

PRIFYSGOL CYMRU

Y Drindod Dewi Sant

UNIVERSITY OF WALES

Trinity Saint David

- FOLD

Complete section, remove strip, fold as indicated and SEAL

Examination Answer Book

24 Pages

Instructions to candidates

1. Please give the information requested in the boxes below.
2. Enter your name in the space provided to the right and seal to hide your name.
3. The answers must be **legibly** written. The Examiners can either ignore illegible script or have it typed and the expense of typing charged to the candidate.
4. Write your answers in ink.
5. Begin each answer on a fresh page. Do all rough work in the answer book and cross it through.
6. No part of this book is to be torn out; it must be handed in complete.
7. If more books than one are used, fasten them together using the tags available from the invigilator(s).
8. **Every book must be handed in. In no circumstances may answer books, used or unused, be taken out of the examination venue.**

1	Student Number	P149064
2	Title of Examination Paper	ADS (Algorithm)
3	Module Code	M5X01023
4	Date and Time of Examination	1 st February 2018
5	Examination Venue	~~XH~~ MH312
6	Seat Number	
7	Number of Answer Books handed in	

[illegible]

Please complete this section and SEAL before the examination starts.

ROBERT

(Block Capitals) Forename(s)

~~McIntyre~~ McIntyre

Surname

PATENT PENDING

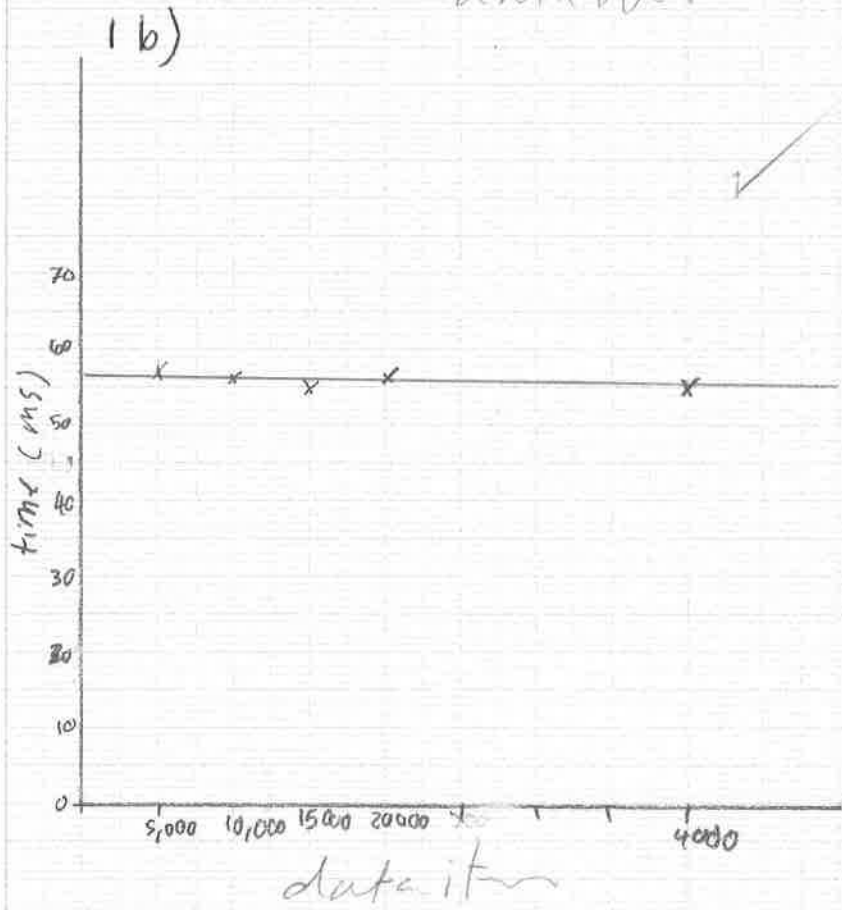
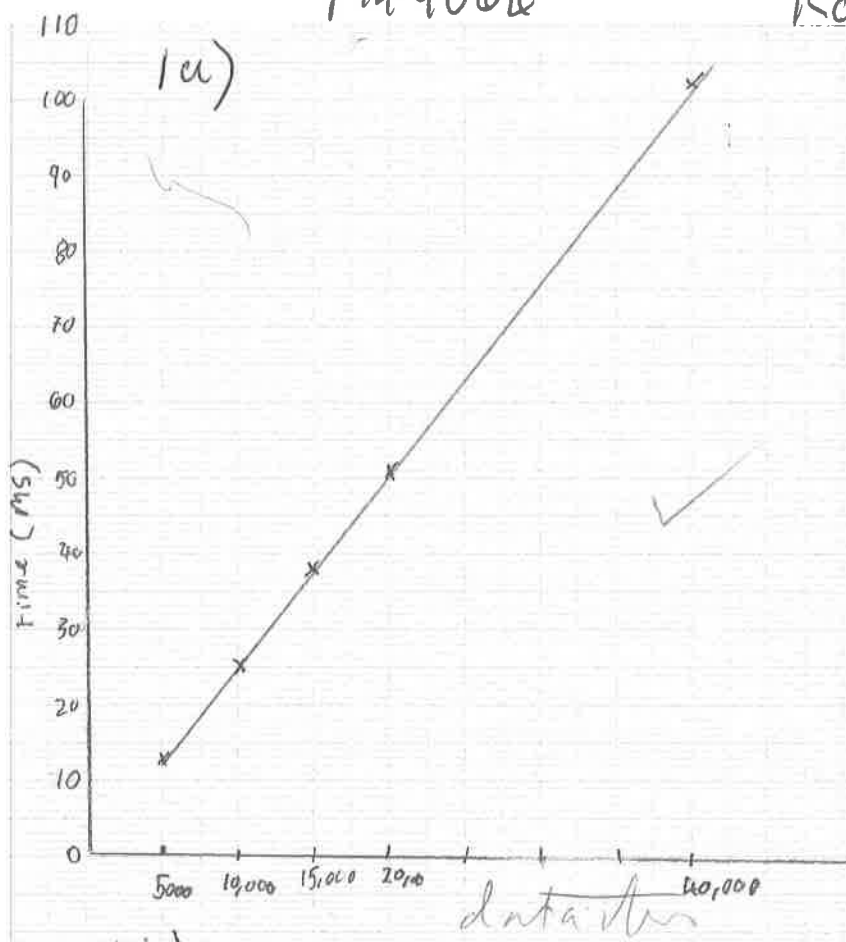
(Gweler yr ochr arall am y fersiwn Cymraeg)

