



# Cambridge International AS & A Level

CANDIDATE NAME



CENTRE NUMBER

--	--	--	--	--

CANDIDATE NUMBER

--	--	--	--



**COMPUTER SCIENCE**

**9618/32**

Paper 3 Advanced Theory

**October/November 2024**

**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. Any blank pages are indicated.





1 (a) Describe how packet switching is used to transmit messages across a network.

.....

.....

.....

.....

.....

.....

..... [3]

(b) State **two** benefits and **two** drawbacks of packet switching as a method of transmitting messages across a network.

Benefit 1 .....

.....

Benefit 2 .....

.....

Drawback 1 .....

.....

Drawback 2 .....

.....

[4]

2 (a) Describe **serial file organisation** as a method of storing data records in a file.

.....

.....

.....

..... [2]

(b) State **one** example of a use for serial file organisation.

.....

..... [1]

DO NOT WRITE IN THIS MARGIN

DO NOT WRITE IN THIS MARGIN

DO NOT WRITE IN THIS MARGIN

DO NOT WRITE IN THIS MARGIN

DO NOT WRITE IN THIS MARGIN





3 (a) Describe the user-defined data type **record**.

.....

.....

.....

.....

.....

.....

..... [3]

(b) A programmer defines a record, `Order`, to store the following data:

- account number
- order number
- order price
- order date.

Write **pseudocode** statements to define this record.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... [4]

DO NOT WRITE IN THIS MARGIN



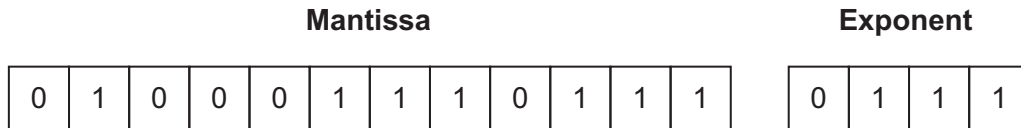


4 Numbers are stored in a computer using binary floating-point representation with:

- 12 bits for the mantissa
- 4 bits for the exponent
- two's complement form for both the mantissa and the exponent.

(a) Calculate the denary value of the given normalised binary floating-point number.

Show your working.



Working .....

.....

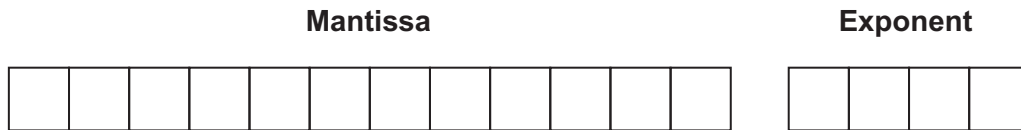
.....

Answer .....

[2]

(b) Calculate the normalised binary floating-point representation of -49.1875 in this system.

Show your working.



Working .....

.....

.....

.....

.....

.....

.....

.....

[4]





5 (a) Name and describe **two** protocols used by the Application Layer of the TCP/IP protocol suite.

Protocol 1 .....

Description .....

.....

.....

Protocol 2 .....

Description .....

.....

.....

[4]

(b) Explain the purpose and function of the Application Layer in the TCP/IP protocol suite.

.....

.....

.....

.....

.....

.....

[3]



DO NOT WRITE IN THIS MARGIN



6 The truth table for a logic circuit is shown.

INPUT				OUTPUT
A	B	C	D	X
0	0	0	0	0
0	0	0	1	1
0	0	1	0	1
0	0	1	1	0
0	1	0	0	0
0	1	0	1	1
0	1	1	0	1
0	1	1	1	0
1	0	0	0	0
1	0	0	1	1
1	0	1	0	1
1	0	1	1	0
1	1	0	0	0
1	1	0	1	1
1	1	1	0	1
1	1	1	1	0

(a) Write the Boolean logic expression that corresponds to the given truth table as the sum-of-products.

