

THE UNIVERSITY OF AUCKLAND

FIRST SEMESTER, 2016
Campus: City

COMPUTER SCIENCE

An Introduction to Practical Computing

(Time Allowed: TWO hours)

NOTE:

You must answer **all** questions in this exam.

Calculators are NOT permitted.

Answer Section A (Multiple choice questions) on the Teleform answer sheet provided.

Answer Section B in the space provided in this booklet.

There is space at the back for answers that overflow the allotted space.

Surname	
Forename(s)	
Student ID	
Login (UPI)	

Question	Mark	Out Of
1 - 35 Multiple Choice		35
36 Programming using Python		15
37 Spreadsheets		10
38 Databases		10
39 LaTeX		15
40 HTML5 and CSS		15
TOTAL		100

SECTION A**MULTIPLE CHOICE QUESTIONS**

Each question in this section is worth **1 mark**. There is only **one** correct answer for each question. For each question, choose the **best** answer according to the information presented in lectures. Select your preferred answer on the Teleform answer sheet provided by shading in the appropriate box.

Question 1

[1 mark] Which of the following unit measurements is NOT used to specify the speed of a processor?

- (a) OPS
- (b) PFLOPS
- (c) GB
- (d) FLOPS
- (e) Hz

Question 2

[1 mark] Which of the following forms of data storage is NOT classified as persistent storage?

- (a) SSD
- (b) CD
- (c) HDD
- (d) DVD
- (e) RAM

Question 3

[1 mark] Which of the following statements is TRUE?

- (a) 1 GB = 100 MB
- (b) 1 GiB = 1020 MiB
- (c) 1 GiB < 1 GB
- (d) 1 GB < 1000 MiB
- (e) 1 GiB = 1000 MiB

Question 4

[1 mark] What is the decimal number 88 in binary?

- (a) 01011000
- (b) 00111000
- (c) 00101100
- (d) 11011000
- (e) 01011100

Question 5

[1 mark] How many different values can be stored in 9 bits?

- (a) 2000
- (b) 16
- (c) 1024
- (d) 512
- (e) 256

Question 6

[1 mark] Which of the following is classified as free software?

- (a) Skype.
- (b) Microsoft Internet Explorer.
- (c) Microsoft Word.
- (d) Adobe Acrobat Reader.
- (e) None of the above.

Question 7

[1 mark] Which of the following statements about file formats is FALSE?

- (a) A file format describes how the file will be formatted on the screen.
- (b) File formats are either proprietary or open.
- (c) A file format specifies how data is encoded in the file.
- (d) Some operating systems use the file extension to determine the file format.
- (e) MP3, Ogg and WMA are file formats for sound files.

Question 8

[1 mark] When setting up a home network broadband, which of the following would most likely be connected to a filter?

- (a) Router.
- (b) Broadband modem.
- (c) ISP Server.
- (d) Network Card.
- (e) Computer.

Question 9

[1 mark] What is the task of the Internet Protocol?

- (a) Makes sure that packets are not sent faster than they can be received.
- (b) Allows us to associate a human readable name with an IP address.
- (c) Combines packets to reform message.
- (d) Divides the message into packets.
- (e) Defines addresses for computers on the network and the routing information.

Question 10

[1 mark] Which of the following network types works best for transmitting real-time voice data?

- (a) Circuit Switching Network.
- (b) Local Area Network.
- (c) Wireless Network.
- (d) Packet Switching Network.
- (e) Wide Area Network.

Question 11

[1 mark] Which of the following systems use asynchronous communication?

- (a) IP telephony.
- (b) Instant messaging.
- (c) Video conferencing.
- (d) Email.
- (e) All of the above.

Question 12

[1 mark] Which of the following commands would be used to insert a subsection heading on a page in the Stage One Wiki?

- (a) =====Subsection Heading=====
- (b) ===Subsection Heading===
- (c) ==Subsection Heading==
- (d) Subsection Heading
- (e) =Subsection Heading=

Question 13

[1 mark] Which of the following statements is FALSE?

