

**B O A R D O F S T U D I E S**  
NEW SOUTH WALES

**2007**

**HIGHER SCHOOL CERTIFICATE  
EXAMINATION**

# Information Processes and Technology

## **General Instructions**

- Reading time – 5 minutes
- Working time – 3 hours
- Write using black or blue pen
- Draw diagrams using pencil

**Total marks – 100**

**Section I** Pages 2–12

**20 marks**

- Attempt Questions 1–20
- Allow about 40 minutes for this section

**Section II** Pages 14–19

**40 marks**

- Attempt Questions 21–24
- Allow about 1 hour and 10 minutes for this section

**Section III** Pages 20–27

**40 marks**

- Attempt TWO questions from Questions 25–28
- Allow about 1 hour and 10 minutes for this section

## Section I

20 marks





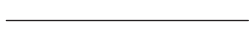



Attempt Questions 1–20

Allow about 40 minutes for this section

Use the multiple-choice answer sheet for Questions 1–20.

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- 1 Which of the following represents analog to digital conversion of a telecommunications signal?

	<i>Before conversion</i>	<i>After conversion</i>
(A)		
(B)		
(C)		
(D)		

- 2 While visiting a website that sells popular surfing movies, Lachlan decided to save an image from the website. Lachlan later used that image as part of a logo for his surfboard business, without permission.

How is Lachlan's action best described?

- (A) Breach of privacy
- (B) Protection of copyright
- (C) Infringement of copyright
- (D) Acknowledgement of sources

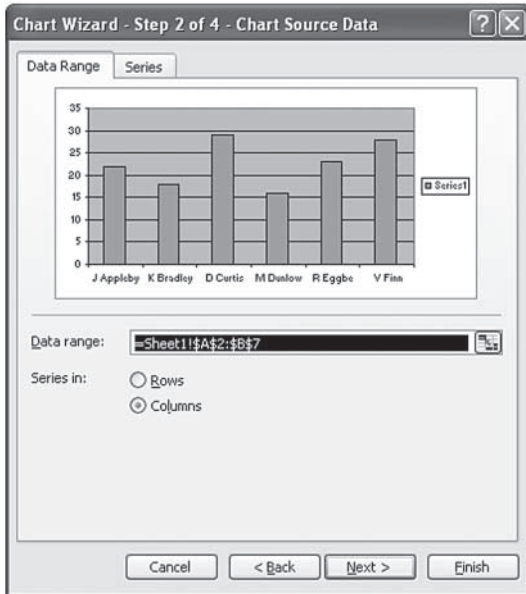
3 What communication medium is shown?



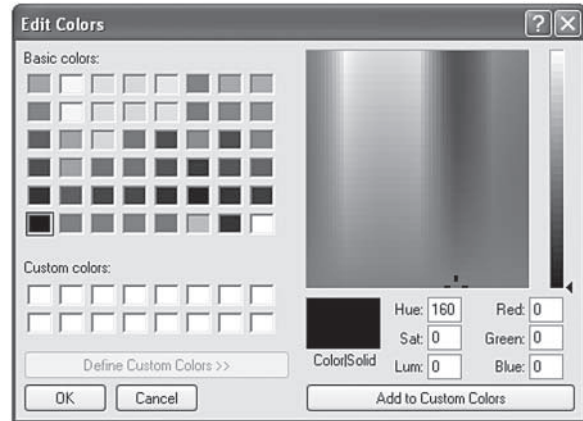
- (A) Coaxial cable
- (B) Optic fibre
- (C) Microwave
- (D) Twisted pair

4 Which screenshot shows a stage of a guided process in an application package?

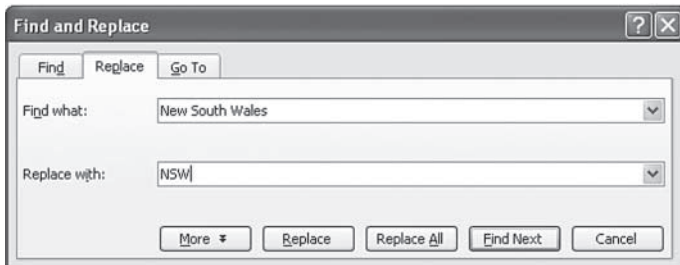
(A)



(B)



(C)



(D)

	A	B	C	D
1	Month	Pay		
2	Jan	\$ 1,063.00		
3	Feb	\$ 998.00		
4	Mar	\$ 1,104.00		
5	Apr	\$ 1,025.00		
6	May	\$ 886.00		
7	Jun	\$ 936.00		
8	Jul	\$ 873.00		
9	Aug	\$ 1,006.00		
10	Sep	\$ 976.00		
11	Oct	\$ 1,049.00		
12	Nov	\$ 884.00		
13	Dec	\$ 1,218.00		
14				
15	Total	\$ 12,018.00		

- 5 Which conflict resolution strategies would be best for a project leader to use to help his/her team overcome a disagreement?
- (A) Active listening and negotiation
  - (B) Role playing and model building
  - (C) Feasibility assessment and team building
  - (D) Interview techniques and prototype modification

- 6 In 2007 Centrelink installed a new data warehouse that stores detailed information on its clients. This information is available to other agencies in charge of welfare, employment and social policy.