PULL & TEAR

FOR ADMINISTRATIVE USE ONLY, CAREFULLY REMOVE PERFORATED STRIP

Pl49066

Robert McIntyre



P14 9064

Robert McIntyre

atune 3?

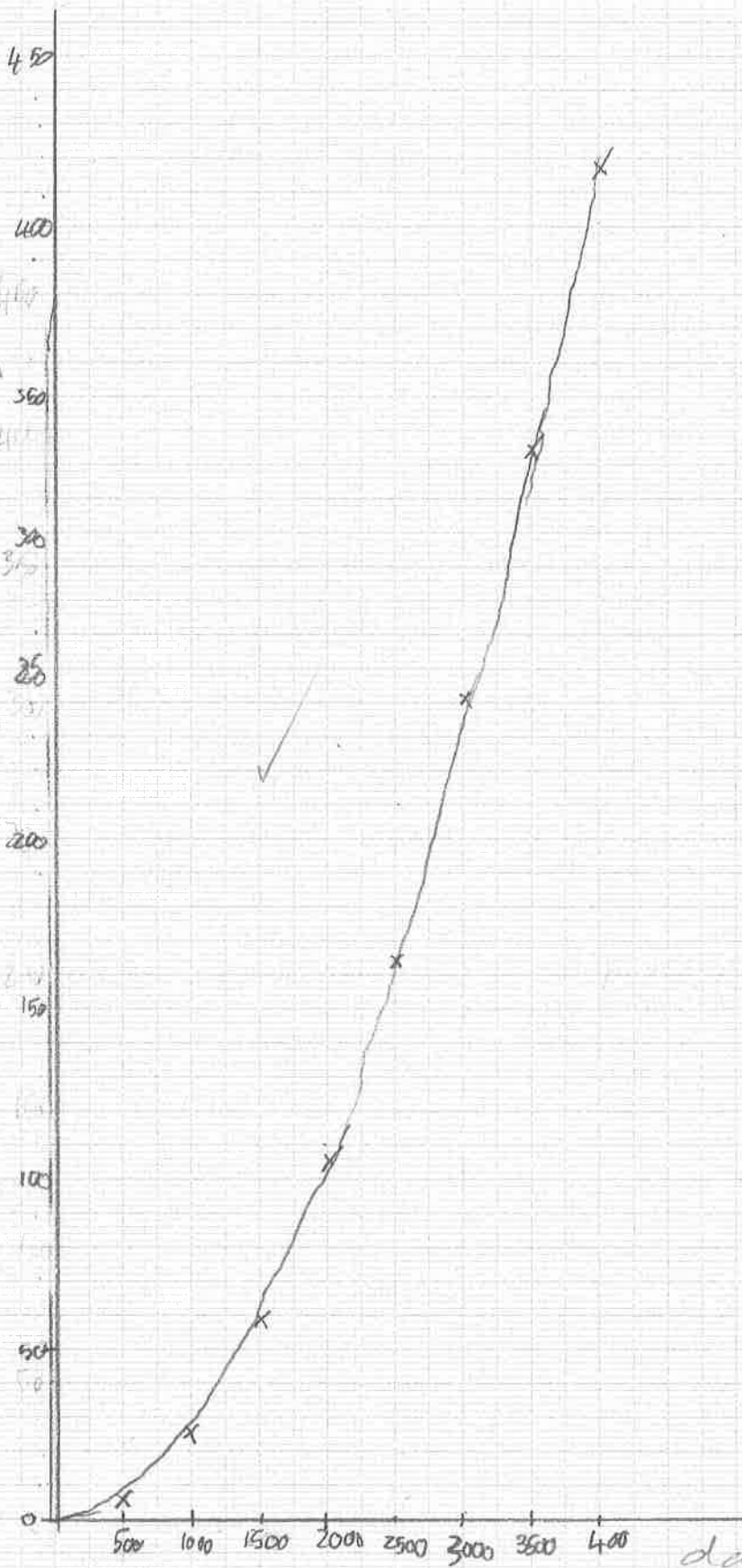
1b)

