday and extra crowds were expected. Sharon was required to work in the ticket office and in reception for the day, so she was not able to work on her investigation.

Annotate the Gantt chart on page 14 to reflect the adjustments required for the unexpected events described above. In your annotations, ensure that the new completion date of the project is clearly identified.

2 marks

Question 3 (5 marks)

In the online survey, Sharon wants to ask UBPP staff and volunteers to express their concerns regarding the penguin population. She will provide a list of potential impacts that humans can have on the penguins and staff can choose from the list. The list will include increased noise levels (NL), camera flashes (CF), litter (L) and physical interference (PI), plus others (O).

Sharon feels confident that she can determine a more accurate picture of the impact of humans on the penguins from the results of the survey than from just relying on anecdotal evidence; however, she is most concerned about responses to three questions that Michael has suggested she include:

1. How important is penguin conservation to you?
2. Why do you think the penguin population is decreasing?
3. How could visitors be made more aware of the potential dangers for penguins?

- a.** Describe **one** method Sharon could use so that the responses to these questions are coded to support data manipulation once the survey is closed.

2 marks

- b.** Use the coding method described in **part a.** to answer the following questions.

- i.** Suggest **one** technique Sharon could use to identify any patterns in the responses to the survey questions.

2 marks

- ii.** Identify **one** type of pattern Sharon could expect to find in the responses to the survey questions.

1 mark

Question 4 (2 marks)

As part of the considerations for the development of the infographic solution, Sharon is aware that she needs to analyse the requirements, constraints and scope of the investigation. After a conversation with Michael, she has a good understanding of the requirements and the scope; however, she is a little concerned about the constraints.

Identify two constraints that Sharon will need to consider when developing the infographic solution.

Constraint 1 _____

Constraint 2 _____

Question 5 (3 marks)

While her investigation will focus on the feedback from staff and volunteers through a survey, Sharon also wants to collect some data from large wildlife data repositories online. After an initial search, she is a little overwhelmed at the amount of data available from these repositories.

- a.** Describe a method Sharon could use to help her identify and select the appropriate data repositories for her investigation.

2 marks

- b.** Identify the standard referencing system that Sharon will need to use in order to acknowledge organisations for the intellectual property of the data she uses.

1 mark

Question 6 (7 marks)

Sharon has now collected her primary and secondary data. She is thinking about how she will proceed with the development of the infographic, but she needs to import her data into a spreadsheet first. She will then need to design a solution for her spreadsheet and develop some design ideas for the infographic.

- a.** Identify and outline two design tools for representing Sharon's spreadsheet solution. 2 marks

Design tool 1 _____

Design tool 2 _____

- b.** Describe two techniques Sharon could use to generate alternative design ideas for her infographic. 2 marks

Technique 1 _____

Technique 2 _____

- c.** Suggest one criterion Sharon could use to evaluate which of her designs she should choose for the infographic. Justify your answer. 3 marks

Criterion _____

Justification _____

Question 7 (6 marks)

Sharon has produced a mock-up of her preferred design for the infographic she will use to present her findings from the investigation to the management board. A mock-up of the design is shown below.

UBPP logo or penguin photo	Udiptula Beach Penguin Park
Introduction to UBPP Lorem ipsum dolor sit amet, consectetur adipiscing elit. Ut eu nisl a enim rhoncus euis mod. Suspendisse non laoreet sapien. Morbi et massa non sapien commodo bibendum. Sed sodales egestas dictum. Integer in sodales risus. Quisque egestas condimentum efficitur diam et aliquet. Aliquam massa ligula, rutrum at volutpat vel, convallis et dolor. Aenean imperdiet ultricies tellus, et efficitet anim id est laborum.	
Research question Lorem ipsum dolor sit amet, consectetur adipiscing elit. Ut eu nisl a enim rhoncus euis mod. Suspendisse non laoreet sapien et efficitet anim id est laborum ullamco.	
Penguin photo #1 Penguin photo #2 Penguin photo #3 Penguin photo #4 Penguin photo #5	
Findings Lorem ipsum dolor sit amet, consectetur adipiscing elit. Ut eu nisl a enim rhoncus euis mod. Suspendisse non laoreet sapien. Morbi et massa non sapien commodo bibendum. Sed sodales egestas dictum. Integer in sodales risus. Quisque egestas condimentum efficitur diam et aliquet. Aliquam massa ligula, rutrum at volutpat vel, convallis et dolor. Aenean imperdiet ultricies tellus, et efficitet anim id est laborum.	
Chart #1 World map showing global distribution of little penguins Chart #2 Little penguin facts Chart #3 Map of Australia showing little penguin locations	
References Lorem ipsum dolor sit amet, consectetur adipiscing elit. Ut eu nisl a enim rhoncus euis mod. Suspendisse non laoreet sapien. Morbi et massa non sapien commodo bibendum. Sed sodales egestas dictum. Integer in sodales risus. Quisque egestas condimentum efficitur diam et aliquet. Aliquam massa ligula, rutrum at volutpat vel, convallis et dolor. Aenean imperdiet ultricies tellus, et efficitet anim id est laborum.	

