

Parallel Prefix Sum (1A)

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Prefix Sum Problem

$$S_1 = x_1$$

$$S_2 = x_1 + x_2$$

$$S_3 = x_1 + x_2 + x_3$$

$$S_4 = x_1 + x_2 + x_3 + x_4$$

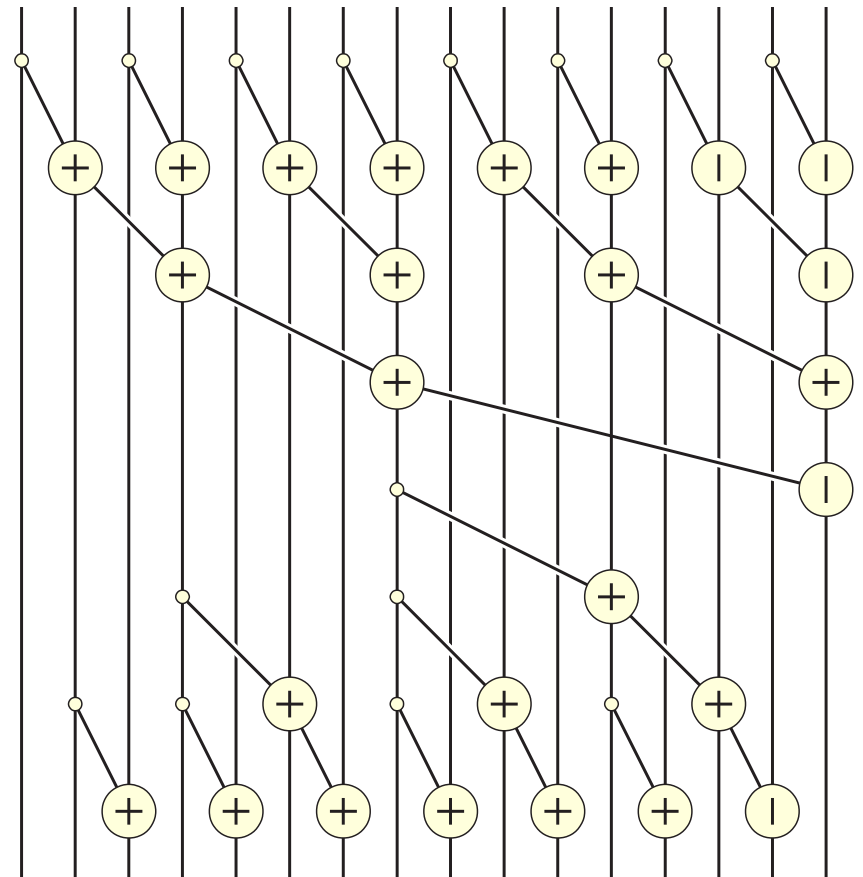
$$S_5 = x_1 + x_2 + x_3 + x_4 + x_5$$

x_0	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}
5	3	-6	2	7	10	-2	8	3	4	-3	1	2	8	9	1

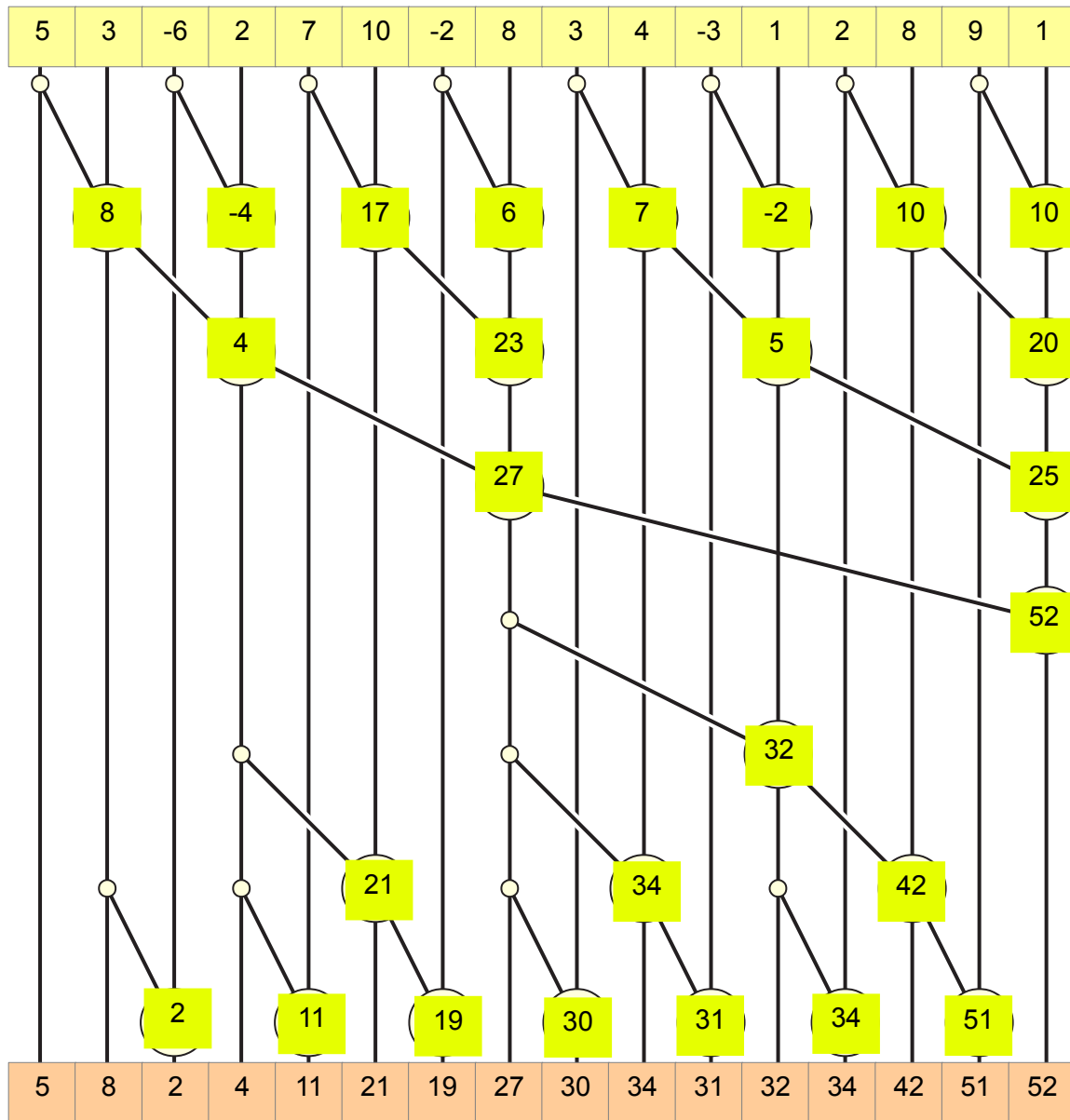
y_0	y_1	y_2	y_3	y_4	y_5	y_6	y_7	y_8	y_9	y_{10}	y_{11}	y_{12}	y_{13}	y_{14}	y_{15}
5	8	2	4	11	21	19	27	30	34	31	32	34	42	51	52