- (a) A blogger is a person that posts entries to a blog.
- (b) A blog consists of entries called posts.
- (c) Blog posts are always displayed in chronological order where older posts are shown first.
- (d) Blogs can be of different forms such as photoblogs, videoblogs and audioblogs.
- (e) Blogs are sometimes used as online diaries.

Question 14

[1 mark] When Netscape became open source, it developed into ...

- (a) Yahoo!
- (b) Mosaic.
- (c) Google.
- (d) Microsoft Internet Explorer.
- (e) Mozilla.

Question 15

[1 mark] Which of the following statements regarding search engines is FALSE?

- (a) Search engines determine the relevance of a page.
- (b) Google is the search engine that has the largest market share of users.
- (c) DuckDuckGo is a search engine that emphasizes protecting searchers' privacy.
- (d) All search engines allow you to pay to have the ranking of your website changed in its search result.
- (e) Search engines use a web-crawler to browse the WWW, and index pages that it encounters.

Question 16

[1 mark] Which of the following can keep a log of ALL the web pages you have accessed in a day?

- (a) URL.
- (b) Search Engine.
- (c) Web Server hosting the web page.
- (d) Domain Name Server.
- (e) None of the above.

Question 17

[1 mark] Which of the following is a common criticism of PowerPoint?

- (a) PowerPoint's presenter view is confusing.
- (b) PowerPoint encourages superficial thinking in audience members.
- (c) PowerPoint lacks simulation features.
- (d) PowerPoint encourages presenters to use ineffective humour aids (e.g. comics).
- (e) PowerPoint lacks animation features.

Question 18

[1 mark] Which of the following would improve a presentation to a group of secondary school students, encouraging them to consider a degree in Science, Technology, Engineering or Mathematics (STEM)?

- (a) A well-organized hierarchy of bullet points to convey details about STEM degrees.
- (b) Animated slide transitions to keep the audience engaged.
- (c) Showing bullet points one at a time to maintain focus.
- (d) A comic about women in STEM to lighten the mood.
- (e) A story about something exciting that you made during your STEM degree.

Question 19

[1 mark] A story told through a game by its developers to its players is called ...

- (a) an intended narrative.
- (b) an embedded narrative.
- (c) an a priori narrative.
- (d) a pre-defined narrative.
- (e) an emergent narrative.

Question 20

[1 mark] In game design, what are aesthetics?

- (a) The game's approach to beauty and meaning.
- (b) The style of the game's artwork.
- (c) The emotions evoked by the game.
- (d) The genre or category of the game.
- (e) The cumulative effect of thousands of micro design decisions.

Question 21

[1 mark] Which of the following is an example of poor alignment?

- (a) Dark and dreary artwork in a post-apocalyptic, dystopian role-playing game.
- (b) Cartoonishly evil, one-dimensional villains in a shoot-and-loot science-fiction game.
- (c) Permadeath in an open-world survival game.
- (d) Heavily-armoured, gun-toting protagonist in a horror game.
- (e) The ability to slow time in a medieval fantasy adventure game.

Question 22

[1 mark] Which of the following is good for delivering emergent narratives?

- (a) Comm chatter.
- (b) A large open world.
- (c) Cut scenes.
- (d) Dialogue with decision points.
- (e) Using artwork to imply past events.

Question 23

[1 mark] Which of the following is a negative consequence of banning Tor?

- (a) Banning Tor would hamstring police investigations.
- (b) Banning Tor would undermine organized crime.
- (c) Banning Tor would facilitate money laundering.
- (d) Banning Tor would increase cyberstalking.
- (e) Banning Tor would discourage whistleblowing.

Question 24

[1 mark] If you are experiencing cyberstalking, which of the following is a bad idea?

- (a) Ask the police to give the stalker a written warning letter.
- (b) Ask the police to visit the stalker in person.
- (c) Reason with the stalker.
- (d) Tell the stalker to stop contacting you.
- (e) Review your privacy settings on social networking sites.

Question 25

[1 mark] Which of the following words is represented by the ASCII codes: 068 111 103 103 121?

- (a) Foggy
- (b) Doggy
- (c) Patty
- (d) Paddy
- (e) Maddy

Question 26

[1 mark] Which of the following statements best describes the Turing test?