X = .....  
..... [3]

DO NOT WRITE IN THIS MARGIN





(b) Complete the Karnaugh map (K-map) for the given truth table.

		AB			
		00	01	11	10
CD	00				
	01				
	11				
	10				

[2]

(c) Draw loop(s) around appropriate group(s) in the K-map to produce an optimal sum-of-products. [2]

(d) Write the Boolean logic expression from your answer to part (c) as the simplified sum-of-products.

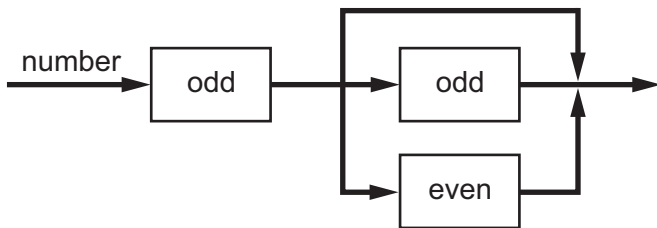
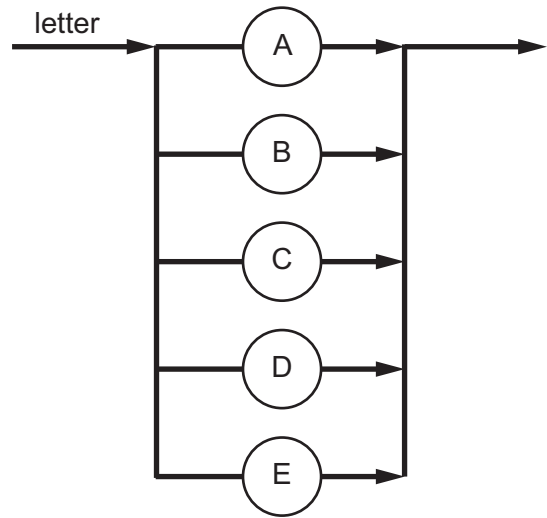
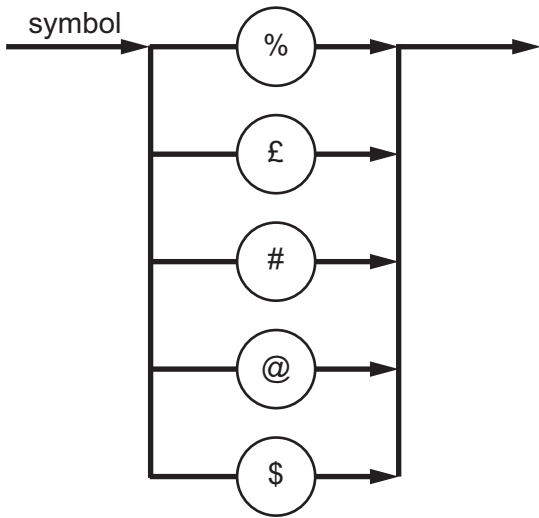
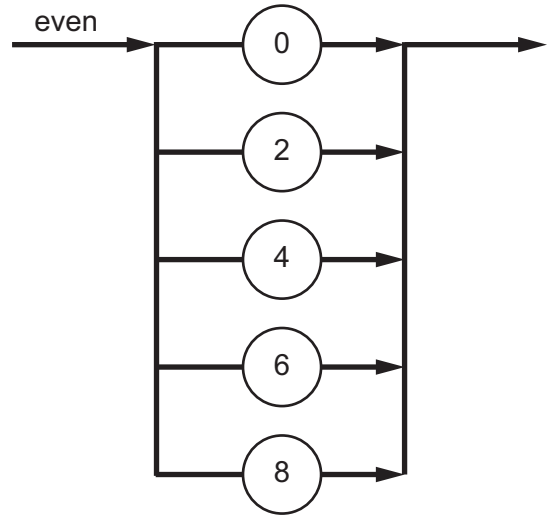
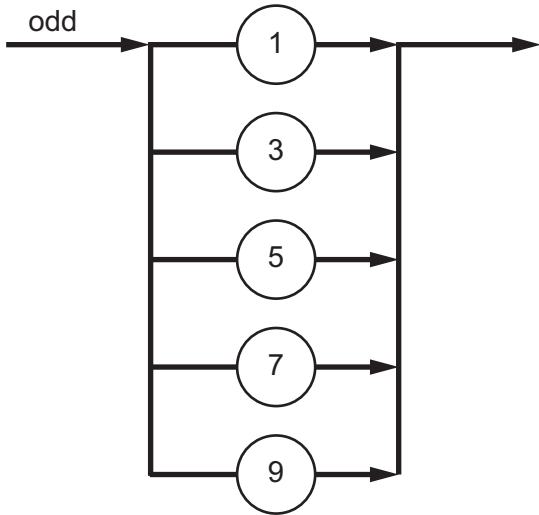
X = ..... [2]

