COMPSCI 111 / 111G

Mastering Cyberspace:
An introduction to practical computing

Introduction
Digital Information

Teaching staff

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Teaching Staff

Ann Cameron (Lab Tutor / Course Coordinator)
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- Office hours: Mon 10am - 12 noon, Wed 1pm - 3pm

Course Ground Rules

Behaviour
- Respect other people
- One person speaks at a time
- Questions welcome any time
- Answers expected when questions asked

Active learning
- Expect you to think
- Expect you to work on exercises

Expect you to keep up with the class
- Read Internet resources regularly
- Find out the answers to questions

Independent Learning
- Experimentation

Course Content

Introduction
- Digital Information, Hardware, Software

Internet
- WWW, Email, Instant Messaging, Forum, Blog, Wiki
- Social issues and risks

Home / Office Applications and Publication tools
- Word Processing, Spreadsheets, Databases
- HTML, PowerPoint, LaTeX

Programming
- Python

Special Topics
- Research areas in Computer Science

Course Requirements

Required reading
- No textbook for this course
- Coursebook is required - $25
  - Available from Student Resource Centre in basement of building 303
- Online sources

Assessment

• Labs	15%	Practical
• Test	20%	Theory
• Exam	65%	Theory

- Must pass both practical and theory

Class Representative

Laboratories

Overview
- Designed to provide practical experience
- Challenging / varied range of software
- Prepare for labs by reading the coursebook thoroughly
- Friendly atmosphere. Talk to other students.

Assessment
- Compulsory three hour lab each week (starts in week 02)
- 10 labs, worth 1.5% of final grade each
- Must complete a lab report before the start of the following lab.

Locations - All labs
- 303.131 - Old Tutorial Lab (OTL)

Study

Time management
- 10 hours per course
  - 3 hours lectures
  - 3 hour lab
  - 4 hours reading

Internet resources
- http://www.cs.auckland.ac.nz/compsci111s2c/
- http://en.wikipedia.org/

People
- Students
- Tutors
- Teaching Staff

Problems?

Everyone has problems sometimes

- Friendly department
- Happy to discuss options
- Come and talk to us :)

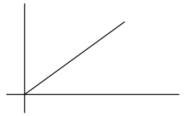
Getting started

- Find the OTL
- Log in to the computers
- Meet Ann Cameron
- Available in OTL from 2 - 3 on Monday, Wednesday and Friday this week.

Digital Information

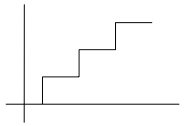
Information in real world is analogue

- Continuous signal
- Weight



Information stored by a computer is digital

- Represented by discrete numbers
- Weight

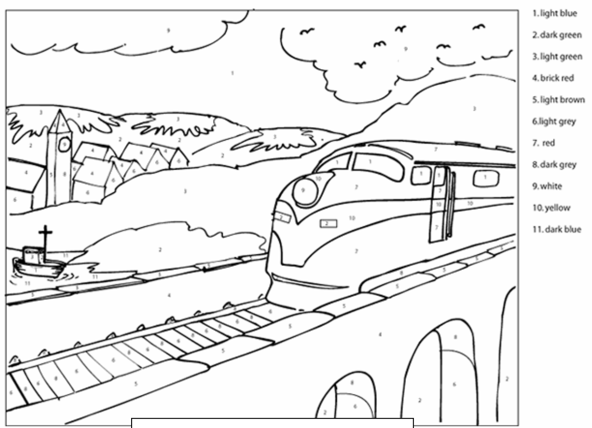


http://en.wikipedia.org/wiki/Digital

Encoding information

Any information can be encoded using numbers

- Paint by numbers

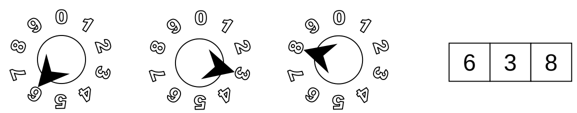


http://www.trakkies.co.uk/

Storing numbers in a machine

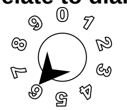
Series of dials

- Each dial goes from 0 to 9
- Store information digitally
- Decimal system



Exercises

All of the following questions relate to dials that have 10 different states (0-9).