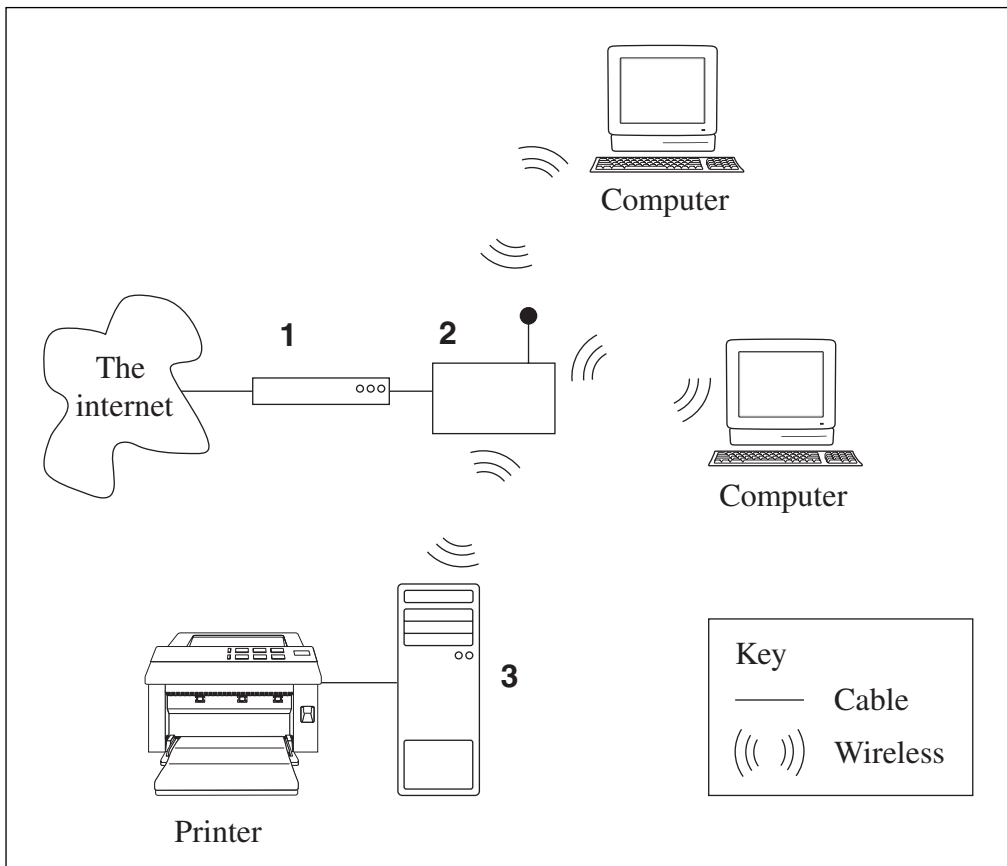
What technique will allow these agencies to retrieve detailed information from Centrelink's data warehouse?

- (A) Data back-up
  - (B) Data mining
  - (C) Normalisation
  - (D) What-if analysis
- 7 Sebastian is using an internet search engine to investigate the extinction of the Golden Toad species.

What search specification will locate the most relevant information?

- (A) "extinction + golden + toad"
- (B) extinction + golden + toad
- (C) extinction + "golden toad"
- (D) extinction – golden + toad

8 The diagram shows a network used in an office.



Which row of the following table most accurately identifies devices **1**, **2** and **3** in the diagram?

	<i>Device 1</i>	<i>Device 2</i>	<i>Device 3</i>
(A)	Broadband modem	Wireless router	Wireless print server
(B)	Wireless router	Broadband modem	Network file server
(C)	Network file server	Hub	Wireless print server
(D)	Broadband modem	Wireless print server	Wireless router

- 9 The Roads and Traffic Authority (RTA) uses a secure database in its offices to update information about licensed drivers in New South Wales.

Which option correctly identifies participants and data/information for this situation?

	<i>Participants</i>	<i>Data/information</i>
(A)	Drivers	Licence number, Driver's details
(B)	Drivers	Computer terminal, Internet
(C)	RTA employees	Licence number, Driver's details
(D)	RTA employees	Computer terminal, Internet

- 10 Bluetooth®-enabled devices such as mobile phones, laptops, printers and digital cameras exchange information over a wireless connection. To establish a connection, a Bluetooth®-enabled device will transmit:

- Name of device
- Device class
- Available services
- Technical details such as features, manufacturer and specifications

Other Bluetooth®-enabled devices may then respond.

What name is given to this process?

- (A) Handshaking
- (B) Network logon
- (C) Error correction
- (D) Cyclic redundancy check

- 11 Which option contains activities used for testing, evaluating and maintaining an information system?

	<i>Testing</i>	<i>Evaluating</i>	<i>Maintaining</i>
(A)	Checking that the original objectives are met	Using live data	Deciding on a system conversion method
(B)	Ensuring performance specifications are met	Checking that the original objectives are met	Applying a software upgrade
(C)	Using live data	Checking that the original objectives are met	Creating a prototype
(D)	Deciding on a system conversion method	Using live data	Backing up system data

- 12 The BB Little Athletics Club holds details of over 500 club members in a flat-file database. Lee would like to know the total number of boys and girls in each age group. This is a task done weekly to organise competitions.

What procedure would be the most efficient for Lee to use?

- (A) Construct and run a report that produces totals for each gender and age group.
  - (B) Construct and run an SQL query for each age group and each gender to find totals.
  - (C) Obtain a printed copy of the database, highlight the relevant records and manually count them.
  - (D) Construct an SQL query that orders records by age followed by gender, and then manually count each group.
- 13 The following address was noted in a technical manual for a school website.

`ftp://www.northpoinths.edu.au`

What is the main purpose of this address?

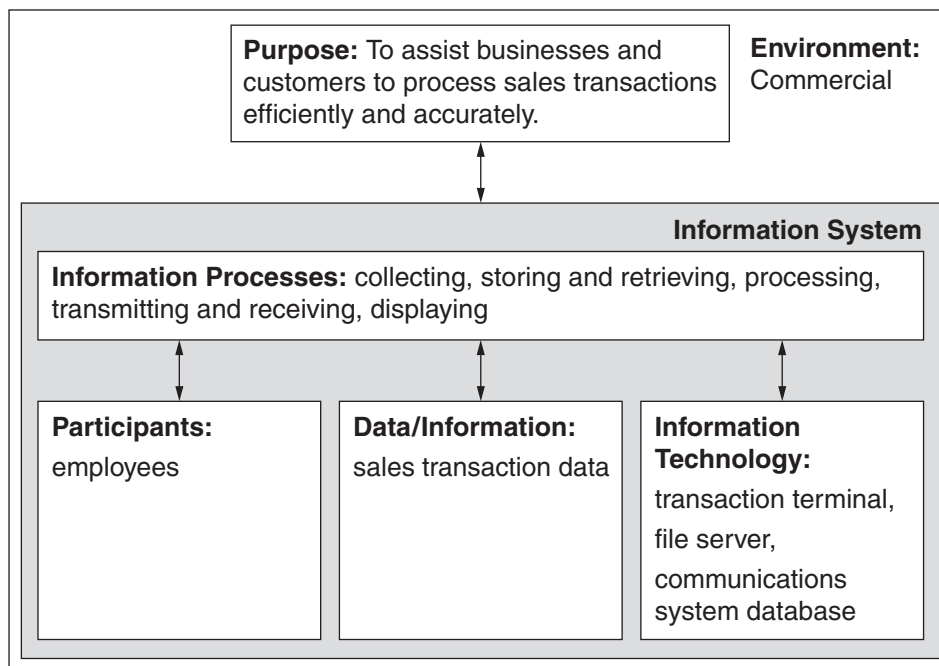
- (A) To locate the school's website
- (B) To locate the school's email server
- (C) To locate files to be uploaded and downloaded
- (D) To locate the school's database for the administrative staff

- 14 A library wishes to provide wireless ‘hot spots’ to allow people to access the internet using their laptop computers.

