THE UNIVERSITY OF AUCKLAND

SUMMER SEMESTER, 2017
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	*Sample*
Forename(s)	*Answers*
Student ID	
Login (UPI)	

	Question	Mark	Out Of
1 - 30	Multiple Choice		30
31	Programming using Python		10
32	Spreadsheets		10
33	HTML5 and CSS		20
34	LaTeX		15
35	Databases		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 one of the following items would you NOT find inside a CPU?

(a) Transistors.
(b) Instruction set.
(c) Cache.
(d) RAM.
(e) Processing core.

Question 2
[1 mark] Two computers have the following specifications:

Computer A	Computer B
• Intel Pentium processor at 1.7GHz • 4GB DDR3 RAM • Intel Iris Pro on-board graphics • 512GB SSD • Windows 10.1	• Intel Core i7 quad-core processor at 2.3GHz • 8GB DDR3 RAM • GeForce GTX discrete graphics • 1TB HDD • Windows 10.1

Based on this information, which one of the following statements is TRUE?

(a) Computer A uses built-in graphics while Computer B uses a graphics card.
(b) Computer A and Computer B use different operating systems.
(c) Computer B's primary memory is likely to be faster than Computer A's primary memory.
(d) Computer B's secondary memory is likely to be faster than Computer A's secondary memory.
(e) Computer B does not use a SoC while Computer A uses a SoC.

Question 3
[1 mark] What is the next number in this sequence: 101_2, 1010_2, 1111_2 … ?

(a) 10000_2
(b) 1001_2
(c) 1100_2
(d) 10101_2
(e) 10100_2

Question 4
[1 mark] How many numbers can you generate using a 5-bit binary number?

    (a) 20
    (b) 32
    (c) 25
    (d) 50
    (e) 10

Question 5
[1 mark] Which one of the following pieces of software is NOT application software?

    (a) Microsoft Visual Studio.
    (b) OpenOffice Writer.
    (c) Disk Defragmenter.
    (d) Microsoft Outlook.
    (e) Firefox.

Question 6
[1 mark] Under the Copyright Act 1994, what legal mechanism lets software developers permit customers to use their copyrighted software?

    (a) Patent.
    (b) Signed letter of consent.
    (c) The Copyright Act does not contain such a mechanism.
    (d) Licence.
    (e) Source code.

Question 7
[1 mark] What is the job of backbone cables on the Internet?

    (a) Connect cellphone towers together.
    (b) Provide high-capacity links that connect countries together to form the global Internet.
    (c) Connect Wi-Fi hotspots together.
    (d) Connect home users to their Internet Service Provider (ISP).
    (e) Provide high-capacity data transfer for applications such as video calling and file sharing.

Question 8

[1 mark] Which statement about packet-switching networks is TRUE?

(a) Satellite connections are incompatible with packet-switching networks.

(b) ARPANET was a packet-switching network, while the Internet is a circuit-switching network.

(c) Individual packets can follow different routes to get from the sender to the recipient.

(d) There is a direct connection between the sender and recipient in a packet-switching network.

(e) Packet-switching networks use one hub, while circuit-switching networks use multiple hubs.

Question 9

[1 mark] Which one of the following functions is an email server likely to perform?

(a) Assess an email to determine whether it is spam.

(b) Establish a direct connection between sender and recipient.

(c) Help the recipient to find the addresses in the BCC field.

(d) Assess an email to ensure it meets the standards of netiquette.

(e) Determine the location of the sender to ensure they actually sent the email.

Question 10

[1 mark] Which list contains all of the main protocols used by email clients?

(a) IPv6, SMTP, 2FA, DNS.

(b) POP3, SMTP, IMAP.

(c) DNS, IPv4, HTTP.

(d) POP3, HTTP, DNS, IMAP.

(e) PGP, IMAP, SMTP.

Question 11

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

(a) Micro-blogging platforms only allow users to share content under 5MB in size, while blogs allow users to share content of any size.

(b) Micro-blogs are blogs that are designed for smartphones, while blogs are designed to be used on desktop PCs.

(c) Micro-blogging platforms are designed to share smaller pieces of content than blogs.

(d) Blogs are usually written by experts so the information is always reliable. However, micro-blogs are usually written by ordinary people, so the information is mostly unreliable.