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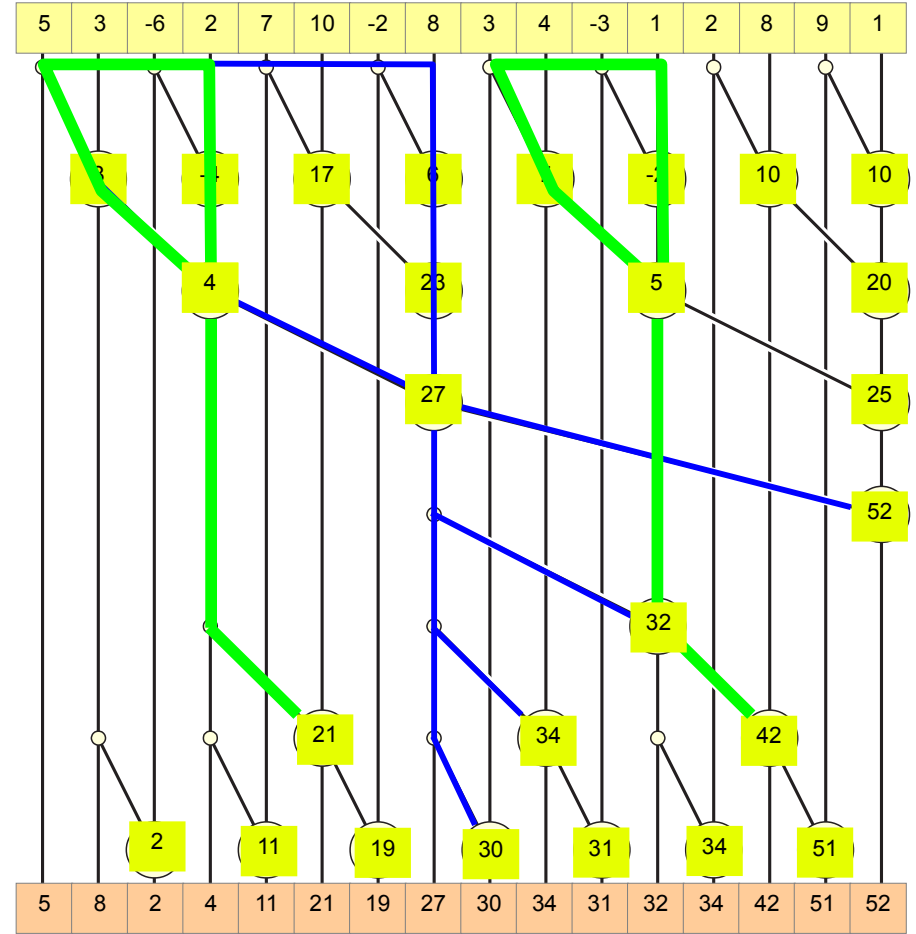
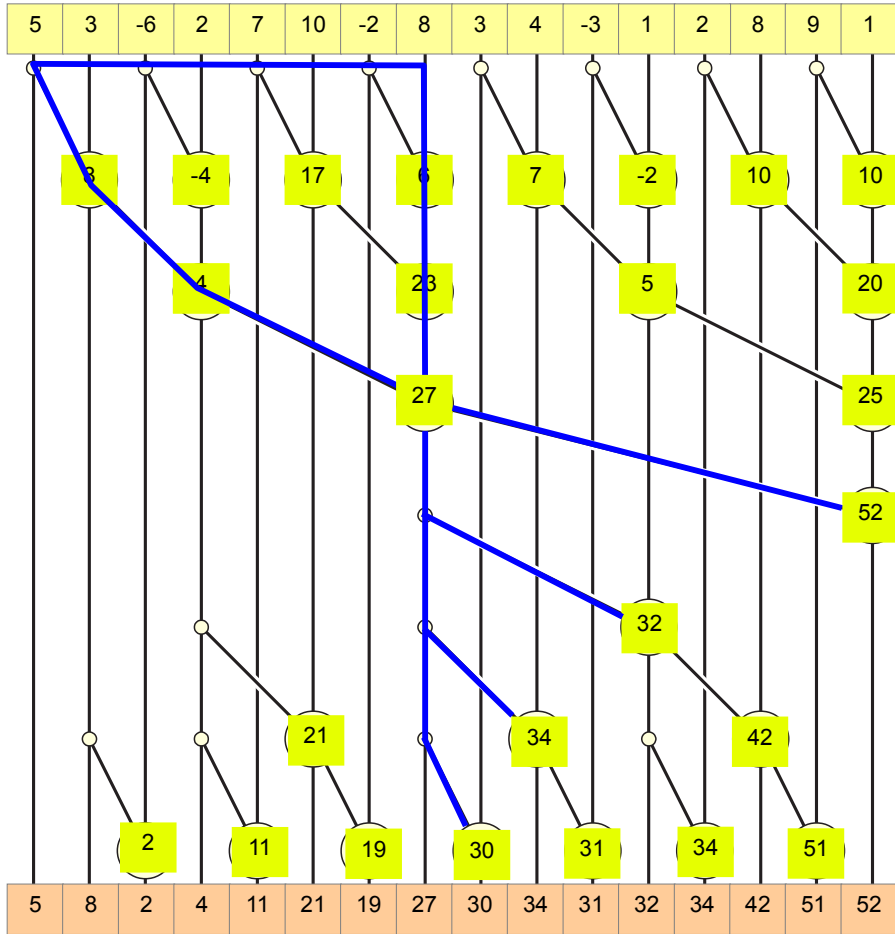
- Compute the sums of consecutive pairs of items in which the first item of the pair has an even index: $z_0 = x_0 + x_1$, $z_1 = x_2 + x_3$, etc.
- Recursively compute the prefix sum w_0, w_1, w_2, \dots of the sequence z_0, z_1, z_2, \dots
- Express each term of the final sequence y_0, y_1, y_2, \dots as the sum of up to two terms of these intermediate sequences: $y_0 = x_0$, $y_1 = z_0$, $y_2 = z_0 + x_2$, $y_3 = w_0$, etc.
After the first value, each successive number y_i is either copied from a position half as far through the w sequence, or is the previous value added to one value in the x sequence.