Which option most accurately compares the choice of wireless over cabled network?

	<i>Mobility for users</i>	<i>Risk of signal interception</i>	<i>Interference from electromagnetic radiation</i>
(A)	Better for wireless	The same for wireless and cabled	More likely for cabled
(B)	Better for wireless	More likely for wireless	More likely for wireless
(C)	The same for wireless and cabled	More likely for cabled	More likely for cabled
(D)	Better for wireless	More likely for wireless	More likely for cabled

- 15 Consider the information system represented in the diagram.



Which option most accurately describes this information system?

- (A) An ATM system
- (B) An EFTPOS system
- (C) A library loans system
- (D) A voicemail messaging system



- 16** A new online system is being developed to allow doctors to access patient records in hospital wards.

Which of the following does NOT relate to potential social and ethical issues of this new system?

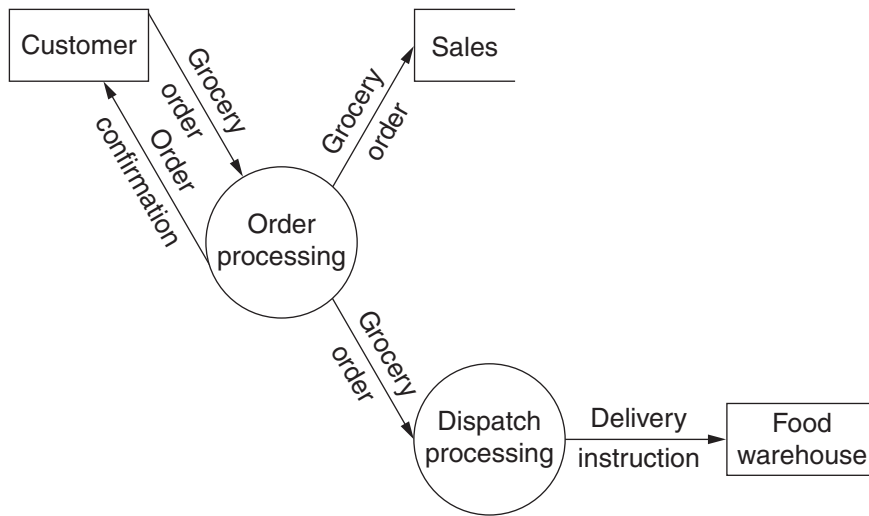
- (A) Protection of the system from unauthorised access
- (B) Inclusion of data validation techniques to ensure only accurate data is entered
- (C) Production of user documentation that helps doctors to easily access required data
- (D) Production of accurate system design documentation for future system development

- 17** The table shows pairs of statements about error detection methods.

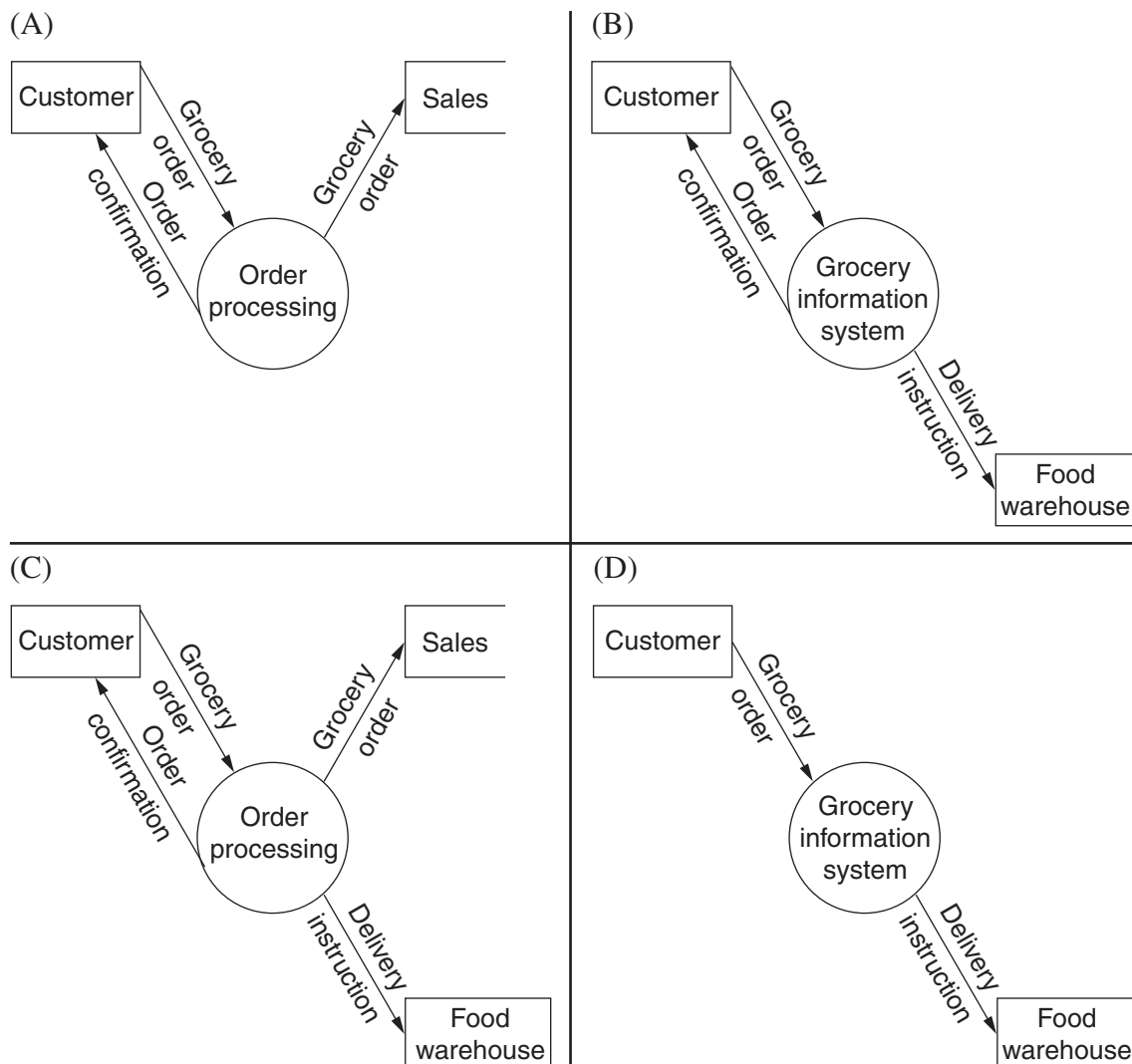
In which row are both statements TRUE?

