UCONN
UNIVERSITY OF CONNECTICUT

Department of Computer Science and Engineering

Data Structures and Object-Oriented Design

(CSE – 2050)

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Assignment 2 Task 3 Exaplanation

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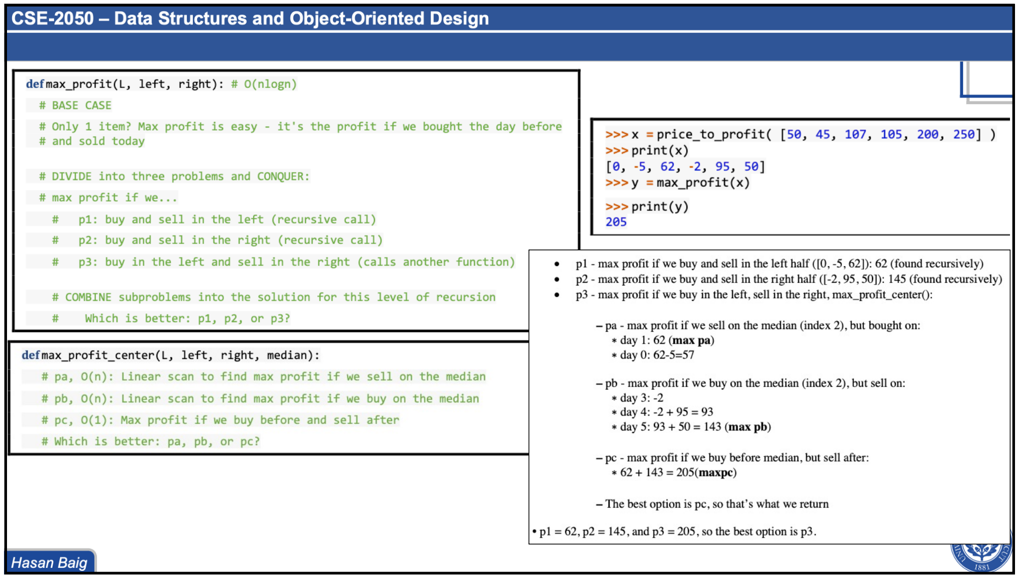

CSE-2050 – Data Structures and Object-Oriented Design

```
defmax_profit(L, left, right): # O(nlogn)
  # BASE CASE
  # Only 1 item? Max profit is easy - it's the profit if we bought the day before
  # and sold today

  # DIVIDE into three problems and CONQUER:
  # max profit if we...
  #   p1: buy and sell in the left (recursive call)
  #   p2: buy and sell in the right (recursive call)
  #   p3: buy in the left and sell in the right (calls another function)

  # COMBINE subproblems into the solution for this level of recursion
  #    Which is better: p1, p2, or p3?
```

```
defmax_profit_center(L, left, right, median):
  # pa, O(n): Linear scan to find max profit if we sell on the median
  # pb, O(n): Linear scan to find max profit if we buy on the median
  # pc, O(1): Max profit if we buy before and sell after
  # Which is better: pa, pb, or pc?
```

```
>>> x = price_to_profit( [50, 45, 107, 105, 200, 250] )
>>> print(x)
[0, -5, 62, -2, 95, 50]
>>> y = max_profit(x)

>>> print(y)
205
```

- p1 - max profit if we buy and sell in the left half ([0, -5, 62]): 62 (found recursively)
- p2 - max profit if we buy and sell in the right half ([-2, 95, 50]): 145 (found recursively)
- p3 - max profit if we buy in the left, sell in the right, max_profit_center():
  - pa - max profit if we sell on the median (index 2), but bought on:
    - day 1: 62 (**max pa**)
    - day 0: 62-5=57
  - pb - max profit if we buy on the median (index 2), but sell on:
    - day 3: -2
    - day 4: -2 + 95 = 93
    - day 5: 93 + 50 = 143 (**max pb**)
  - pc - max profit if we buy before median, but sell after:
    - 62 + 143 = 205(**maxpc**)
  - The best option is pc, so that's what we return
- p1 = 62, p2 = 145, and p3 = 205, so the best option is p3.

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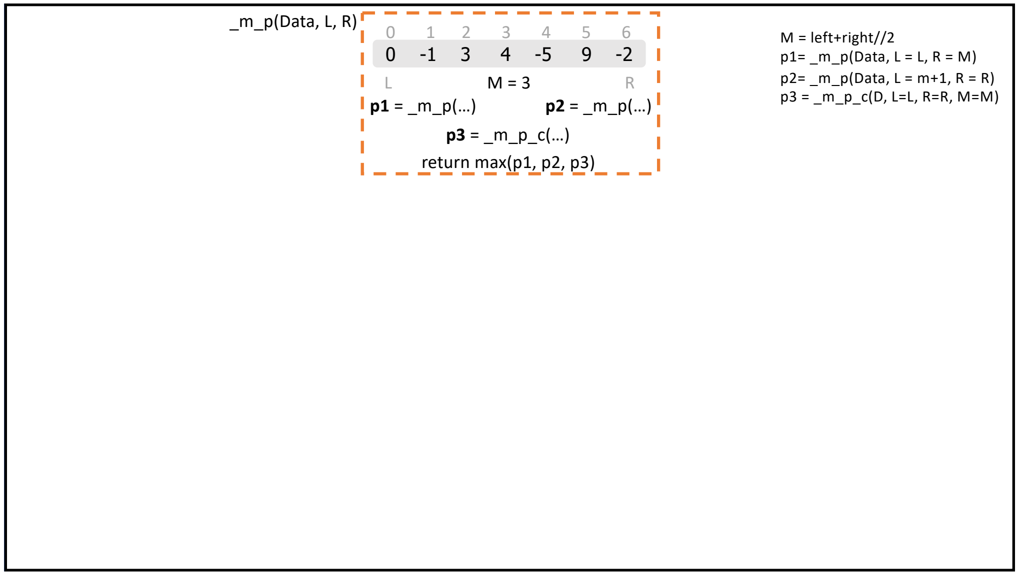


_m_p(Data, L, R)

0	1	2	3	4	5	6
0	-1	3	4	-5	9	-2

L M = 3 R

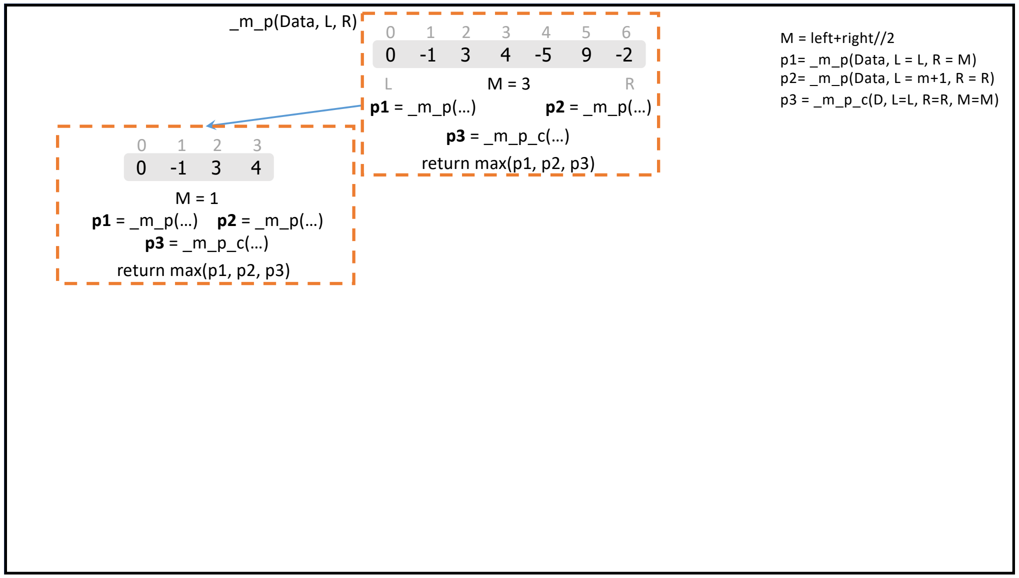
p1 = _m_p(...) **p2** = _m_p(...)

p3 = _m_p_c(...)

return max(p1, p2, p3)

M = left+right//2
p1= _m_p(Data, L = L, R = M)
p2= _m_p(Data, L = m+1, R = R)
p3 = _m_p_c(D, L=L, R=R, M=M)

4



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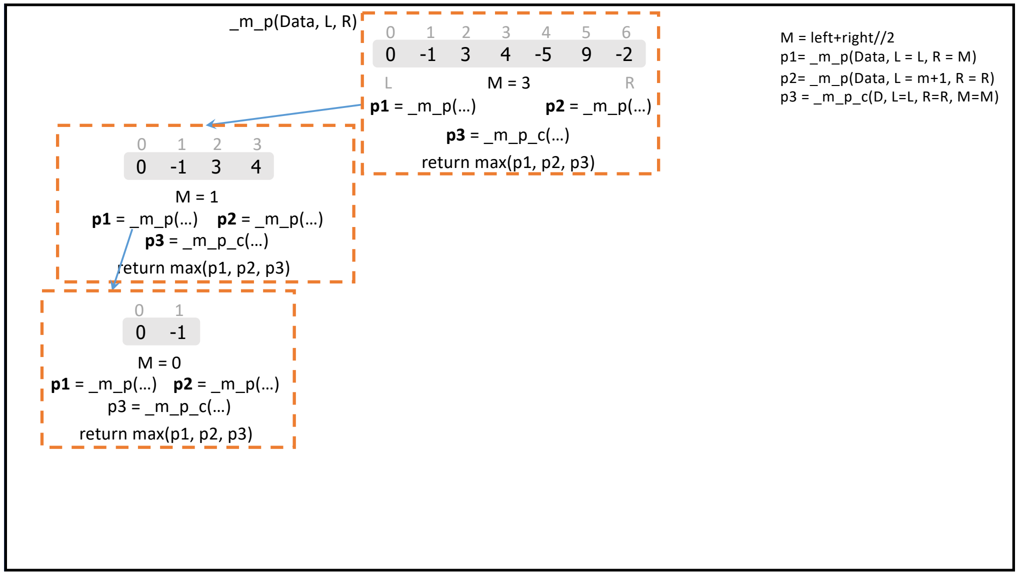
p3 = _m_p_c(D, L=L, R=R, M=M)

5



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return max(p1, p2, p3)

0 1
0 -1
M = 0
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p3 = _m_p_c(…)
return max(p1, p2, p3)

M = left+right//2
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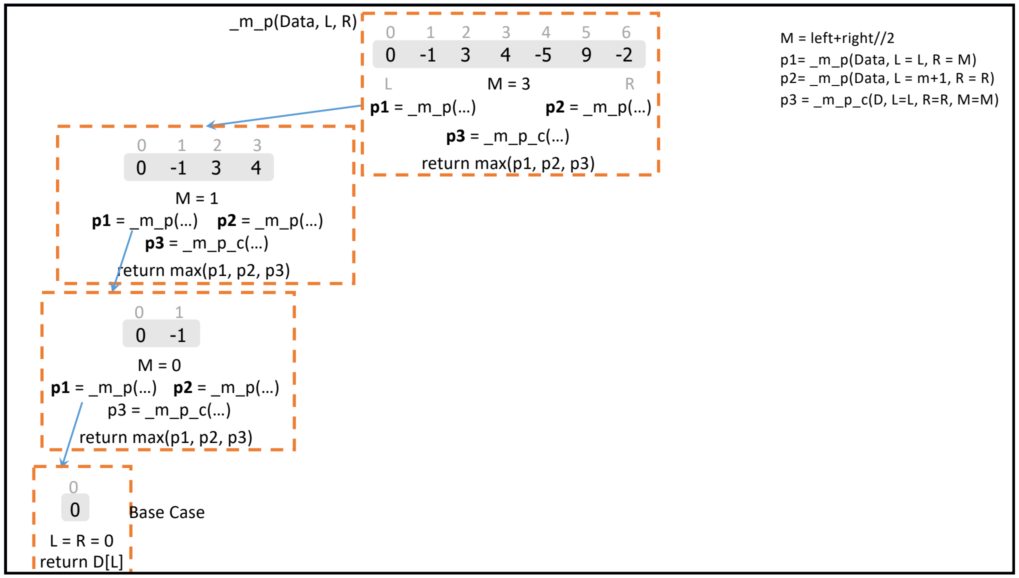
6



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M = 1
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p3 = _m_p_c(…)
return max(p1, p2, p3)

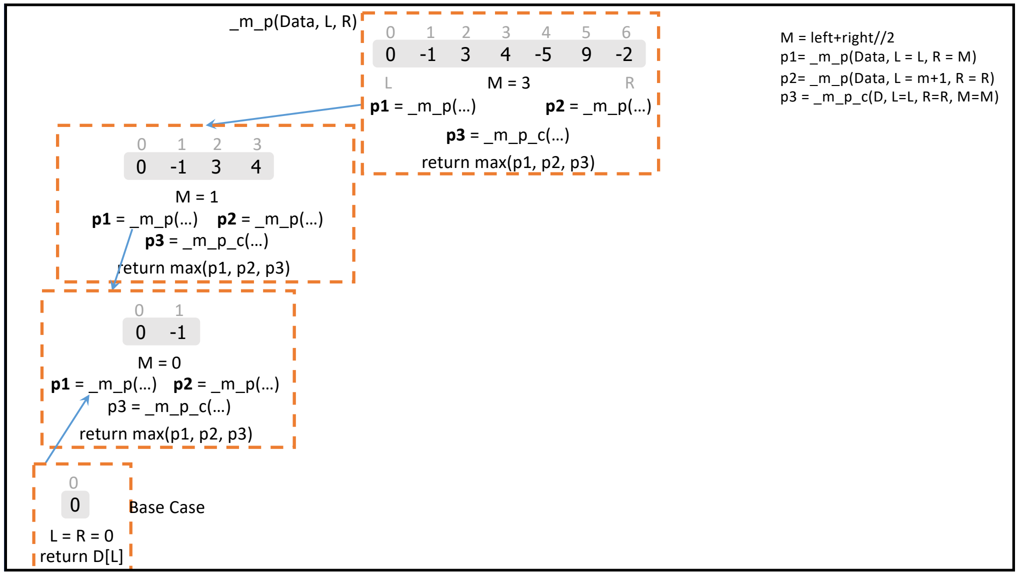
0 1
0 -1
M = 0
p1 = _m_p(…) **p2** = _m_p(…)
p3 = _m_p_c(…)
return max(p1, p2, p3)

0
0
L = R = 0
return D[L]

Base Case

M = left+right//2
p1= _m_p(Data, L = L, R = M)
p2= _m_p(Data, L = m+1, R = R)
p3 = _m_p_c(D, L=L, R=R, M=M)

7



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0 -1
M = 0
p1 = _m_p(…) **p2** = _m_p(…)
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0
0
L = R = 0
return D[L]

Base Case

M = left+right//2
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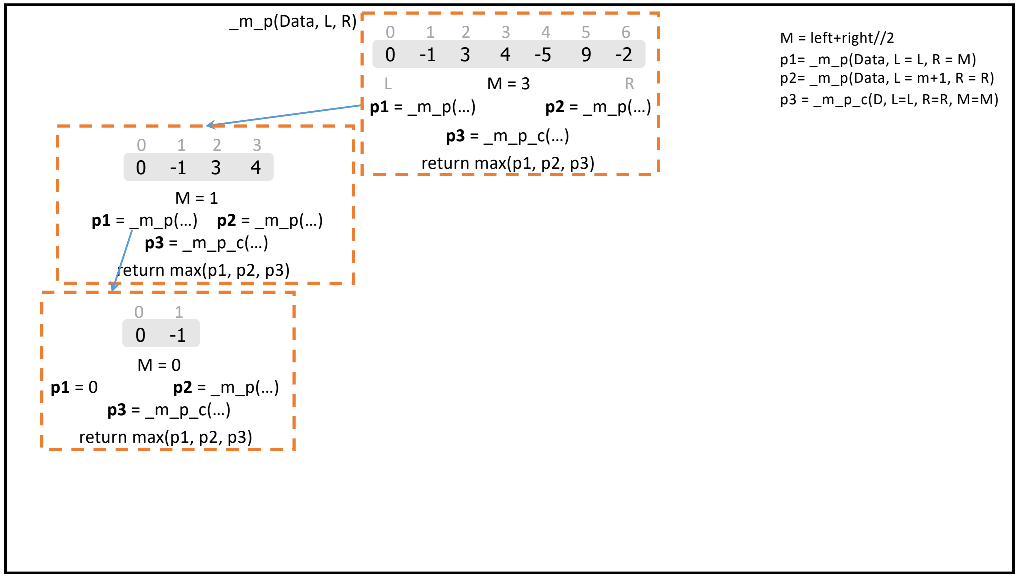
p2= _m_p(Data, L = m+1, R = R)
p3 = _m_p_c(D, L=L, R=R, M=M)

8



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M = left+right//2
p1= _m_p(Data, L = L, R = M)
p2= _m_p(Data, L = m+1, R = R)
p3 = _m_p_c(D, L=L, R=R, M=M)

0	1	2	3
0	-1	3	4

M = 1

p1 = _m_p(…) **p2** = _m_p(…)

p3 = _m_p_c(…)

return max(p1, p2, p3)