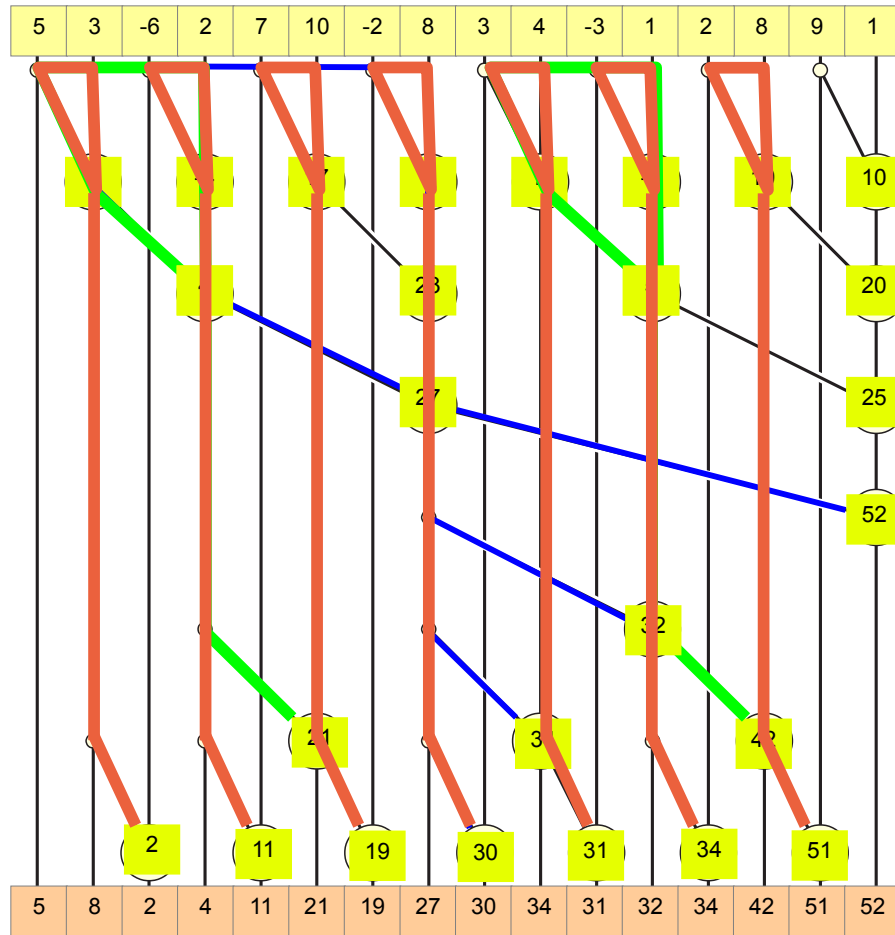
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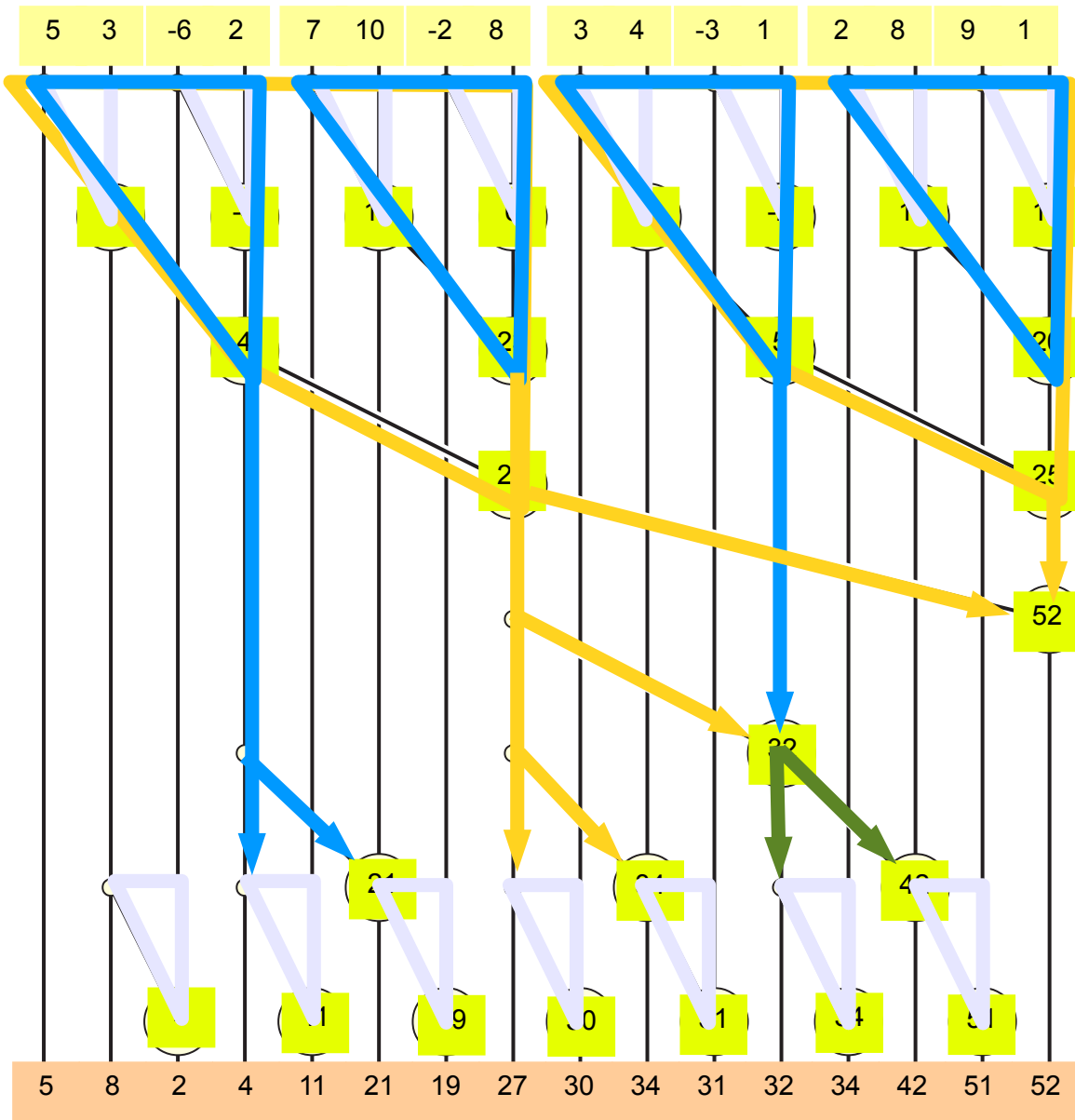
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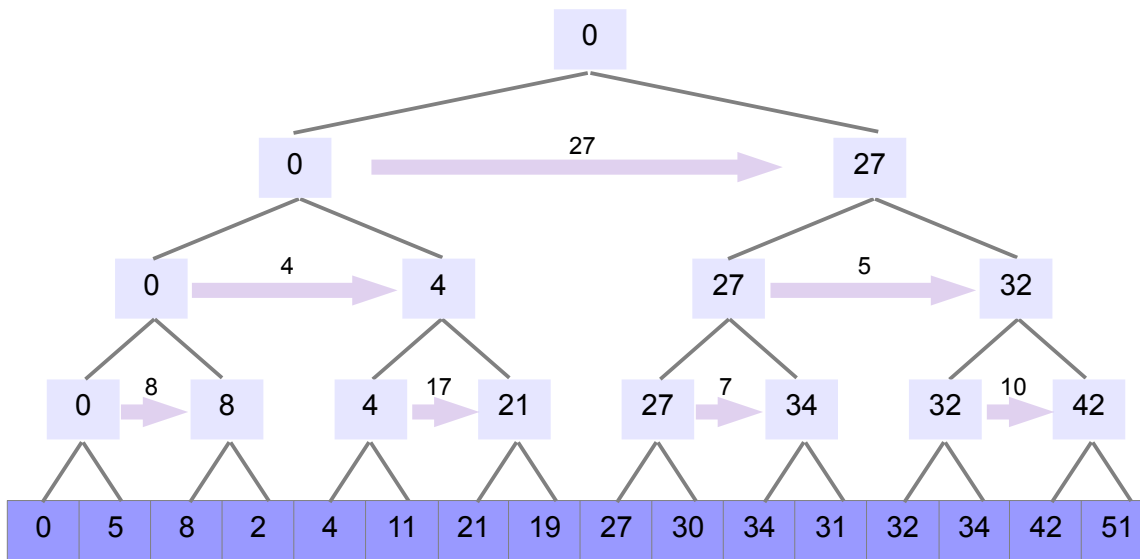