DO NOT WRITE IN THIS MARGIN





7 Several syntax diagrams are shown.



DO NOT WRITE IN THIS MARGIN

DO NOT WRITE IN THIS MARGIN

DO NOT WRITE IN THIS MARGIN

DO NOT WRITE IN THIS MARGIN

DO NOT WRITE IN THIS MARGIN







(a) State why each number is invalid for the given syntax diagrams.

21

Reason .....

.....

123

Reason .....

.....

[2]

(b) Complete the Backus-Naur Form (BNF) for the given syntax diagrams.

<symbol> ::= .....

.....

<number> ::= .....

.....

[2]

(c) A new syntax rule, **code**, is required. It must begin with a letter, followed by one or two numbers, and end with a symbol.

(i) Draw a syntax diagram for **code**.

[3]

(ii) Write the BNF for **code**.

.....

.....

.....

..... [2]

DO NOT WRITE IN THIS MARGIN





8 Complex Instruction Set Computer (CISC) is a type of processor.

Identify **four** features of a CISC processor.

- 1 .....
  - .....
  - 2 .....
  - .....
  - 3 .....
  - .....
  - 4 .....
  - .....
- [4]

9 (a) The kernel is the central component of an Operating System (OS).

Outline how the kernel of an OS acts as an interrupt handler.

- .....
  - .....
  - .....
  - .....
- [2]

(b) (i) State what is meant by the term **multi-tasking** in an Operating System.

- .....
  - .....
- [1]

(ii) Describe how multi-tasking is implemented in an Operating System.

- .....
  - .....
  - .....
  - .....
- [2]

DO NOT WRITE IN THIS MARGIN

DO NOT WRITE IN THIS MARGIN

DO NOT WRITE IN THIS MARGIN

DO NOT WRITE IN THIS MARGIN

DO NOT WRITE IN THIS MARGIN





10 Objects and classes form the basic structure of Object-Oriented Programming (OOP).

(a) Outline the structure of a class.

.....

.....

.....

.....

.....

.....

..... [3]

(b) Give **three** differences between an object and a class.

1 .....

.....

.....

.....

2 .....

.....

.....

.....

3 .....

.....

.....

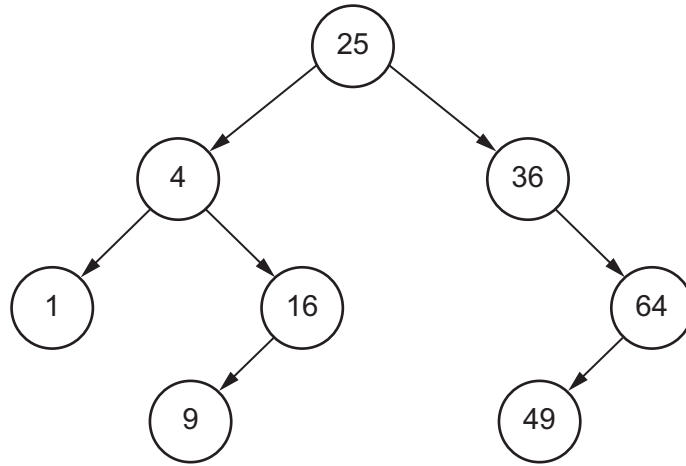
..... [3]