0	1
0	-1

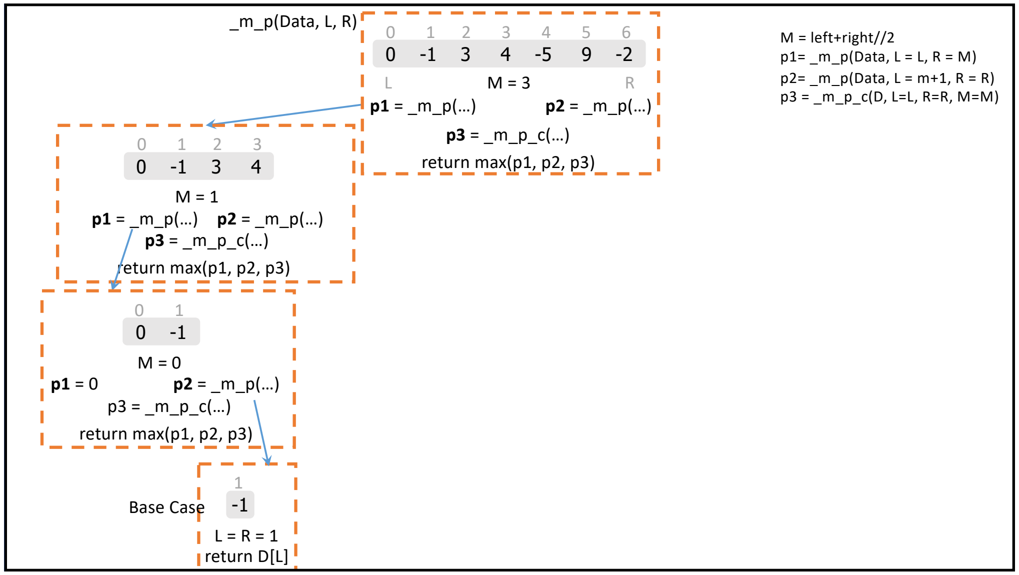
M = 0

p1 = 0 **p2** = _m_p(…)

p3 = _m_p_c(…)

return max(p1, p2, p3)

9



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p2= _m_p(Data, L = m+1, R = R)
p3 = _m_p_c(D, L=L, R=R, M=M)

0	1	2	3
0	-1	3	4

M = 1

p1 = _m_p(…) **p2** = _m_p(…)

p3 = _m_p_c(…)

return max(p1, p2, p3)

0	1
0	-1

M = 0

p1 = 0 **p2** = _m_p(…)

p3 = _m_p_c(…)

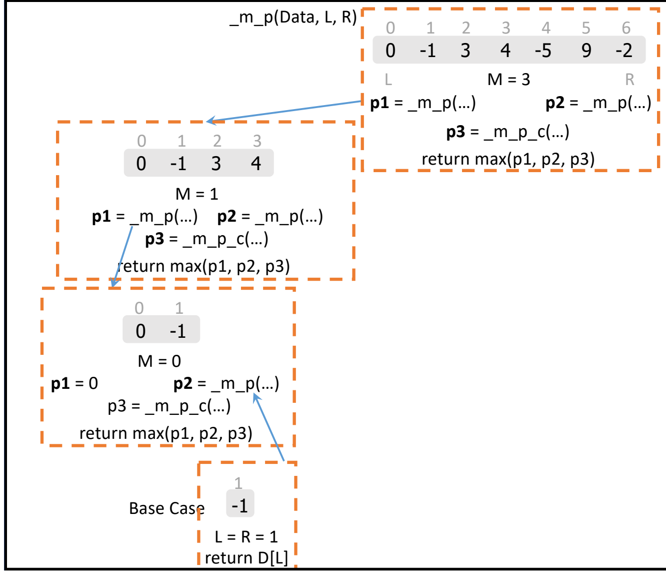
return max(p1, p2, p3)

Base Case

1
-1

L = R = 1
return D[L]

10



_m_p(Data, L, R)

0	1	2	3	4	5	6
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M = 1

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p3 = _m_p_c(…)

return max(p1, p2, p3)

0	1
0	-1

M = 0

p1 = 0 **p2** = _m_p(…)

p3 = _m_p_c(…)

return max(p1, p2, p3)

Base Case

1
-1

L = R = 1

return D[L]

M = left+right//2

p1= _m_p(Data, L = L, R = M)

p2= _m_p(Data, L = m+1, R = R)

p3 = _m_p_c(D, L=L, R=R, M=M)

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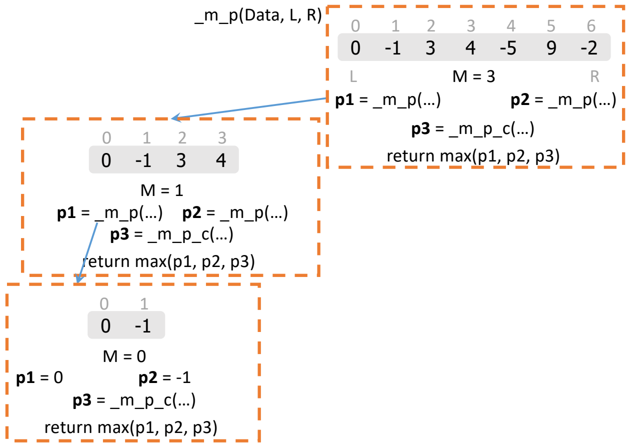

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0	1
0	-1

M = 0

p1 = 0 **p2** = -1

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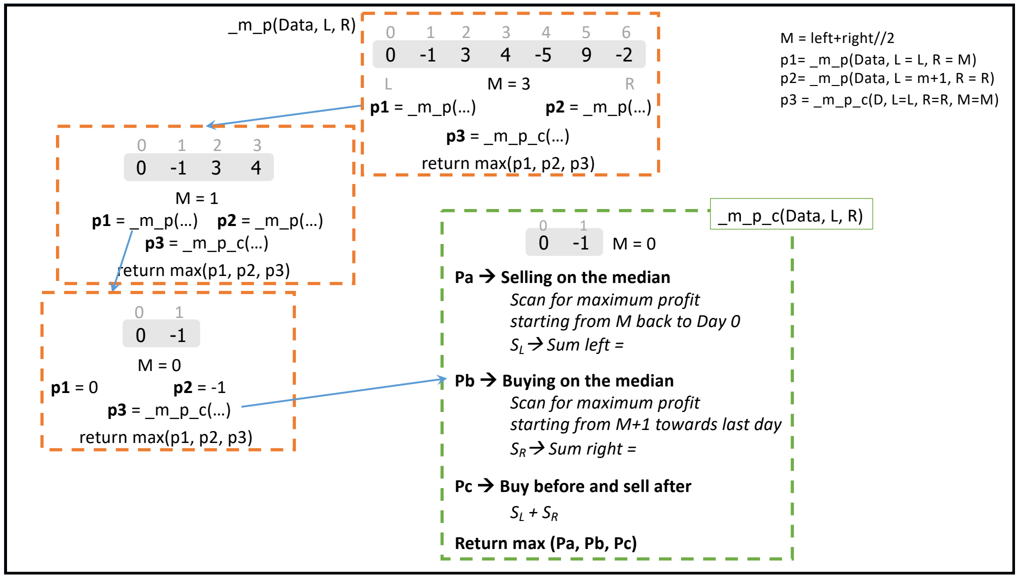

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p3 = _m_p_c(D, L=L, R=R, M=M)

0	1	2	3
0	-1	3	4

M = 1

p1 = _m_p(…) **p2** = _m_p(…)

p3 = _m_p_c(…)

return max(p1, p2, p3)

0	1
0	-1

M = 0

p1 = 0 **p2** = -1

p3 = _m_p_c(…)

return max(p1, p2, p3)

_m_p_c(Data, L, R)

0	1
0	-1

M = 0

Pa → Selling on the median

Scan for maximum profit
starting from M back to Day 0
S_L → Sum left =

Pb → Buying on the median

Scan for maximum profit
starting from M+1 towards last day
S_R → Sum right =

Pc → Buy before and sell after

S_L + S_R

Return max (Pa, Pb, Pc)

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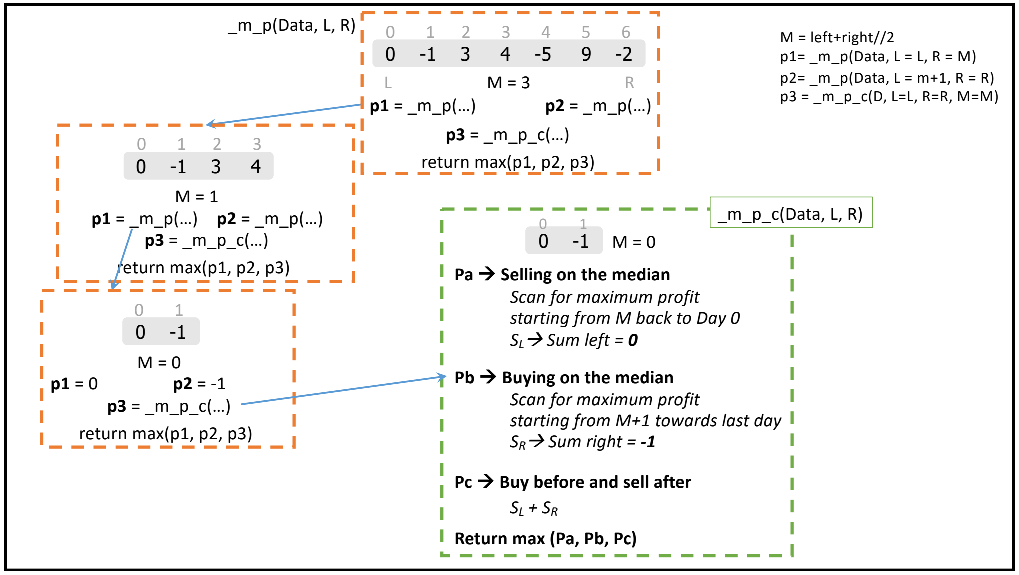

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p2= _m_p(Data, L = m+1, R = R)
p3 = _m_p_c(D, L=L, R=R, M=M)

0	1	2	3
0	-1	3	4

M = 1

p1 = _m_p(…) **p2** = _m_p(…)

p3 = _m_p_c(…)

return max(p1, p2, p3)

0	1
0	-1

M = 0

p1 = 0 **p2** = -1

p3 = _m_p_c(…)

return max(p1, p2, p3)

_m_p_c(Data, L, R)

0	1
0	-1

M = 0

Pa → Selling on the median

Scan for maximum profit
starting from M back to Day 0
*S_L → Sum left = **0***

Pb → Buying on the median

Scan for maximum profit
starting from M+1 towards last day
*S_R → Sum right = **-1***

Pc → Buy before and sell after

S_L + S_R

Return max (Pa, Pb, Pc)

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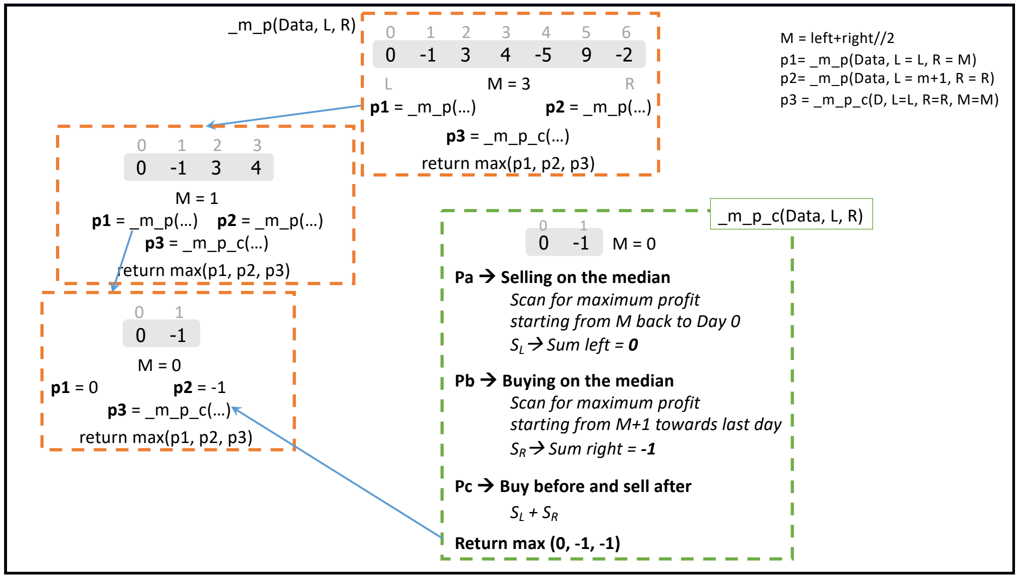

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0	1	2	3
0	-1	3	4

M = 1

p1 = _m_p(…) **p2** = _m_p(…)

p3 = _m_p_c(…)

return max(p1, p2, p3)

0	1
0	-1

M = 0

p1 = 0 **p2** = -1

p3 = _m_p_c(…)

return max(p1, p2, p3)

_m_p_c(Data, L, R)

0	1
0	-1

M = 0

Pa → Selling on the median
Scan for maximum profit
starting from M back to Day 0
*S_L → Sum left = **0***

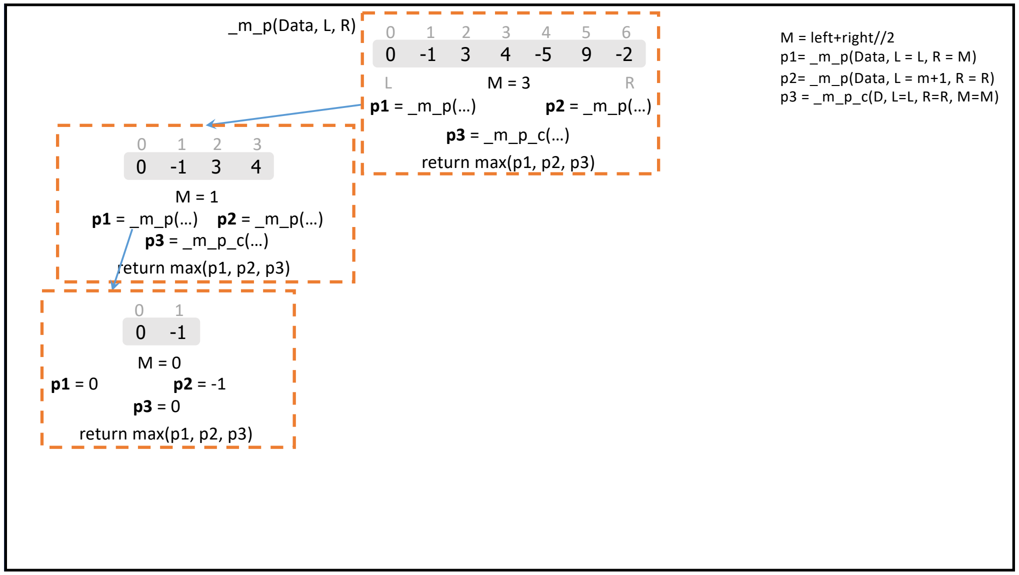
Pb → Buying on the median
Scan for maximum profit
starting from M+1 towards last day
*S_R → Sum right = **-1***

Pc → Buy before and sell after
$S_L + S_R$

Return max (0, -1, -1)

M = left+right//2
p1= _m_p(Data, L = L, R = M)
p2= _m_p(Data, L = m+1, R = R)
p3 = _m_p_c(D, L=L, R=R, M=M)

15



_m_p(Data, L, R)

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0	-1	3	4	-5	9	-2

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0	1	2	3
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M = 1

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p3 = _m_p_c(…)

return max(p1, p2, p3)

0	1
0	-1

M = 0

p1 = 0 **p2** = -1

p3 = 0

return max(p1, p2, p3)

M = left+right//2
p1= _m_p(Data, L = L, R = M)
p2= _m_p(Data, L = m+1, R = R)
p3 = _m_p_c(D, L=L, R=R, M=M)

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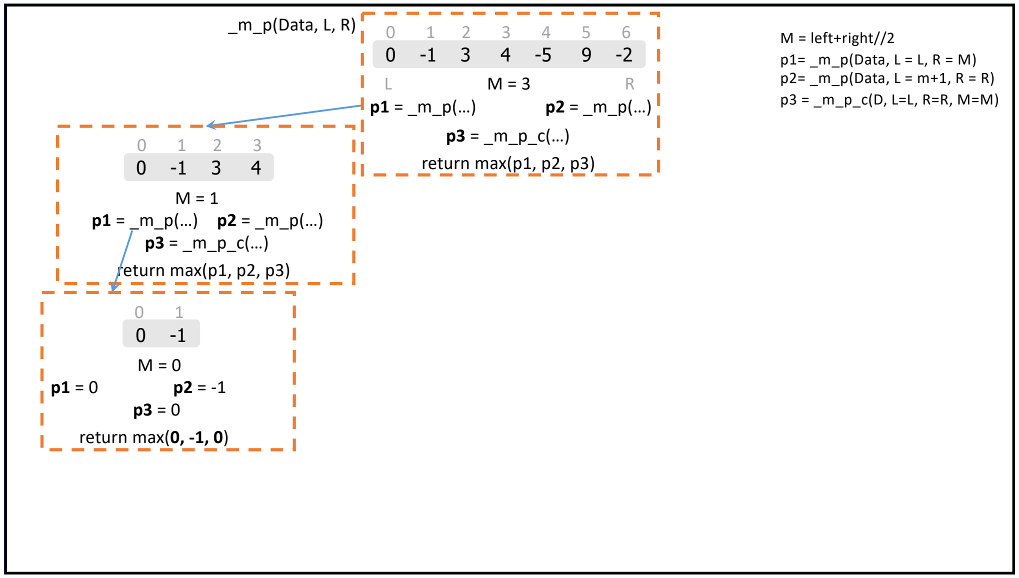

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0	1	2	3
0	-1	3	4

M = 1

p1 = _m_p(…) **p2** = _m_p(…)

p3 = _m_p_c(…)

return max(p1, p2, p3)