(e) Twitter is the most popular blogging platform and Wordpress is the most popular micro-blogging platform.

Question 12

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

    (a) Wikis must always allow the public to edit pages.

    (b) Some wikis use bots to find and reverse vandalism on the wiki's pages.

    (c) '#' is used to create an ordered list, while '*' is used to create an unordered list.

    (d) Some wikis allow users to use a combination of wiki markup and HTML when writing pages.

    (e) Placing three single quote marks on either side of a word will make the word bold on a wiki page when viewed in a web browser.

Question 13

[1 mark] Complete this sentence: "The 'right to be forgotten' …"

    (a) requires a search engine to allow users to delete their search history by clicking one button.

    (b) prevents websites from using software to track your browsing history.

    (c) enables a person to remove their name from any website on the Internet.

    (d) enables a person to request a search engine to remove certain links from search results.

    (e) does not exist.

Question 14

[1 mark] How does a cache work together with a proxy server?

    (a) The cache prevents unauthorised access to the proxy server.

    (b) The cache stores a copy of recent requests sent to the proxy server so that they can be accessed quickly.

    (c) Caches and proxy servers are two separate devices that do not work together.

    (d) The cache sends requests slowly to the proxy server to ensure the server does not get overloaded.

    (e) The cache ensures the request is genuine before sending it to the proxy server.

Question 15

[1 mark] A writer should insert a reference in their text when they…

    (a) discuss another author's ideas.

    (b) paraphrase another author's work.

    (c) quote another author's work.

    (d) summarise the contents of a book written by two authors.

    (e) All of the above.

Question 16

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

 (a) Refworks enables you to group references belonging to a certain document in a folder.
 (b) Refworks can scan your document and automatically determine where to insert references.
 (c) References can be imported from external sources such as databases.
 (d) Refworks helps an author to comply with referencing styles.
 (e) The user can install a plugin to insert references from their Refworks account into their document.

Question 17

[1 mark] Which of the following lists of events is in chronological order (i.e. earliest event to latest event)?

 (a) Analytical Engine developed, transistor invented, Altair released, Intel 4004 processor released.
 (b) VisiCalc released, Apple I released, Altair released, transistor invented.
 (c) Analytical Engine developed, transistor invented, Altair released, Macintosh released.
 (d) Lotus 1-2-3 released, VisiCalc released, Microsoft Windows released, Microsoft Office released.
 (e) None of the above.

Question 18

[1 mark] What does *The Universal Machine* describe as "one of the shrewdest business deals of the century"?

 (a) Microsoft's purchase of MS-DOS.
 (b) Microsoft's purchase of IBM.
 (c) Microsoft's purchase of Nokia.
 (d) Microsoft's purchase of VisiCalc.
 (e) Microsoft's purchase of QDOS.

Question 19

[1 mark] If a person is harmed by an offensive blog post, what action can they take under the Harmful Digital Communications Act 2015?

 (a) Ask the blog's host to remove the offensive blog post.
 (b) A blog post is not a 'digital communication' so the person cannot take any action under the Act.
 (c) Request an authorised person to break into the blog's server and remove the post.
 (d) Go to court to get financial compensation for the harm caused by the post.
 (e) Complain directly to the person who wrote the offensive blog post.

Question 20

[1 mark] What is Tor and what does it allow users to do?

(a) A security program that protects users' computers from viruses and other harmful applications.

(b) A peer-to-peer file sharing system that enables large files to be shared quickly.

(c) An email client that encrypts all sent messages and decrypts all received messages automatically.

(d) A network of servers that helps users to anonymise their Internet traffic.

(e) A network of servers that helps users to retrieve old versions of their files.

Question 21

[1 mark] Which one of the following is NOT a video game controversy?

(a) Gamers have been associated with online harassment (e.g. Gamergate).

(b) Playing video games is associated with heightened aggression and lowered empathy.

(c) Women and minorities are often poorly represented, if at all, in video games.

(d) Censorship and regulation of video game content is a contentious issue.

(e) None of the above.

Question 22

[1 mark] Which of the following can be **both** input and output devices?

I   Touchscreen

II   Keyboard

III Speakers

IV   Haptic gamepad

(a) I and IV.

(b) II and III.

(c) III.

(d) IV.

(e) None of the above.

Question 23

[1 mark] Which of the following is NOT an artifact element?