- (a) The Turing test is trying to determine which participant is the computer.
- (b) The Turing test is trying to determine which participant is the woman.
- (c) The Turing test is trying to determine which participant is the man.
- (d) The Turing test is trying to determine which participant is the child.
- (e) None of the above.

Question 27

[1 mark] What is the main difference between the Functionalist approach to AI and the Cognitive approach?

- (a) A Functionalist believes that a computer could “appear” to be self-aware and reason while a Cognitivist believes that a computer could become self-aware and exhibit intelligent behaviour.
- (b) A Functionalist believes that a computer could become self-aware and exhibit intelligent behaviour, while a Cognitivist believes that a computer could “appear” to be self-aware and reason.
- (c) A Functionalist believes that what happens internally matters, while a Cognitivist believes that external behaviour matters.
- (d) A Functionalist believes that external behaviour matters, while a Cognitivist believes that what happens internally matters.
- (e) None of the above.

Question 28

[1 mark] Which of the following would be the most effectively compressed by an image format that uses run-length encoding?

- (a) An image that is the same uniform colour of pink everywhere.
- (b) A 256-colour photo of someone's face.
- (c) An image that shows the same 256-colour photo of a face 100 times.
- (d) A horizontal gradient of any colour.
- (e) An image where the pixels alternate between two colours such that no two pixels that are next to each other are the same colour.

Question 29

[1 mark] Which one of the following claims is FALSE?

- (a) Models are used to develop and evaluate theories about how real-world systems work.
- (b) A model can be as simple as a single equation, such as $y = mx + b$.
- (c) Models can be an effective tool for communicating ideas and providing intuition about how systems work.
- (d) If a computational model predicts one event well, then it can be relied upon to predict other similar events well.
- (e) Models are used to make predictions about real-world systems.

Question 30

[1 mark] Approximately how many bytes would it take to store a 16-colour bitmap image which is 800 pixels wide and 600 pixels high?

- (a) 180,000
- (b) 960,000
- (c) 240,000
- (d) 7,680,000
- (e) 1,920,000

Question 31

[1 mark] In the context of simulations and modelling, saying that a model is "sensitive to initial conditions" means that ...

- (a) in the model, two very similar (but not identical) starting points can result in radically different dynamics.
- (b) in the model, it is easy to distinguish between starting states that are very similar.
- (c) the final state of the model is always the same, regardless of the initial state.
- (d) if the model is run twice, starting from exactly the same configuration, it can produce a different final state.
- (e) the model is built using conditional statements like "IF x, THEN y".

Question 32

[1 mark] How many of the following four research areas use computational modelling as a research tool?

Research Areas: Climate Science; Economics; Social Media Science; Nuclear Physics.

- (a) 1
- (b) 3
- (c) 0
- (d) 2
- (e) 4

Question 33

[1 mark] For which of the following would it be better to use vector-based graphics rather than bitmap-based graphics?

- (a) An animated, single-colour, low resolution, LED display.
- (b) A simple typographic business logo that will be used in large-format posters, on web sites and printed stationery.
- (c) Scanning historical documents for archival purposes.
- (d) An image that shows the portraits of every staff member in the Computer Science Department.
- (e) An image of thousands of overlapping blades of grass; each a different colour and shape than the others.

Question 34

[1 mark] Which one of the following statements about Artificial Intelligence is FALSE?

- (a) An AI program has beaten a 9-dan professional Go player.
- (b) An AI program has beaten a human at a game of Jeopardy.
- (c) An AI program has beaten a Chess Grandmaster.
- (d) AI programs were used on the Curiosity rover on Mars.
- (e) Some AI programs have been shown to exhibit strong AI.

Question 35

[1 mark] Which of the following best describes the Simple Mail Transfer Protocol?

- (a) Used to send email message to destination mail server.
- (b) Allows the user to view and manipulate the messages as though they were stored locally on the user's computing device.
- (c) Allows email to be downloaded from server to local computer and deleted from the server after download.
- (d) Allows email to be downloaded while keeping a copy on the server.
- (e) Makes backup copies automatically on the mail server.

THIS PAGE HAS BEEN INTENTIONALLY LEFT BLANK.