0	1
0	-1

M = 0

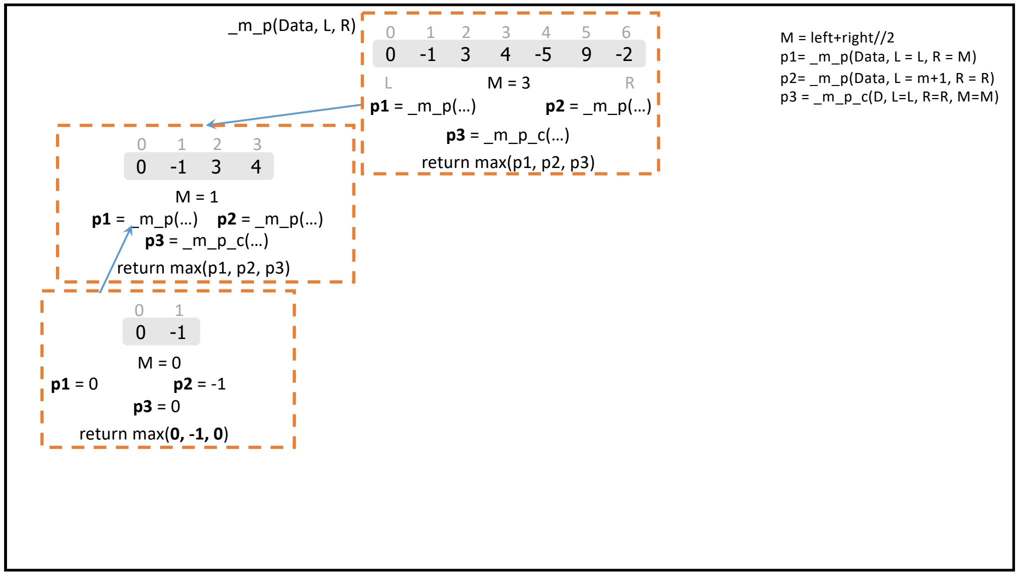
p1 = 0 **p2** = -1

p3 = 0

return max(**0**, **-1**, **0**)

M = left+right//2
p1= _m_p(Data, L = L, R = M)
p2= _m_p(Data, L = m+1, R = R)
p3 = _m_p_c(D, L=L, R=R, M=M)

17



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0	-1	3	4	-5	9	-2

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0	1	2	3
0	-1	3	4

M = 1

p1 = _m_p(…) **p2** = _m_p(…)

p3 = _m_p_c(…)

return max(p1, p2, p3)

0	1
0	-1

M = 0

p1 = 0 **p2** = -1

p3 = 0

return max(**0**, **-1**, **0**)

M = left+right//2
p1= _m_p(Data, L = L, R = M)
p2= _m_p(Data, L = m+1, R = R)
p3 = _m_p_c(D, L=L, R=R, M=M)

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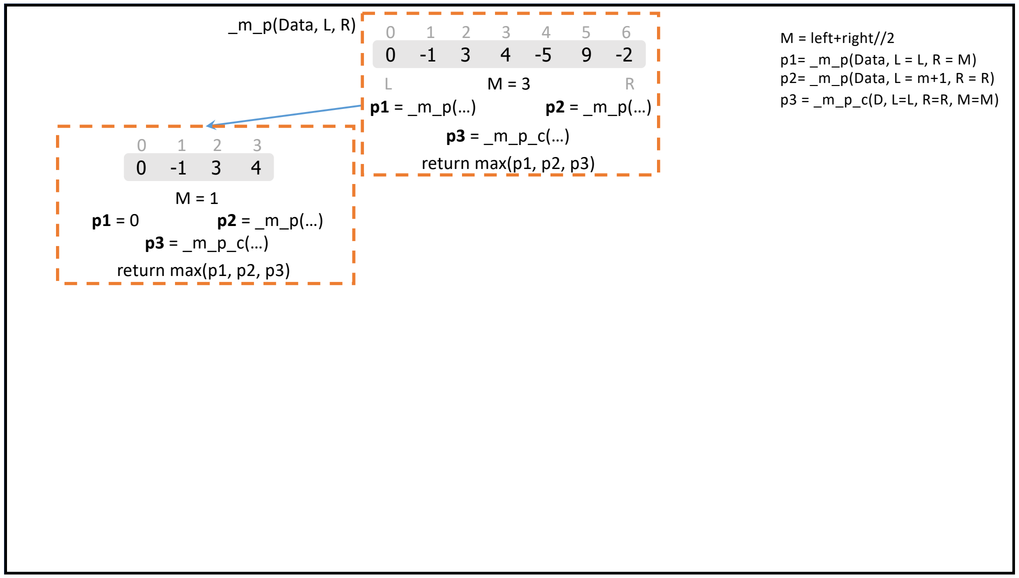

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0	-1	3	4	-5	9	-2

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return max(p1, p2, p3)

0	1	2	3
0	-1	3	4

M = 1

p1 = 0 **p2** = _m_p(…)

p3 = _m_p_c(…)

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M = left+right//2
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p3 = _m_p_c(D, L=L, R=R, M=M)

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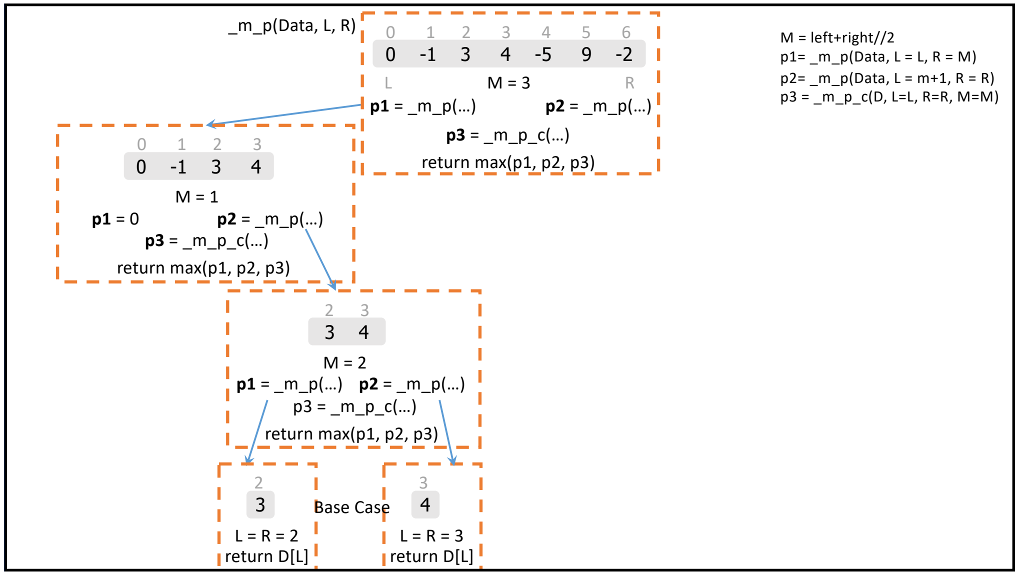


_m_p(Data, L, R)

0	1	2	3	4	5	6
0	-1	3	4	-5	9	-2

L M = 3 R

p1 = _m_p(…) **p2** = _m_p(…)

p3 = _m_p_c(…)

return max(p1, p2, p3)

0	1	2	3
0	-1	3	4

M = 1

p1 = 0 **p2** = _m_p(…)

p3 = _m_p_c(…)

return max(p1, p2, p3)

2	3
3	4

M = 2

p1 = _m_p(…) **p2** = _m_p(…)

p3 = _m_p_c(…)

return max(p1, p2, p3)

2
3

L = R = 2
return D[L]

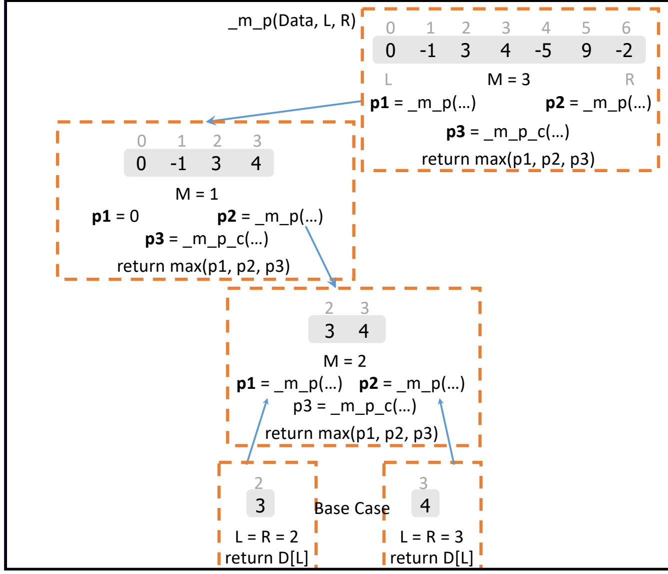
Base Case

3
4

L = R = 3
return D[L]

M = left+right//2
p1= _m_p(Data, L = L, R = M)
p2= _m_p(Data, L = m+1, R = R)
p3 = _m_p_c(D, L=L, R=R, M=M)

20



_m_p(Data, L, R)

0 1 2 3 4 5 6
0 -1 3 4 -5 9 -2
L M = 3 R
p1 = _m_p(…) **p2** = _m_p(…)
p3 = _m_p_c(…)
return max(p1, p2, p3)

0 1 2 3
0 -1 3 4
M = 1
p1 = 0 **p2** = _m_p(…)
p3 = _m_p_c(…)
return max(p1, p2, p3)

2 3
3 4
M = 2
p1 = _m_p(…) **p2** = _m_p(…)
p3 = _m_p_c(…)
return max(p1, p2, p3)

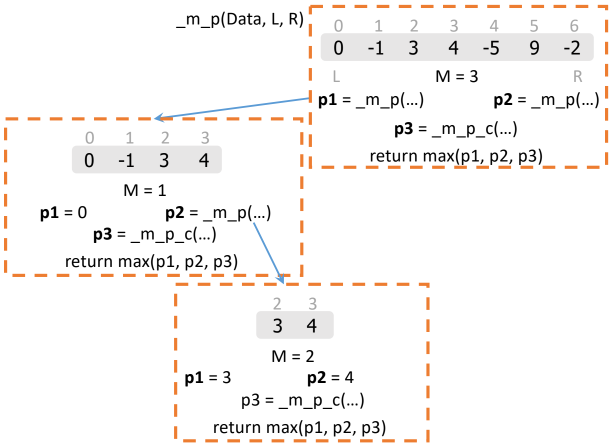
2
3
L = R = 2
return D[L]

Base Case

3
4
L = R = 3
return D[L]

M = left+right//2
p1= _m_p(Data, L = L, R = M)
p2= _m_p(Data, L = m+1, R = R)
p3 = _m_p_c(D, L=L, R=R, M=M)

21



_m_p(Data, L, R)

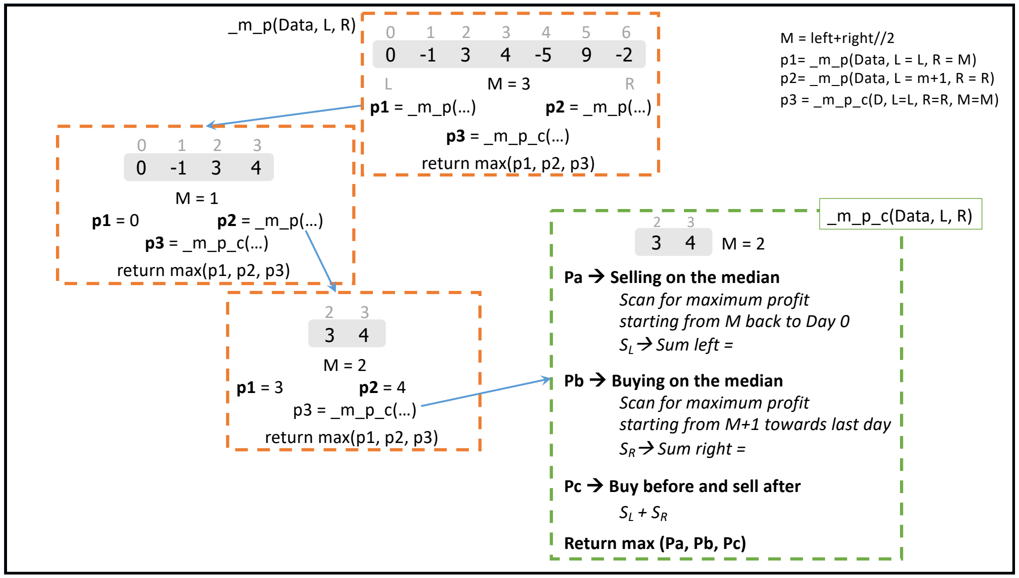
0 1 2 3 4 5 6
0 -1 3 4 -5 9 -2
L M = 3 R
p1 = _m_p(…) **p2** = _m_p(…)
p3 = _m_p_c(…)
return max(p1, p2, p3)

0 1 2 3
0 -1 3 4
M = 1
p1 = 0 **p2** = _m_p(…)
p3 = _m_p_c(…)
return max(p1, p2, p3)

2 3
3 4
M = 2
p1 = 3 **p2** = 4
p3 = _m_p_c(…)
return max(p1, p2, p3)

M = left+right//2
p1= _m_p(Data, L = L, R = M)
p2= _m_p(Data, L = m+1, R = R)
p3 = _m_p_c(D, L=L, R=R, M=M)

22



_m_p(Data, L, R)

0	1	2	3	4	5	6
0	-1	3	4	-5	9	-2

L M = 3 R

p1 = _m_p(...) **p2** = _m_p(...)

p3 = _m_p_c(...)

return max(p1, p2, p3)

M = left+right//2
p1= _m_p(Data, L = L, R = M)
p2= _m_p(Data, L = m+1, R = R)
p3 = _m_p_c(D, L=L, R=R, M=M)

0	1	2	3
0	-1	3	4

M = 1

p1 = 0 **p2** = _m_p(...)

p3 = _m_p_c(...)

return max(p1, p2, p3)

2	3
3	4

M = 2

p1 = 3 **p2** = 4

p3 = _m_p_c(...)

return max(p1, p2, p3)

_m_p_c(Data, L, R)

2	3
3	4

M = 2

Pa → Selling on the median

Scan for maximum profit
starting from M back to Day 0
S_L → Sum left =

Pb → Buying on the median

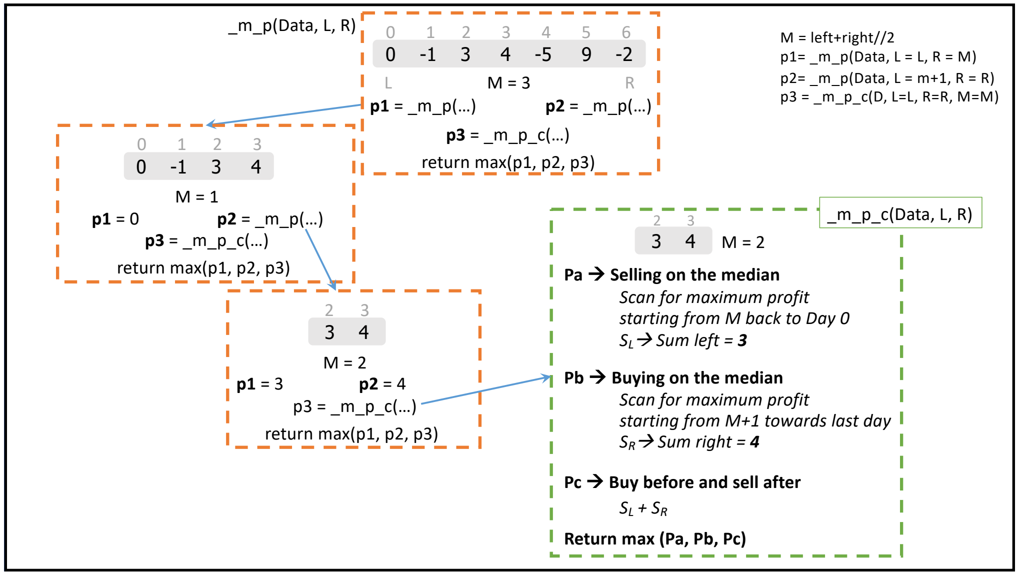
Scan for maximum profit
starting from M+1 towards last day
S_R → Sum right =

Pc → Buy before and sell after

$S_L + S_R$

Return max (Pa, Pb, Pc)

23



_m_p(Data, L, R)

0	1	2	3	4	5	6
0	-1	3	4	-5	9	-2

L M = 3 R

p1 = _m_p(...) **p2** = _m_p(...)

p3 = _m_p_c(...)

return max(p1, p2, p3)

M = left+right//2
p1= _m_p(Data, L = L, R = M)
p2= _m_p(Data, L = m+1, R = R)
p3 = _m_p_c(D, L=L, R=R, M=M)

0	1	2	3
0	-1	3	4

M = 1

p1 = 0 **p2** = _m_p(...)

p3 = _m_p_c(...)

return max(p1, p2, p3)

2	3
3	4

M = 2

p1 = 3 **p2** = 4

p3 = _m_p_c(...)

return max(p1, p2, p3)

_m_p_c(Data, L, R)

