

Cambridge International AS & A Level

CANDIDATE
NAME

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CENTRE
NUMBER

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CANDIDATE
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COMPUTER SCIENCE

9618/13

Paper 1 Theory Fundamentals

May/June 2021

1 hour 30 minutes

You must answer on the question paper.

No additional materials are needed.

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You may use an HB pencil for any diagrams, graphs or rough working.
- Calculators must **not** be used in this paper.

INFORMATION

- The total mark for this paper is 75.
- The number of marks for each question or part question is shown in brackets [].
- No marks will be awarded for using brand names of software packages or hardware.

This document has **16** pages.

1 Anya scans an image into her computer for a school project.

(a) The scanned image is a bitmapped image.

(i) Complete the following table to describe the two terms about graphics.

Term	Description
Pixel	<ul style="list-style-type: none"> • A single square of one colour • The smallest addressable element in an image
File header	<ul style="list-style-type: none"> • Data about the bitmap image (e.g. number of colours)

[2]

(ii) The image is scanned with an image resolution of 1024×512 pixels, and a colour depth of 8 bits per pixel.

Calculate an estimate for the file size, giving your answer in mebibytes. Show your working.

Working $1024 \times 512 = 524\,288$ pixels/bytes
 $524288 / 1024 / 1024$

Answer 0.50 mebibytes

[3]

(b) The image is compressed using lossless compression.

Identify **one** method of lossless compression that can be used to compress the image **and** describe how the method will reduce the file size.

Lossless compression method Run-length encoding

Description Replace sequences of the same colour pixel

.....
 ...with colour code and number of indentical pixels

[3]

- (c) One of the colours used in the image has the hexadecimal colour code:

#FC238A

FC is the amount of red, 23 is the amount of green and 8A is the amount of blue in the colour.

- (i) Convert the hexadecimal code FC into denary.

252

[1]

- (ii) The amount of green in binary is 00100011. This has the denary number 15 added to it to create a second colour.

Add the denary number 15 to the binary number 00100011 and give your answer in binary.

Perform the addition in binary. Show your working.

Working

0010 0011
+0000 1111

0011 0010

Answer (in binary) 00110010

[3]

- (iii) Hexadecimal 23 in two's complement representation is 00100011. The denary number 10 needs to be subtracted from this value.

Subtract the denary number 10 from the two's complement representation 00100011.

Give your answer in binary. Show your working.

Working

0010 0011
+ 1111 0110

0001 1001

Answer (in binary) 00011001

[3]

(d) Anya made sure that the image was not subject to any copyright before scanning it.

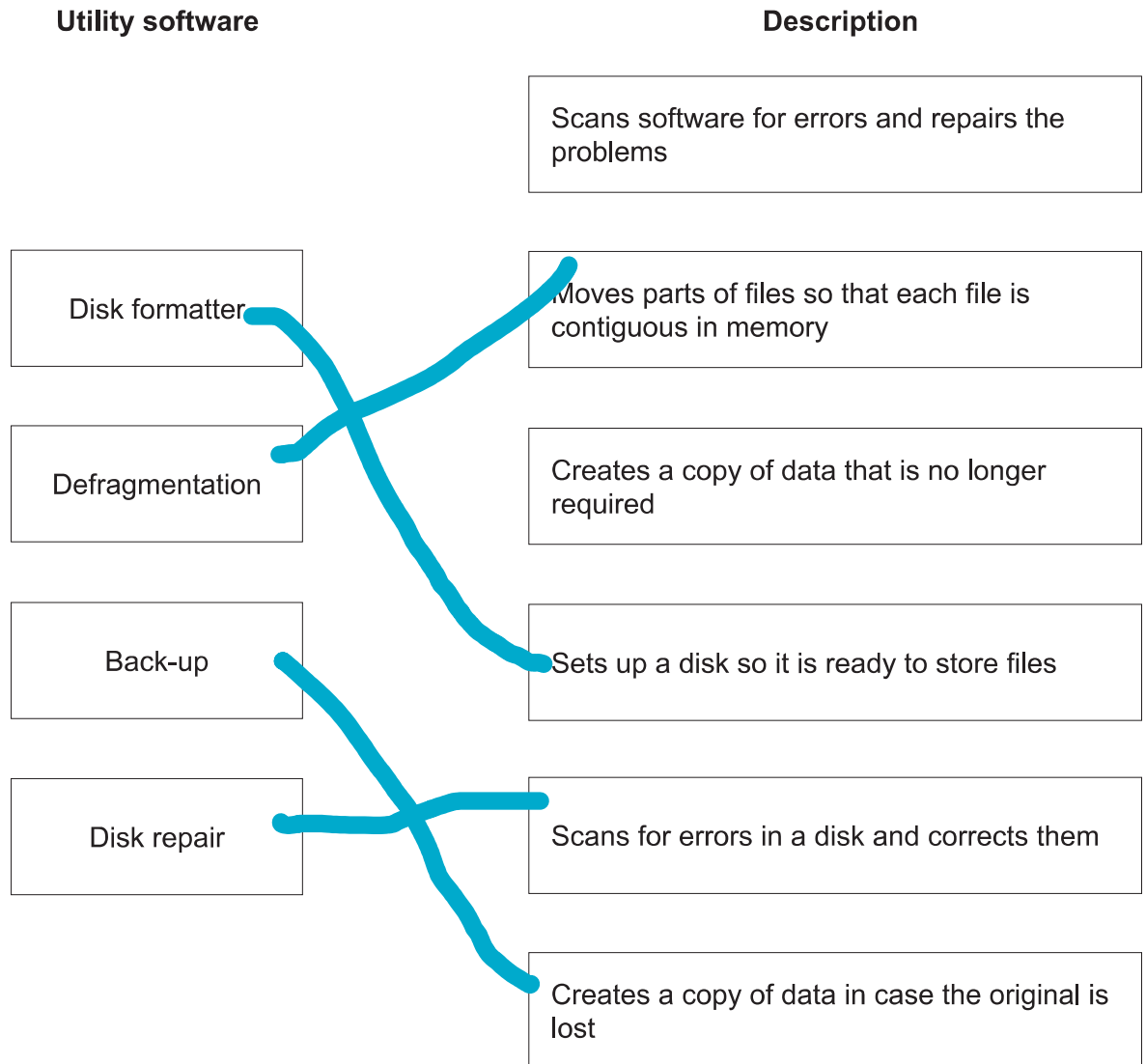
Describe what is meant by **copyright**.

- The formal and legal rights to ownership // intellectual property rights
- Protects against unauthorised reproduction of work
- Provides for legal right of redress

[2]

2 Bingwen's computer comes with an Operating System and utility software.

(a) Draw **one** line from each utility software to its correct description.



[4]

(b) Identify **four** key management tasks that the Operating System will perform.

- memory management
- security management
- process management
- provision of a platform for software
- hardware / device / peripheral / resources management
- file management
- input/output management
- error checking and recovery
- provision of a user interface

[4]

- 3 A processor has one general purpose register, the Accumulator (ACC), and several special purpose registers.

- (a) Complete the following description of the role of the registers in the fetch-execute cycle by writing the missing registers.

The **Program Counter** holds the address of the next instruction to be loaded. This address is sent to the **Memory Address Register**
 The **Memory Data Register** holds the data fetched from this address. This data is sent to the **Current Instruction Register** and the Control Unit decodes the instruction's opcode.
 The **Program Counter** is incremented.

[5]

Rest is same as
 9618/s21/12