QUESTION/ANSWER BOOKLET FOLLOWS

SECTION B

Answer all questions in this section in the space provided. If you run out of space, please use the Overflow Sheet and indicate in the allotted space that you have used the Overflow Sheet.

36. Programming Using Python (15 marks)

- (a) In the space below, write a Python program that prompts the user for a positive integer. You can assume that the number entered by the user is a valid integer, but if the user enters 0 or a negative number, the program displays the text “The input must be a positive integer” and again prompts the user for a positive integer. Once a positive number is entered by the user, the program prints out in ascending order all of the positive even numbers that are less than the number entered by the user. The following **example** shows the exact formatting expected for the prompts and output.

Example:

```
Enter a positive integer: 0
The input must be a positive integer.
Enter a positive integer: 11
2
4
6
8
10
```

(6 marks)

(b) Using the space provided below, draw the output produced by two executions of the Python 'turtle' program listed below. The only difference between the two executions is the value of the variable **angle**:

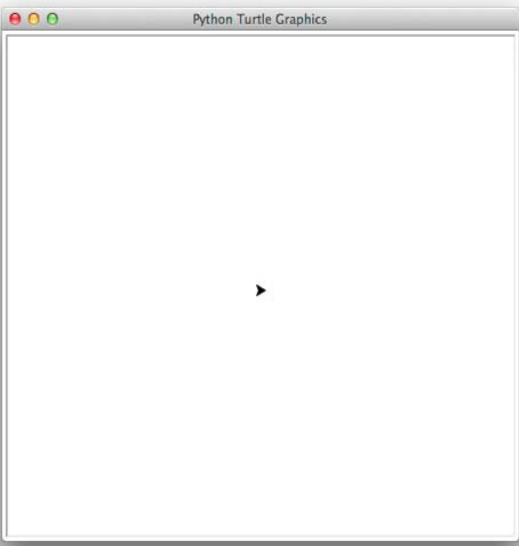
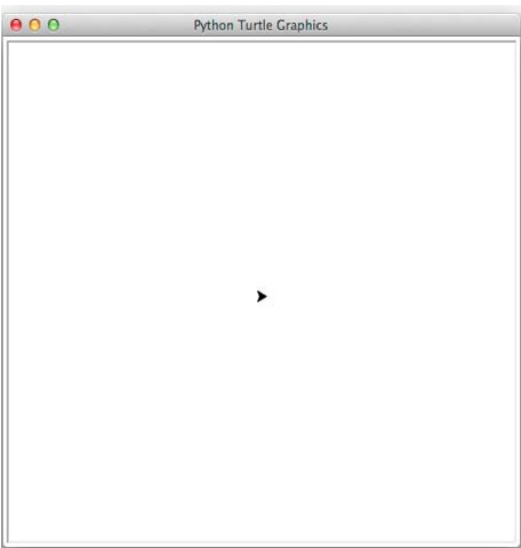
- In the first execution, the variable **angle** is set to 45.
- In the second execution, the variable **angle** is set to 90.

For each drawing, assume that the turtle begins in the middle of the window facing right and that the window is approximately 400 steps wide.

Make sure to clearly indicate:

- the text output.
- the path drawn by the turtle.
- the final position and direction of the turtle (using the arrowhead).

```
import turtle
x = 0
angle = SEE_INSTRUCTIONS (45 for 1st execution, 90 for 2nd)
while x < 5 :
    print(angle * x)
    turtle.left(angle * x)
    turtle.forward(100)
    x = x + 1
```

First execution (angle = 45)	Second execution (angle = 90)
	
Text output for first execution:	Text output for second execution:

(6 marks)

(c) What is the output of the following two programs, Program A and Program B?

Program A

```
x = "5"  
x = float(x + x)  
x = x / 5  
print(x)
```

Program B

```
x = int("5")  
x = float(x + x)  
x = x / 5  
print(x)
```

Program A's output	Program B's output

(2 marks)

(d) Why do Program A and Program B in Part (c) above produce different output?

(1 mark)

37. Spreadsheets (10 marks)

Pat’s Movie Theatre is an independent movie theatre. The following spreadsheet displays sales information for food and tickets sold during a week.

