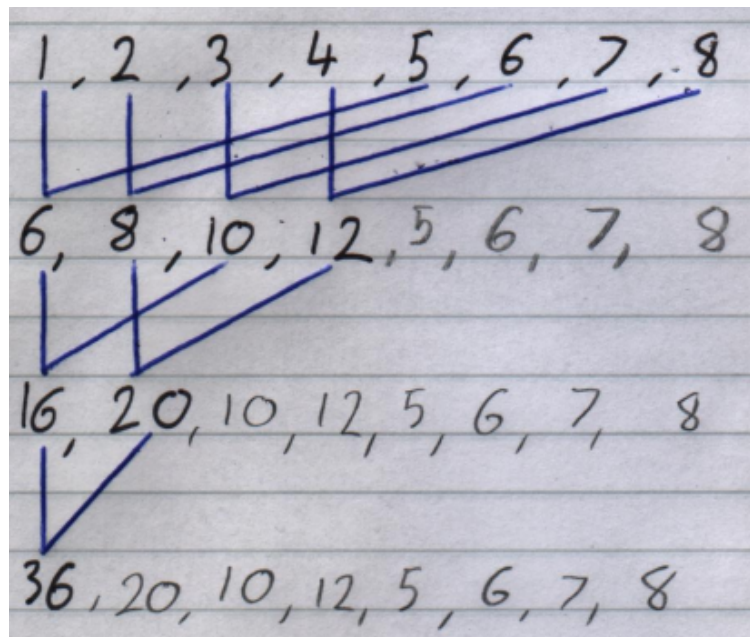


PAL: Tutorial, Sheet 3

Week2, Question 1

Binary fan-in sum on $A = [1, 2, 3, 4, 5, 6, 7, 8]$.

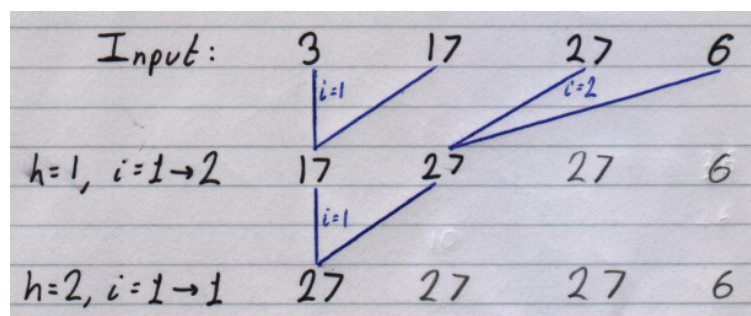


Sum = **36**.

Work = 7 additions.

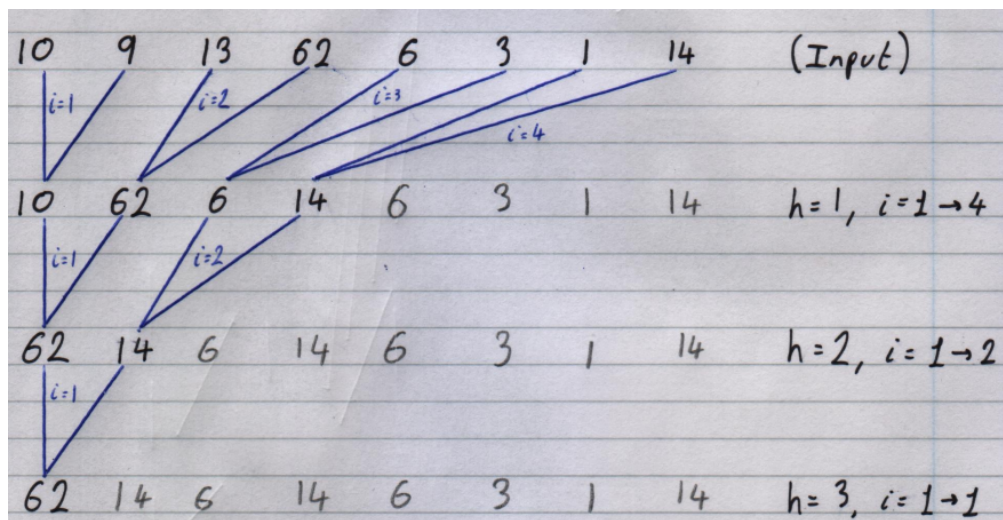
Time = 3 parallel actions carried out sequentially.

Week 3, Question 1



Max = **27**

Week 3, Question 2



Max = **27**

Work = 7 comparisons.

Time = 3 parallel actions carried out sequentially.

Week 3, Question 3

1. Performing pairwise check on $i > j$, writing 1 into $M[j]$ where it holds true.
2. Remove duplicates from M .
3. The result is the value at the last remaining index i at which $M[i] = 0$.

	j	1	2	3	4	5
i		16	112	8	112	112
1	16	0	0	1	0	0
2	112	1	0	1	0	0
3	8	0	0	0	0	0
4	112	1	0	1	0	0
5	112	1	0	1	0	0
$M_1 =$		1	0	1	0	0
$M_2 =$		1	0	1	1	1

Result : $A[2] = 112$

Week 3, Question 4

Determine whether $x = 5$ is present in $A = [2, -1, 5, 33, 0, 5, 5]$ using PRAM-EREW.

