

**UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS**  
International General Certificate of Secondary Education

**MARK SCHEME for the May/June 2012 question paper**  
**for the guidance of teachers**

**0420 COMPUTER STUDIES**

**0420/12**

Paper 1, maximum raw mark 100

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

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- 1** Any **three** from:
- fact finding
  - feasibility study
  - analysis
  - design
  - testing
  - documentation/technical documentation/user guide
  - implementation/installation
  - evaluation
  - maintenance
- [3]

**2 email**

**advantages** (one from:)

- easier to send attachments
- easier/faster to type
- can format text
- cheaper to send an email

**disadvantage** (one from:)

- need to buy computer equipment
- computer equipment not as portable as mobile phone
- need a broadband connection/modem/Internet access
- need account for emails
- can send a virus

**mobile phones**

**advantages** (one from:)

- completely portable method/can be used on the move
- more people have mobile phones
- use of predictive texting
- cheaper to buy a phone

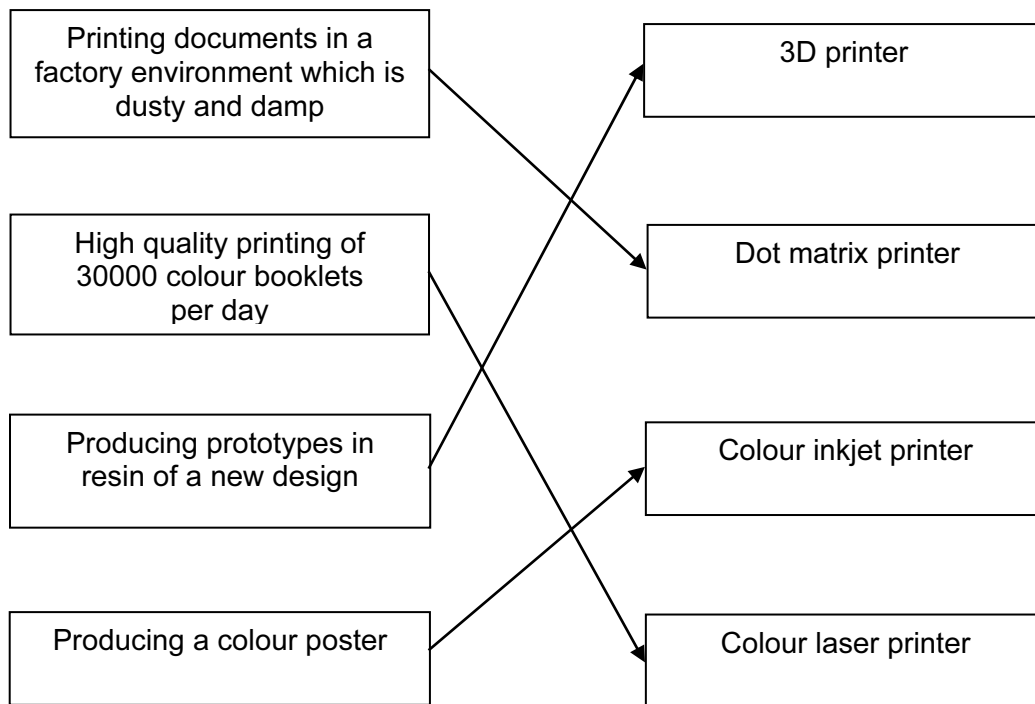
**disadvantage** (one from:)

- can't send large documents/files/limited number of characters
  - phone charges for sending messages are relatively high
  - phone charges for sending messages overseas are high
  - slow to key in messages/small keyboard
  - often out of range of signal/poor signal
  - smaller screens
- [4]

**3** Any **five** from:

- viruses
  - hacking
  - cookies
  - pharming
  - phishing
  - spyware
  - tapping into unsecured wifi network/war driving
  - shoulder surfing/over-the-shoulder observation of the Internet user's credentials/user name and password
- [5]

4 (a)



[4]

(b) **3D printer**

- capable of producing solid objects
- cheaper than making a working model (by conventional methods)
- works with CAD

**dot matrix printer**

- can work in harsh environments
- (since in a factory,) noise levels are not important
- quality of printout not important
- robust printer

**colour inkjet printer**

- suited to low volume
- good/photographic quality printing

**colour laser printer**

- fast for volume printing

[4]