Exercise: Given a machine that used 4 dials, how many different numbers could we represent?

Exercise: If we wanted to represent 123 different colours, each encoded as a different number, how many dials do we need?

Exercise: If we used numbers to represent each letter of the alphabet, how many dials would we need to store a single letter?

Switches

A dial is complicated.

- Each dial has 10 different states (0, 1, 2, 3, 4, 5, 6, 7, 8, 9).
- Physically creating the circuits is complicated

Switches are simple

- Each switch is off or on (0 or 1)
- Physically creating the circuits is easy

Binary

Binary number system

- Off represents 0
- On represents 1

1 1 1

http://en.wikipedia.org/wiki/Binary_numeral_system

Binary digits (bit)

Each switch is known as a binary digit, or bit

- A bit can be either 0 or a 1

We use them in groups

3 bits

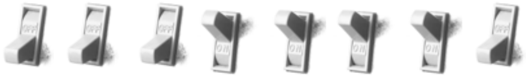
2 bits

http://en.wikipedia.org/wiki/Bit

Byte

Group the bits together into sets of 8

- 8 bits is known as a byte



One byte

http://en.wikipedia.org/wiki/Byte

Using binary numbers

Using 2 switches, how many different states can we have?

Exercises

How many different numbers can we represent using 3 bits?

How many different numbers can we represent using 4 bits?

How many different numbers can we represent using 5 bits?

Bytes

One byte consists of 8 bits

- Can represent 2 x 2 x 2 x 2 x 2 x 2 x 2 x 2 different numbers
- 2^8 = 256 different numbers

One byte

Storing information

Measure the amount of information we can store

- Bytes are the unit of measurement

A byte holds a single number between 0 and 255 inclusive

- 256 different possible numbers
- Very small amount of information

Talking about bytes

- 450 bytes
- 50,000 bytes
- 3,932,160 bytes (1280 x 1024 x 3)

Decimal Prefixes

Decimal prefixes

10^n	Prefix	Symbol	Decimal
10^0	none		1
10^3	kilo	k	1000
10^6	mega	M	1,000,000
10^9	giga	G	1,000,000,000
10^{12}	tera	T	1,000,000,000,000
10^{15}	peta	P	1,000,000,000,000,000
10^{18}	exa	E	1,000,000,000,000,000,000
10^{21}	zetta	Z	1,000,000,000,000,000,000,000
10^{24}	yotta	Y	1,000,000,000,000,000,000,000,000

http://en.wikipedia.org/wiki/SI_prefix

Using prefixes in Computer Science

Situation is very confused

- Designers of computers use multiples of 2

Incorrect, but in common useage

- 8 bits = 1 Byte
- 1024 B = 1 KB
- 1024 KB = 1 MB
- 1024 MB = 1 GB

Also in common use is the decimal usage

- 8 bits = 1 Byte
- 1000 B = 1 KB
- 1000 KB = 1 MB
- 1000 MB = 1 GB

Usage depends on industry conventions

Binary Prefixes

Binary prefixes

2^n	Prefix	Symbol	Decimal
2^0	none		1
2^{10}	kibi	Ki	1024
2^{20}	mebi	Mi	1,048,576
2^{30}	gibi	Gi	1,073,741,824
2^{40}	tebi	Ti	1,099,511,627,776
2^{50}	pebi	Pi	1,125,899,906,842,624
2^{60}	exbi	Ei	1,152,921,504,606,846,976
2^{70}	zebi	Zi	1,180,591,620,717,411,303,424
2^{80}	yobi	Yi	1,208,925,819,614,629,174,706,176

http://en.wikipedia.org/wiki/Binary_prefix

Exercises

Exactly how many bytes is there in 1 KB?

Exactly how many bytes is there in 1 KiB?

Which is bigger, 1000 KiB or 1 MB?

Summary

Any information can be digitized

- Simply decide how to encode the information using numbers
- Computers use numbers to store all information

Computers are built with hardware that uses binary numbers

Unit of measurement for information is a Byte

- Computer industry uses decimal prefixes correctly and incorrectly
- New units created to prevent confusion
- New units will become more common over time