2	3
3	4

M = 2

Pa → Selling on the median

Scan for maximum profit
starting from M back to Day 0
*S_L → Sum left = **3***

Pb → Buying on the median

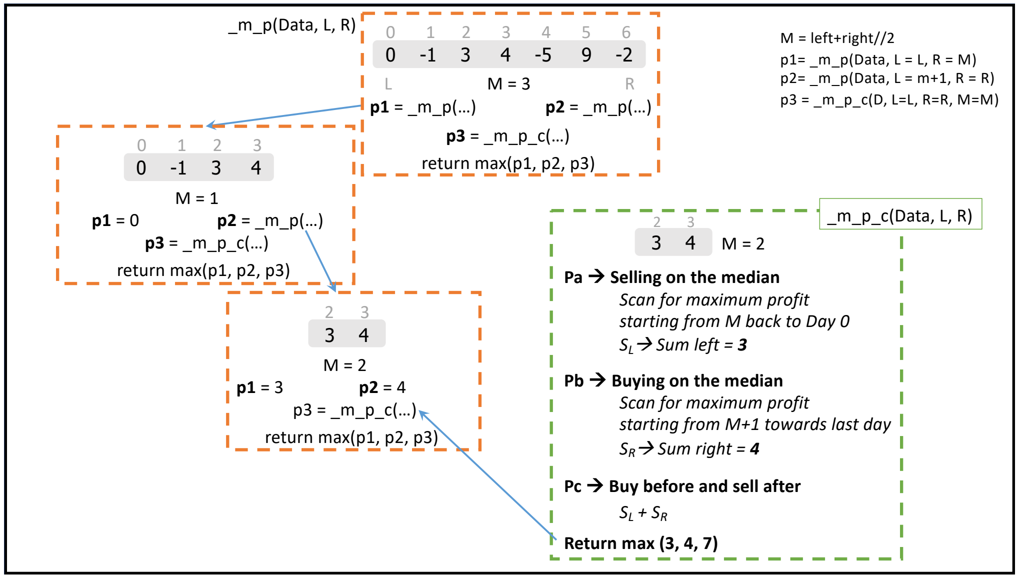
Scan for maximum profit
starting from M+1 towards last day
*S_R → Sum right = **4***

Pc → Buy before and sell after

$S_L + S_R$

Return max (Pa, Pb, Pc)

24



_m_p(Data, L, R)

0	1	2	3	4	5	6
0	-1	3	4	-5	9	-2

L M = 3 R

p1 = _m_p(…) **p2** = _m_p(…)

p3 = _m_p_c(…)

return max(p1, p2, p3)

M = left+right//2
p1= _m_p(Data, L = L, R = M)
p2= _m_p(Data, L = m+1, R = R)
p3 = _m_p_c(D, L=L, R=R, M=M)

0	1	2	3
0	-1	3	4

M = 1

p1 = 0 **p2** = _m_p(…)

p3 = _m_p_c(…)

return max(p1, p2, p3)

2	3
3	4

M = 2

p1 = 3 **p2** = 4

p3 = _m_p_c(…)

return max(p1, p2, p3)

_m_p_c(Data, L, R)

2	3
3	4

M = 2

Pa → Selling on the median

Scan for maximum profit
starting from M back to Day 0
*S_L → Sum left = **3***

Pb → Buying on the median

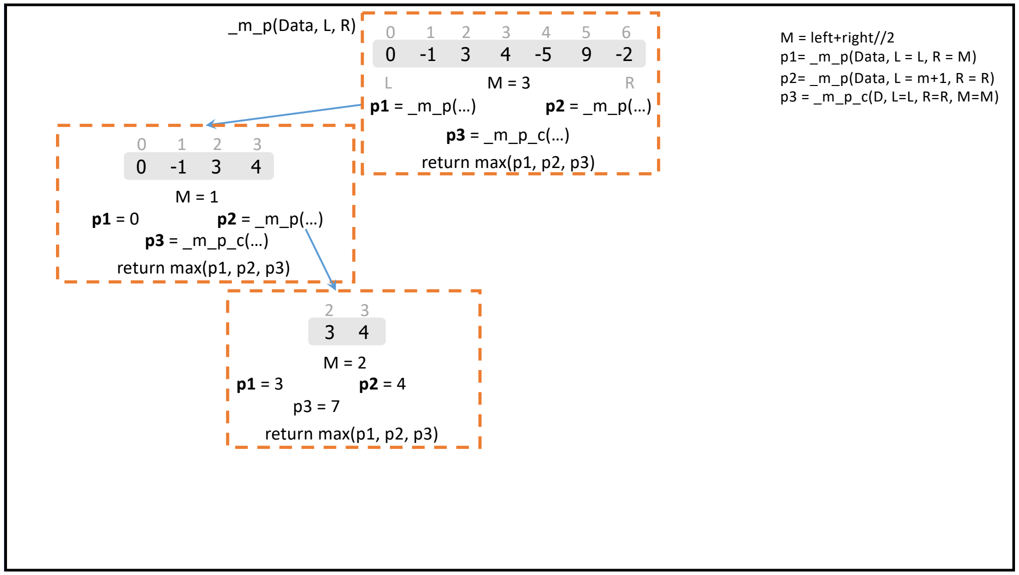
Scan for maximum profit
starting from M+1 towards last day
*S_R → Sum right = **4***

Pc → Buy before and sell after

$S_L + S_R$

Return max (3, 4, 7)

25



_m_p(Data, L, R)

0	1	2	3	4	5	6
0	-1	3	4	-5	9	-2

L M = 3 R

p1 = _m_p(…) **p2** = _m_p(…)

p3 = _m_p_c(…)

return max(p1, p2, p3)

M = left+right//2
p1= _m_p(Data, L = L, R = M)
p2= _m_p(Data, L = m+1, R = R)
p3 = _m_p_c(D, L=L, R=R, M=M)

0	1	2	3
0	-1	3	4

M = 1

p1 = 0 **p2** = _m_p(…)

p3 = _m_p_c(…)

return max(p1, p2, p3)

2	3
3	4

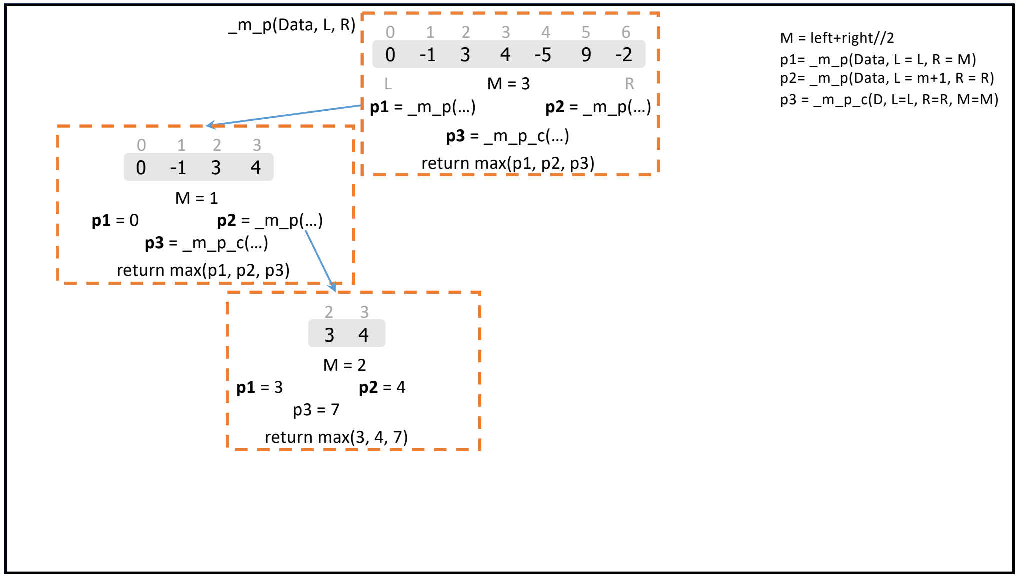
M = 2

p1 = 3 **p2** = 4

p3 = 7

return max(p1, p2, p3)

26



_m_p(Data, L, R)

0	1	2	3	4	5	6
0	-1	3	4	-5	9	-2

L M = 3 R

p1 = _m_p(...) **p2** = _m_p(...)

p3 = _m_p_c(...)

return max(p1, p2, p3)

0	1	2	3
0	-1	3	4

M = 1

p1 = 0 **p2** = _m_p(...)

p3 = _m_p_c(...)

return max(p1, p2, p3)

2	3
3	4

M = 2

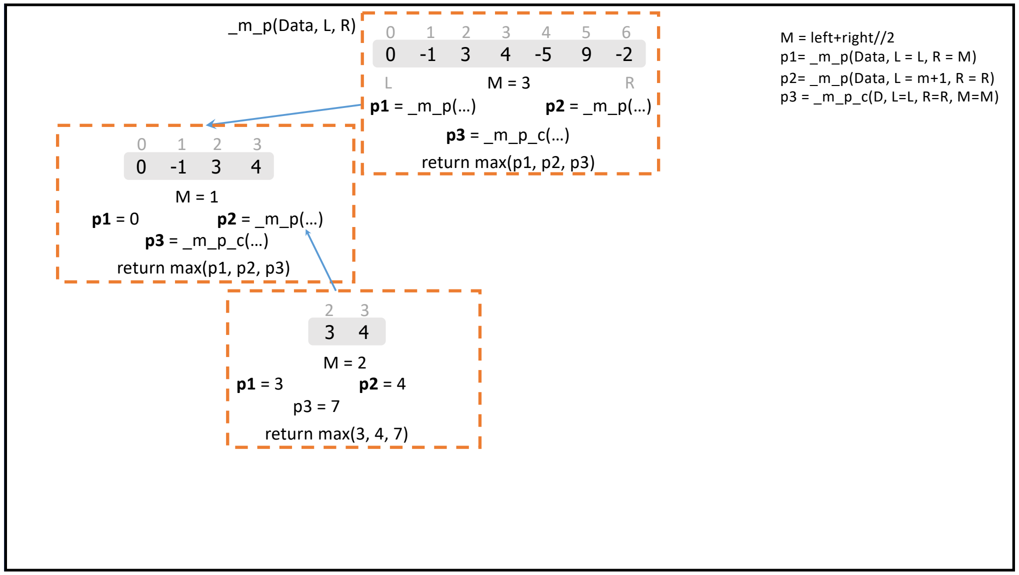
p1 = 3 **p2** = 4

p3 = 7

return max(3, 4, 7)

M = left+right//2
p1= _m_p(Data, L = L, R = M)
p2= _m_p(Data, L = m+1, R = R)
p3 = _m_p_c(D, L=L, R=R, M=M)

27



_m_p(Data, L, R)

0	1	2	3	4	5	6
0	-1	3	4	-5	9	-2

L M = 3 R

p1 = _m_p(...) **p2** = _m_p(...)

p3 = _m_p_c(...)

return max(p1, p2, p3)

0	1	2	3
0	-1	3	4

M = 1

p1 = 0 **p2** = _m_p(...)

p3 = _m_p_c(...)

return max(p1, p2, p3)

2	3
3	4

M = 2

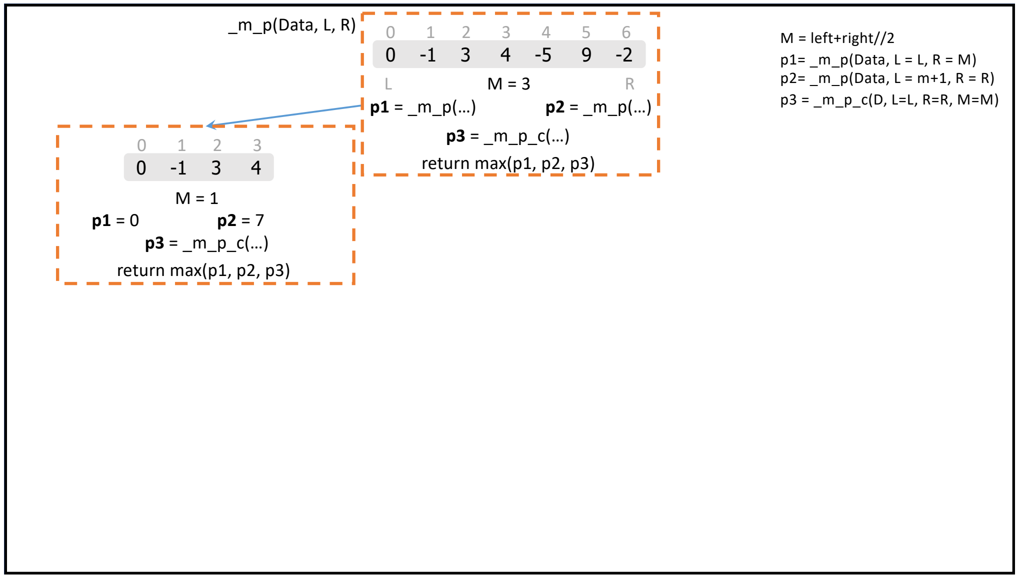
p1 = 3 **p2** = 4

p3 = 7

return max(3, 4, 7)

M = left+right//2
p1= _m_p(Data, L = L, R = M)
p2= _m_p(Data, L = m+1, R = R)
p3 = _m_p_c(D, L=L, R=R, M=M)

28



_m_p(Data, L, R)

0	1	2	3	4	5	6
0	-1	3	4	-5	9	-2

L M = 3 R

p1 = _m_p(…) **p2** = _m_p(…)

p3 = _m_p_c(…)

return max(p1, p2, p3)

0	1	2	3
0	-1	3	4

M = 1

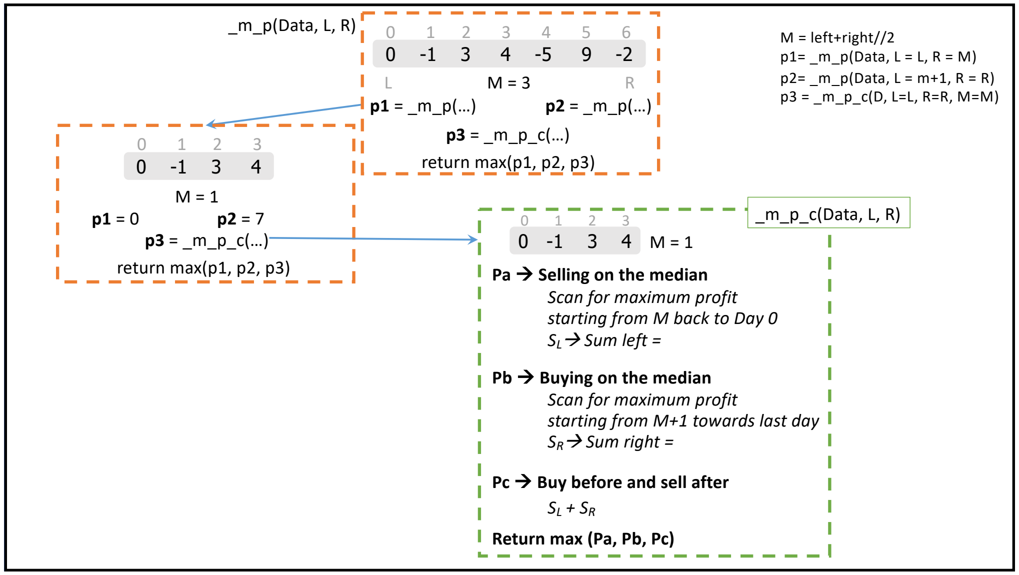
p1 = 0 **p2** = 7

p3 = _m_p_c(…)

return max(p1, p2, p3)

M = left+right//2
p1= _m_p(Data, L = L, R = M)
p2= _m_p(Data, L = m+1, R = R)
p3 = _m_p_c(D, L=L, R=R, M=M)

29



_m_p(Data, L, R)

0	1	2	3	4	5	6
0	-1	3	4	-5	9	-2

L M = 3 R

p1 = _m_p(…) **p2** = _m_p(…)

p3 = _m_p_c(…)

return max(p1, p2, p3)

0	1	2	3
0	-1	3	4

M = 1

p1 = 0 **p2** = 7

p3 = _m_p_c(…)

return max(p1, p2, p3)

M = left+right//2
p1= _m_p(Data, L = L, R = M)
p2= _m_p(Data, L = m+1, R = R)
p3 = _m_p_c(D, L=L, R=R, M=M)

_m_p_c(Data, L, R)

0	1	2	3
0	-1	3	4

M = 1

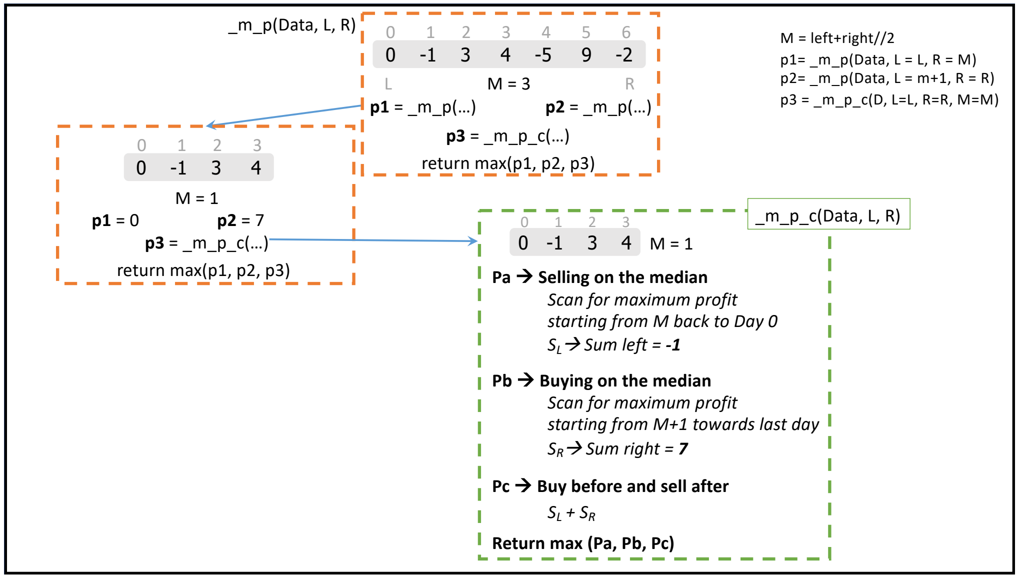
Pa → Selling on the median
Scan for maximum profit
starting from M back to Day 0
S_L → *Sum left =*

Pb → Buying on the median
Scan for maximum profit
starting from M+1 towards last day
S_R → *Sum right =*