(a) Technology.

(b) Embedded narratives.

(c) Dynamics.

(d) Narrative mechanics.

(e) Game mechanics.

Question 24

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

(a) An artifact element can be both a game mechanic and a narrative mechanic.
(b) Emergent narratives only involve the player(s).
(c) Aesthetics determine how scary a game is.
(d) It is not important for game mechanics to align with the technology available.
(e) None of the above.

Question 25

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

(a) MYCIN only consists of a knowledge base of medical data and rules.
(b) The Curiosity Rover is an example of an agent.
(c) Weak AI is primarily seen in Hollywood movies, particularly science-fiction ones.
(d) IBM Deep Blue is an example of strong AI as it defeated the then reigning chess world champion.
(e) None of the above.

Question 26

[1 mark] With regard to AI, which of the following statements is FALSE?

(a) In order to manipulate symbols, a computer needs to understand what they mean.
(b) Solving a problem involves using actions to transition from a start state to a goal state.
(c) Problems are solved through the manipulation of symbols.
(d) AI programs reduce problems to symbols.
(e) None of the above.

Question 27

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

(a) The Turing test defines a criteria for determining machine intelligence.
(b) If a machine cannot distinguish between the two human participants it fails the Turing test.
(c) The person in the Chinese Room has no understanding of the Chinese language.
(d) The Turing test is a variant of the imitation game.
(e) The Chinese Room is a thought experiment that refutes the Turing test.

Question 28

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

I   The GIF compression algorithm is lossless and supports 16 million colours.

II   The PNG compression algorithm is lossless and supports only 256 colours.

III The PNG compression algorithm is not particularly effective for photos.

IV The JPEG compression algorithm is lossy, but is effective for photos.

   (a) III and IV.

   (b) I, II and IV.

   (c) I and II.

   (d) I, II, and III.

   (e) All of the statements.

Question 29

[1 mark] You are trying to print a square picture taken by a 16 megapixel camera. The printer has a resolution of 5000 dots per inch. How many inches across would the picture be when it was printed?

   (a) 1.25 inches.

   (b) 0.8 inches.

   (c) 0.64 inches.

   (d) 3.2 inches.

   (e) None of the above.

Question 30

[1 mark] How much memory, in bytes, would be required to store a 64 colour image that is 20 pixels high by 40 pixels wide?

   (a) 1200 bytes.

   (b) 4800 bytes.

   (c) 600 bytes.

   (d) 2400 bytes.

   (e) None of the above.

THIS PAGE HAS BEEN INTENTIONALLY LEFT BLANK.

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.

31. Programming Using Python (10 marks)

(a) What is the output of the following program?

```
print("Before")
i = 1
k = 0
while i < 3:
        print("Test", i)
        i = i + 1
        if k == 0:
              k = 2
        else:
              k = 0
        print(k)
print("After")
```

Before
Test 1
2
Test 2
0
After

(2 marks)

(b) What is the output of the following statements?

```
print(2 / 10 * 10.0 / 2.0)
```

1.0

(1 mark)

```
print(2.0 * 3 ** 2 / (1 + 1))
```

9.0

(1 mark)

```
print(21 // 2 + 5 % 2)
```

11

(1 mark)