Based on the mock-up of the infographic on page 20, identify three software functions that would be suitable for creating the infographic solution and describe how each could be used to develop an effective solution.

Software function 1 _____

Description _____

Software function 2 _____

Description _____

Software function 3 _____

Description _____

Question 8 (3 marks)

Sharon has completed the infographic and is now ready to conduct some initial testing to see if it will perform as intended.

One of the tests involves the non-functional requirement of usability. She wants to test the following three attributes:

- clear key message
- visually appealing
- tells a story

Describe a suitable technique for testing each of these attributes.

Clear key message _____

Visually appealing _____

Tells a story _____

Question 9 (4 marks)

Sharon has developed several evaluation criteria to measure the effectiveness of the infographic for UBPP. Two of these criteria are as follows:

1. Charts are to be clear and easy to understand.
2. Minimal text is to be used to explain the message.

For each criterion, outline a strategy for evaluating the effectiveness of the infographic.

Strategy for criterion 1 _____

Strategy for criterion 2 _____

Question 10 (6 marks)

Last year Michael went on a study tour to research a range of tourist venues around Australia and the United States. He focused on the number of visitors and how they were handled by the venues, as well as how the organisations secured their data and information.

Michael is aware of the significant amount of work and research that UBPP performs and how vulnerable it could potentially be to any emerging threats. He is especially concerned about the types of threats UBPP faces in 2020 and beyond.

For each type of threat listed below, identify a specific threat and evaluate the potential damage or adverse effect of the specific threat to UBPP's data and information.

Type of threat	Specific threat	Evaluation
accidental		
deliberate		
events-based		

Question 11 (2 marks)

After evaluating potential threats to the organisation, Michael's next step is to determine how the threats could affect the integrity of the data.

Describe the potential impact of diminished data integrity to UBPP if it could not guarantee the authenticity of the secondary data collected for Sharon's research.

Question 12 (6 marks)

Once Michael starts to identify the threats to the organisation's data and information, as well as some possible data integrity issues, he decides to conduct a full evaluation of UBPP's current data and information security strategies.

Michael identifies the following issues, along with their physical and software security controls:

- no access restrictions for network users and any staff member or volunteer can access any files
- no audit trail software to determine which staff members are accessing which files and when
- backup procedures, particularly as part of UBPP's disaster recovery plan, are not being followed
- confidential documentation is thrown out into UBPP's general rubbish skip rather than being shredded when no longer required

Michael is also aware that there is key legislation for how UBPP should control the collection, storage, communication and disposal of its data and information.

Recommend and justify two strategies to improve UBPP's current data and information security strategies.

	Recommended strategy for improvement	Justification
Strategy 1		
Strategy 2		

Question 13 (5 marks)

On his study tour, Michael noticed that many of the tourist venues he visited used cloud storage as their main backup facility. He is considering using a local backup solution because he would prefer to have full control over the data.

- a.** State **one** important advantage to UBPP of using cloud storage as its backup facility. 1 mark

- b.** With regard to the disposal of data, explain how having a local backup solution would give Michael more control over the data than cloud storage. 2 marks

- c.** Describe **one** important test that UBPP should carry out to ensure that the data backup aspect of its disaster recovery plan will function correctly, regardless of whether it uses cloud storage or local storage. 2 marks

Insert for Section C – Case study

Please remove from the centre of this book during reading time.

Udiptula Beach Penguin Park

Udiptula Beach is a popular tourist destination on the south-eastern Victorian coast. Each evening, around 2000 visitors go to the Udiptula Beach Penguin Park (UBPP) to see little penguins returning to their nests. Visitor numbers have steadily increased over the past three years. The manager of UBPP is Michael Vesis.