	<i>Parity bit check will detect an:</i>	<i>Cyclic redundancy will:</i>
(A)	even number of bit changes	detect a change in the order of the data
(B)	odd number of bit changes	not detect a change in the order of the data
(C)	even number of bit changes	not detect a change in the order of the data
(D)	odd number of bit changes	detect a change in the order of the data

- 18 Ahmed is a systems analyst who has created a context diagram to model an online grocery store's information system. He has then refined the context diagram to create the following first draft data flow diagram.

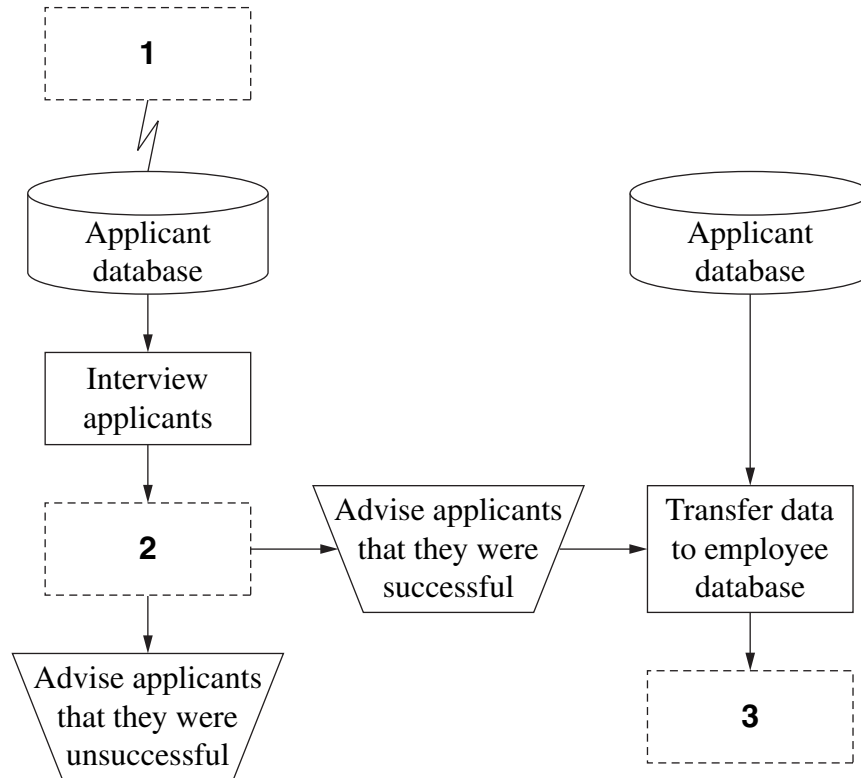


Ahmed now wants to check that his context diagram is consistent. Which context diagram below is consistent with his data flow diagram?



- 19 A company's recruitment system requires all applicants to submit their résumés over the internet. Once received, this information is stored in an applicant database. A selection panel interviews applicants. Applicants are advised by telephone of the success or otherwise of their applications. Details of the successful applicants are transferred to the employee database.

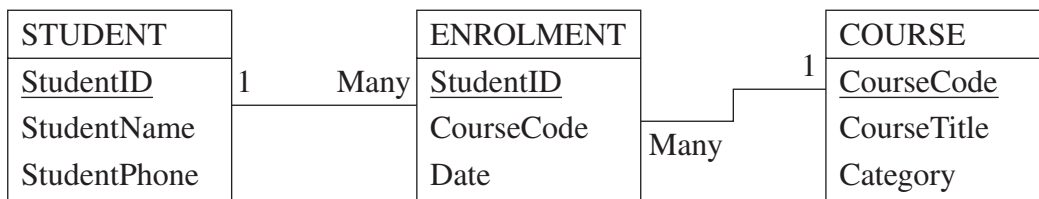
This system flowchart describes the recruitment system.



Which symbols would be included in areas **1**, **2** and **3**?

- |     | <b>1</b> | <b>2</b> | <b>3</b> |
|-----|----------|----------|----------|
| (A) |          |          |          |
| (B) |          |          |          |
| (C) |          |          |          |
| (D) |          |          |          |

20 The following tables are used by a university to record student enrolment in courses.



The university would like to include the details of a textbook (Title, Author, Publisher) for each course.

What would be the most effective way to do this without causing data redundancy?

- (A) Add a field 'Textbook' to the ENROLMENT table.
- (B) Add a field 'Textbook' to the COURSE table.
- (C) Create a table 'TEXTBOOK' and link it to the COURSE table with a one-to-one relationship.
- (D) Create a table 'TEXTBOOK' and link it to the ENROLMENT table with a one-to-many relationship.

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**Please turn over**

## Section II

40 marks

Attempt Questions 21–24

Allow about 1 hour and 10 minutes for this section

Answer each question in a SEPARATE writing booklet. Extra writing booklets are available.

If you include diagrams in your answer, ensure that they are clearly labelled.

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Marks

**Question 21** (9 marks) Use a SEPARATE writing booklet.

A family of five people has dial-up internet access at home. They plan to upgrade to cable internet access. The family wants to send text-based email and download podcasts, radio, television and music online. The family has the following table of information about plans offered by an internet service provider.