DO NOT WRITE IN THIS MARGIN





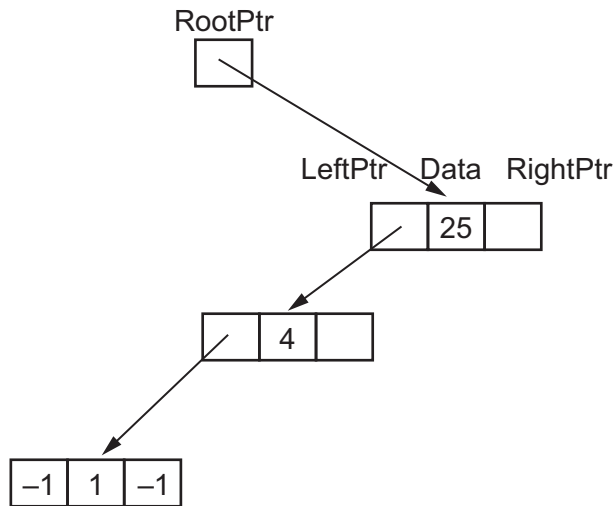
11 This binary tree shows an ordered list of integers.



(a) A linked list of nodes is used to store the data. Each node consists of a left pointer, the data and a right pointer.

-1 is used to represent a null pointer.

Complete this linked list to represent the given binary tree organisation.



[4]





(b) A 2D array is used to store the nodes of the linked list in part (a).

Complete the diagram using your answer for part (a).

<b>RootPtr</b>	<b>Index</b>	<b>LeftPtr</b>	<b>Data</b>	<b>RightPtr</b>
0	0		25	
	1		4	
	2		36	
	3		1	
	4		16	
	5		64	
<b>FreePtr</b>	6		9	
	7		49	
	8			

[4]

(c) The linked list in part (a) is implemented using a 1D array of records. Each record contains a left pointer, data and a right pointer.

The following pseudocode represents a function that searches for an element in the array of records `LinkList`. It returns the index of the record if the element is found, or it returns a null pointer if the element is not found.

Complete the pseudocode for the function.

```

FUNCTION SearchList(Item : INTEGER).....
    NullPtr ← -1

    ..... ← RootPtr
    WHILE NowPtr <> NullPtr
        IF LinkList[NowPtr].Data < Item THEN
            NowPtr ← LinkList[NowPtr].RightPtr
        ELSE
            IF ..... THEN
                NowPtr ← .....
            ELSE
                RETURN NowPtr
            ENDIF
        ENDIF
    ENDWHILE
    RETURN NullPtr
ENDFUNCTION

```

[4]



DO NOT WRITE IN THIS MARGIN



BLANK PAGE

DO NOT WRITE IN THIS MARGIN

DO NOT WRITE IN THIS MARGIN

DO NOT WRITE IN THIS MARGIN

DO NOT WRITE IN THIS MARGIN

DO NOT WRITE IN THIS MARGIN





BLANK PAGE

DO NOT WRITE IN THIS MARGIN





**BLANK PAGE**

DO NOT WRITE IN THIS MARGIN

DO NOT WRITE IN THIS MARGIN

DO NOT WRITE IN THIS MARGIN

DO NOT WRITE IN THIS MARGIN

DO NOT WRITE IN THIS MARGIN

---

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced online in the Cambridge Assessment International Education Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at [www.cambridgeinternational.org](http://www.cambridgeinternational.org) after the live examination series.

Cambridge Assessment International Education is part of Cambridge Assessment. Cambridge Assessment is the brand name of the University of Cambridge Local Examinations Syndicate (UCLES), which is a department of the University of Cambridge.