(c) Using the Python window below, draw the output produced by the execution of the Python 'turtle' program listed below. Assume that the turtle begins in the middle of the window facing right and that the window is approximately 800 steps wide.
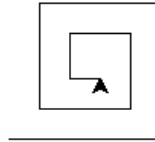
Make sure you clearly indicate:
- the path drawn by the turtle.
- the final position and direction of the turtle (using the arrowhead).

```python
import turtle
angle = 60
a_line = 100
count = 0
while count < 4:
    turtle.forward(a_line)
    if count % 2 == 0:
        turtle.left(angle)
    else:
        turtle.right(angle * 2)
    count = count + 1
```
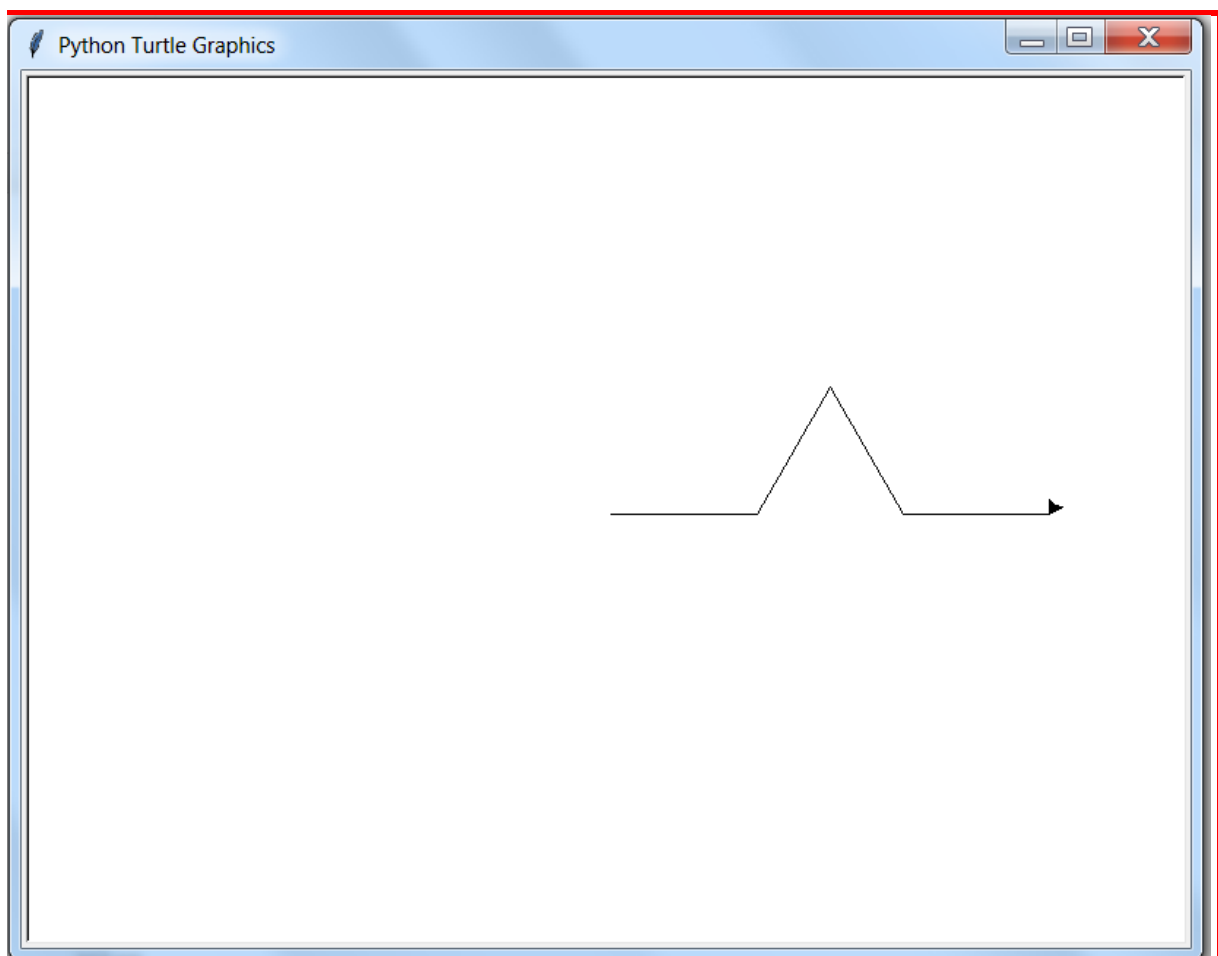

(3 marks)

(d) Consider the screenshot below:

Complete the following program to draw the output above.

```
import turtle
angle = 90
a_line = 100
count = 0
while count < 9:
    turtle.forward(a_line)
    turtle.left(angle)
    a_line = a_line - 10
    count = count + 1
```

(2 marks)

32. Spreadsheets (10 marks)

The following spreadsheet displays information about shipping invoices recorded by a courier company delivering goods from overseas within New Zealand.