Time (ms)

Quadratic
 $O(n^2)$

$$\frac{50}{4} = 12.5$$

data items



Q1 Experiment 1

- testing afunc1()

Number of values	time (ms)
5,000	13.23
10,000	25.94
15,000	38.26
20,000	51.53
40,000	102.70

Looking at ~~the~~ graph for afunc1() the graph afunc1() is a linear complexity. $O(n)$

Number of values	time (ms)
5000°	57.38
500	6.95
10,000	56.01
1000	26.87
15,000	55.67
1500	69.37
20,000	55.99
2000	106.11
40,000	55.67
4000	418.15

- Q1 -
- func1() has a linear complexity $O(n)$ as it increases
 - func2() is constant complexity $O(1)$ as the value does not change. The number of items in list is n
 - func2(n)
 - func3() has a quadratic complexity $O(n^2)$
 - The time increases as the number of items is multiplied by itself.

No of Items	Time (ms)
500	6.95
1000	26.87
1500	59.37
2000	106.11
2500	165.54
3000	241.55
3500	323.73
4000	418.15

func3() time table

24
25
don't forget
to label
graph
axes

24
25

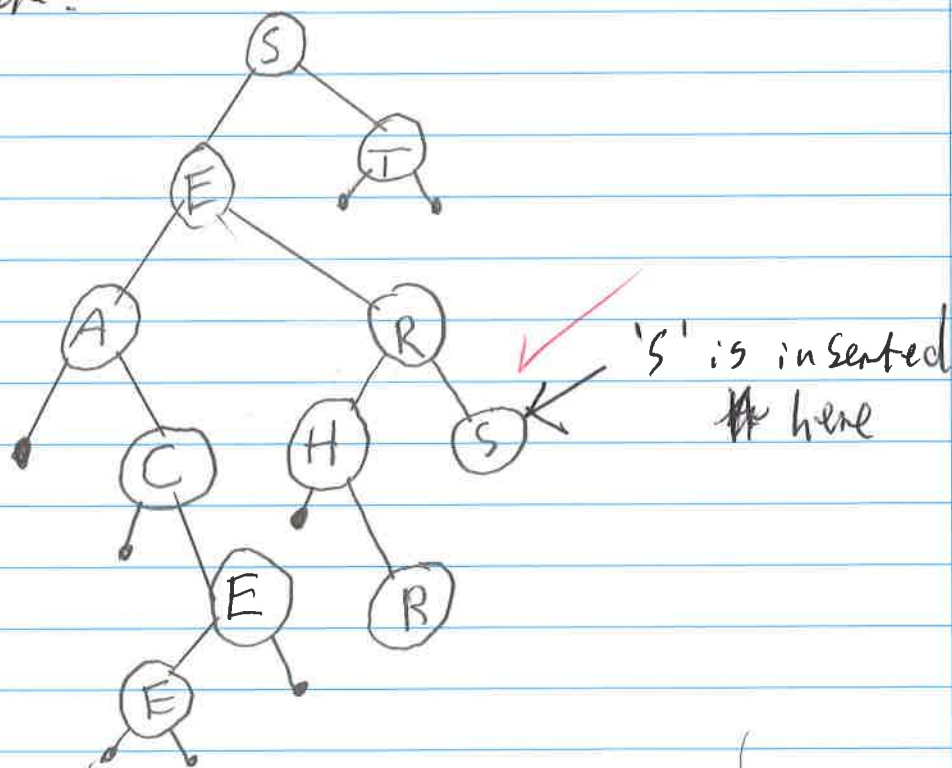
Q3a) Pre-order: ~~S, E~~ S, E, A, C, E, R, H, R, T