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- 5 (a) Any **three** from:
- wire frame
  - 2D / 3D modelling
  - library of parts which can be used in new drawings
  - validation / verification of designs against original specification
  - ability to link with computer-aided manufacture (CAM)
  - facility to calculate the mass of the actual object once built
  - facility to calculate the cost of producing the article
  - features such as rotation, colour, zoom, etc.
  - simulation of designs (without the need to build a prototype)
  - create engineering drawings from solid models
  - import and export to allow the exchange of data with other software packages
  - kinematics (i.e. check moving parts in assemblies don't interfere with each other)
  - automatic routing of cables and hoses
- [3]
- (b) Any **three** from:
- (very) large screens/monitors
  - plotters to draw scale and full size drawings
  - 3D printers
  - CAM machinery/CNC lathe
- [3]
- (c) Any **two** health risks and any **one** safety risk from:
- health risks**
- RSI from repeated/long continuous use of a keyboard/repeated clicking on a mouse
  - back/neck ache from bad posture/incorrect chair position
  - headaches caused by glare from monitors
  - eye strain caused by glare from monitors/poor lighting
  - dry eye caused by staring at screen without blinking
  - respiratory problems etc. caused by ozone/toner particulates emitted from a laser printer
- safety risks**
- electrocution e.g. bare wires, drinks near computers, etc.
  - trip hazards from trailing cables
  - heavy equipment falling due to failure of inadequate desks, work stations etc.
  - fires from short circuits/over-heating equipment
- [3]

6 (a)

<b>M</b>	<b>T</b>	<b>S</b>	<b>C</b>	<b>D</b>
32	1	0	1	1
16	32	32	2	
8	0	32	3	0
4	8	40	4	1
2	4	44	5	1
1	0	44	6	0
	1	45	7	1

(1 mark)

(1 mark)

(1 mark)

(1 mark)

[4]

(b) converting binary number into equivalent base 10 number

[1]

(c) 60

[1]

7 (a) (i) Any **one** from:

- sound card and/or speakers
- possibly F1 key is faulty

[1]

(ii) Any **two** from:

- ask a further series of questions
- based on responses of the user
- reference to knowledge base/rules base/explanation system/inference engine

[2]

(iii) Any **one** from:

- % probability of identified fault found
- advice on how to correct fault
- change the speakers/sound card/keypad

[1]

(b) Any **three** from:

- knowledge base
- rules base
- inference engine
- expert system shell
- explanation system

[3]

**(c) RAM**

- to store data/programs/parts of operating system in use
- to store data that can be changed

**ROM**

- where operating system/bios is stored
- where data that starts up the system is stored

[2]

**8 (a)** –1 mark for each different error

	<b>D</b>
<b>1</b>	<b>bmi</b>
<b>2</b>	= B2/(C2*C2) OR = B2/C2^2
<b>3</b>	= B3/(C3*C3) OR = B3/C3^2
<b>4</b>	= B4/(C4*C4) OR = B4/C4^2
<b>5</b>	= B5/(C5*C5) OR = B5/C5^2
<b>6</b>	= B6/(C6*C6) OR = B6/C6^2
<b>7</b>	= B7/(C7*C7) OR = B7/C7^2

[2]

**(b) (i)** normal (correct spelling only)

[1]

- (ii)** = SUM(D2:D7)/6 or  
= AVERAGE(D2:D7) or  
= (D2 + D3 + D4 + D5 + D6 + D7)/6

[1]

**(iii)** = IF(D8 < 18.5, "underweight", IF(D8 > 25, "overweight", "normal"))

< ----- 1 mark ----- > < ----- 1 mark ----- >

[2]

**(c)** = 20 \* C2 \* C2

OR

= 20 \* C2 ^ 2

[1]

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**9 (a) barcode reader**

e.g. (any reasonable application these are just examples)

- stock control
- library loans
- Point Of Sale system
- tracking systems
- itemised billing

**RFID**

e.g. (any reasonable application these are just examples)

- identifying/tracking individual items e.g. livestock, vehicles

**magnetic stripe**

e.g. (any reasonable application these are just examples)

- security cards (e.g. hotel room keys)
- credit/debit/smart cards/ATMs/banking
- loyalty cards

[3]

**(b) 1 mark for naming validation check + 1 mark for example of its use (the two must match up)**

- |                   |   |
|-------------------|---|
| length check      | – check if an id number is exactly 8 characters long                          |
| range check       | – check if a person's age is in the range 11 to 19                            |
| limit check       | – check if salary paid greater than 0   |
| character/type    | – check if a telephone number contains digits only                            |
| consistency check | – return flight date after outbound flight date                               |
| format check      | – check if a date is in the form dd/mm/yyyy                                   |
| presence check    | – filling out a form online where a given field <b>MUST</b> have data entered |
| check digit       | – ISBN of a book  |

[4]

**10 (a)**

<b>A</b>	<b>B</b>	<b>C</b>	<b>X</b>	
0	0	0	<b>1</b>	(1 mark)
0	0	1	<b>1</b>	
0	1	0	<b>0</b>	(1 mark)
0	1	1	<b>1</b>	
1	0	0	<b>0</b>	(1 mark)
1	0	1	<b>0</b>	
1	1	0	<b>0</b>	(1 mark)
1	1	1	<b>1</b>	

[4]

(b) 1 mark for correct logic gate + 1 mark for correct associated truth table.