	A	B	C	D	E	F	G	H
1				Shipping Invoices				
2								
3-4	Order ID	Order Value	Shipping Cost	Total Value	Currency	Total Value (NZD)	Status	Import Duty
5	0010	3500	60	3560	USD	5019.60	Warranty	0
6	0567	385	12	397	GBP	706.66	Import	156.00
7	3456	825	35	860	EURO	1307.20	Import	246.08
8	0009	220	50	270	USD	380.70	Import	0
9	2350	450	15	465	AUD	492.90	Warranty	0
10								
11	Order ID	Status					Currency	Exchange Rate
12	0009	Import					USD	1.41
13	0010	Warranty					GBP	1.78
14	0567	Import					EURO	1.52
15	2350	Warranty					AUD	1.06
16	3456	Import						

(a) Cell **D5** calculates the total value of the shipment. What is the best formula to use in Cell **D5**? Your formula must be able to be filled down from **D5** to **D9** correctly.

```
= B5 + C5
```

(1 mark)

(b) Cell **F5** contains the total value of the shipment in New Zealand dollars (NZD). To solve this you must know the exchange rate of the currency used to appraise the shipment. This is summarized in the table in cells **G12:H15**. What is the best formula to use in Cell **F5**? Your answer must use the **VLOOKUP** function to retrieve the appropriate exchange rate for a shipment, and use this to calculate the total value of the shipment in NZD. 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 **F5** to **F9** correctly.

```
= D5 * VLOOKUP(E5, $G$12:$H$15, 2, FALSE)
```

(3 marks)

(c) Cell **G5** displays the status of each order, differentiating between shipments of new items (**Import**), and items being shipped as part of a warranty claim (**Warranty**). The status of each order is summarized in the table in cells **A12:B16**. What is the best formula to use in Cell **G5**? Your answer must use the **VLOOKUP** function to retrieve the appropriate status for each order. 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 **G5** to **G9** correctly.

```
= VLOOKUP(A5, $A$12:$B$16, 2, FALSE)
```

(2 marks)

(d) Cell **H5** displays the import duty which is to be levied on the order. A shipment only receives an import duty if the order is an **import** order and has a total value of greater than 400 NZD. The import duty is calculated as the sum of 15% GST on the total value of the order in NZD and a 50 NZD processing fee. What is the best formula to use in Cell **H5**? Your answer must use an **IF** function and an **AND** function.

Note: Your formula must be able to be filled down from **H5** to **H9** correctly.

```
=IF(AND(G5 = "IMPORT", F5 > 400),

    F5 * 0.15 + 50, 0)
```

(4 marks)

33. HTML5 and CSS (20 marks)

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

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 film festival website is:
        "https://en.wikipedia.org/wiki/2017_in_video_gaming".

```
<!DOCTYPE html>
<html lang="en">
<head>
<meta charset="UTF-8">
<title>HTML/CSS Exam Question</title>
<style type="text/css">
body{text-align: justify; font-family: sans-serif}
h1, h2{font-family: "MS Courier New", monospace;
      background-color: #415b41; color: white;
      font-variant: small-caps; text-align: center}
table, tr, td{border: 2px solid #415b41}
#year{font-weight: bold; font-style: italic; font-size: large}
```

```
#tablehead{background-color: #415b41; color: white;
           text-align: center; font-size: large; font-weight: bold}

.genre{font-variant: small-caps; font-weight: bold;
      font-size: x-large}
.titles{font-style: italic}
</style>
</head>

<body>
```

```
<!-- Main Heading -->
```

```
<h1>2017 in Video Gaming</h1>
```

(2 marks)

```
<!-- Introductory Paragraph -->
```

```
<p>
The year <span id = "year">2017</span> will see the
release of numerous video games, both new IPs and
sequels.  A summary is provide here with a more
complete list available from
 <a href=
"https://en.wikipedia.org/wiki/2017_in_video_gaming">
Wikipedia</a>.
</p>
```

(4 marks)

```
<!-- Games of Note Section-->
```

```
<section>
<h2>Games of Note</h2>
<dl>
<dt class = "genre">Role Playing Games</dt>
  <dd class = "titles">Mass Effect: Andromeda,
Scalebound</dd>
<dt class = "genre">Action-Adventure Games</dt>
  <dd class = "titles">Crackdown 3, Red Dead
Redemption 2</dd>
<dt class = "genre">Platform Games</dt>
  <dd class = "titles">Sonic Mania, Yooka-Laylee</dd>
</dl>
</section>
```