In-Order: A, C, E, E, E, H, R, R, S, T

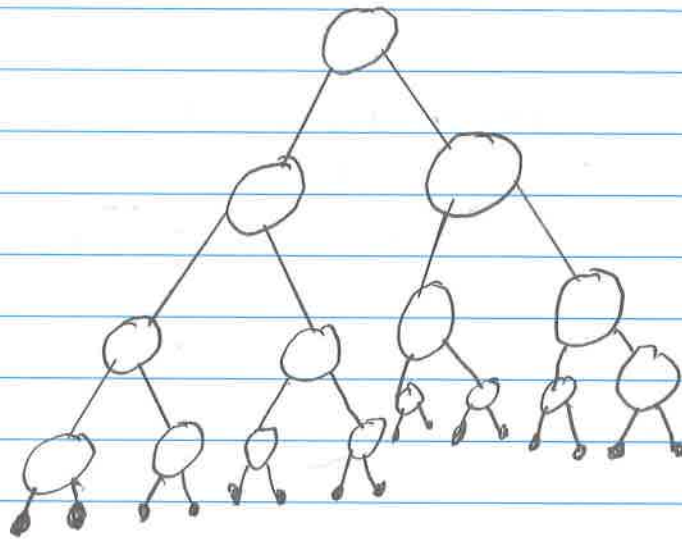
Post-order: ~~E, E, C, A, H, R, R, S, T~~

Post-order: E, E, C, A, R, H, R, E, T, S

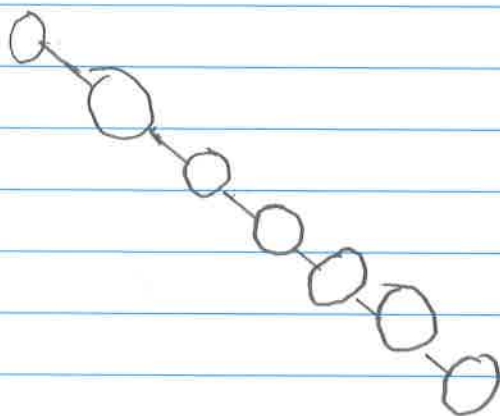
Q3b) The steps that are involved when inserting any new character in the tree. In this case we are inserting the character 'S'. Looking at the root is the letter S greater than or less than 'S' as they are both the same 'S' will branch to the left. Moving to the left leaf, is S greater or less than E. Since it is greater than E will traverse down the right. Is 'S' greater or less than R. Since it is greater than R will traverse the right node. As there is nothing on the right node the 'S' is placed there.



The big Oh notation for a binary search tree is $O(\log n)$. This is typically the best time. Example shown below.

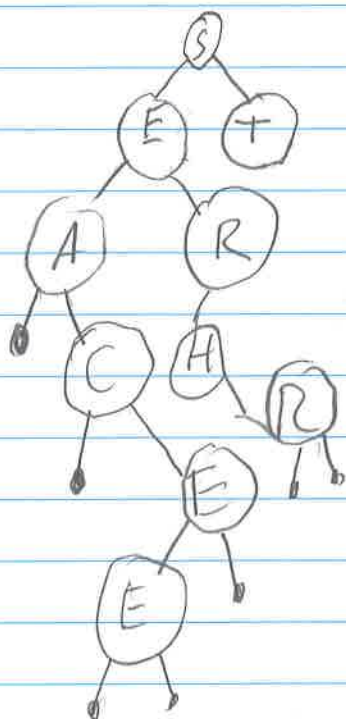


This is the best case scenario as when searching for data half of the data is taken out. There are fewer steps to get to the item. The case would be if the tree is weighted 50/50 on each branch. The worst case scenario would be when the data is in order, linear time $O(n)$. An example is shown below.