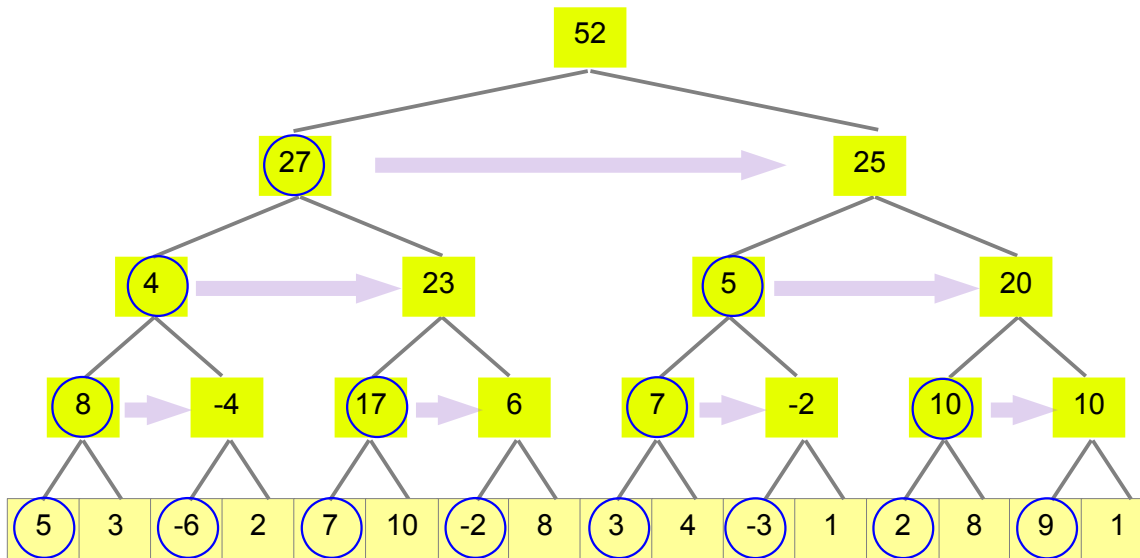
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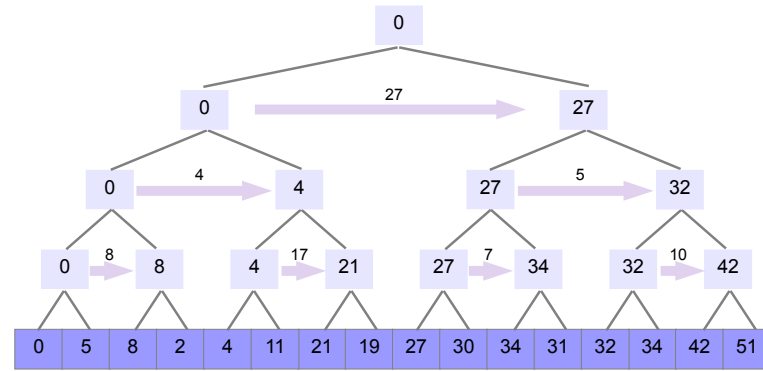
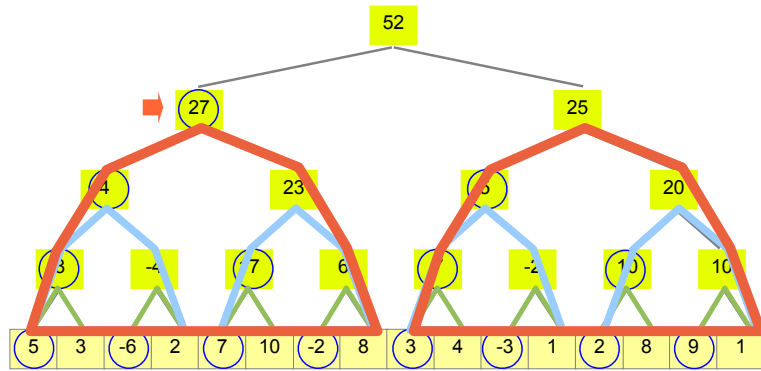
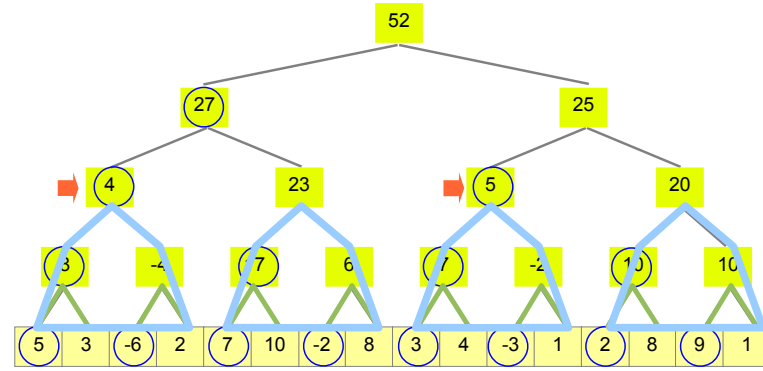