Pc → Buy before and sell after
$S_L + S_R$

Return max (Pa, Pb, Pc)

30



_m_p(Data, L, R)

0	1	2	3	4	5	6
0	-1	3	4	-5	9	-2

L M = 3 R

p1 = _m_p(…) **p2** = _m_p(…)

p3 = _m_p_c(…)

return max(p1, p2, p3)

M = left+right//2
p1= _m_p(Data, L = L, R = M)
p2= _m_p(Data, L = m+1, R = R)
p3 = _m_p_c(D, L=L, R=R, M=M)

0	1	2	3
0	-1	3	4

M = 1

p1 = 0 **p2** = 7

p3 = _m_p_c(…)

return max(p1, p2, p3)

_m_p_c(Data, L, R)

0	1	2	3
0	-1	3	4

M = 1

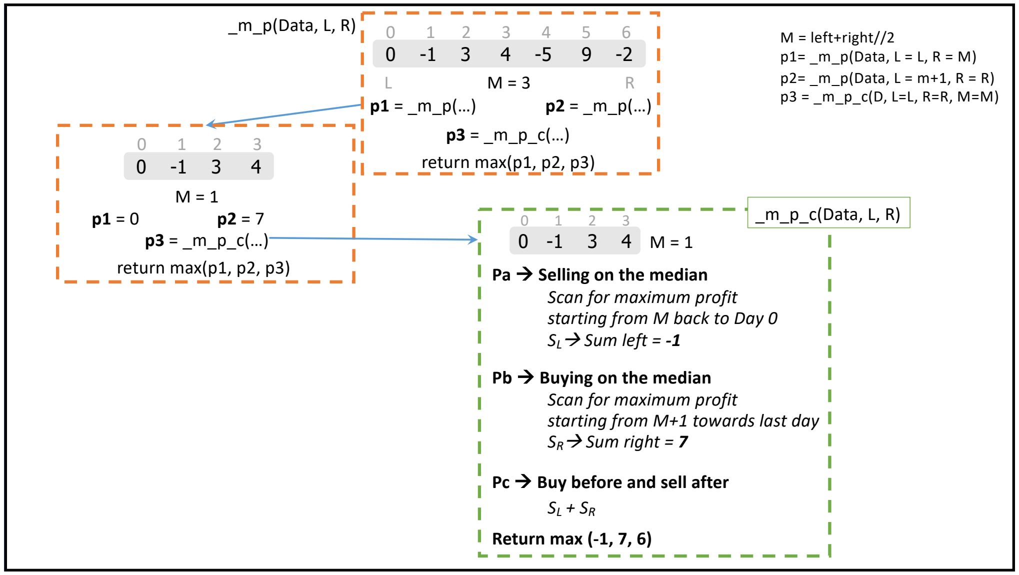
Pa → Selling on the median
Scan for maximum profit
starting from M back to Day 0
S_L → *Sum left =* ***-1***

Pb → Buying on the median
Scan for maximum profit
starting from M+1 towards last day
S_R → *Sum right =* ***7***

Pc → Buy before and sell after
$S_L + S_R$

Return max (Pa, Pb, Pc)

31



_m_p(Data, L, R)

0	1	2	3	4	5	6
0	-1	3	4	-5	9	-2

L M = 3 R

p1 = _m_p(…) **p2** = _m_p(…)

p3 = _m_p_c(…)

return max(p1, p2, p3)

M = left+right//2
p1= _m_p(Data, L = L, R = M)
p2= _m_p(Data, L = m+1, R = R)
p3 = _m_p_c(D, L=L, R=R, M=M)

0	1	2	3
0	-1	3	4

M = 1

p1 = 0 **p2** = 7

p3 = _m_p_c(…)

return max(p1, p2, p3)

_m_p_c(Data, L, R)

0	1	2	3
0	-1	3	4

M = 1

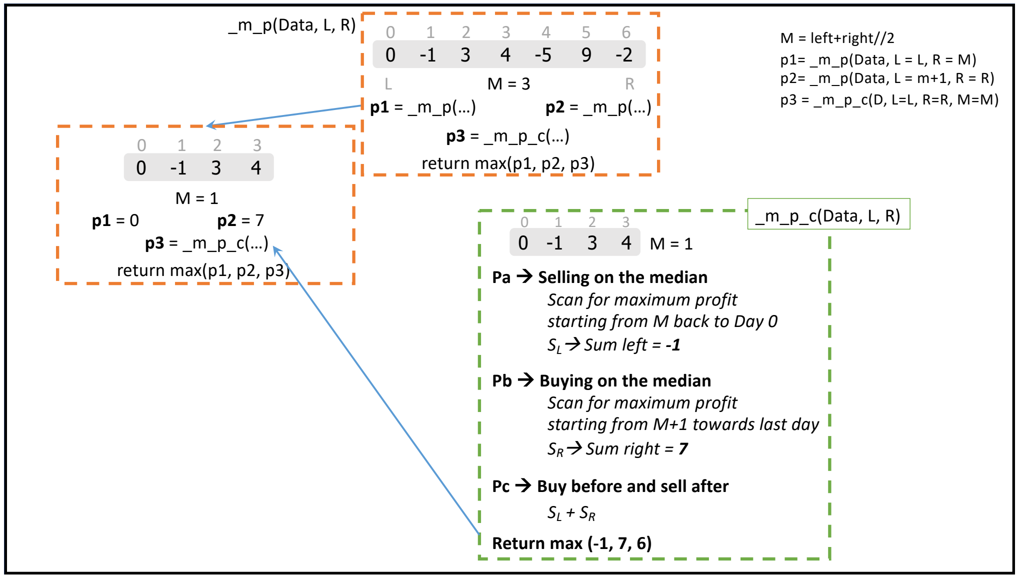
Pa → Selling on the median
Scan for maximum profit
starting from M back to Day 0
S_L → *Sum left =* ***-1***

Pb → Buying on the median
Scan for maximum profit
starting from M+1 towards last day
S_R → *Sum right =* ***7***

Pc → Buy before and sell after
$S_L + S_R$

Return max (-1, 7, 6)

32



_m_p(Data, L, R)

0	1	2	3	4	5	6
0	-1	3	4	-5	9	-2

L M = 3 R

p1 = _m_p(…) **p2** = _m_p(…)

p3 = _m_p_c(…)

return max(p1, p2, p3)

M = left+right//2
p1= _m_p(Data, L = L, R = M)
p2= _m_p(Data, L = m+1, R = R)
p3 = _m_p_c(D, L=L, R=R, M=M)

0	1	2	3
0	-1	3	4

M = 1

p1 = 0 **p2** = 7

p3 = _m_p_c(…)

return max(p1, p2, p3)

_m_p_c(Data, L, R)

0	1	2	3
0	-1	3	4

M = 1

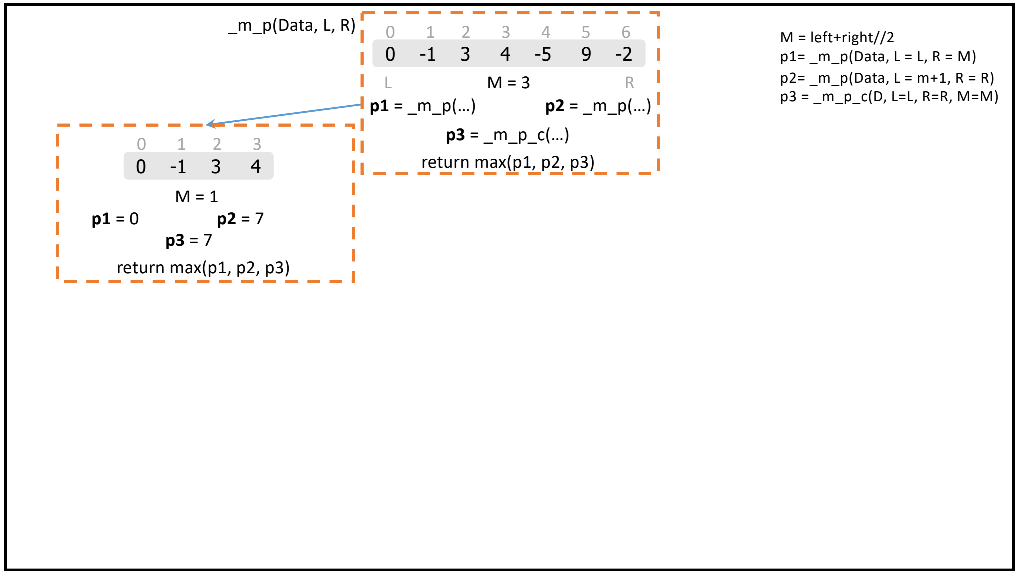
Pa → Selling on the median
Scan for maximum profit
starting from M back to Day 0
S_L → Sum left = ***-1***

Pb → Buying on the median
Scan for maximum profit
starting from M+1 towards last day
S_R → Sum right = ***7***

Pc → Buy before and sell after
S_L + S_R

Return max (-1, 7, 6)

33



_m_p(Data, L, R)

0	1	2	3	4	5	6
0	-1	3	4	-5	9	-2

L M = 3 R

p1 = _m_p(…) **p2** = _m_p(…)

p3 = _m_p_c(…)

return max(p1, p2, p3)

M = left+right//2
p1= _m_p(Data, L = L, R = M)
p2= _m_p(Data, L = m+1, R = R)
p3 = _m_p_c(D, L=L, R=R, M=M)

0	1	2	3
0	-1	3	4

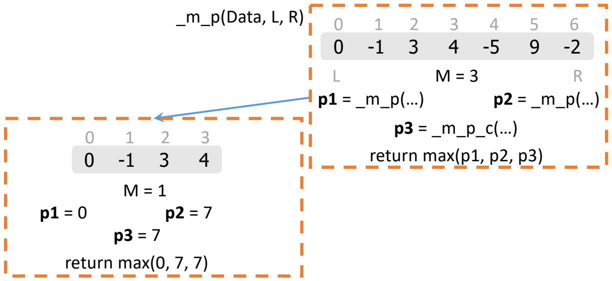
M = 1

p1 = 0 **p2** = 7

p3 = 7

return max(p1, p2, p3)

34



_m_p(Data, L, R)

0	1	2	3	4	5	6
0	-1	3	4	-5	9	-2

L M = 3 R

p1 = _m_p(…) **p2** = _m_p(…)

p3 = _m_p_c(…)

return max(p1, p2, p3)

0	1	2	3
0	-1	3	4

M = 1

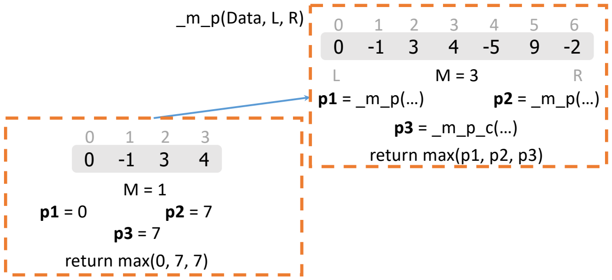
p1 = 0 **p2** = 7

p3 = 7

return max(0, 7, 7)

M = left+right//2
p1= _m_p(Data, L = L, R = M)
p2= _m_p(Data, L = m+1, R = R)
p3 = _m_p_c(D, L=L, R=R, M=M)

35



_m_p(Data, L, R)

0	1	2	3	4	5	6
0	-1	3	4	-5	9	-2

L M = 3 R

p1 = _m_p(…) **p2** = _m_p(…)

p3 = _m_p_c(…)

return max(p1, p2, p3)

0	1	2	3
0	-1	3	4

M = 1

p1 = 0 **p2** = 7

p3 = 7

return max(0, 7, 7)

M = left+right//2
p1= _m_p(Data, L = L, R = M)
p2= _m_p(Data, L = m+1, R = R)
p3 = _m_p_c(D, L=L, R=R, M=M)

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_m_p(Data, L, R)

0	1	2	3	4	5	6
0	-1	3	4	-5	9	-2

L M = 3 R

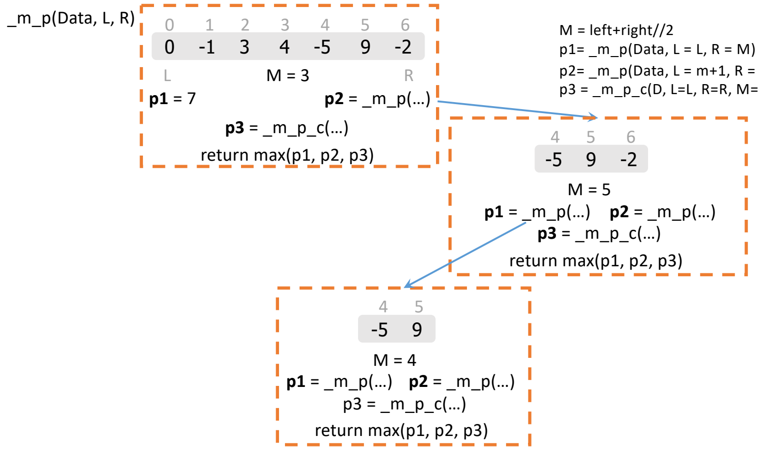
p1 = 7 **p2** = _m_p(…)

p3 = _m_p_c(…)

return max(p1, p2, p3)

M = left+right//2
p1= _m_p(Data, L = L, R = M)
p2= _m_p(Data, L = m+1, R = R)
p3 = _m_p_c(D, L=L, R=R, M=M)

37



_m_p(Data, L, R)

0	1	2	3	4	5	6
0	-1	3	4	-5	9	-2

L M = 3 R

p1 = 7 **p2** = _m_p(…)

p3 = _m_p_c(…)

return max(p1, p2, p3)

4	5	6
-5	9	-2

M = 5

p1 = _m_p(…) **p2** = _m_p(…)

p3 = _m_p_c(…)

return max(p1, p2, p3)

4	5
-5	9

M = 4

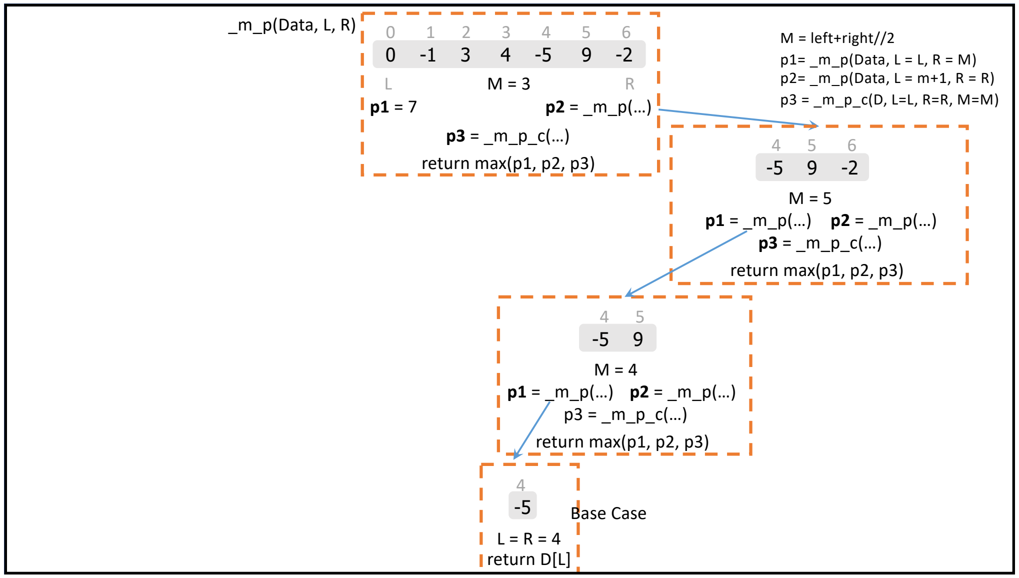
p1 = _m_p(…) **p2** = _m_p(…)

p3 = _m_p_c(…)

return max(p1, p2, p3)

M = left+right//2
p1= _m_p(Data, L = L, R = M)
p2= _m_p(Data, L = m+1, R = R)
p3 = _m_p_c(D, L=L, R=R, M=M)

38



_m_p(Data, L, R)

0	1	2	3	4	5	6
0	-1	3	4	-5	9	-2

L M = 3 R

p1 = 7 **p2** = _m_p(…)

p3 = _m_p_c(…)

return max(p1, p2, p3)

M = left+right//2
p1= _m_p(Data, L = L, R = M)
p2= _m_p(Data, L = m+1, R = R)
p3 = _m_p_c(D, L=L, R=R, M=M)

4	5	6
-5	9	-2

M = 5

p1 = _m_p(…) **p2** = _m_p(…)

p3 = _m_p_c(…)

return max(p1, p2, p3)

4	5
-5	9

M = 4

p1 = _m_p(…) **p2** = _m_p(…)

p3 = _m_p_c(…)

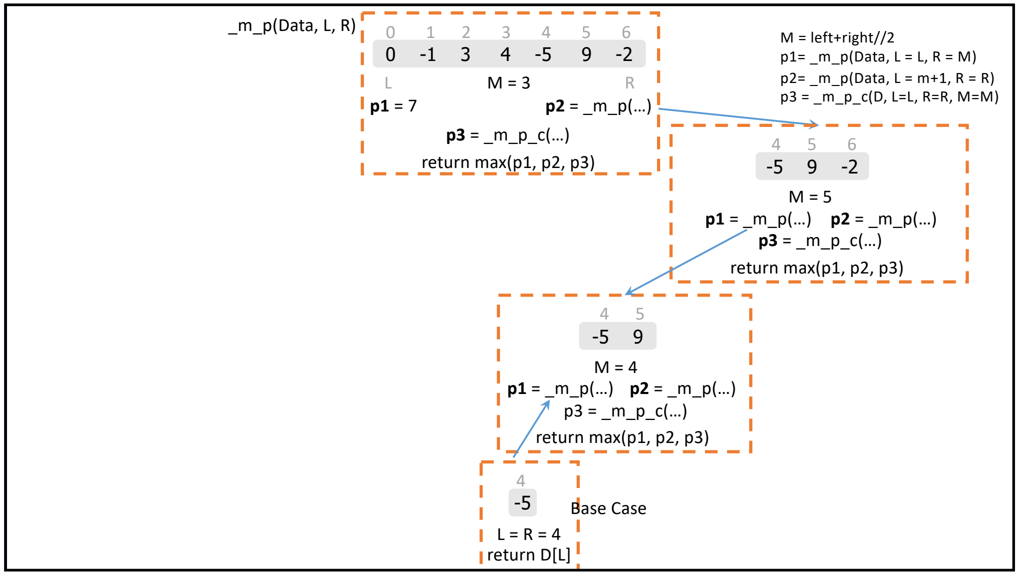
return max(p1, p2, p3)

