



**COMPUTER SCIENCE
STANDARD LEVEL
PAPER 2**

Monday 7 November 2005 (morning)

1 hour 45 minutes

INSTRUCTIONS TO CANDIDATES

- Do not open this examination paper until instructed to do so.
- Answer all the questions.

- 1. A program of mathematical games is designed to help young children to improve their mental arithmetic skills.

The first game at level 1 gives a set of equations and the player has to say whether the equations are true or false.

The programmer decides to hold the equations in an array of string and the correct answers in a parallel Boolean array.

For example:

SUMS	CORRECT
2 + 2 = 5	0
3 × 4 = 12	1
.	.
.	.

- (a) State why this data has to be held in two separate arrays. [2 marks]

A bank of 50 equations is stored.

- (b) Construct an algorithm for a Boolean function `PLAY` that accepts an integer between 1 and 50, outputs the equation which corresponds to that position in the array, accepts an input from the player and returns whether the answer is correct or not. The player’s input is “y” if he thinks the equation is true and “n” if he thinks it is not true. [5 marks]

- (c) Construct an algorithm for a procedure `GAME1` which gives the player 10 equations and outputs the number of times that the player was correct. The equations are randomly selected from the array and are never repeated. You should use your function `PLAY` without rewriting it, and can assume a library function `random` exists which returns a random number between 0 and 1. Recall also that the function `round` returns an integer from a real number such that `round(3.7)` returns the integer 4. [9 marks]

Young children are sometimes slow at typing and the purpose of the game is to help their mathematical skills, not test their typing.

- (d) Suggest a suitable form of input to the game and explain how it would be used. You should describe the screen display in your answer. [3 marks]
- (e) The following algorithm is for a level 2 game.

```

procedure GAME2 (val EQUATION string, N integer)
  declare COUNT integer, ANSWER string
  if N # 1 then
    for COUNT<--1 upto N-1 do
      output (COPY (EQUATION, COUNT, 1))
    endfor
  endif
  output ("*")
  for COUNT<--N+1 upto 5 do
    output (COPY (EQUATION, COUNT, 1))
  endfor
  input (ANSWER)
  if ANSWER = COPY (EQUATION, N, 1) then
    output ("√")
  else output ("x")
  endif
endprocedure

```

Recall that COPY (WORD, M, N) takes N characters from the string WORD, starting at the Mth character.

By completing the following table, trace this algorithm for the equation 9-4=5 and N=3 and deduce the output for an input of 5, from the player. [5 marks]

N	COUNT	output	input
3	1	9	
	2	9-	
...

- (f) Design an algorithm to check whether an EQUATION passed to the above procedure is correct. You do not need to write your algorithm in pseudo code but should make all necessary steps clear and should allow for equations which involve up to two digit numbers (for example 19+24=43 is correct and 19*24=43 is not correct). [6 marks]

This question requires the use of the Case Study.

2. (a) Outline the effect that *spamming* can have on a business. [3 marks]

A large multi national business holds information in a database which is stored in one central location and can be accessed from all countries over the Internet, using a secure connection, for financial and stock information.

- (b) (i) Outline **two** benefits of *normalisation* in a such a large database. [2 marks]

- (ii) Compare the holding of one central DBMS compared with each individual store holding their own copy. [4 marks]

- (c) (i) State the stages of the traditional software design lifecycle and identify the way in which it is cyclic. [3 marks]

- (ii) Compare your answer to part (i) with the cyclic nature of the prototyping approach to software design. [5 marks]

- (d) Explain why it is sometimes suggested that the final prototype should be abandoned and the final design started from scratch. [4 marks]

- (e) Discuss the implications of privacy in information technology. [4 marks]

3. A graphics designer uses a computer to design multi media web advertisements. This involves using programs that can create moving images and sound, storing files of many different types and finally uploading the adverts onto the web.

(a) Describe the use of each of the following, stating the features needed, in this application

(i) CPU [2 marks]

(ii) RAM [2 marks]

(iii) Cache [2 marks]

(iv) Hard disk [2 marks]

A user does not always see the advertisements in the same way as the designer, when they are downloaded over the Internet.

(b) Discuss **one** software feature of the user's computer that could enhance the running of a multi media file. [3 marks]

(c) Define *data compression* and explain why it is important in this application. [4 marks]