	A	B	C	D	E	F	G	H	I	J	K
1	Pat's Movie Theatre										
2											
3	Day of Week	Popcorn Sold	Drinks Sold	Adult Tickets	Child Tickets	Total Food Sales	Total Ticket Sales	Total Sales	Rating	Food Advice	Ticket Advice
4	Monday	12	3	10	5	\$87	\$190	\$277	Low	Sell more	Sell more
5	Tuesday	8	6	8	3	\$78	\$144	\$222	Low	Sell more	Sell more
6	Wednesday	6	6	6	4	\$66	\$122	\$188	Low	Sell more	Sell more
7	Thursday	9	12	14	8	\$114	\$274	\$388	Low	Sell more	Sell more
8	Friday	12	14	22	16	\$142	\$458	\$600	OK	Sell more	
9	Saturday	58	49	20	14	\$593	\$412	\$1,005	High		
10	Sunday	20	16	15	16	\$200	\$353	\$553	Low		Sell more
11											
12											
13	Product	Price								Rating Table	
14	Drink	\$5				Required Sales				\$0	Low
15	Popcorn	\$6				Food	\$200			\$600	OK
16	Adult Ticket	\$15				Tickets	\$400			\$1,000	High
17	Child Ticket	\$8									

- (a) Cell **H4** calculates the total sales value (i.e. total food sales plus total ticket sales) for Monday. What is the best formula to use in Cell **H4**? Your formula must be able to be filled down from **H4** to **H10** correctly.

(1 mark)

- (b) Cell **G4** calculates the total value of tickets sold on Monday. The number of each type of ticket sold (Adult Ticket or Child Ticket) is multiplied by the appropriate price in Cells **A16** - **A17**. What is the best formula to use in Cell **G4**? Your formula must be able to be filled down from **G4** to **G10** correctly.

(2 marks)

- (c) Cell **I4** contains an evaluation of the day's performance based on the total sales value for the day (i.e. the value in Cell **H4**). What is the best formula to use in Cell **I4**? Your answer must use the **VLOOKUP** function to retrieve the appropriate rating from the table in Cells **J14:K16**. The **VLOOKUP** function has the following syntax:

`VLOOKUP(lookup_value, table_array, col_index_num, range_lookup)`

Note: Your formula must be able to be filled down from **I4** to **I10** correctly.

`=VLOOKUP (_____ , _____ , _____ , _____)`

(4 marks)

- (d) Cell **K4** displays a message if too few tickets were sold that day. If the value of the total ticket sales for the day is below the minimum specified in Cell **G16** then the message "**Sell more**" is displayed, otherwise Cell **K4** should be blank. What is the best formula to use in Cell **K4**? Your answer must use an **IF** function.

Note: Your formula must be able to be filled down from **K4** to **K10** correctly.

`=IF (_____ , _____ , _____)`

(3 marks)

38. Databases (10 marks)

A chain of clothing stores uses the following shared database to manage their stock. The following tables show the full contents of the database.

Table: Products		
ID	Description	Price
1	t-shirt	\$10.00
2	sandals	\$8.00
3	socks	\$6.00
4	jacket	\$50.00

Table: Stock			
ID	Shop	Product	Quantity
1	1	2	5
2	1	1	0
3	2	3	14
4	1	3	15
5	2	4	0

Table: Shops		
ID	Description	Address
1	CBD	11 Main Street
2	St Heliers	44 Tamaki Drive

- (a) The **Shop** and **Product** fields in the **Stock** table are foreign keys. The **ID** field of each table is its primary key. In the space below, draw a relationship diagram for this database. Make sure to indicate **the type of each relationship between tables** (e.g. one-to-one).

(3 marks)

(b) Given the contents of the database and the description of foreign and primary keys in Part (a) above, does this database have referential integrity? Briefly explain your answer.