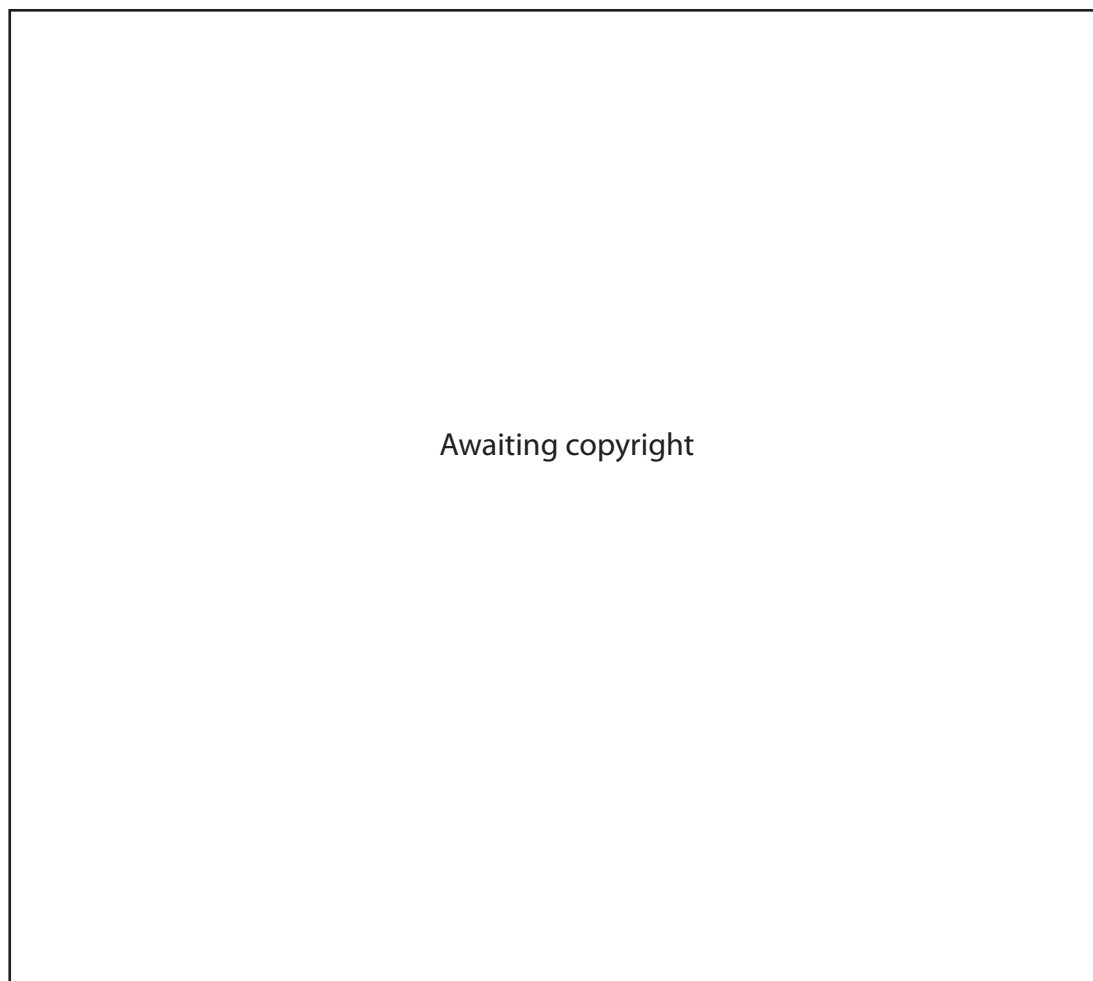
<i>Upload speed</i>	<i>Monthly data allowance</i>	<i>Monthly price</i>	<i>Plan name</i>
128 kbps	800 MB	\$29.95	Cable Light
256 kbps	800 MB	\$34.95	Cable Light Plus
128 kbps	2 GB	\$39.95	Cable Extra
256 kbps	7 GB	\$49.95	Cable Max

- (a) Identify the hardware, software and system security the family would need if they were to purchase cable internet access. **3**
- (b) Draw a decision tree to describe the data in the table. **3**
- (c) The family is considering the Cable Light Plus or Cable Extra plans. **3**

Which would be the better plan for this family? Justify your answer.

**Question 22** (11 marks) Use a SEPARATE writing booklet.

Use this extract from a newspaper article to answer Question 22.



- (a) For the RFID prisoner tracking system described in the article, identify the: **3**
- purpose of the system
  - data/information, and
  - technology.
- (b) Describe how the collecting, processing and displaying of data occurs in this prisoner tracking system. **3**
- (c) Predict how RFID could be used to track people other than prisoners – for example, children, motorists or employees. **5**

Discuss the implications for individuals who are tracked.

**Question 23** (12 marks) Use a SEPARATE writing booklet.

Bower Pty Ltd manufactures and distributes medicines to chemist shops. Bower has recently taken over its competitor, Gibson Pty Ltd. At present, the databases for the accounts departments of both companies have different data structures. Bower wants to create one central information system to manage all of their data.

Below are the data dictionaries for both company databases.

**Data Dictionary for Bower Accounts Department**

<i>Field name</i>	<i>Data type</i>	<i>Size</i>	<i>Description</i>
Chemist ID	Number	5	Unique number to identify chemist shop
Chemist name	Text	40	Chemist shop's name
Chemist address	Text	50	Chemist's delivery address
Telephone	Text	12	Chemist's phone number
Contact person	Text	30	Main contact person at the chemist shop
Invoice ID	Number	5	Unique invoice number
Amount owing	Number	10	Amount owing on order
Delivery date	Date	10	Expected delivery date of the order

**Data Dictionary for Gibson Accounts Department**

<i>Field name</i>	<i>Data type</i>	<i>Size</i>	<i>Description</i>
Company_Name	Text	30	Chemist shop's name
Street_Address	Text	50	Chemist's delivery address
Postcode	Text	4	Chemist's postcode
Chemist_Phone	Text	12	Chemist's phone number
Invoice_No	Number	5	Unique invoice number
Account_Balance	Number	10	Amount owing on order
Account_Paid	Boolean	1	Shows if the account has been paid in full
Delivery	Date/Time	10	Expected delivery date of the order

**Question 23 continues on page 17**



Question 23 (continued)

- (a) The data from the two separate databases must be combined into a new relational database without data redundancy. 5

Draw a schema to show the design of the new relational database. Show field names and identify key fields.