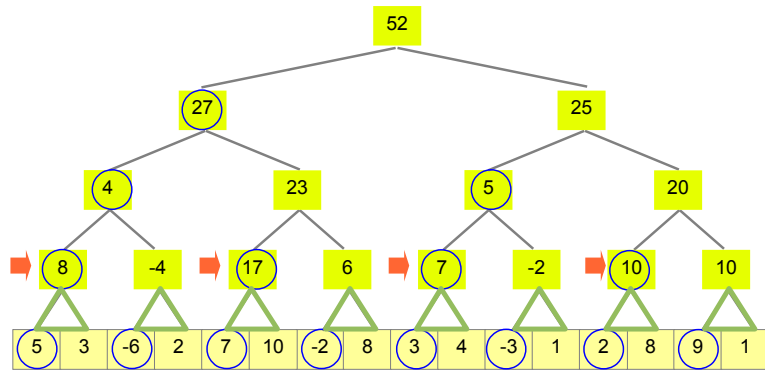
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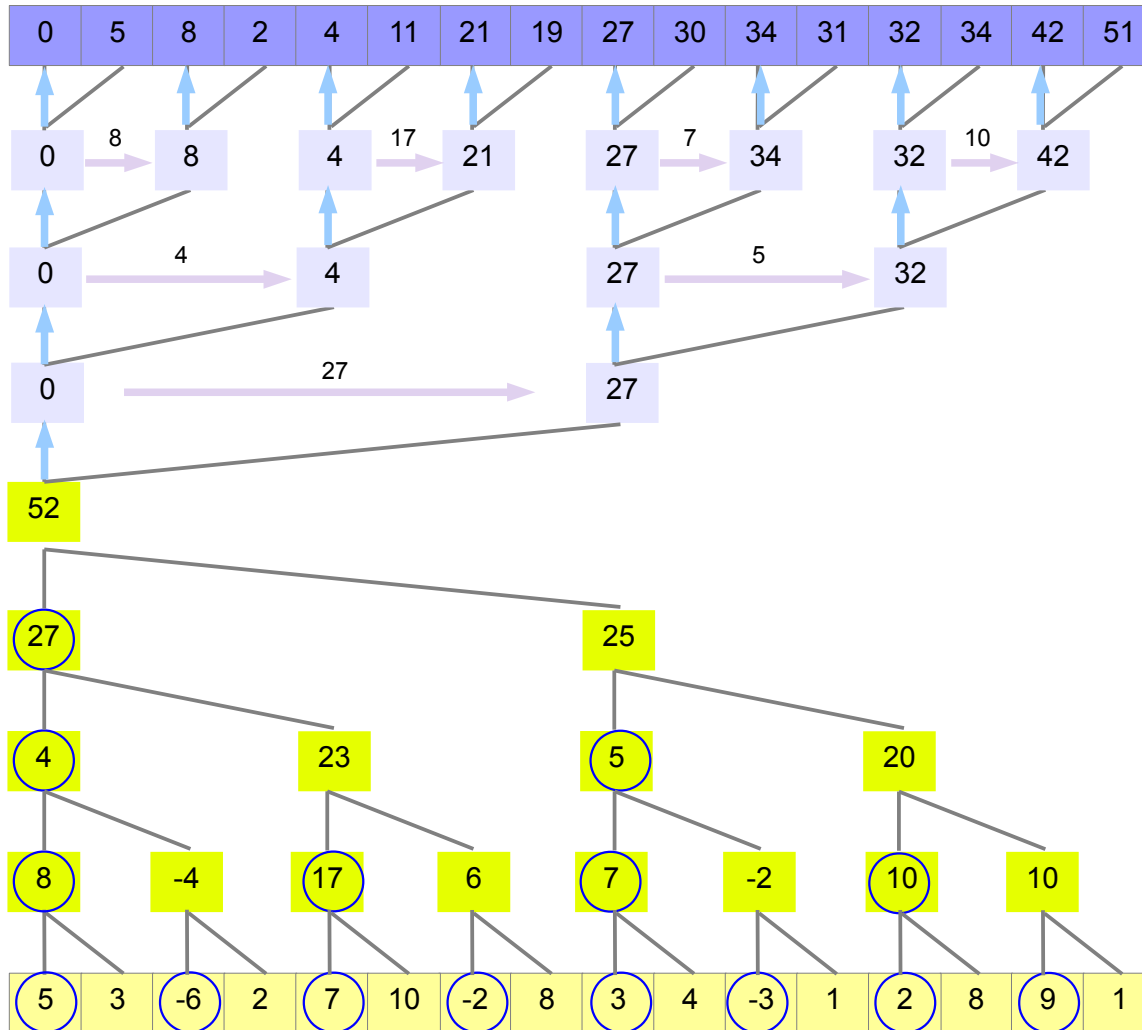
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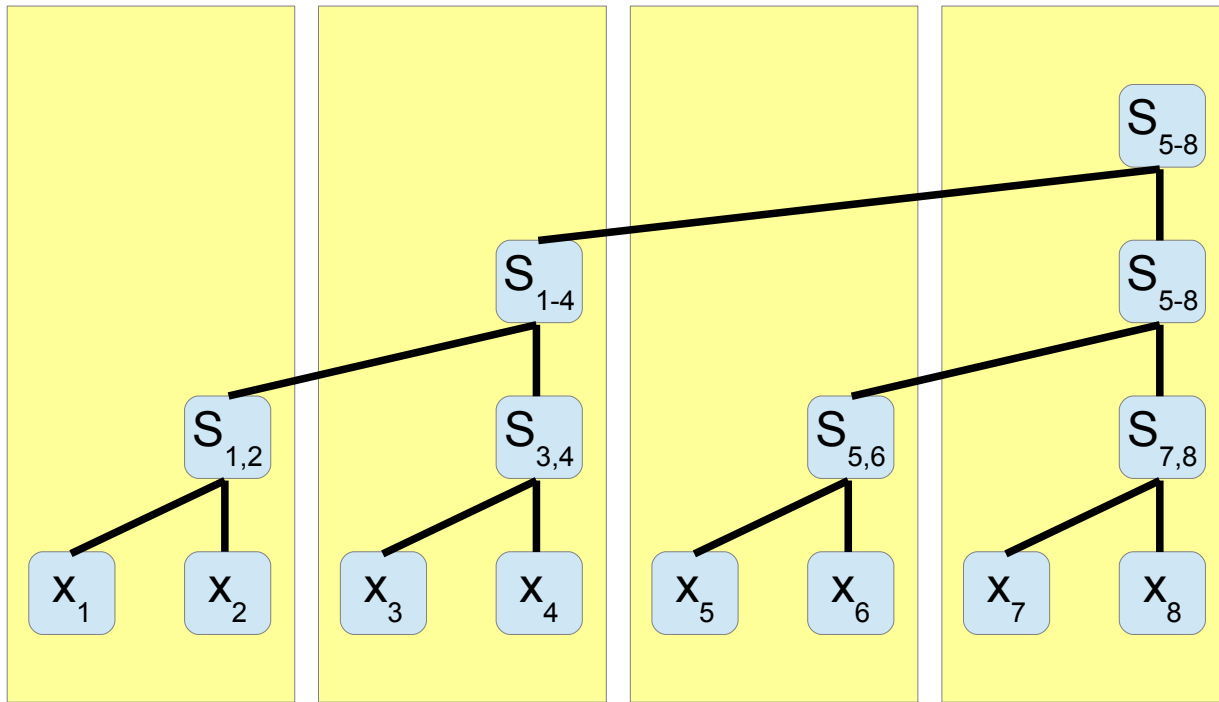