(2 marks)

(c) In the space below, show the output that the following SQL query would produce.

```
SELECT Product
FROM Stock
WHERE Quantity > 0 AND Shop = 1
ORDER BY Product DESC;
```

(2 marks)

(d) Complete the Query By Example (QBE) form below so that it generates a query that displays (**ONLY**) the **Description** and **Price** of every product which is listed as having a **Quantity** of **0** in the **Stock** table. The displayed information should be sorted to be in order of increasing price. The correct output of this query on the database as described above is the following:

Description ▾	Price ▾
t-shirt	\$10.00
jacket	\$50.00

Field:				
Table:				
Sort:				
Show:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Criteria:				

(3 marks)

39. LaTeX (15 marks)

On the following page, complete the LaTeX code that will produce the output below:

Benford's Law

Wikipedia

First Semester Exam

1 Introduction

Benford's law is a phenomenological law about the frequency distribution of leading digits in many real-life sets of numerical data.

2 Mathematical Statement

A set of numbers is said to satisfy Benford's law if the leading digit d occurs with probability

$$P(d) = \log_{10}(d + 1) - \log_{10}(d) = \log_{10}\left(\frac{d + 1}{d}\right) = \log_{10}\left(1 + \frac{1}{d}\right).$$

Numerically, the leading digits (1...9) have the following distribution in Benford's law:

1. 30.1%
2. 17.6%
3. 12.5% ...

The following LaTeX commands have been included as a reference. You will not need to use all of these commands. Note that the basic document structure has been completed for you.

<i>Normal commands</i>	<i>Environments</i>	<i>Math mode commands</i>
<code>\emph{}</code>	<code>itemize</code>	<code>\$</code>
<code>\section{}</code>	<code>enumerate</code>	<code>\sqrt{}</code>
<code>\subsection{}</code>	<code>verbatim</code>	<code>\log</code>
<code>\large</code>	<code>flushright</code>	<code>\frac{ }{ }</code>
<code>\textbf{}</code>	<code>center</code>	<code>\cdots</code>
<code>\title{}</code>	<code>quote</code>	<code>\pi</code>
<code>\author{}</code>	<code>displaymath</code>	<code>\geq</code>
<code>\date{}</code>	<code>equation</code>	<code>\sum_{ }^{ }</code>
<code>\maketitle</code>	<code>quotation</code>	<code>^</code>
<code>\item</code>		<code>-</code>
<code>\%</code>		

```
\documentclass[a4paper]{article}  
\begin{document}
```

```
\end{document}
```

(15 marks)

40. HTML5 and CSS (15 marks)

The following screenshot shows the body of a web page created using HTML5 and CSS:

The Country of New Zealand

New Zealand is an island nation in the southwestern Pacific Ocean.

Ethnic Groups (2013)

- 74.0% **European**
- 14.9% **Maori**
- 11.8% **Asian**
- 7.4% **Pacific peoples**

Largest Cities (2015)

RANK	NAME	POPULATION
1	Auckland	1,454,300
2	Wellington	398,300
3	Christchurch	381,800

For further information, see [The New Zealand Wikipedia Page](#).

Complete the HTML5 code below so that it produces the output shown above.

You **must** use the styles defined in the internal style sheet in the head section below, and **must not** define any new styles.

Note: The URL for the New Zealand Wikipedia Page is:
`"https://en.wikipedia.org/wiki/New_Zealand".`

```
<!DOCTYPE html>
<html>
<head>
<meta charset="UTF-8">
<title>Information on New Zealand</title>
<style type="text/css">
  table, tr, td {border: 1px solid black;}
  body {font-family: serif;}
  .legend {font-variant: small-caps; font-weight: bold;}
</style>
</head>
<body>
</body>
</html>
```

```
.number {text-align: right;}  
h2 {font-style: italic;}  
.fancy {font-weight: bold;}  
#foot {font-family: monospace; font-size: xx-small;}  
</style>  
</head>
```

<body>

<!-- Main Heading -->

(1 mark)