- (b) Recommend and justify an appropriate systems conversion method from the two databases (present systems) to the new relational database (proposed system). 3

Use this information to answer part (c).

Below are two screenshots from the accounts database of new company Bower and Gibson. View 1 represents the screen available to the accounts department intranet. View 2 represents the screen available to chemist shops when they access a website.

View 1

<b>Bower and Gibson Accounts Department</b>			
Customer number	<input type="text" value="13457"/>	Amount owing	<input type="text" value="\$2,561.22"/>
Chemist name	<input type="text" value="Chelsea Chemist"/>	Account paid	<input type="text" value="N"/>
Invoice number	<input type="text" value="34542"/>	Delivery date	<input type="text" value="18/09/2007"/>
<input type="button" value="Submit changes"/>		<input type="button" value="Edit address"/>	<input type="button" value="Print"/>

View 2

<b>Bower and Gibson Chemist Online Portal</b>		<a href="#">Logout</a>
<i>Welcome Chelsea Chemist, your current order status is:</i>		
<b>Invoice Number:</b>	34542	
<b>Delivery Date:</b>	18/09/2007	
<b>Amount owing:</b>	\$2,561.22	
<input type="button" value="Print this page"/>		

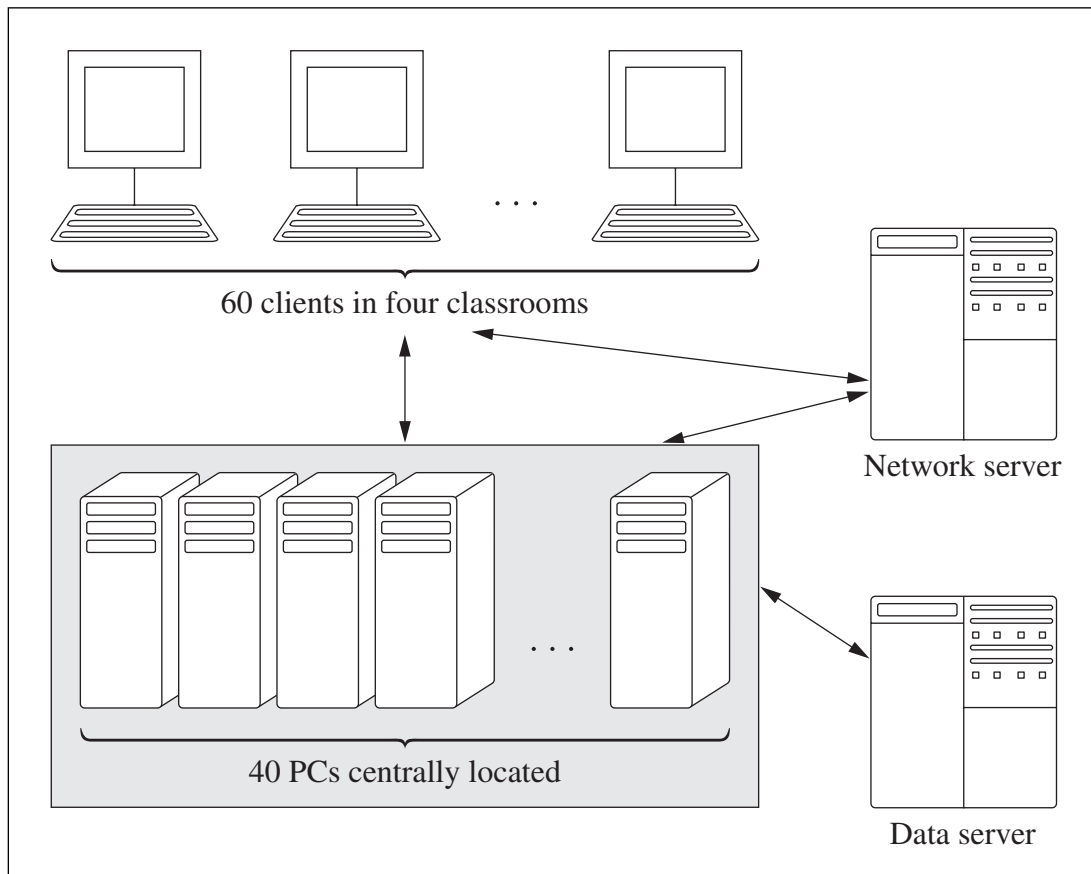
- (c) Explain why the accounts department of Bower and Gibson and a chemist shop need different views of the data. 4

**End of Question 23**

**Question 24** (8 marks) Use a SEPARATE writing booklet.

Use this information to answer Question 24.

A school is considering the network solution represented below as a replacement for networked personal computers (PCs) in classrooms.



The network operates in the following ways:

- Users log on to the network at a client
- The logon is validated by the network server
- The user is automatically assigned a PC from a bank of centrally located PCs. The PC contains an operating system and applications software
- User data is stored on a data server accessed via the PC
- Users log off from the network at the client and the centrally located PC is released for other users.

This solution assigns PCs to users as required rather than every user having a dedicated PC. Another PC can be automatically reassigned to a client if a fault occurs on the allocated PC.

**Question 24 continues on page 19**

**Marks**

Question 24 (continued)

- (a) Explain the processing that occurs and indicate where it occurs when a user logs on and then accesses an application package. **3**
- (b) A consultant has been asked by the school to prepare a feasibility study for the new network solution. **5**

Discuss the issues that should be considered by the consultant. Your answer may include:

- technical issues
- economic issues
- staff expertise
- other relevant issues.

**End of Question 24**

## Section III

40 marks

Attempt TWO questions from Questions 25–28

Allow about 1 hour and 10 minutes for this section

Answer each question in a SEPARATE writing booklet. Extra writing booklets are available.

If you include diagrams in your answer, ensure that they are clearly labelled.

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	Marks
<b>Question 25 — Transaction Processing Systems</b> (20 marks) Use a SEPARATE writing booklet.	
(a) (i) Define <i>data validation</i> and give an example.	3
(ii) Explain the difference between <i>real time processing</i> and <i>batch processing</i> , using examples.	3

Use the following information to answer parts (b) and (c).