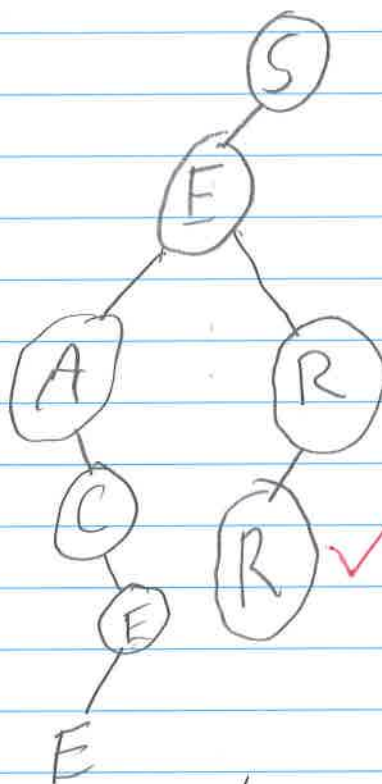


8
8

Q3C) When a character is deleted from a Binary search tree. Find the required g:



Before



After.

The 'H' is removed from the tree. All the elements that were connected replaces where the character 'H' was conn. Character R moves up.

more detail please
algorithm? Q3 =

23/25

4a

Hashing is way of mapping items in a ~~linked~~ list using an arithmetic key. When inserting an item in a table a modulus is involved. *more detail please*

$h_i(k) = 36 \text{ modulus } 7 = 1$ ✓
there is a collision (36 + 3) mod 7

b

0	
1	8
2	23
3	
4	
5	
6	

Before

0		39 mod 7
1	8	= 4 ✗
2	23	
3		
4	36	
5		
6		

After

4c Quadratic probing $h_i(k) = (\text{hash}(k) + i^2) \text{ mod } m$ ✓

0	
1	8
2	23
3	
4	
5	
6	

Before

0	
1	8
2	23
3	36
4	
5	
6	

After

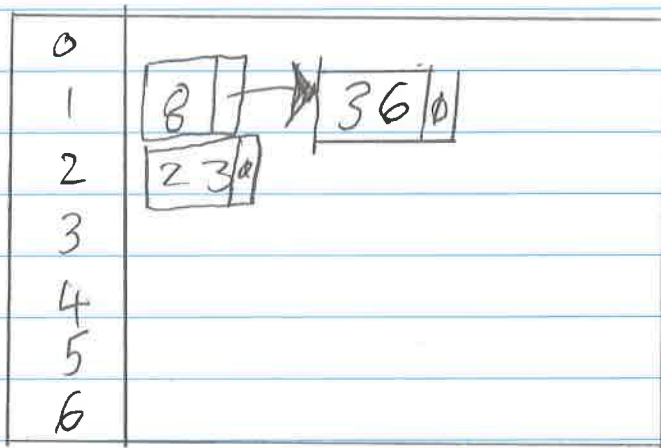
$i=0$ collision
 $i=1$ collision
 $i=2$ no collision
 $i=3$ 3rd entry.

$(36 + 3^2) \text{ mod } 7$
 $45 \text{ mod } 7$
 $= 3 + 5$

With the problem of clustering problem it is easy this approach will make it difficult to search for the item once a collision happens, how?

explain what clustering problem is.

d Separate chaining is a type of open address, where when the collision happens the item is then joined onto a linked list at the end of the node to where the collision happens. An example ~~is~~ below shows what happens when there is a collision between two items. All items are on one table.