4
-5

Base Case

L = R = 4
return D[L]

39



_m_p(Data, L, R)

0	1	2	3	4	5	6
0	-1	3	4	-5	9	-2

L M = 3 R

p1 = 7 **p2** = _m_p(…)

p3 = _m_p_c(…)

return max(p1, p2, p3)

M = left+right//2
p1= _m_p(Data, L = L, R = M)
p2= _m_p(Data, L = m+1, R = R)
p3 = _m_p_c(D, L=L, R=R, M=M)

4	5	6
-5	9	-2

M = 5

p1 = _m_p(…) **p2** = _m_p(…)

p3 = _m_p_c(…)

return max(p1, p2, p3)

4	5
-5	9

M = 4

p1 = _m_p(…) **p2** = _m_p(…)

p3 = _m_p_c(…)

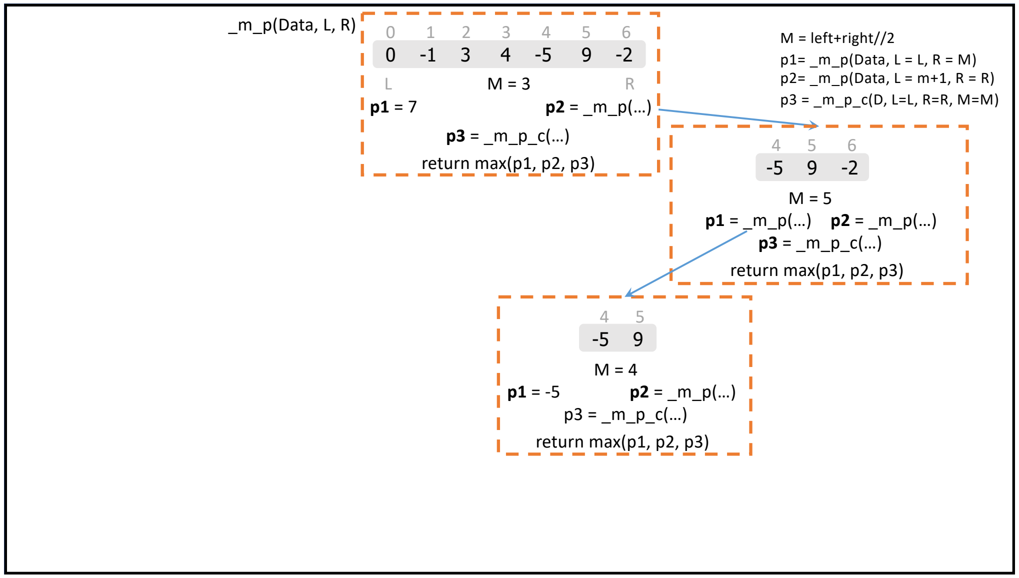
return max(p1, p2, p3)

4
-5

Base Case

L = R = 4
return D[L]

40



_m_p(Data, L, R)

0	1	2	3	4	5	6
0	-1	3	4	-5	9	-2

L M = 3 R

p1 = 7 **p2** = _m_p(…)

p3 = _m_p_c(…)

return max(p1, p2, p3)

M = left+right//2
p1= _m_p(Data, L = L, R = M)
p2= _m_p(Data, L = m+1, R = R)
p3 = _m_p_c(D, L=L, R=R, M=M)

4	5	6
-5	9	-2

M = 5

p1 = _m_p(…) **p2** = _m_p(…)

p3 = _m_p_c(…)

return max(p1, p2, p3)

4	5
-5	9

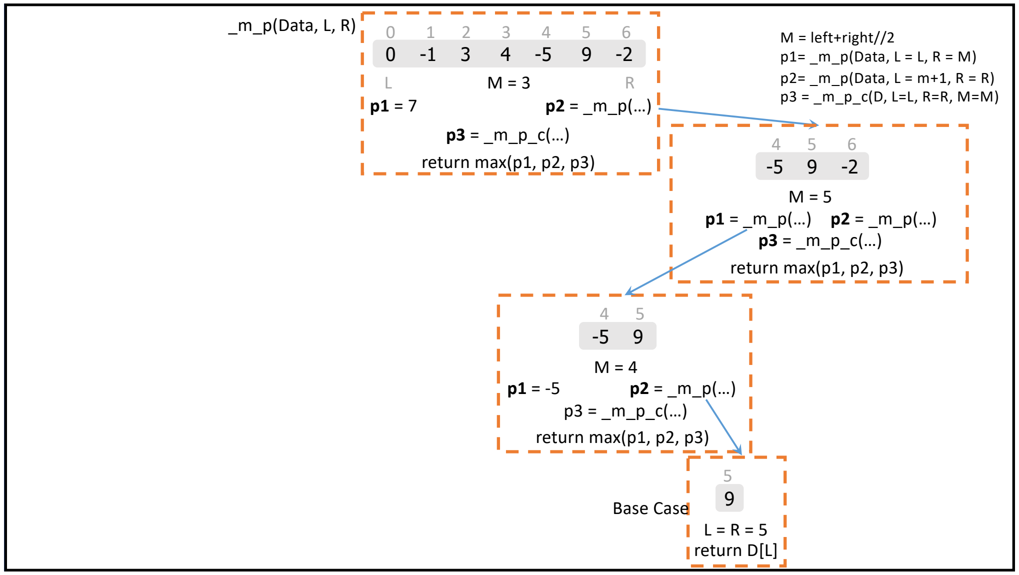
M = 4

p1 = -5 **p2** = _m_p(…)

p3 = _m_p_c(…)

return max(p1, p2, p3)

41



_m_p(Data, L, R)

0	1	2	3	4	5	6
0	-1	3	4	-5	9	-2

L M = 3 R

p1 = 7 **p2** = _m_p(…)

p3 = _m_p_c(…)

return max(p1, p2, p3)

M = left+right//2
p1= _m_p(Data, L = L, R = M)
p2= _m_p(Data, L = m+1, R = R)
p3 = _m_p_c(D, L=L, R=R, M=M)

4	5	6
-5	9	-2

M = 5

p1 = _m_p(…) **p2** = _m_p(…)

p3 = _m_p_c(…)

return max(p1, p2, p3)

4	5
-5	9

M = 4

p1 = -5 **p2** = _m_p(…)

p3 = _m_p_c(…)

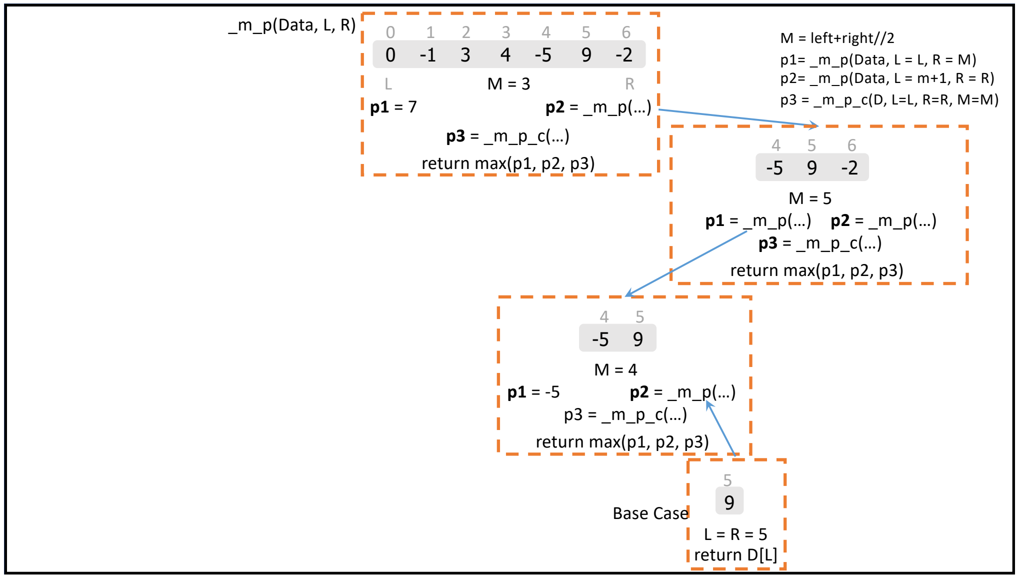
return max(p1, p2, p3)

5
9

Base Case

L = R = 5
return D[L]

42



_m_p(Data, L, R)

0	1	2	3	4	5	6
0	-1	3	4	-5	9	-2

L M = 3 R

p1 = 7 **p2** = _m_p(…)

p3 = _m_p_c(…)

return max(p1, p2, p3)

M = left+right//2
p1= _m_p(Data, L = L, R = M)
p2= _m_p(Data, L = m+1, R = R)
p3 = _m_p_c(D, L=L, R=R, M=M)

4	5	6
-5	9	-2

M = 5

p1 = _m_p(…) **p2** = _m_p(…)

p3 = _m_p_c(…)

return max(p1, p2, p3)

4	5
-5	9

M = 4

p1 = -5 **p2** = _m_p(…)

p3 = _m_p_c(…)

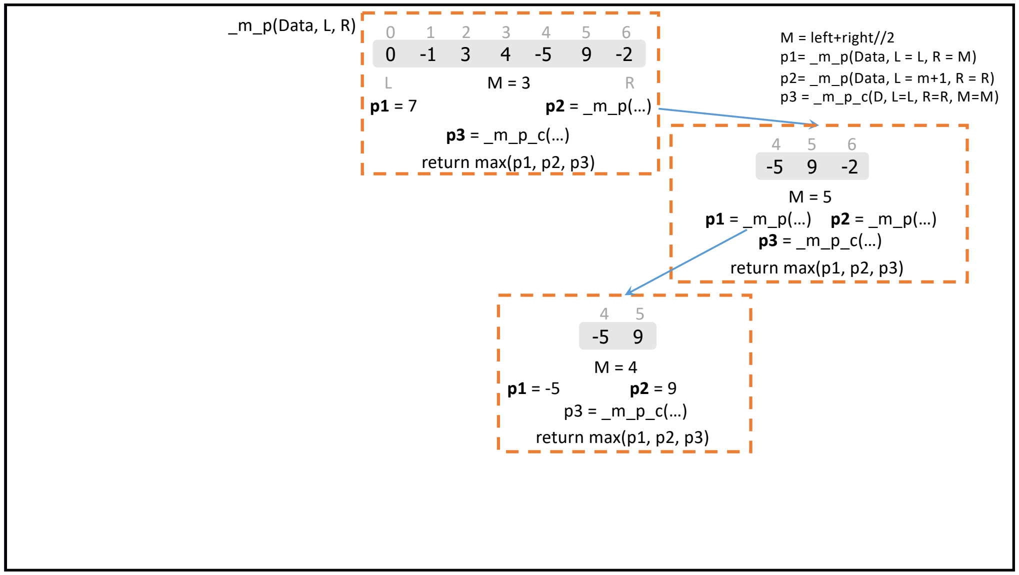
return max(p1, p2, p3)

Base Case

5
9

L = R = 5
return D[L]

43



_m_p(Data, L, R)

0	1	2	3	4	5	6
0	-1	3	4	-5	9	-2

L M = 3 R

p1 = 7 **p2** = _m_p(…)

p3 = _m_p_c(…)

return max(p1, p2, p3)

M = left+right//2
p1= _m_p(Data, L = L, R = M)
p2= _m_p(Data, L = m+1, R = R)
p3 = _m_p_c(D, L=L, R=R, M=M)

4	5	6
-5	9	-2

M = 5

p1 = _m_p(…) **p2** = _m_p(…)

p3 = _m_p_c(…)

return max(p1, p2, p3)

4	5
-5	9

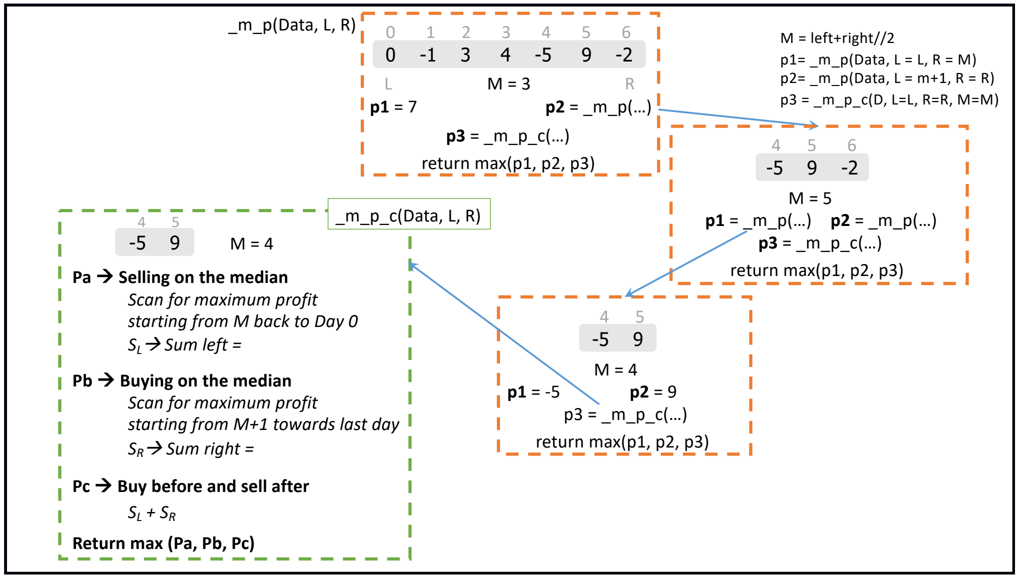
M = 4

p1 = -5 **p2** = 9

p3 = _m_p_c(…)

return max(p1, p2, p3)

44



_m_p(Data, L, R)

0 1 2 3 4 5 6
0 -1 3 4 -5 9 -2
L M = 3 R

p1 = 7 **p2** = _m_p(…)

p3 = _m_p_c(…)

return max(p1, p2, p3)

M = left+right//2
p1= _m_p(Data, L = L, R = M)
p2= _m_p(Data, L = m+1, R = R)
p3 = _m_p_c(D, L=L, R=R, M=M)

4 5 6
-5 9 -2
M = 5

p1 = _m_p(…) **p2** = _m_p(…)

p3 = _m_p_c(…)

return max(p1, p2, p3)

4 5
-5 9
M = 4

p1 = -5 **p2** = 9

p3 = _m_p_c(…)

return max(p1, p2, p3)

_m_p_c(Data, L, R)

4 5
-5 9 M = 4

Pa → Selling on the median

Scan for maximum profit
starting from M back to Day 0
S_L → Sum left =

Pb → Buying on the median

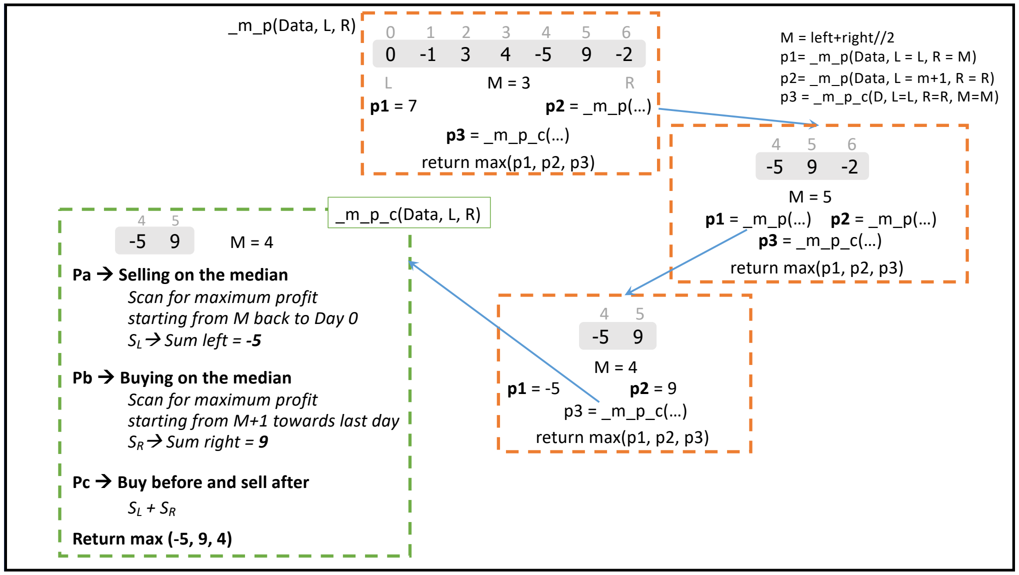
Scan for maximum profit
starting from M+1 towards last day
S_R → Sum right =

Pc → Buy before and sell after

S_L + S_R

Return max (Pa, Pb, Pc)

45



_m_p(Data, L, R)

0 1 2 3 4 5 6
0 -1 3 4 -5 9 -2
L M = 3 R

p1 = 7 **p2** = _m_p(…)

p3 = _m_p_c(…)

return max(p1, p2, p3)

