S2 ICT Practice Paper (Set 2): binary and hexadecimal, spreadsheet functions, computer hardware, networks and information security

S2 Information and Communication Technology | Time: 60 minutes | Total: 100 marks | 22 questions

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Section A: Binary and Encoding (16 marks)

Answer all questions and show your working.

1. (a) Convert the binary number 10110110 to a decimal number and list the place value of each bit.

The place values from left to right are 128, 64, 32, 16, 8, 4, 2 and 1. Add the values where the bit is 1: 128 + 32 + 16 + 4 + 2 = 182. The decimal value is 182.

2. (b) Convert the hexadecimal number 2F to decimal, and write the decimal number 47 as an 8-bit binary number.

In 2F the digit 2 has place value 16 and F stands for 15, so 2 x 16 + 15 = 47. In reverse, 47 = 32 + 8 + 4 + 2 + 1, which is 00101111 in 8 bits.

3. (c) In ASCII the decimal value of the character A is 65. State the decimal values of C and c, and say how much the upper-case and lower-case letters differ.

C is 67 (65 + 2) and c is 99 (65 + 32 + 2). Upper-case and lower-case letters differ by 32, for example A is 65 and a is 97.

4. (d) In UTF-8 a Chinese character usually takes 3 bytes. A short passage has 40 Chinese characters. How many bytes does it take, and how many KB is that, taking 1024 bytes as 1 KB? Give the answer to 2 decimal places.

40 x 3 = 120 bytes. 120 / 1024 = 0.1172, which is about 0.12 KB.

Section B: Spreadsheet Formulas and Functions (16 marks)

The questions below refer to a spreadsheet. The scores of five students are stored in B2, B3, B4, B5 and B6.

5. (a) The five scores are 78, 85, 62, 90 and 70. State the results of =SUM(B2:B6) and =AVERAGE(B2:B6).

78 + 85 + 62 + 90 + 70 = 385, so =SUM(B2:B6) returns 385; 385 / 5 = 77, so =AVERAGE(B2:B6) returns 77.

6. (b) Write a suitable function formula to count how many students scored 75 or above, and state its result.

The formula is =COUNTIF(B2:B6,">=75"). The scores that reach 75 are 78, 85 and 90, so the result is 3.

7. (c) Explain the difference between a relative reference and an absolute reference, and state what happens to B1 and to B1 when a formula is copied from C2 to C3.

A relative reference shifts with the position of the formula, while an absolute reference marked with dollar signs stays fixed. Copying from C2 to C3 keeps B1 pointing at B1, but B1 moves down one row and becomes B2.

8. (d) Write an IF formula that shows Pass when the score in B2 is 60 or above, and Fail otherwise.

The formula is =IF(B2>=60,"Pass","Fail"). If B2 holds 62, the cell shows Pass.

Section C: Computer Hardware and Storage (16 marks)

Answer all questions.

9. (a) Compare RAM and ROM in terms of volatility, whether data can be written, and main use.

RAM is volatile: its contents are lost when power is cut, it can be read and written, and it holds programs and data in use temporarily. ROM is non-volatile: it keeps its contents without power, is normally read-only, and stores the firmware needed to boot.

10. (b) A computer has 8 GB of memory. Taking 1 GB as 1024 MB and 1 MB as 1024 KB, how many MB and how many KB is 8 GB?

8 x 1024 = 8192 MB; 8192 x 1024 = 8388608 KB.

11. (c) A 24-bit colour image is 1024 x 768 pixels and each pixel takes 3 bytes. How many bytes and how many KB does it take before compression?

1024 x 768 = 786432 pixels, times 3 gives 2359296 bytes; dividing by 1024 gives 2304 KB.

Section D: Networks and the Internet (16 marks)

Answer all questions.

12. (a) Explain the difference between a local area network (LAN) and a wide area network (WAN), and give one example of each.

A LAN covers a small area, usually inside one building, and is managed by one organisation, such as a school computer room network. A WAN covers a large area, possibly across cities or countries, and usually uses lines from a telecom operator, such as the Internet.

13. (b) A web address is https://www.school.edu.hk/form/index.html. State its protocol, domain name, path and file name.

The protocol is https; the domain name is www.school.edu.hk; the path is /form; the file name is index.html.

14. (c) Explain the difference between HTTP and HTTPS, and name the technology HTTPS uses to protect data in transit.

HTTP sends data in plain text, so anyone who intercepts it can read it. HTTPS adds an encryption layer on top of HTTP; data is encrypted with TLS (also called SSL), so intercepted data cannot easily be read. It is used for login and payment pages.

15. (d) A 24 MB file is downloaded over an 8 Mbps connection. Taking 1 MB as 8 Mb, what is the minimum time needed in seconds?

24 MB equals 24 x 8 = 192 Mb; 192 / 8 = 24, so the minimum time is 24 seconds.

Section E: Information Security and Copyright (16 marks)

Answer all questions.

16. (a) List three common features of a phishing email and suggest two ways to protect yourself.

Features: (1) the sender address looks like an official one but is not identical; (2) the message presses the reader to click a link or enter a password; (3) links lead to unknown domains, or attachments ask for macros to be enabled. Protection: do not click links in the email, type the official address yourself; check the sender address and confirm with the organisation directly.

17. (b) Explain the 3-2-1 backup rule and how backups help against ransomware.

The 3-2-1 rule means keeping at least 3 copies of the data, on 2 different types of media, with 1 copy stored off site. Ransomware encrypts local files and demands payment; with an offline or off-site backup the data can be restored without paying.

18. (c) A student uses an image found online for a school magazine cover. State two copyright points to note.

(1) Images online are not automatically free to use; check the licence terms, including whether modification and commercial use are allowed. (2) Credit the author and source; if the terms do not allow the use, buy a licence or use public domain or openly licensed material instead.

Section F: Integrated Task (20 marks)

The school IT club is running a coding day and needs an online registration form plus a spreadsheet summary. Answer the questions below.

19. (a) List four fields for the form and state a suitable validation rule for each.

(1) Name: text, required, 2 to 20 characters. (2) Class: drop-down list limited to 1A to 6C. (3) Email: format check requiring an at sign and a domain. (4) Fee: number within the range 0 to 500, text rejected.

20. (b) Suppose classes are in C2:C21 and fees in D2:D21. Write two formulas that count the number of applicants and total the fees.

Use =COUNTA(C2:C21) for the number of applicants and =SUM(D2:D21) for the total fee. If 20 applicants each pay 50 dollars, the total is 1000 dollars.

21. (c) Describe three steps to publish the form on the Internet and collect the data, and state one essential security consideration.

(1) Upload the form page and its handler to a server that supports server-side programs. (2) Configure the form to write submissions into a database or email them to a given address. (3) Test with sample data to confirm validation and records work. Security: serve the form over HTTPS so names and contact details are not sent in plain text.

22. (d) A classmate claims that data is safe once a password is set. Give one counter-argument and explain why.

A password only stops people who do not know it; a weak password can be guessed or cracked from leaked lists, and if an administrator account is taken over the data still leaks. Two-factor authentication, least privilege and regular backups are also needed.

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