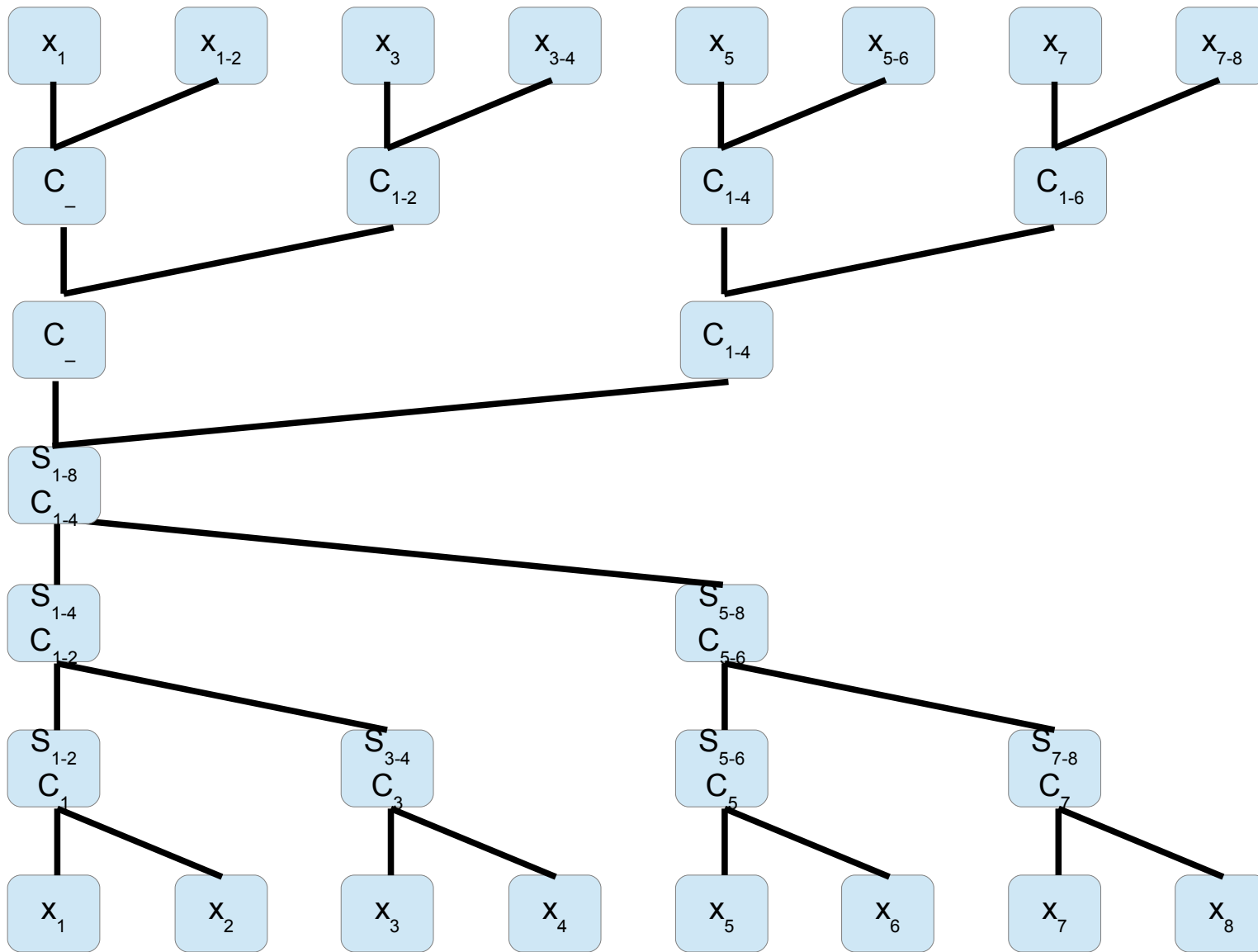
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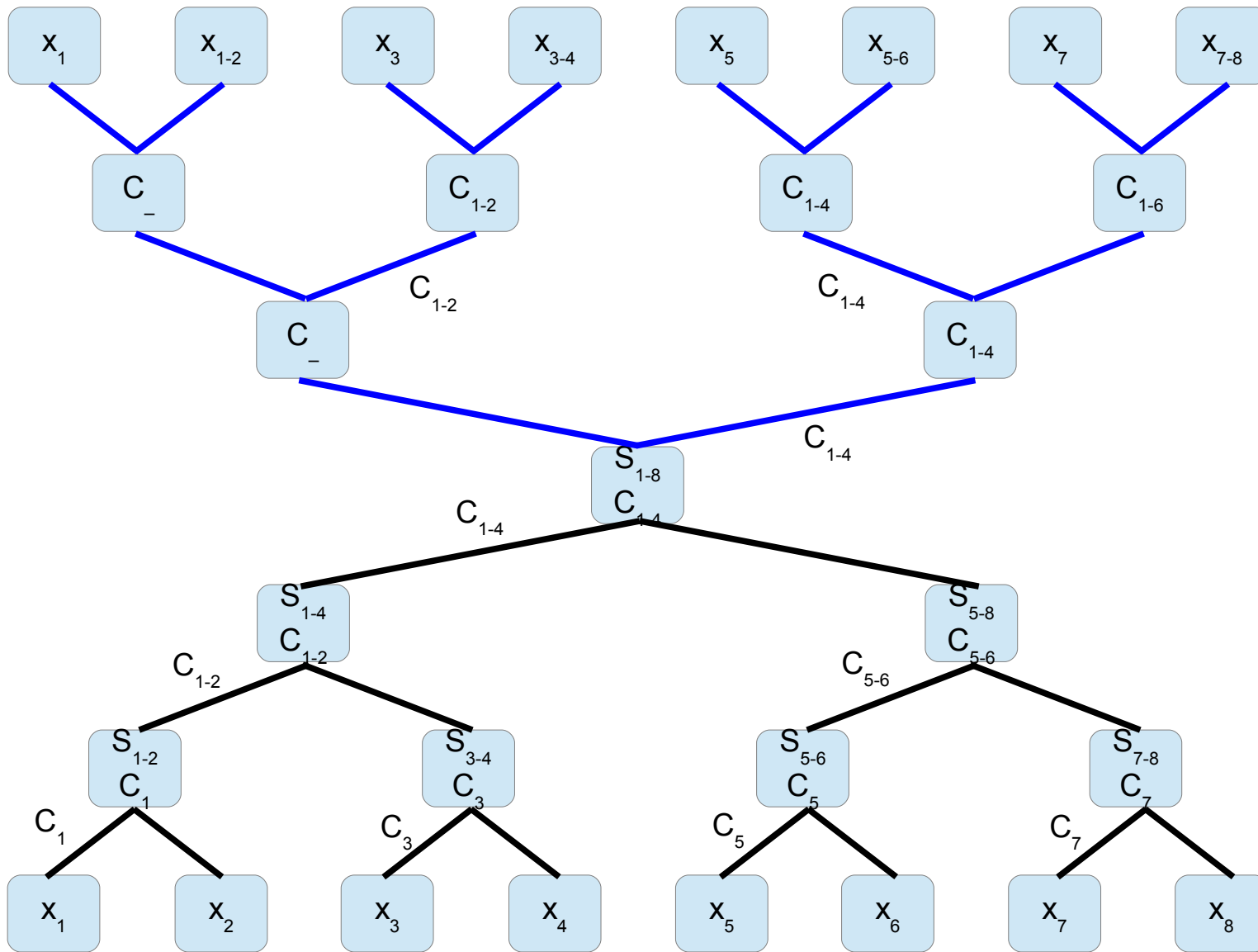