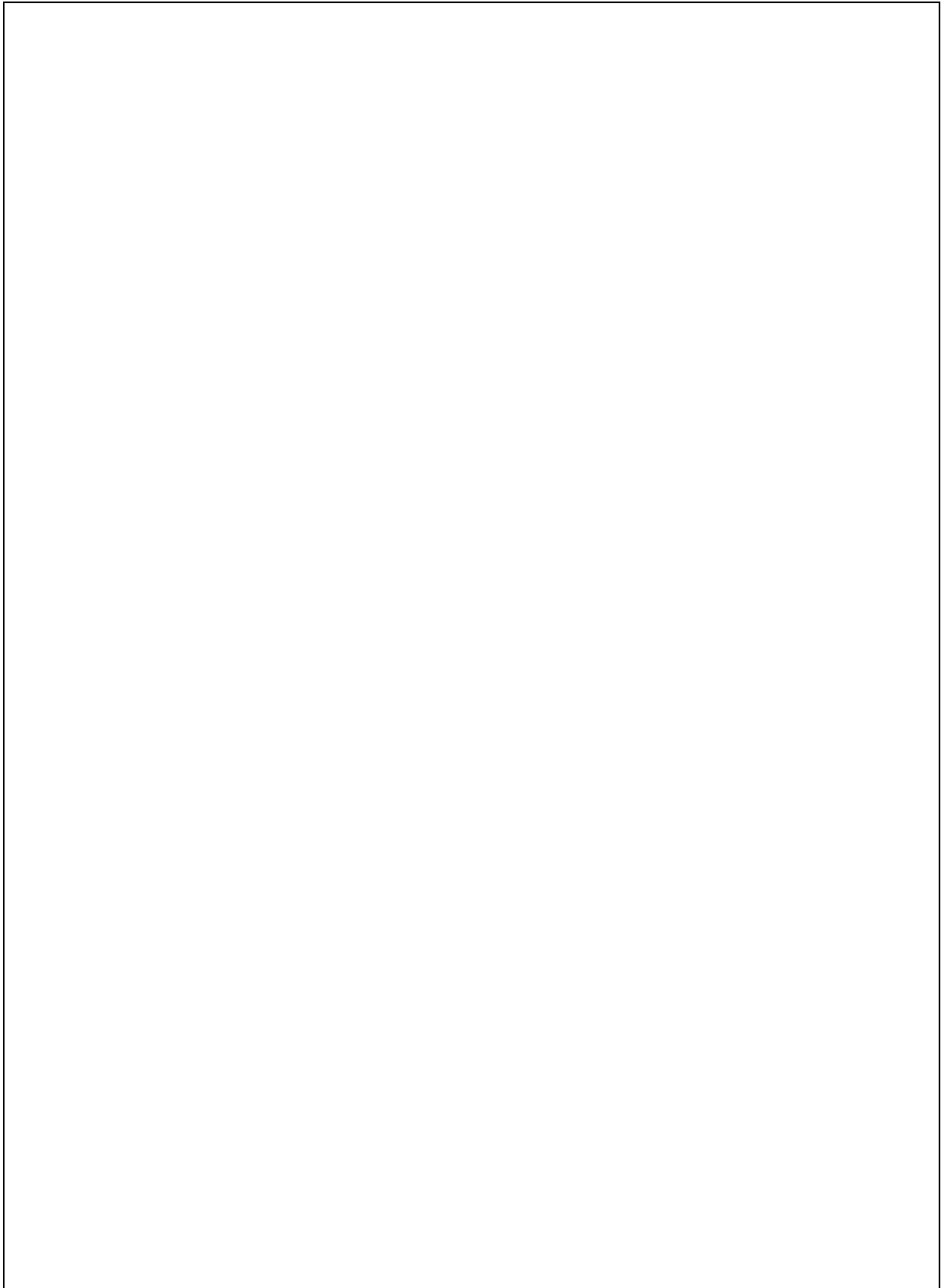
<!-- Introductory Paragraph -->

(1 mark)

<!-- Ethnic Groups Section -->

(5 marks)

<!-- Largest Cities Section -->



(6 marks)

<!-- Wikipedia Reference Footer Paragraph-->

(2 marks)

</body>
</html>

- Overflow Sheet 1 -

Write the question number and letter next to your answer. You must ALSO indicate in the allotted space that you have used the overflow sheet.

Overflow Sheet 2 -

Write the question number and letter next to your answer. You must ALSO indicate in the allotted space that you have used the overflow sheet.

Overflow Sheet 3 -

Write the question number and letter next to your answer. You must ALSO indicate in the allotted space that you have used the overflow sheet.

Rough Working – This page will not be marked

Rough Working – This page will not be marked