M = left+right//2
p1= _m_p(Data, L = L, R = M)
p2= _m_p(Data, L = m+1, R = R)
p3 = _m_p_c(D, L=L, R=R, M=M)

4 5 6
-5 9 -2
M = 5

p1 = _m_p(…) **p2** = _m_p(…)

p3 = _m_p_c(…)

return max(p1, p2, p3)

4 5
-5 9
M = 4

p1 = -5 **p2** = 9

p3 = _m_p_c(…)

return max(p1, p2, p3)

_m_p_c(Data, L, R)

4 5
-5 9 M = 4

Pa → Selling on the median

Scan for maximum profit
starting from M back to Day 0
S_L → Sum left = ***-5***

Pb → Buying on the median

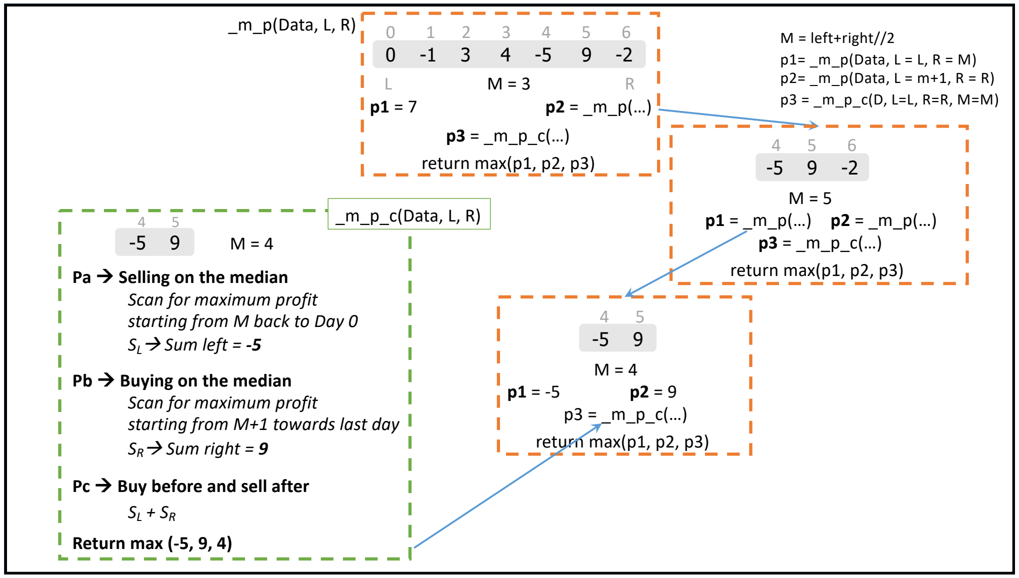
Scan for maximum profit
starting from M+1 towards last day
S_R → Sum right = ***9***

Pc → Buy before and sell after

S_L + S_R

Return max (-5, 9, 4)

46



_m_p(Data, L, R)

0	1	2	3	4	5	6
0	-1	3	4	-5	9	-2

L M = 3 R

p1 = 7 **p2** = _m_p(…)

p3 = _m_p_c(…)

return max(p1, p2, p3)

M = left+right//2
p1= _m_p(Data, L = L, R = M)
p2= _m_p(Data, L = m+1, R = R)
p3 = _m_p_c(D, L=L, R=R, M=M)

4	5	6
-5	9	-2

M = 5

p1 = _m_p(…) **p2** = _m_p(…)

p3 = _m_p_c(…)

return max(p1, p2, p3)

4	5
-5	9

M = 4

p1 = -5 **p2** = 9

p3 = _m_p_c(…)

return max(p1, p2, p3)

_m_p_c(Data, L, R)

4	5
-5	9

M = 4

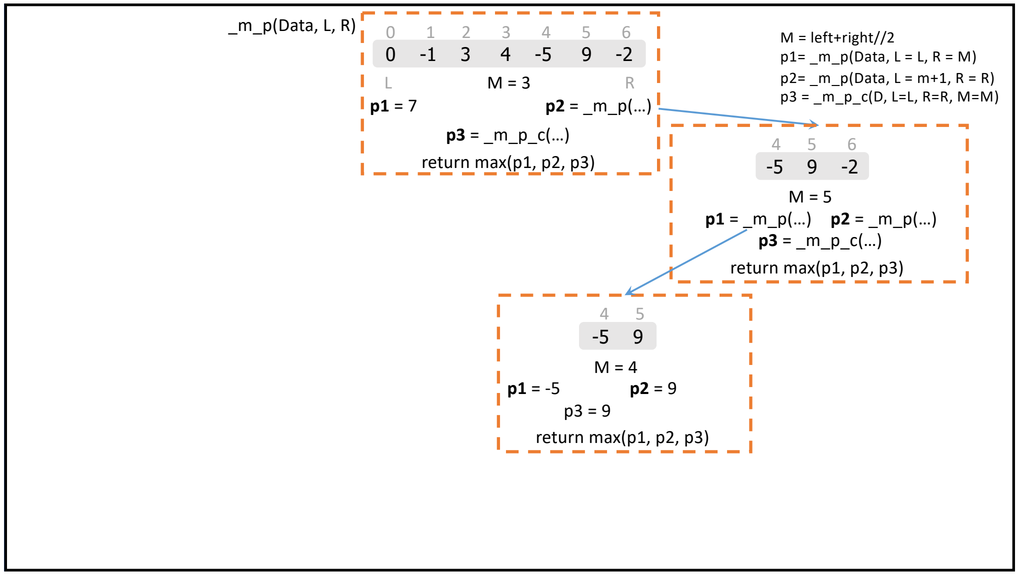
Pa → Selling on the median
Scan for maximum profit
starting from M back to Day 0
S_L → Sum left = ***-5***

Pb → Buying on the median
Scan for maximum profit
starting from M+1 towards last day
S_R → Sum right = ***9***

Pc → Buy before and sell after
$S_L + S_R$

Return max (-5, 9, 4)

47



_m_p(Data, L, R)

0	1	2	3	4	5	6
0	-1	3	4	-5	9	-2

L M = 3 R

p1 = 7 **p2** = _m_p(…)

p3 = _m_p_c(…)

return max(p1, p2, p3)

M = left+right//2
p1= _m_p(Data, L = L, R = M)
p2= _m_p(Data, L = m+1, R = R)
p3 = _m_p_c(D, L=L, R=R, M=M)

4	5	6
-5	9	-2

M = 5

p1 = _m_p(…) **p2** = _m_p(…)

p3 = _m_p_c(…)

return max(p1, p2, p3)

4	5
-5	9

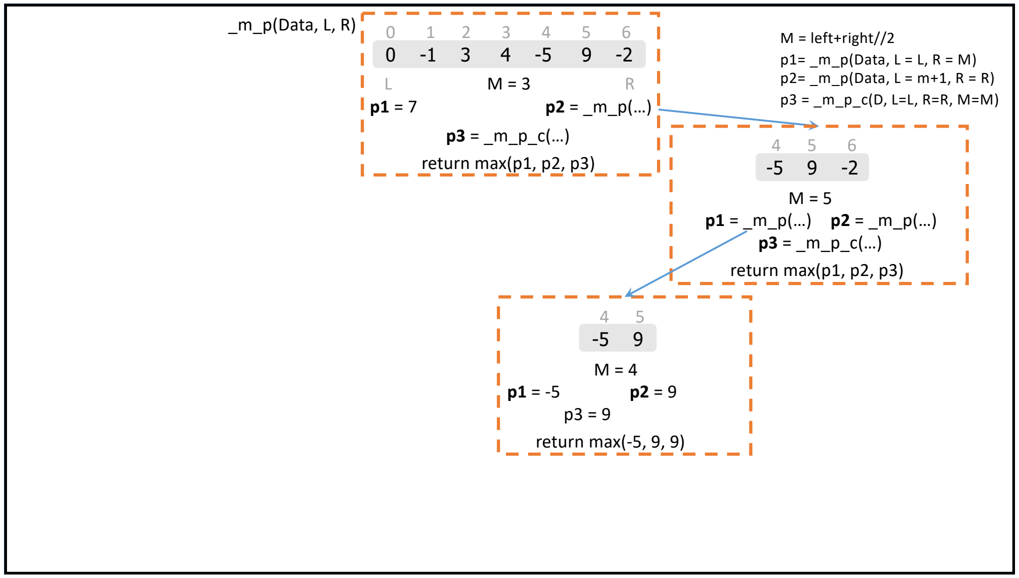
M = 4

p1 = -5 **p2** = 9

p3 = 9

return max(p1, p2, p3)

48



_m_p(Data, L, R)

0 1 2 3 4 5 6

0 -1 3 4 -5 9 -2

L M = 3 R

p1 = 7 **p2** = _m_p(…)

p3 = _m_p_c(…)

return max(p1, p2, p3)

M = left+right//2
p1= _m_p(Data, L = L, R = M)
p2= _m_p(Data, L = m+1, R = R)
p3 = _m_p_c(D, L=L, R=R, M=M)

4 5 6

-5 9 -2

M = 5

p1 = _m_p(…) **p2** = _m_p(…)

p3 = _m_p_c(…)

return max(p1, p2, p3)

4 5

-5 9

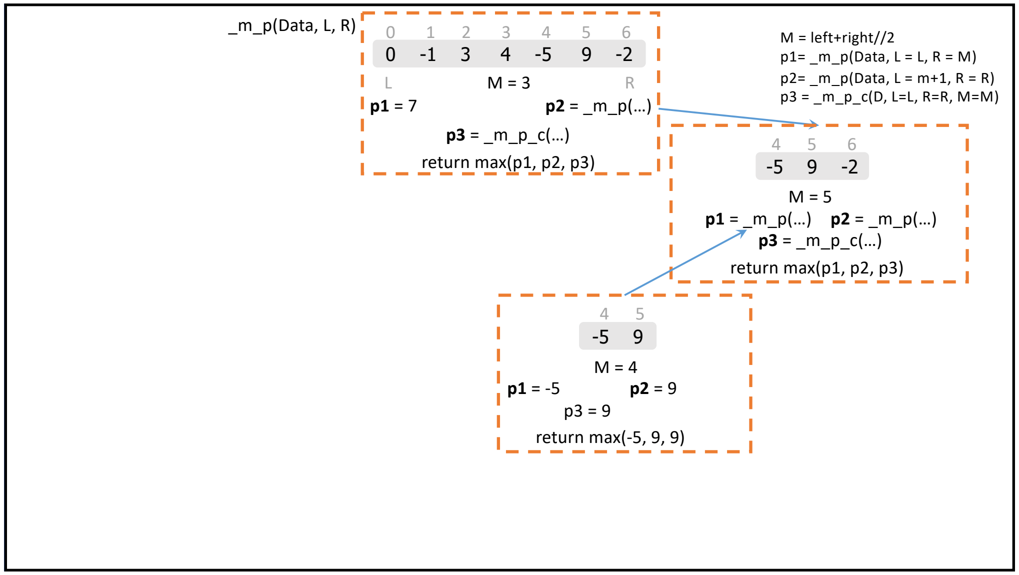
M = 4

p1 = -5 **p2** = 9

p3 = 9

return max(-5, 9, 9)

49



_m_p(Data, L, R)

0 1 2 3 4 5 6

0 -1 3 4 -5 9 -2

L M = 3 R

p1 = 7 **p2** = _m_p(…)

p3 = _m_p_c(…)

return max(p1, p2, p3)

M = left+right//2
p1= _m_p(Data, L = L, R = M)
p2= _m_p(Data, L = m+1, R = R)
p3 = _m_p_c(D, L=L, R=R, M=M)

4 5 6

-5 9 -2

M = 5

p1 = _m_p(…) **p2** = _m_p(…)

p3 = _m_p_c(…)

return max(p1, p2, p3)

4 5

-5 9

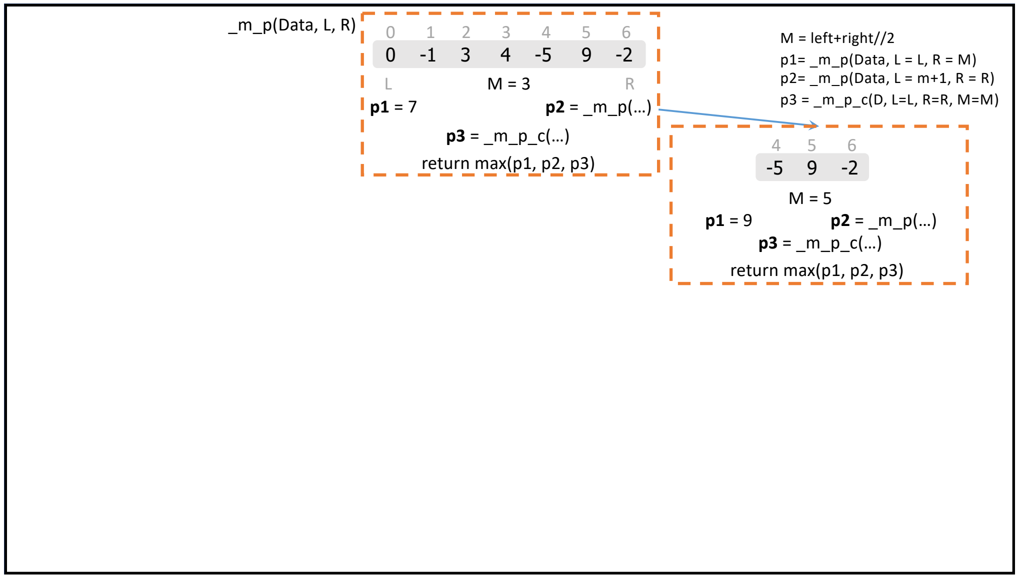
M = 4

p1 = -5 **p2** = 9

p3 = 9

return max(-5, 9, 9)

50



_m_p(Data, L, R)

0	1	2	3	4	5	6
0	-1	3	4	-5	9	-2

L M = 3 R

p1 = 7 **p2** = _m_p(…)

p3 = _m_p_c(…)

return max(p1, p2, p3)

M = left+right//2
p1= _m_p(Data, L = L, R = M)
p2= _m_p(Data, L = m+1, R = R)
p3 = _m_p_c(D, L=L, R=R, M=M)

4	5	6
-5	9	-2

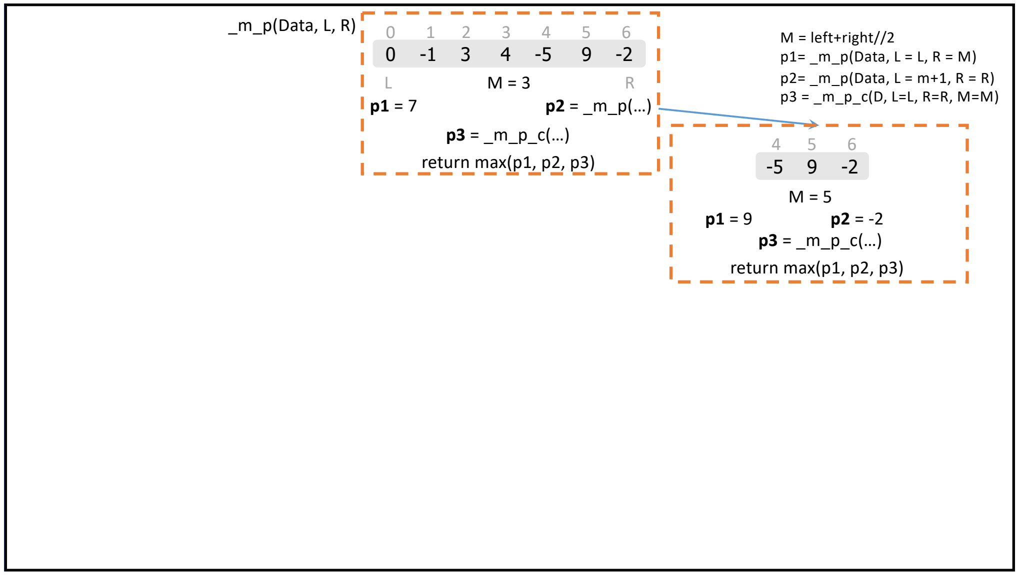
M = 5

p1 = 9 **p2** = _m_p(…)

p3 = _m_p_c(…)

return max(p1, p2, p3)

51



_m_p(Data, L, R)

0	1	2	3	4	5	6
0	-1	3	4	-5	9	-2

L M = 3 R

p1 = 7 **p2** = _m_p(…)

p3 = _m_p_c(…)

return max(p1, p2, p3)

M = left+right//2
p1= _m_p(Data, L = L, R = M)
p2= _m_p(Data, L = m+1, R = R)
p3 = _m_p_c(D, L=L, R=R, M=M)

4	5	6
-5	9	-2

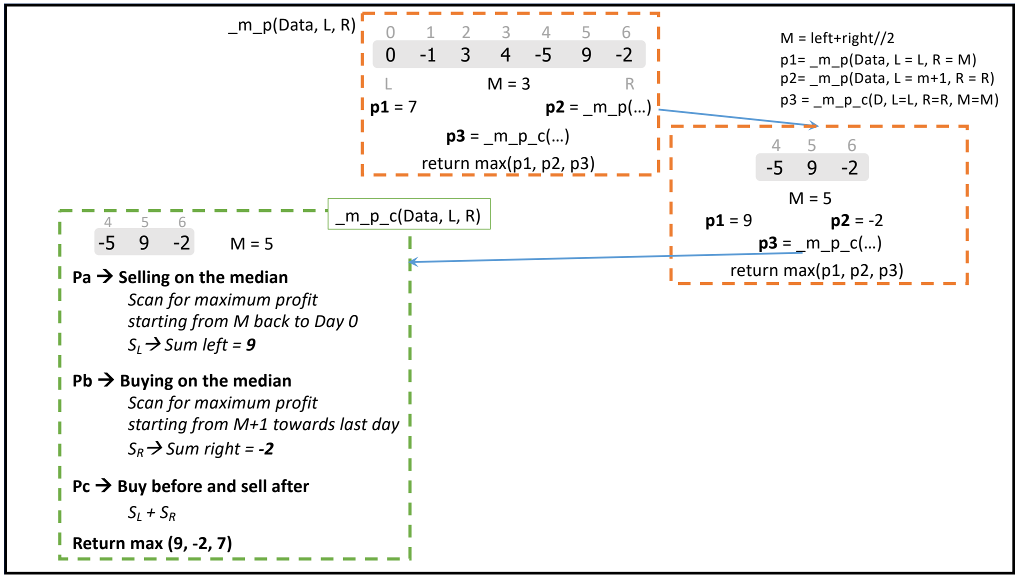
M = 5

p1 = 9 **p2** = -2

p3 = _m_p_c(…)

return max(p1, p2, p3)

