

1.4.1 Data types

OCR A-Level Computer Science (H446) - H446/01 - Exam questions and mark schemes

22 past paper questions, 49 marks in total. Answer each question in the space provided, then check your work against the mark schemes at the end. compsciwizard.com

Question 1 H446/01 [3 marks]

Tick one box for each piece of data to show if it is an example of a String, Float or Character data type. Data: 3.14, 'j', 'Hello World'.

Question 2 H446/01 [2 marks]

Beth records how many steps she has completed over a seven-day period. She stores the values in a text file as strings. State the data type the values will need to be converted to and state the reason why.

Question 3 H446/01 [2 marks]

Explain one benefit of using Unicode instead of ASCII.

Question 4 H446/01 [2 marks]

Explain one drawback of using Unicode instead of ASCII.

Question 5 H446/01, June 2024 [1 mark]

Convert the denary number -124 into an 8-bit two's complement binary number.

Question 6 H446/01, June 2024 [1 mark]

State one other way to represent negative binary numbers.

Question 7 H446/01, June 2024 [2 marks]

Convert the denary number 298 into hexadecimal.

Question 8 H446/01, June 2024 [3 marks]

The binary number 10011101 0110 is stored in normalised floating point form with an 8-bit mantissa and a 4-bit exponent both in two's complement. Convert this into denary.

Question 9 H446/01 [3 marks]

Using the binary value 1001 1101, convert this into: a positive denary number, a negative denary number using two's complement, and a hexadecimal value.

Question 10 H446/01 [9 marks]

Discuss the different types of data that can be stored in binary and why computer systems store data in binary format.

Question 11 H446/01, June 2023 [1 mark]

Convert the denary number 189 to hexadecimal.

Question 12 H446/01, June 2023 [2 marks]

Convert the denary number -107 to an 8-bit binary number using sign and magnitude, then using two's complement.

Question 13 H446/01, June 2023 [1 mark]

Give one advantage of storing values using two's complement instead of sign and magnitude.

Question 14 H446/01, June 2023 [4 marks]

Show how the denary value -15.75 can be represented as a normalised floating point binary number using 8 bits for the mantissa and 4 bits for the exponent.

Question 15 H446/01, June 2023 [2 marks]

Complete the sentences: Increasing the number of bits used for the mantissa increases the _____ of the number. Increasing the number of bits used for the exponent increases the _____ of the number.

Question 16 H446/01 [1 mark]

State the benefit of using a normalised form when representing data as a floating point number.

Question 17 H446/01, June 2017 [2 marks]

Describe what is meant by the term 'character set'.

Question 18 H446/01 [2 marks]

Convert the hexadecimal number 66 into a denary number.

Question 19 H446/01 [2 marks]

State two reasons why a programmer would prefer to use hexadecimal numbers rather than binary numbers.

Question 20 H446/01 [1 mark]

State why computer systems store data in binary.

Question 21 H446/01, June 2022 [1 mark]

Give one similarity between ASCII and Unicode.

Question 22 H446/01, June 2022 [2 marks]

Give two differences between ASCII and Unicode.

Mark schemes

One mark per valid point unless the scheme says otherwise. Practice questions are written by Comp Sci Wizard in the style of OCR mark schemes.

Question 1 [3 marks] H446/01

3.14 - Float

"j" - Character

"Hello World" - String

(3 marks - 1 per correct match)

Question 2 [2 marks] H446/01

Data Type: Integer / real / float / single / double

Reason: To complete calculations (on the numeric data)

(2 marks - 1 for type, 1 for reason)

Question 3 [2 marks] H446/01

It has more bits / possible combinations

Can represent more characters/emojis

Can represent more worldwide languages

(2 marks - 1 per bullet)

Question 4 [2 marks] H446/01

Each character is stored using more bits

Increases file size

(2 marks - 1 per bullet)

Question 5 [1 mark] H446/01, June 2024

1000 0100 (1 mark)

Question 6 [1 mark] H446/01, June 2024

Sign and magnitude (or One's complement) (1 mark)

Question 7 [2 marks] H446/01, June 2024

12A (2 marks - 1 for 12, 1 for A)

Question 8 [3 marks] H446/01, June 2024

Converting exponent to 6

Converting mantissa to 1001110.1 (moving binary point 6 to right)

-49.5 (denary answer)

(3 marks - 1 per bullet)

Question 9 [3 marks] H446/01

Positive denary: 157

Negative denary (two's complement): -99

Hexadecimal: 9D

(3 marks - 1 per answer)

Question 10 [9 marks] H446/01

Levels of response question (9 marks)

AO1 Types of data: Numeric, Alphanumeric/text/characters/symbols, Sound, Images, Video

AO2 Examples: Text - ASCII/Unicode character sets; Numbers - sign and magnitude, two's complement, floating point; Images - pixels with binary colour values; Sound - sampled as binary numbers

AO3 Reasons: Computers use binary logic for on/off states; Computer systems based on switches/transistors; Binary is high tolerance; Two states easily translate to binary values

Question 11 [1 mark] H446/01, June 2023

BD (1 mark)

Question 12 [2 marks] H446/01, June 2023

Sign and magnitude: 1110 1011

Two's complement: 1001 0101

(2 marks - 1 per answer)

Question 13 [1 mark] H446/01, June 2023

Calculations are more easily performed on two's complement

Two's complement allows for a larger range of numbers to be stored

No additional hardware is required in two's complement

Two's complement has only one representation for 0

(1 mark for any valid point)

Question 14 [4 marks] H446/01, June 2023

-15.75 is 10000.01 in fixed point two's complement

Binary point moved 4 places left

Mantissa: 1000 0010

Exponent: 0100

(4 marks - 1 per bullet)

Question 15 [2 marks] H446/01, June 2023

Mantissa: precision / accuracy

Exponent: range / size / magnitude

(2 marks - 1 per blank)

Question 16 [1 mark] H446/01

Allows for more accuracy/precision from the given number of bits

The representation of each binary value is unique

(1 mark)

Question 17 [2 marks] H446/01, June 2017

List/mapping of characters that can be understood by the hardware/software/computer

Each character is given a unique binary/numeric code that is stored instead of the character

(2 marks - 1 per bullet)

Question 18 [2 marks] H446/01

102 ($6 \times 16 + 6 = 102$)

(2 marks - 1 for method, 1 for answer)

Question 19 [2 marks] H446/01

Hexadecimal values are shorter than binary as 4 bits/nibble can be represented by one hex character
Hexadecimal values are faster/more reliable to communicate/enter/write down/read

(2 marks - 1 per bullet)

Question 20 [1 mark] H446/01

Computers use binary logic for on/off or 1/0 states
Computer systems are based on switches/transistors
Binary is high tolerance

(1 mark for any valid point)

Question 21 [1 mark] H446/01, June 2022

Both use binary to represent characters // both are character sets
The first 7/8 bits of Unicode is the same as ASCII (overlaps)

(1 mark)

Question 22 [2 marks] H446/01, June 2022

ASCII has fewer characters (128/256) // Unicode has more characters
ASCII is 7/8 bits whereas Unicode can be larger (16/32 bits) / can have variable sized characters
ASCII limited to Latin/English/European characters whereas Unicode can represent other symbols (e.g. Chinese/Cyrillic/Emojis)

(2 marks - 1 per difference)