Any two from:

- NOR, AND, OR, XOR (EOR)

A	B	NOR	AND	OR	XOR
0	0	1	0	0	0
0	1	0	0	1	1
1	0	0	0	1	1
1	1	0	1	1	0

[4]

11 (a) (i) Any points from (maximum of 3 marks):

- signals/data supplied by sensors to the computer
- use of ADC
- computer compares data with pre-stored values
- if data beyond/greater than stored limit, intruder has been detected
- monitoring continues until re-set

(ii) Any points from (maximum of 2 marks):

- computer sends signal ...
- ... to set off siren/buzzer/light/alarm bell/sounds alarm
- use of a DAC
- automatically informs police/security company

Maximum mark: [4]

(b) Any **two** points from:

- signal sent to ...
- ... motors
- ... actuators

[2]

(c) Any **one** point from:

- motion
- light
- sound
- temperature

[1]

(d) Any **two** points from:

- store realistic values in memory/adjust sensitivity
- use 2 different sensors to monitor the same parameter (e.g. sound sensor and infra-red sensor to monitor intruder)
- fully/regularly test system once installed
- increase fault tolerance by use of redundant sensors and computers

[2]



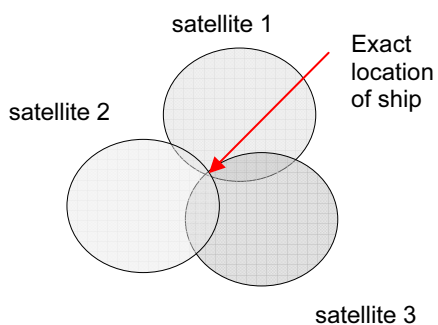
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- 12 (a) (i)** 3 minutes = 180 seconds  
each song = 180 \* 128 = **23 040 kbits**  
number of bytes = 23 040/8 = **2880 kbyte**  
= **2.8(125) Mbyte** [2]
- (ii)** 4 Gbyte = 4 \* 1024 = 4 096 Mbyte  
therefore, number of songs = 4 096/2.8125 = **1456 songs** [2]
- (b)** Any **three** points from:
- uses hard disk/disk pack (2 to 5 disks)
  - each disk surface has a R/W head
  - use of read and write buffers
  - R/W operation is faster than general data transfer rate ...
  - ... therefore simultaneous read/write operations can occur
  - description of how a DVD-RAM works
  - concentric tracks allow R/W at the same time
  - fast R/W operation [3]
- 13 (a)** code B [1]
- (b)** Any **one** from:
- no need to understand workings of a computer
  - easier to understand for programmer/closer to English
  - much easier to debug
  - much easier to test
  - one to many when writing commands
  - not machine specific/portable [1]
- (c)** Any **one** from:
- can address memory addresses directly
  - no need for compilers/interpreters
  - shorter code/code requires less storage/RAM
  - can (be written to) run faster [1]
- (d)**
- compiler produces object code / interpreter doesn't produce object code
  - compiler translates whole program in one go / interpreter translates and executes line at a time
  - compiler produces list of all errors / interpreter produces error message each time an error encountered
  - compiler produces "stand alone code" / interpreter doesn't produce "stand alone code"
  - compilation process is slow but resultant code runs very quickly / interpreted code runs slowly [2]

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**14 (a)** Any **four** points from:

- satellites transmit signals (to sat nav computer in the ship)
- computer receives/interprets these signals
- system depends on very accurate timing/use of atomic clocks
- each satellite transmits data including location and time
- computer in ship calculates its position based on at least 3 satellites
- at least 24 satellites in operation at a given time
- position of ship is known within 1 metre
- refer to triangulation:



[4]

**(b)** Any **two** benefits from:

- safer (can avoid known risks, identify safe harbour etc.)
- more accurate navigation
- can still navigate at night even under full cloud cover etc.
- the ship automatically transmits location 24/7
- ... if accident occurs, ship's exact location is known
- estimate time of arrival

[2]

**(c)** Any **one** from:

- output on LCD screen showing location in relation to known hazards etc.
- animation display (similar to a radar screen)
- verbal instructions

[1]

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**15 sample program:**

```

total2 = 0: totalenquiries = 0 (1 mark)
for day = 1 to 7 (1 mark)
    input enquiries (1 mark)
    total1 = 0 (1 mark)
    totalenquiries = totalenquiries + enquiries
    for i = 1 to enquiries
        input cust_enquiry (1 mark)
        if cust_enquiry < 100000 then total1 = total1 + 1 (1 mark)
        if cust_enquiry > 500000 then total2 = total2 + 1 (1 mark)
    next i
    print total1
next day
percent = (total2/totalenquiries) * 100 (1 mark)
print percent (1 mark)

```

marking points

- initialisation of weekly total (total2) and total enquiries outside first loop
- correct first loop (controlling the number of days i.e. 7)
- input number of enquiries + control of the central loop
- initialisation of daily total inside first loop (total1)
- correct input of customer enquiry (inside second loop)
- check how many enquiries < 100000 and increment total
- check how many enquiries > 500000 and increment total
- calculation of total enquiries and percentage enquiries
- BOTH outputs in the correct place

[6]