(7 marks)

```
<!-- Hardware Releases Section-->
```

```html
<section>
<h2>Hardware Releases</h2>
<table>
<tr id = "tablehead">
  <td>Month</td>
  <td>Day</td>
  <td>Console</td>
</tr>
<tr>
  <td>March</td>
  <td>TBA</td>
  <td>Nintendo Switch</td>
</tr>
<tr>
  <td>TBA</td>
  <td>TBA</td>
  <td>Xbox Project Scorpio</td>
</tr>
</table>
</section>
```

(7 marks)

```html
</body>
</html>
```

34. LaTeX (15 marks)

On the following pages, complete the LaTeX code that will produce the output below:
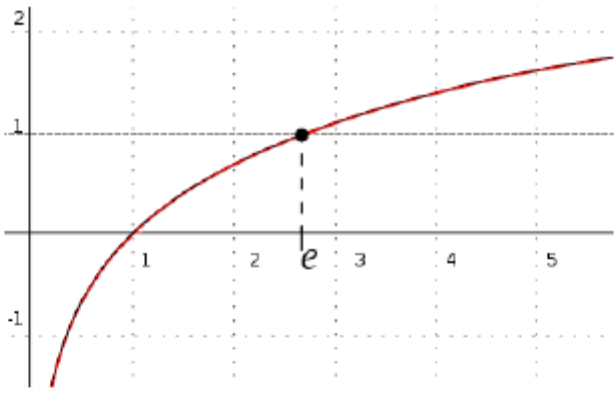
Euler's Number

Wikipedia*

SS, 2017

1 Introduction

The number e is a mathematical constant and is approximately equal to 2.71828. It can be calculated as:

$$e = \sum_{n=0}^{\infty} \frac{1}{n!} = 1 + \frac{1}{1} + \frac{1}{1 \cdot 2} + \cdots$$

This constant is the unique number whose natural logarithm is equal to one, as seen in the graph below:

2 Applications

The constant e has been used in problems involving:

- Compound interest

- Bernoulli trials

- Derangements

- Asymptotics

- Standard normal distribution

---

*based on work by Leonhard Euler

The image is stored in a file called **Graph.png** and is in the same folder as the LaTeX code. When inserted into the document, the image should be **centred** and **7 cm wide**.

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.

Normal commands	Environments	Math mode commands
`\section{}`	`itemize`	`$`
`\footnote{}`	`enumerate`	`\sqrt{}`
`\includegraphics{}`	`verbatim`	`\frac{}{}`
`\title{}`	`flushright`	`\cdot`
`\author{}`	`center`	`\cdots`
`\date{}`	`quote`	`\sum_{}^{}`
`\maketitle`	`displaymath`	`\infty`
`\item`	`equation`	`^`
`\usepackage{graphicx}`	`quotation`	`_`

```
\documentclass[a4paper]{article}

\usepackage{graphicx}

\begin{document}

\title{Euler's Number}
\author{Wikipedia\footnote{based on work by
Leonhard Euler}}
\date{SS, 2017}
\maketitle
\section{Introduction}
The number $e$ is a mathematical constant and is
approximately equal to 2.71828.  It can be
calculated as:
\begin{displaymath}
E = \sum_{n=0}^\infty \frac{1}{n!} = 1 +
\frac{1}{1} + \frac{1}{1 \cdot 2} + \cdots
\end{displaymath}

This constant is the unique number whose natural
logarithm is equal to one, as seen in the graph
below:
\begin{center}
\includegraphics[width=7cm]{Graph.png}
\end{center}
```
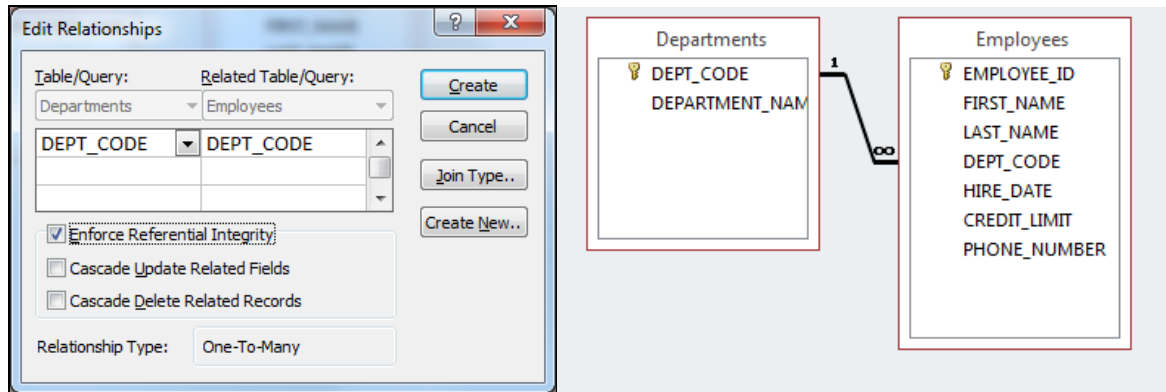
```latex
\section{Aplications}
The constant $e$ has been used in problems
involving:
\begin{itemize}
\item Compound interest
\item Bernoulli trials
\item Derangements
\item Asymptotics
\item Standard normal distribution
\end{itemize}
```

```
\end{document}
```