Decline in penguin chick numbers

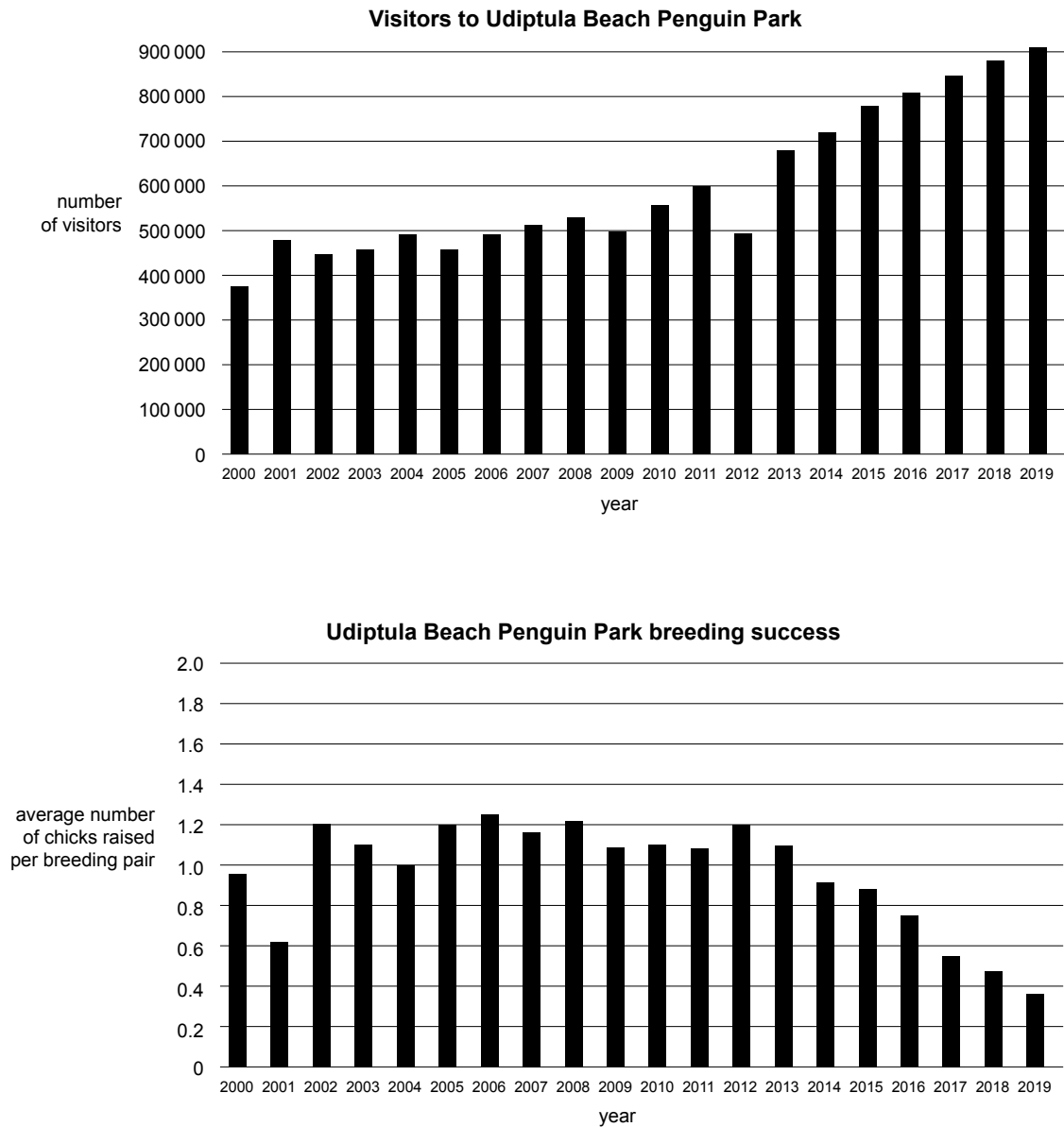
Sharon Chan is the head of Penguin Research at UBPP. While Michael is very pleased about the increasing number of visitors, Sharon has noticed that the number of penguin chicks born each year has started to decline. She wonders if there is a link between the two trends.

Sharon knows that the breeding season for penguins usually begins in winter, around June. She forms a research question: Are penguin chick numbers going down because of an increase in visitor numbers during winter?

After discussing her concerns with Michael, Sharon is given approval to investigate her research question. Michael gives her until 14 June to complete her investigation, in time for the next meeting of UBPP's management board. He asks her to present her findings as an infographic to the board and to make the infographic available for use online so that the public can be informed if Sharon's research question proves to be correct. This deadline gives Sharon two weeks to complete her investigation.

While preparing her investigation, Sharon discusses her research question with some colleagues. One colleague agrees that growing visitor numbers are a concern, but not because of the disturbance that visitors create. He thinks the problem is the increasing amount of litter the visitors leave behind. Considering this different point of view, Sharon thinks a survey of all staff and volunteers is needed to find out what other factors could explain a decline in penguin chick numbers. UBPP employs around 200 people and has many volunteers helping with various activities, so Sharon decides to use an online survey to collect the opinions of everyone who works at UBPP.

Before Sharon commences her investigation, she decides to check UBPP's last annual report, which has some basic data concerning the number of visitors to the park each year and the breeding success of the penguins since 2000. This data is shown in Data set 1 on page 3 of this insert.

Data set 1 – Two charts presented in UBPP’s last annual report**END OF INSERT**

Answers to multiple-choice questions

Question	Answer
1	C
2	B
3	A
4	A
5	B
6	D
7	A
8	B
9	D
10	D
11	B
12	A
13	C
14	C
15	D
16	C
17	A
18	D
19	B
20	D