A health department is considering the use of smart cards to store information about each card holder. A microchip embedded on the card stores data grouped in five zones:

- identification – an encrypted personal identification number (PIN) and basic information about the card holder (name, address, health number)
- emergency – information needed in an emergency, such as blood type
- vaccination – list of vaccinations administered
- medications – prescription medications taken regularly, and details of allergies
- medical – family history, personal history, current treatment, preventative tests, data supporting specific treatments.

The department will store all this information from all the issued smart cards in a central database.

**Question 25 continues on page 21**

Question 25 (continued)

- (b) (i) The department would need to design strategies to overcome problems that may arise with this system. Outline strategies to overcome each of the following: **4**
- loss of the central database due to a fire;
  - a person who needs urgent medical attention but does not have a smart card with them.
- (ii) If the PIN in the microchip is used for verification, describe the information processes of: **4**
- collecting
  - processing
- to verify that a card belongs to the person who presents it.
- (c) The smart card system is intended to manage health data for approximately one million people. Challenges exist for creating, updating and maintaining high quality data. **6**

Discuss this smart card proposal with regard to:

- data integrity, including data accuracy
- data control.

**End of Question 25**

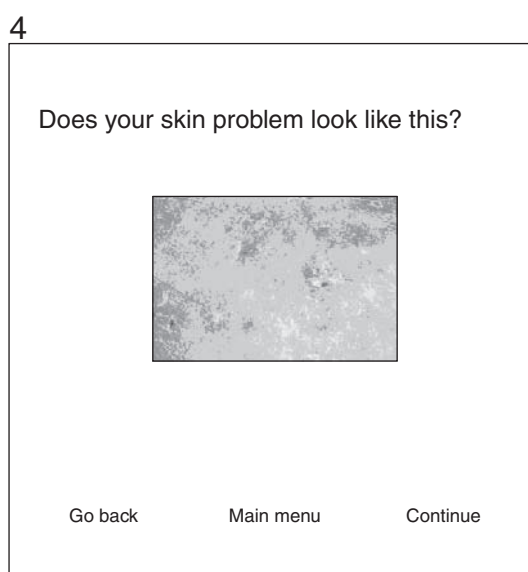
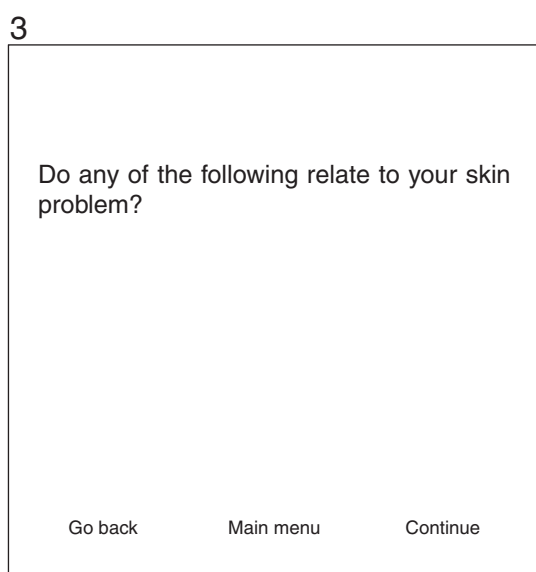
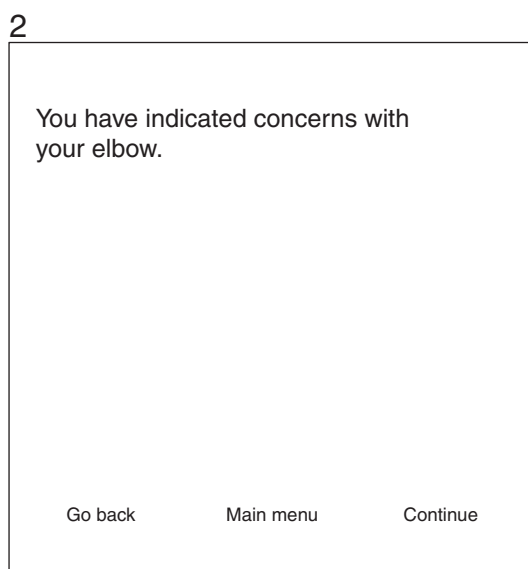
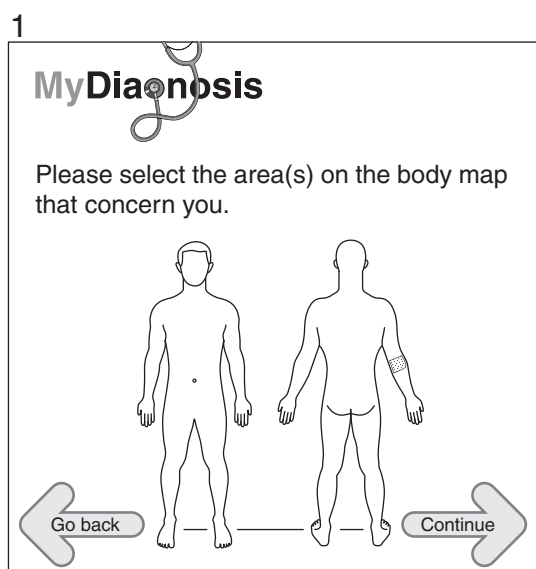
**Question 26 — Decision Support Systems (20 marks)**

Use a SEPARATE writing booklet.

- (a) (i) Using an example, describe how predictions can be made using a spreadsheet. 3
- (ii) Using an example, describe the process of *data matching*. 3

Use the following information to answer parts (b) and (c).


A medical self-diagnosis website allows users to enter health information and receive a diagnosis. A user is offered a series of questions to answer, such as those shown in the screenshots below.



**Question 26 continues on page 23**

## Question 26 (continued)

A diagnosis is displayed after the user has answered the questions. For example:



Ask a doctor  
a question

Any **CURRENT KNOWN HEALTH ISSUES** need to be considered in conjunction with the following diagnoses as identified in this session of **MyDiagnosis**. Click on each diagnosis for more information.

	<b>Probability</b>	<b>Urgency</b>
Solar keratosis	<input type="text"/>	Visit your doctor.
Warts	<input type="text"/>	Tell your doctor at your next visit.
Obsessive Compulsive Disorder	<input type="text"/>	Tell your doctor at your next visit.
Psoriasis	<input type="text"/>	Tell your doctor at your next visit.