(15 marks)

35. Databases (15 marks)

Use the following Microsoft Access Relationship diagrams to answer Parts (a), (b) and (c) of this question.

(a) State the primary key and foreign key(s) (if any) of the **Departments** table in the Relationship diagram above.

Primary Key: **DEPT_CODE**

Foreign Key(s): **There are no foreign keys**

(1 mark)

(b) State the primary key and foreign key(s) (if any) of the **Employees** table in the Relationship diagram above.

Primary Key: **EMPLOYEE_ID**

Foreign Key(s): **DEPT_CODE**

(1 mark)

(c) Which fields in the above two tables are related, and what sort of relationship exists between them?

Related fields: **DEPT_CODE in the Employees table is related to DEPT_CODE in the Departments table.**
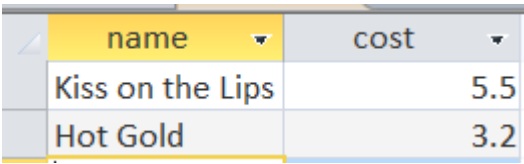
Relationship: **One-to-many relationship.**

(2 marks)

You are given the following table called **Drink_Info** in a Microsoft Access database. Use this table to answer Parts (d), (e) and (f) of this question.

ID	name	cost	carbs	colour	ice	calories
1	Blackthorn	3	8.4	yellow	Y	33
2	Blue Moon	2.5	3.2	blue	Y	12
3	Oh My Gosh	3.5	8.6	orange	Y	35
4	Lime Fizz	2.5	5.4	green	Y	24
5	Kiss on the Lips	5.5	42.5	purple	Y	171
6	Hot Gold	3.2	32.1	orange	N	135
7	Lone Tree	3.6	4.2	red	Y	17
8	Greyhound	4	14	yellow	Y	50
9	Indian Summer	2.8	7.2	brown	N	30
10	Bull Frog	2.6	21.5	tan	Y	80
11	Soda and It	3.8	4.7	red	N	19

(d) Show the output of the following query:

```
SELECT name, cost
FROM Drink_Info
WHERE calories > 80;
```

name	cost
Kiss on the Lips	5.5
Hot Gold	3.2

(3 marks)

(e) Write an SQL query that displays the **name**, **cost** and **calories** of all drinks with **ice**. The query's results should be sorted using the **name** in ascending alphabetical order (i.e. A – Z). An example of the results obtained by running the query is shown below.

name	cost	calories
Blackthorn	3	33
Blue Moon	2.5	12
Bull Frog	2.6	80
Greyhound	4	50
Kiss on the Lips	5.5	171
Lime Fizz	2.5	24
Lone Tree	3.6	17
Oh My Gosh	3.5	35

```
SELECT name, cost, calories
FROM Drink_Info
WHERE ice = "Y"
ORDER BY name;
```

(4 marks)

(f) Complete the Query By Example (QBE) form below so that it generates a query that displays the **name**, **cost** and **calories** of all drinks whose cost is $3 or less. The results should be sorted using the **cost** in descending order. An example of the results obtained by running the query is shown below.

name	cost	calories
Blackthorn	3	33
Indian Summer	2.8	30
Bull Frog	2.6	80
Lime Fizz	2.5	24
Blue Moon	2.5	12

Field:	name	cost	calories		
Table:	Drink_Info	Drink_Info	Drink_Info		
Sort:		Descending			
Show:	✓	✓	✓	☐	☐
Criteria:		<=3			
or:					

(4 marks)

- 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

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