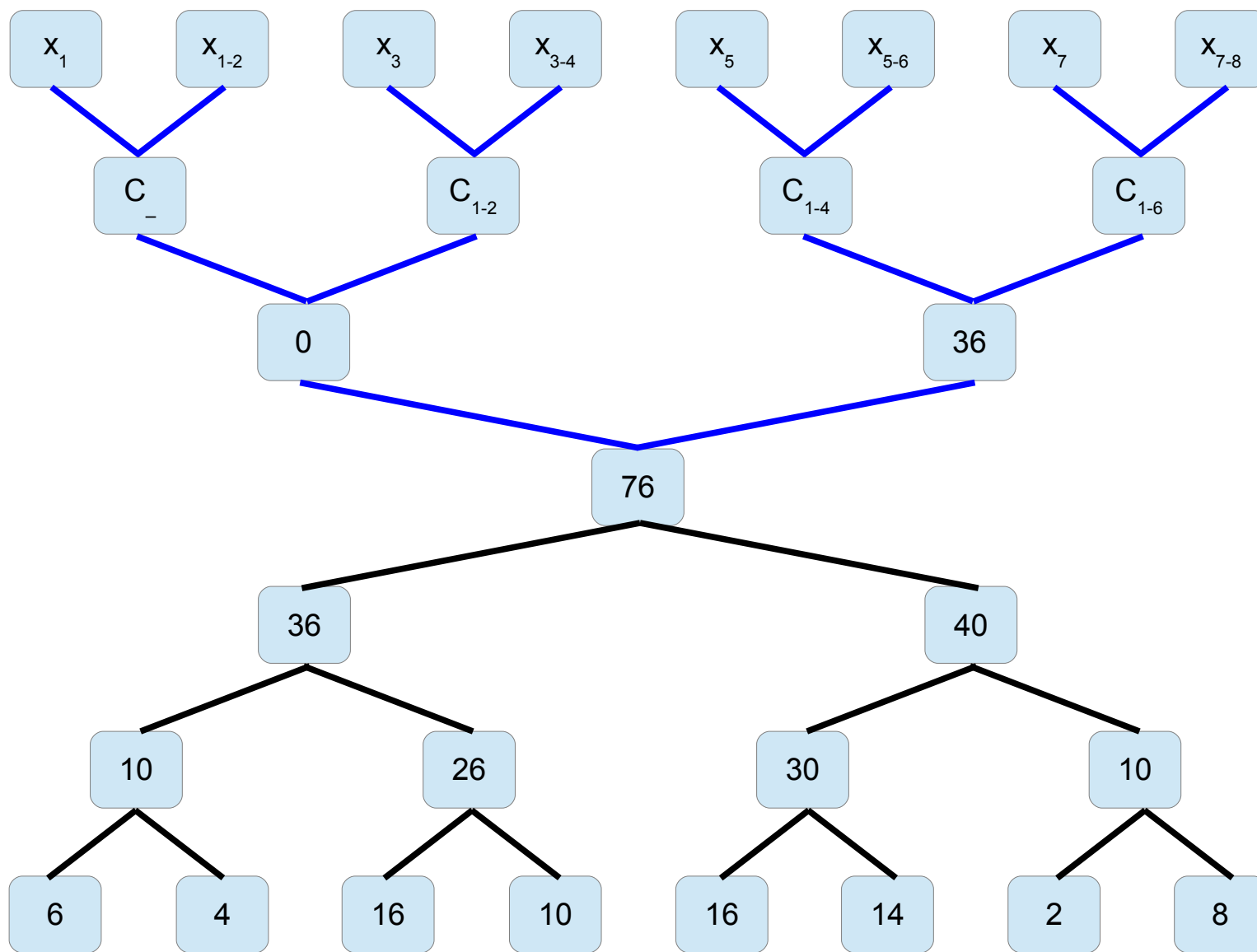
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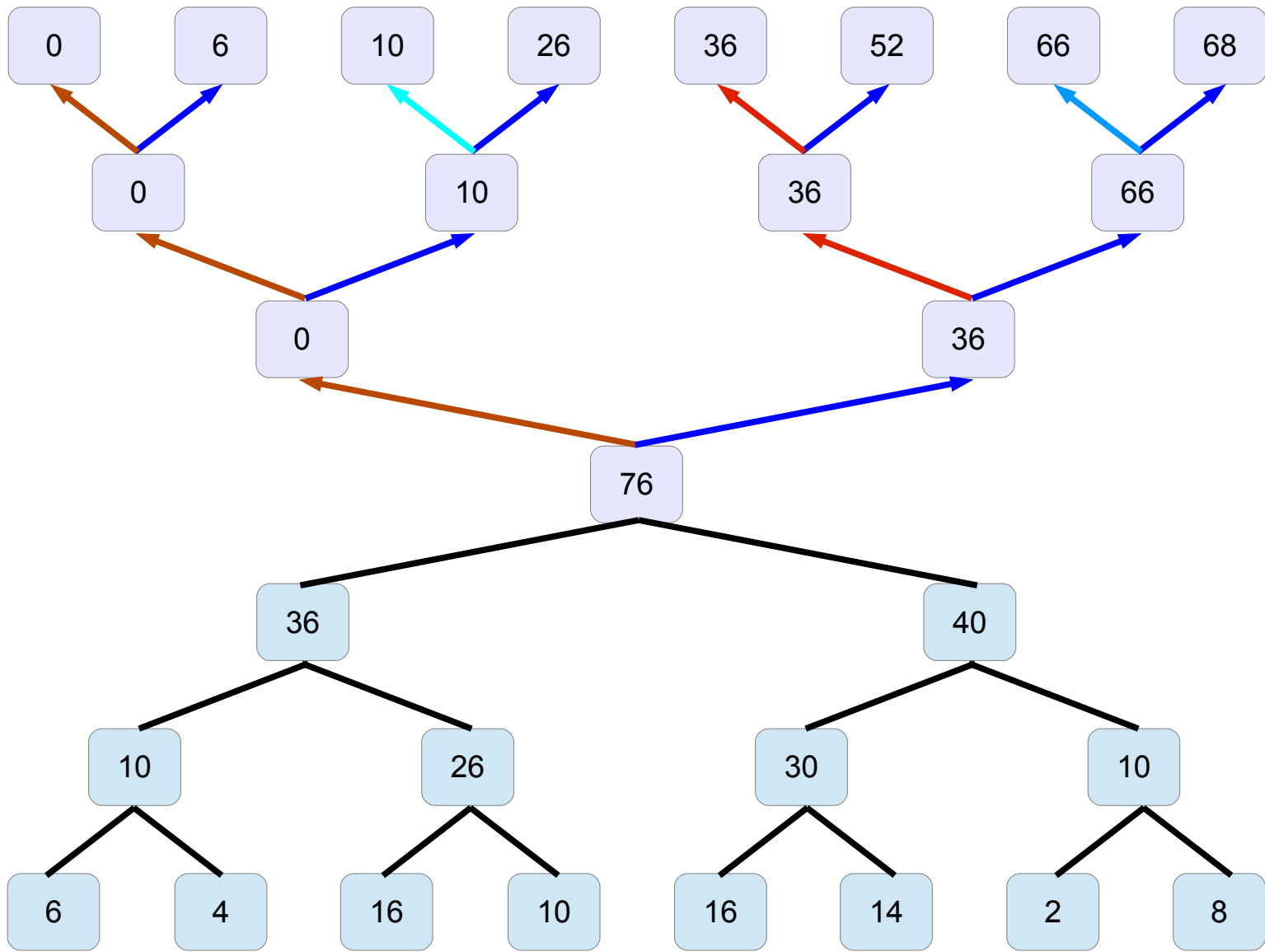


