

QQQ – Decision 1 – Chapter 1 – Algorithms (Version 1)

Total Marks: 25

(25 = Platinum, 23 = Gold, 20 = Silver, 17 = Bronze)

1.

52 48 50 45 64 47 53

The list of numbers above is to be sorted into **descending** order. Perform a bubble sort to obtain the sorted list, giving the state of the list after each completed pass. **(4)**

(Total 4 marks)

Edexcel D1 June 2006 Q1

2.

4.7	2.9	5.5	1.4	5.8	2.8	3.8	6.5	5.1	6.3	4.1
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(a) Use the first-fit bin packing algorithm to determine how the numbers listed above can be packed into bins of size 13 **(3)**

(b) Use the first-fit decreasing bin packing algorithm to determine how the numbers listed above can be packed into bins of size 13 **(2)**

(Total 5 marks)

Edexcel A2 June 2025 Q1

3.

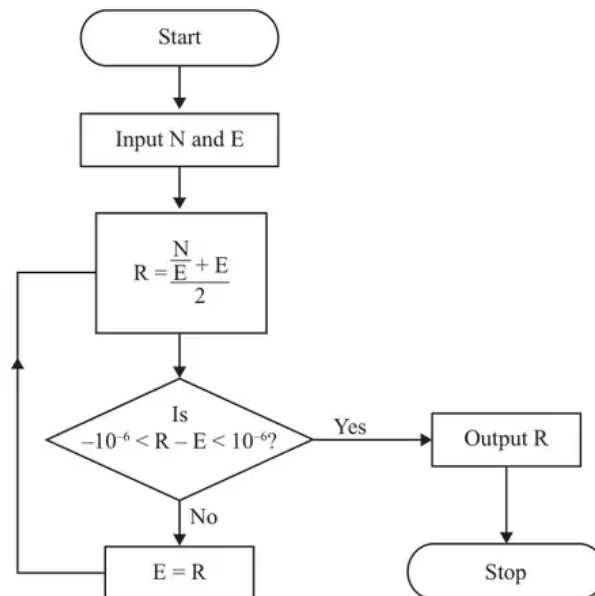


Figure 1

Hero's algorithm for finding a square root is described by the flow chart shown in Figure 1.

Given that $N = 72$ and $E = 8$,

- (a) use the flow chart to complete the table in the answer book, working to at least seven decimal places when necessary. Give the final output correct to seven decimal places. (4)

The flow chart is used with $N = 72$ and $E = -8$,

- (b) describe how this would affect the output. (1)
- (c) State the value of E which cannot be used when using this flow chart. (1)

(Total 6 marks)

4.

271	828	182	845	904	523	536	028	747	135
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The list of ten numbers above is to be sorted into descending order.

- (a) Perform a quick sort on the list to obtain the sorted list. You should show the result of each pass and identify the pivots clearly. (4)

A list of n numbers is to be sorted into descending order using bubble sort.

- (b) Determine, in the worst case, the total number of comparisons required to sort the list. Give your answer as a simplified expression in terms of n . (2)

The following algorithm determines an approximation to the value of e

Step 1 Start
Step 2 Let $a = 1$
Step 3 Let $b = 1$
Step 4 Let $c = 1$
Step 5 Let $d = a$
Step 6 Let $c = c \times b$
Step 7 Let $d = d + \frac{1}{c}$
Step 8 If $b = 6$ go to Step 11
Step 9 Let $b = b + 1$
Step 10 Go to Step 6
Step 11 Output d
Step 12 Stop

- (c) Complete the table in the answer book to show the results obtained at each step of the algorithm. (3)

[The table in the answer book has columns headed a, b, c, d . You may not need to use all the rows in this table. It may not be necessary to complete all boxes in each row.]

a	b	c	d

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- (d)** Calculate, to 3 significant figures, the percentage error in using the value found in (c) to approximate the value of e **(1)**

(Total 10 marks)