- (b) (i) Classify this information system as structured, semi-structured or unstructured and justify your choice. **3**
- (ii) Describe the following components of this information system: **5**
- collecting and organising – the role of the experts and the knowledge engineer in the creation of this expert system and in the way the information is organised;
  - processing – how this occurs to produce the final diagnosis.
- (c) Discuss implications of using this type of expert system. In your response you may consider aspects such as: **6**
- responsibility for decision making
  - potential misuse and legal aspects
  - data quality
  - future use of this technology, including technical and security requirements.

**End of Question 26**

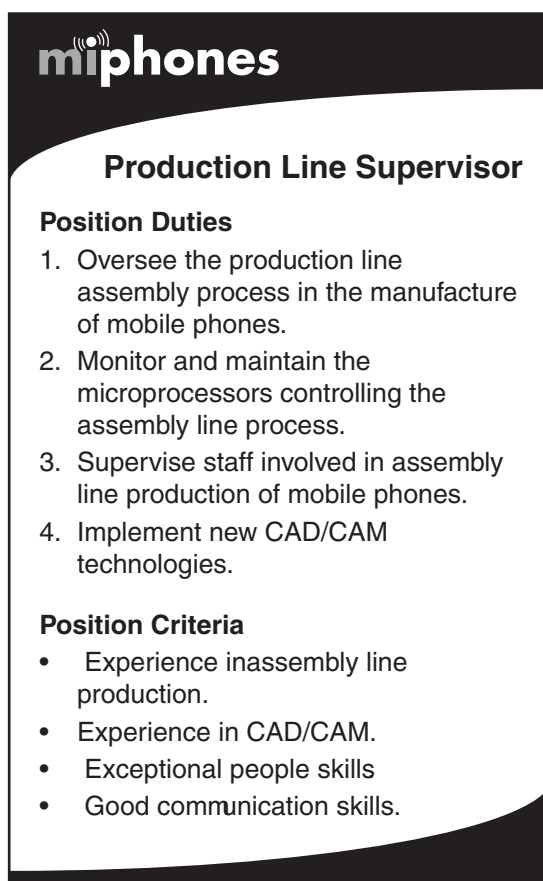
**Question 27 — Automated Manufacturing Systems (20 marks)**

Use a SEPARATE writing booklet.

- (a) (i) Define the term *block diagram* and explain why block diagrams are used to describe automated manufacturing systems. **3**
- (ii) Describe how barcodes can be used in a mail sorting system. **3**

Use the following information to answer parts (b) and (c).

The following job advertisement appeared on a mobile phone manufacturer's website.



**miphones**

**Production Line Supervisor**

**Position Duties**

1. Oversee the production line assembly process in the manufacture of mobile phones.
2. Monitor and maintain the microprocessors controlling the assembly line process.
3. Supervise staff involved in assembly line production of mobile phones.
4. Implement new CAD/CAM technologies.

**Position Criteria**

- Experience in assembly line production.
- Experience in CAD/CAM.
- Exceptional people skills
- Good communication skills.

**Question 27 continues on page 25**



Question 27 (continued)

- (b) (i) One duty of the new supervisor is to implement CAD/CAM technologies. **4**  
Explain how CAD/CAM is relevant to the manufacture of mobile phones.
- (ii) Microprocessors controlling the assembly process rely heavily on the collection of data. **4**  
Identify TWO microprocessor controlled devices that could be used in a production line to assemble mobile phones. Describe the operation of the sensors on these devices.
- (c) Discuss issues that may arise for the assembly line production staff and the supervisor. In your response you may consider aspects such as: **6**
- the day-to-day experience for staff and the nature of the work
  - the responsibilities of the supervisor
  - the supervisor's skills, including communication and people management skills.




**End of Question 27**

**Question 28 — Multimedia Systems (20 marks)**

Use a SEPARATE writing booklet.

- (a) (i) Describe a *head-up display* device and provide an example of its use in virtual reality. 3
- (ii) Distinguish between *morphing* and *distorting* in image processing. 3

Use the following information about the iPhone to answer parts (b) and (c).

 <p>61 mm</p> <p>115 mm</p> <p>iPhone</p> <p>Standard phone</p>	<p><b>Multi-touch 3.5" screen</b> Can read more than one input. For example, to zoom in on a photo, fingers are moved closer together and apart to zoom out.</p> <p><b>Phone</b> </p> <ul style="list-style-type: none"> <li>- calls</li> <li>- voicemail</li> <li>- SMS</li> <li>- camera, 2 Megapixels</li> </ul> <p><b>Internet device</b> </p> <ul style="list-style-type: none"> <li>- HTML email client</li> <li>- Safari web browser with built-in Google and Yahoo! search</li> <li>- multi-tasking</li> </ul>	<p><b>Widescreen iPod</b> </p> <ul style="list-style-type: none"> <li>- music</li> <li>- videos</li> </ul> <p><b>Advanced technology</b> </p> <ul style="list-style-type: none"> <li>- multi-touch display – all functions finger controlled</li> <li>- full QWERTY soft keyboard with predictive error correction</li> <li>- inbuilt sensor automatically orients screen from portrait to landscape</li> <li>- proximity sensor detects when it is next to your ear, turning off display</li> <li>- ambient light sensor adjusts display's brightness</li> </ul>
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- (b) (i) The iPhone has a 420 by 320 pixel screen that can display 256 colours. 3

Demonstrate how to calculate the size of a file, in kilobytes, to store one image without compression. Explain what each number in the calculation represents. Do NOT calculate the answer.

**Question 28 continues on page 27**

Question 28 (continued)

- (ii) Copy the following table into your writing booklet. Do NOT copy the example. 5

Describe the information processes for the iPhone by completing the table.

An example for displaying is provided.

<i>Information processes</i>	<i>Audio/video requirements</i>	<i>iPhone component</i>	<i>Classification (ie hardware/software)</i>
Displaying (example, do not copy)	The ability to stream video and audio data without pauses or jerky pictures	Media player or Quicktime	Software
1 Displaying			
2 Storing			
3 Transmitting			
4 Processing			

- (c) iPhone technology offers opportunities for users to access services anywhere at any time, such as videos on demand, interactive television, gaming, shopping and interactive education. 6

Discuss issues that may arise from the widespread use of these services. In your response you may consider aspects such as:

- ownership of data
- privacy
- interpersonal and social relationships
- equity of access.

**End of paper**

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