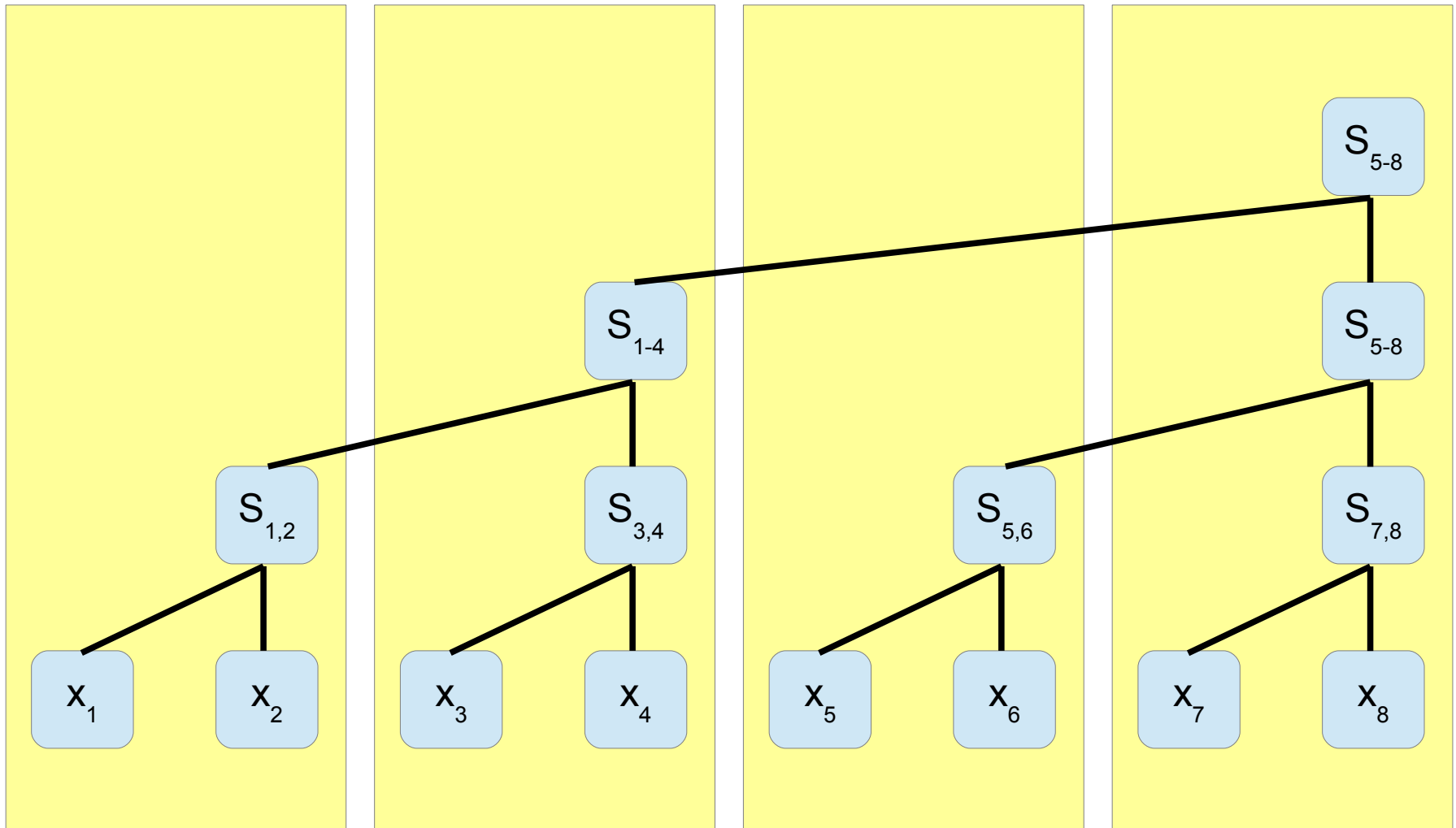




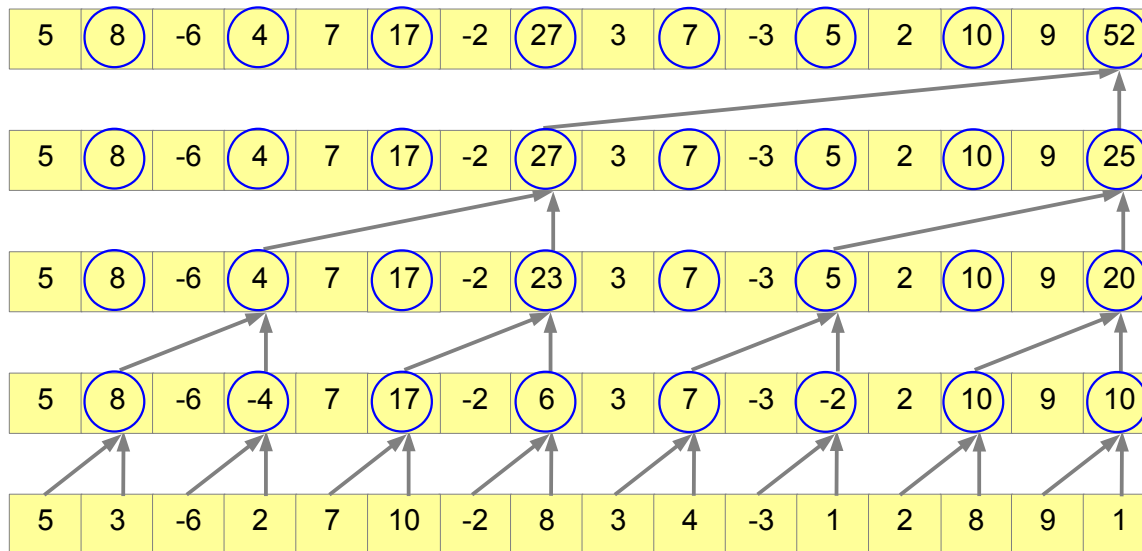




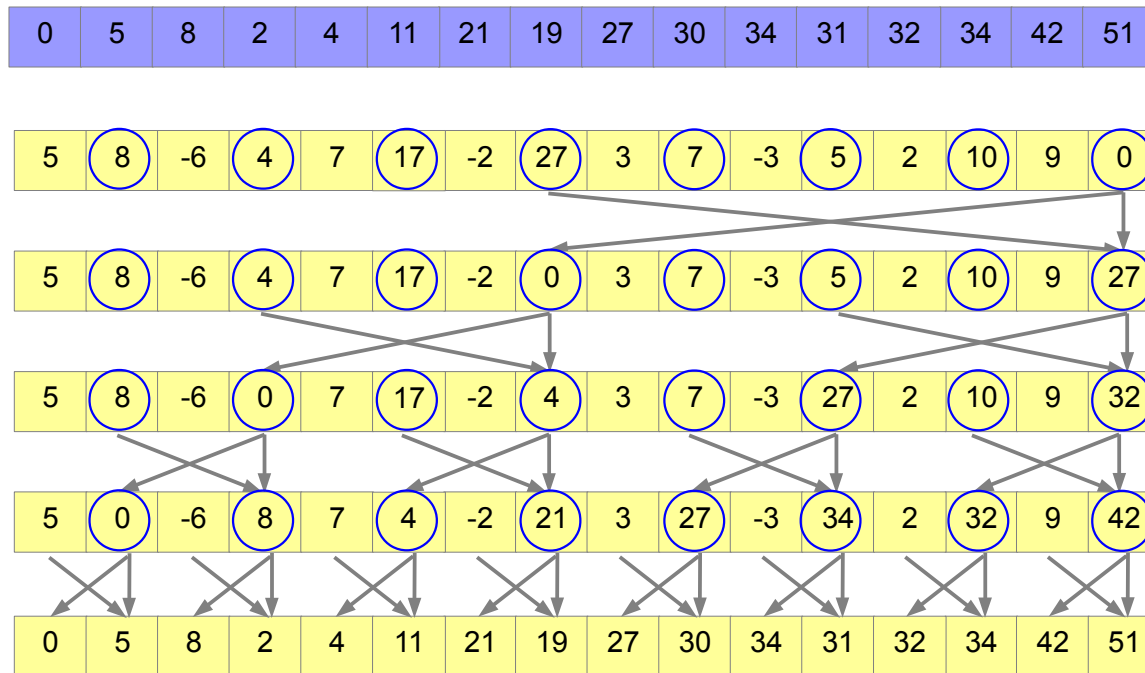




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References

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