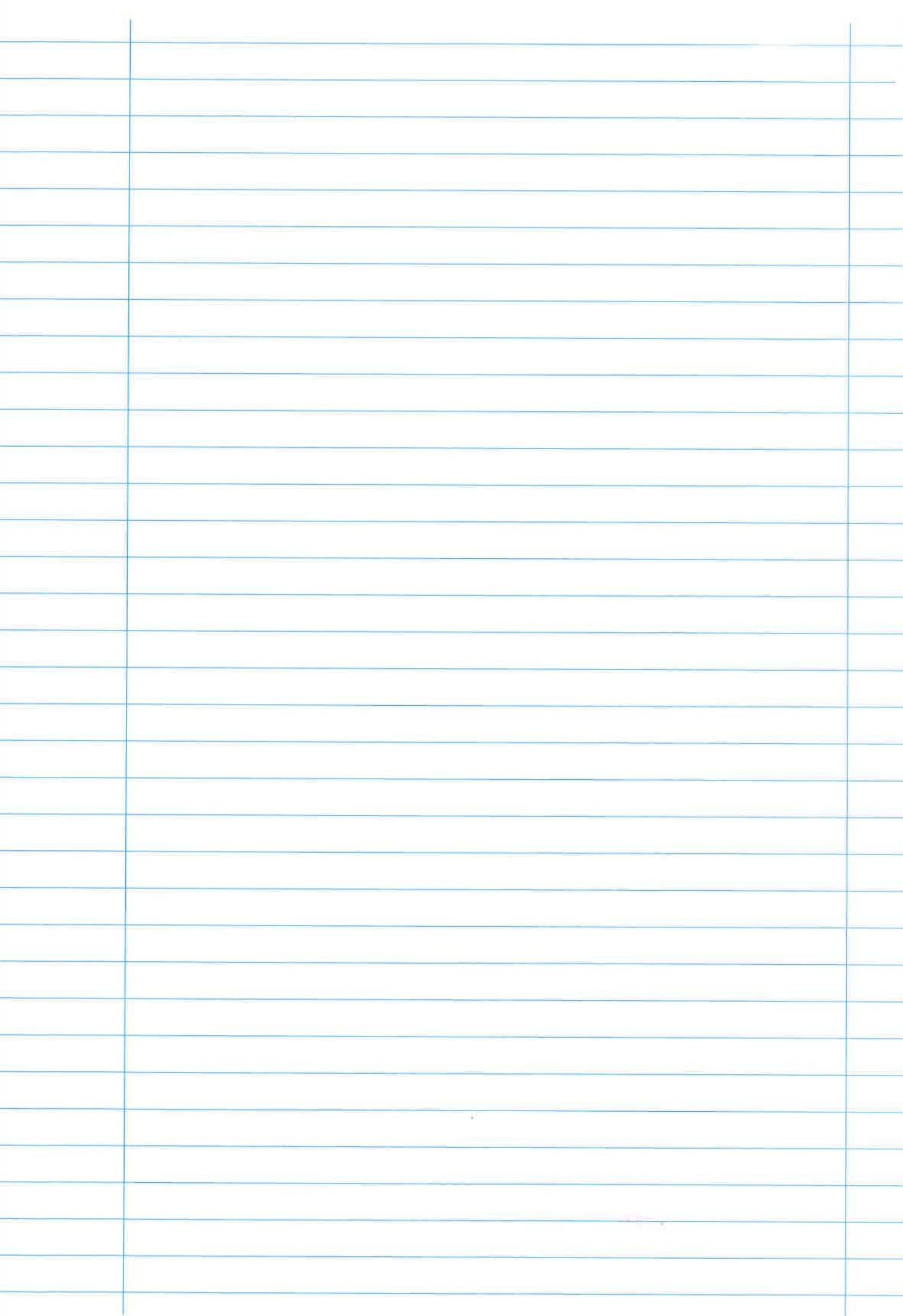
Advantages of it is a deletion of a node is easy: store more values in a table.

Disadvantages are that when there are too many collisions the list will become longer so when inserting items in a longer list the complexity will become inefficient. and is?

h

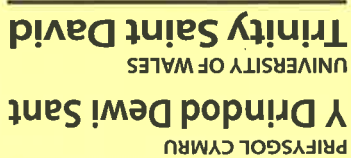
$O(n)$

14/15



TYNNWCH A
RHWYGWCH

AR GYFER DEFNYDD GWEINYDDOL YN UNIG, TYNNWCH Y STRIBYN TYLLOG I FFWRDD YN OFALUS



24 Tudalen

8. Rhaid dychwelyd pob llyfr. Ni chaniateir mynd â llyfrau atebion, wedi eu defnyddio neu heb eu defnyddio, allan o'r lloellad arholi o dan unrhyw amgylchiadan.

1	Rhif Myfyrtiwr	
2	Teil y Papur Arholiad	
3	Cod y Modwl	
4	Dyddiad ac Amser yr Arholiad	
5	Lleoliad yr Arholiad	
6	Rhif Sedd	
7	Nifer y Llyfrau a gyflwynwyd at ebion	

[illegible]

(See the other side for English version)

A wneuch chi lenw'r rhan hon a'i SELIO cyn i'r arholiad ddechrau

Cyfenw _____ (LLYTHRENNAU BREISION) Enw(au) cyntaf _____

PLYGWCH

Llenwch y
 rhan hon,
 tynwch y
 strybn,
 plygwch fel
 a ddangosir
 a SELWCH