Part 1 - Two Problems

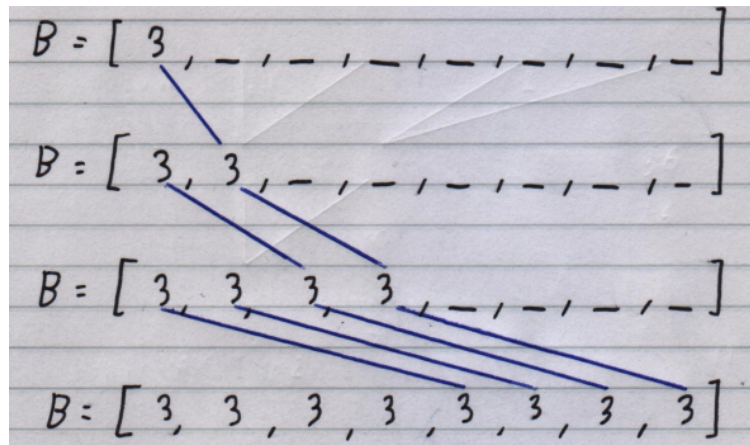
- The search value $x = 5$ can only be read by one process at a time (ER), reducing the algorithm to sequential.
- $n \neq 2^k$ for any integer k , so binary fan-in would require special cases or padding to work correctly. The input contains both positive and negative values, so the padding value would need to be carefully chosen.

Part 2 - 3-Phase Solution

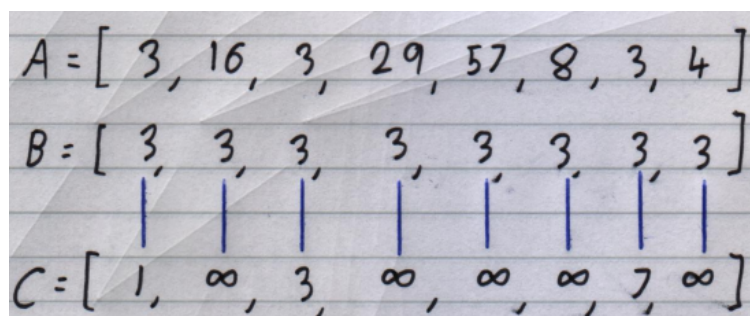
1. **arrBroadcast-PRAM-EREQ**
to create the temporary n -array of the searched-for number x
2. **arrMembership-PRAM-EREQ**
to isolate the positions that contain the searched-for number x
3. **arrMin-PRAM-EREQ**
to return the lowest position from the previous step

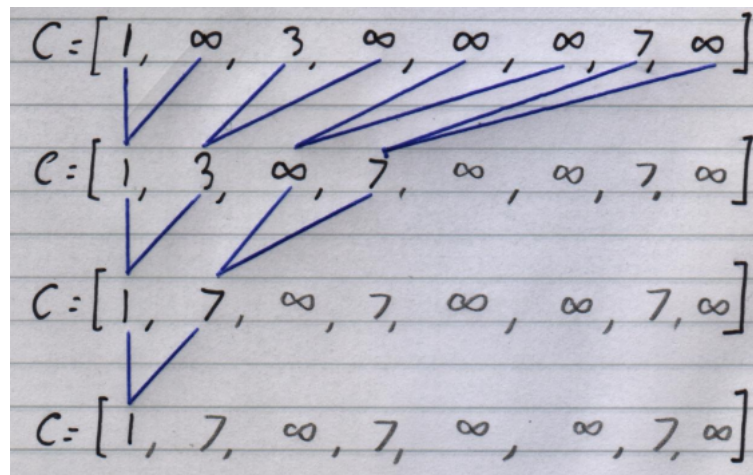
Week 3, Question 6

Broadcast:

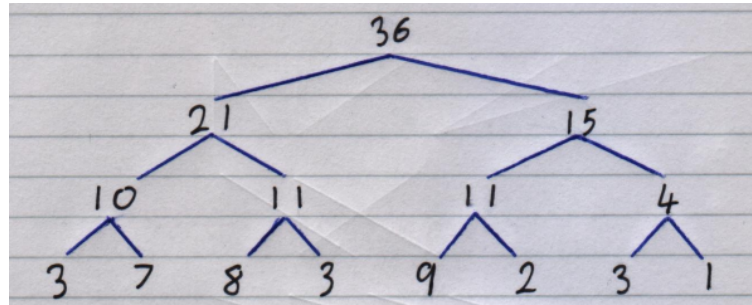
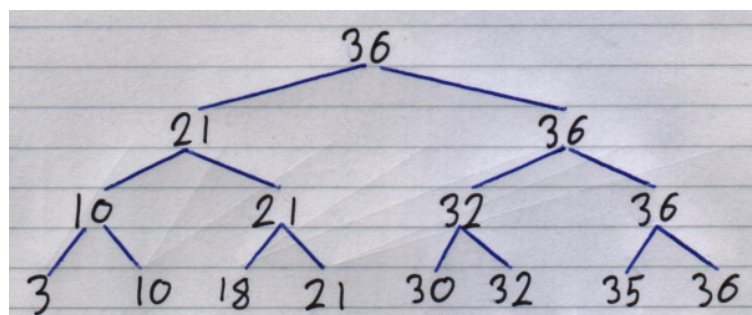


Pair-wise comparison:



Binary min fan-in:**Week 4, Question 1**

$Input = [3, 7, 8, 3, 9, 2, 3, 1]$

Phase 1:**Phase 2:**

$Output = [3, 10, 18, 21, 30, 32, 35, 36]$

Week 4, Question 3

$$A = [a, b, c, d]$$

$$P = [1, 3, 1, 2]$$



Week 4, Question 4

$$A = [a, b, c, d, e, f, g]$$

$$P = [1, 1, 1, 2, 2, 3, 3]$$