52



_m_p(Data, L, R)

0 1 2 3 4 5 6

0 -1 3 4 -5 9 -2

L M = 3 R

p1 = 7 **p2** = _m_p(…)

p3 = _m_p_c(…)

return max(p1, p2, p3)

M = left+right//2

p1= _m_p(Data, L = L, R = M)

p2= _m_p(Data, L = m+1, R = R)

p3 = _m_p_c(D, L=L, R=R, M=M)

4 5 6

-5 9 -2

M = 5

p1 = 9 **p2** = -2

p3 = _m_p_c(…)

return max(p1, p2, p3)

_m_p_c(Data, L, R)

4 5 6

-5 9 -2 M = 5

Pa → Selling on the median

Scan for maximum profit
starting from M back to Day 0
S_L → Sum left = ***9***

Pb → Buying on the median

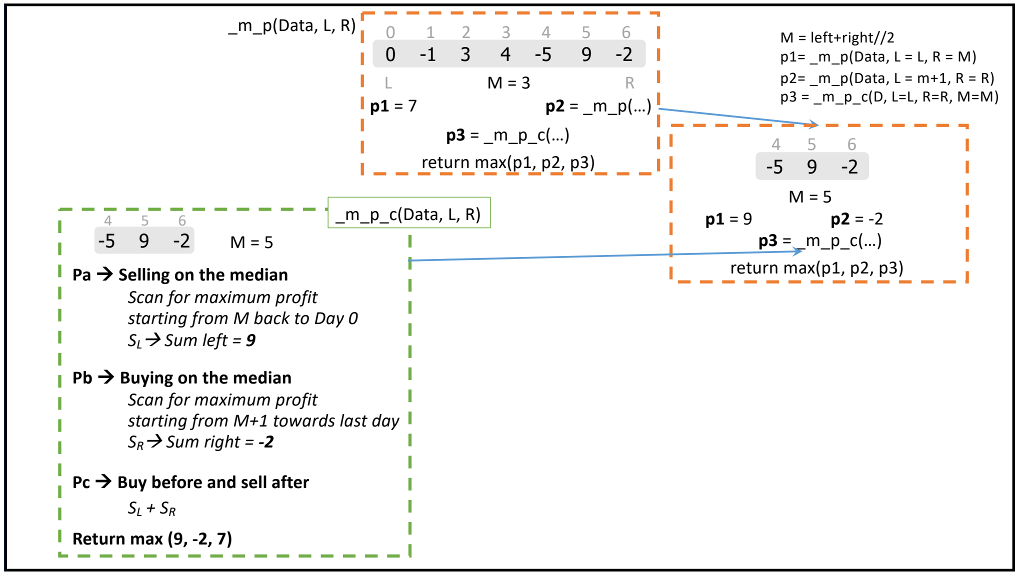
Scan for maximum profit
starting from M+1 towards last day
S_R → Sum right = ***-2***

Pc → Buy before and sell after

$S_L + S_R$

Return max (9, -2, 7)

53



_m_p(Data, L, R)

0 1 2 3 4 5 6

0 -1 3 4 -5 9 -2

L M = 3 R

p1 = 7 **p2** = _m_p(…)

p3 = _m_p_c(…)

return max(p1, p2, p3)

M = left+right//2

p1= _m_p(Data, L = L, R = M)

p2= _m_p(Data, L = m+1, R = R)

p3 = _m_p_c(D, L=L, R=R, M=M)

4 5 6

-5 9 -2

M = 5

p1 = 9 **p2** = -2

p3 = _m_p_c(…)

return max(p1, p2, p3)

_m_p_c(Data, L, R)

4 5 6

-5 9 -2 M = 5

Pa → Selling on the median

Scan for maximum profit
starting from M back to Day 0
S_L → Sum left = ***9***

Pb → Buying on the median

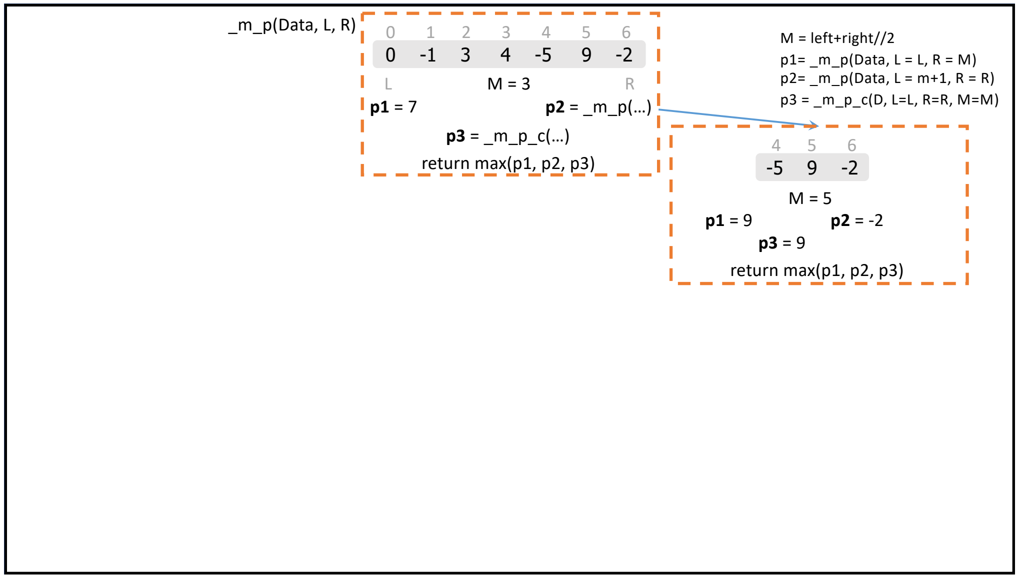
Scan for maximum profit
starting from M+1 towards last day
S_R → Sum right = ***-2***

Pc → Buy before and sell after

$S_L + S_R$

Return max (9, -2, 7)

54



_m_p(Data, L, R)

0	1	2	3	4	5	6
0	-1	3	4	-5	9	-2

L M = 3 R

p1 = 7 **p2** = _m_p(…)

p3 = _m_p_c(…)

return max(p1, p2, p3)

M = left+right//2
p1= _m_p(Data, L = L, R = M)
p2= _m_p(Data, L = m+1, R = R)
p3 = _m_p_c(D, L=L, R=R, M=M)

4	5	6
-5	9	-2

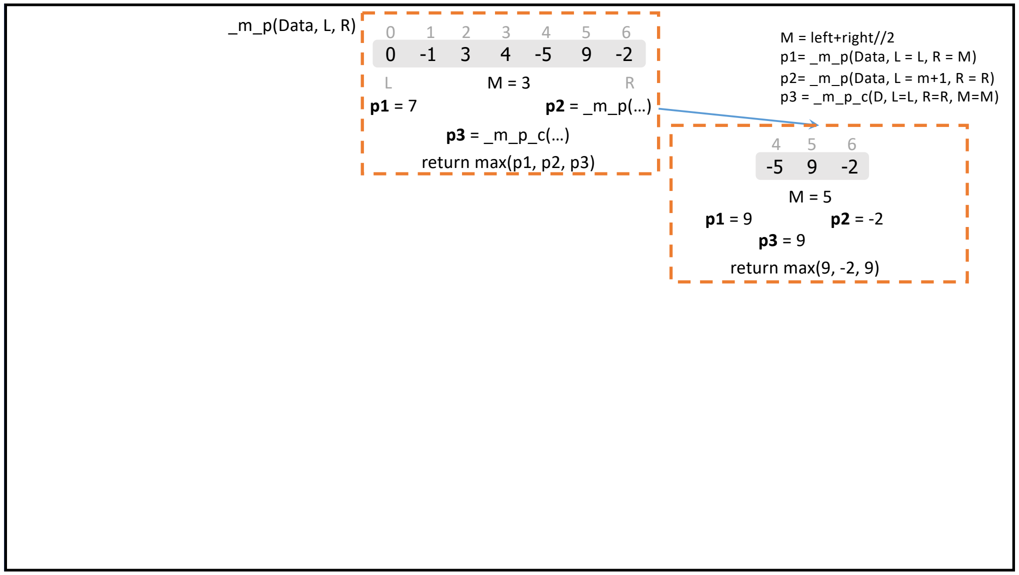
M = 5

p1 = 9 **p2** = -2

p3 = 9

return max(p1, p2, p3)

55



_m_p(Data, L, R)

0	1	2	3	4	5	6
0	-1	3	4	-5	9	-2

L M = 3 R

p1 = 7 **p2** = _m_p(…)

p3 = _m_p_c(…)

return max(p1, p2, p3)

M = left+right//2
p1= _m_p(Data, L = L, R = M)
p2= _m_p(Data, L = m+1, R = R)
p3 = _m_p_c(D, L=L, R=R, M=M)

4	5	6
-5	9	-2

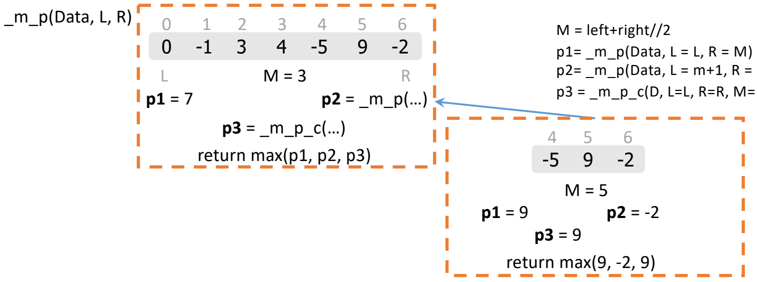
M = 5

p1 = 9 **p2** = -2

p3 = 9

return max(9, -2, 9)

56



_m_p(Data, L, R)

0	1	2	3	4	5	6
0	-1	3	4	-5	9	-2

L M = 3 R

p1 = 7 **p2** = _m_p(…)

p3 = _m_p_c(…)

return max(p1, p2, p3)

4	5	6
-5	9	-2

M = 5

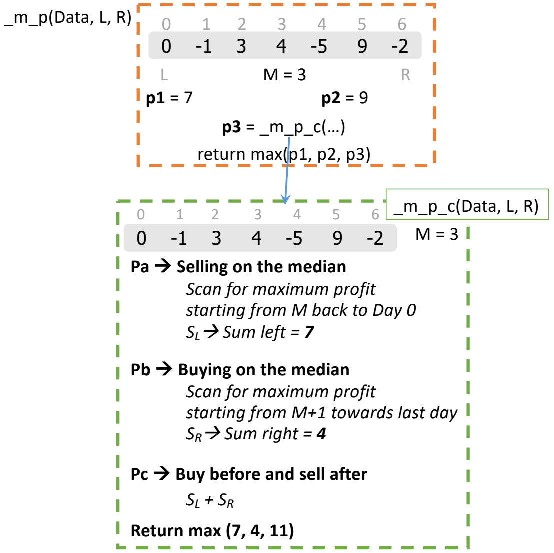
p1 = 9 **p2** = -2

p3 = 9

return max(9, -2, 9)

```
M = left+right//2
p1= _m_p(Data, L = L, R = M)
p2= _m_p(Data, L = m+1, R = R)
p3 = _m_p_c(D, L=L, R=R, M=M)
```

57



_m_p(Data, L, R)

0	1	2	3	4	5	6
0	-1	3	4	-5	9	-2

L M = 3 R

p1 = 7 **p2** = 9

p3 = _m_p_c(…)

return max(p1, p2, p3)

_m_p_c(Data, L, R)

0	1	2	3	4	5	6
0	-1	3	4	-5	9	-2

M = 3

Pa → Selling on the median

Scan for maximum profit
starting from M back to Day 0
S_L → Sum left = ***7***

Pb → Buying on the median

Scan for maximum profit
starting from M+1 towards last day
S_R → Sum right = ***4***

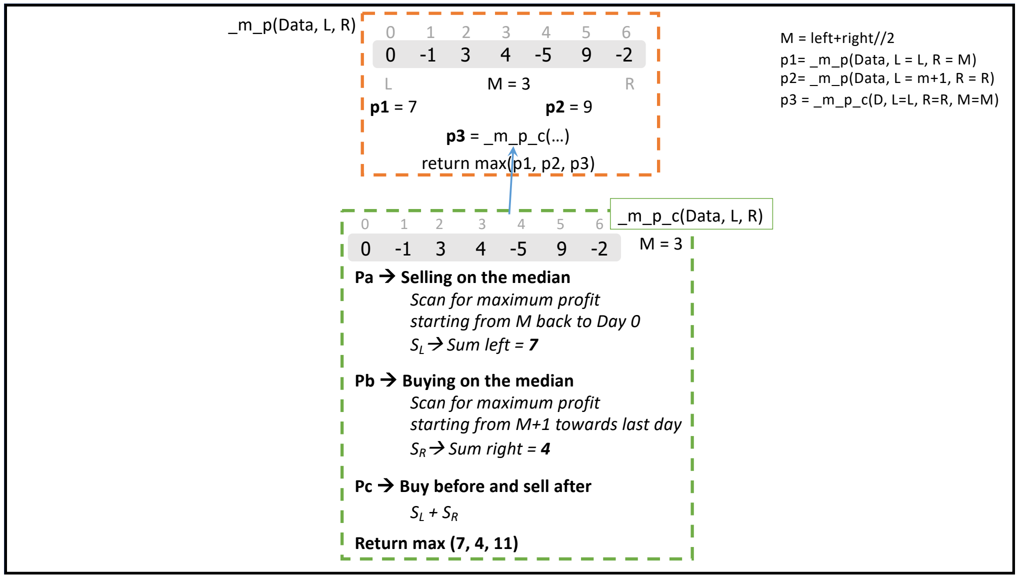
Pc → Buy before and sell after

$S_L + S_R$

Return max (7, 4, 11)

```
M = left+right//2
p1= _m_p(Data, L = L, R = M)
p2= _m_p(Data, L = m+1, R = R)
p3 = _m_p_c(D, L=L, R=R, M=M)
```

58



_m_p(Data, L, R)

0	1	2	3	4	5	6
0	-1	3	4	-5	9	-2
L			M = 3			R

p1 = 7 **p2** = 9

p3 = _m_p_c(…)

return max(p1, p2, p3)

M = left+right//2
p1= _m_p(Data, L = L, R = M)
p2= _m_p(Data, L = m+1, R = R)
p3 = _m_p_c(D, L=L, R=R, M=M)

_m_p_c(Data, L, R)

0	1	2	3	4	5	6
0	-1	3	4	-5	9	-2

M = 3

Pa → Selling on the median

Scan for maximum profit
starting from M back to Day 0
*S_L → Sum left = **7***

Pb → Buying on the median

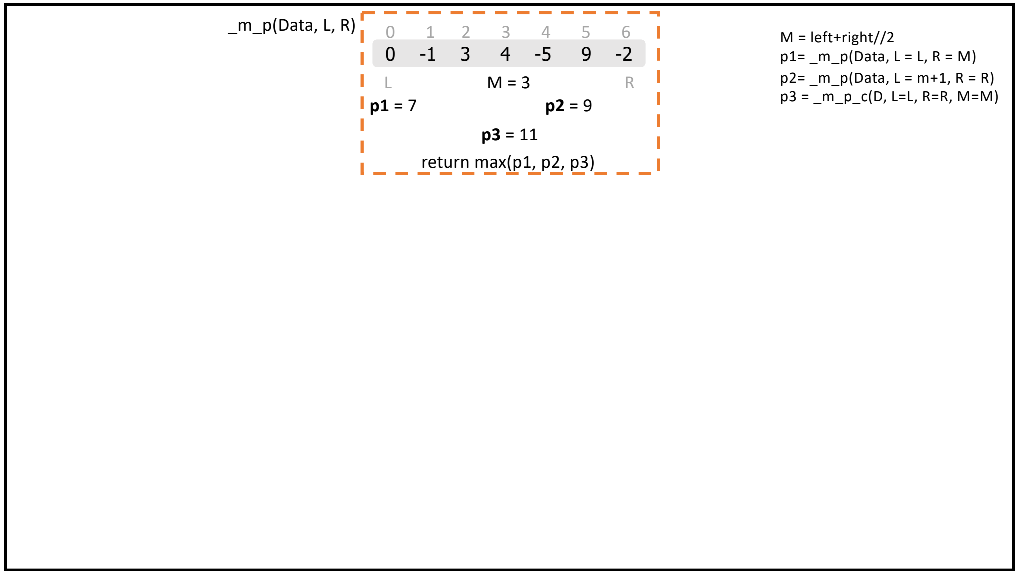
Scan for maximum profit
starting from M+1 towards last day
*S_R → Sum right = **4***

Pc → Buy before and sell after

S_L + S_R

Return max (7, 4, 11)

59



_m_p(Data, L, R)

0	1	2	3	4	5	6
0	-1	3	4	-5	9	-2
L			M = 3			R

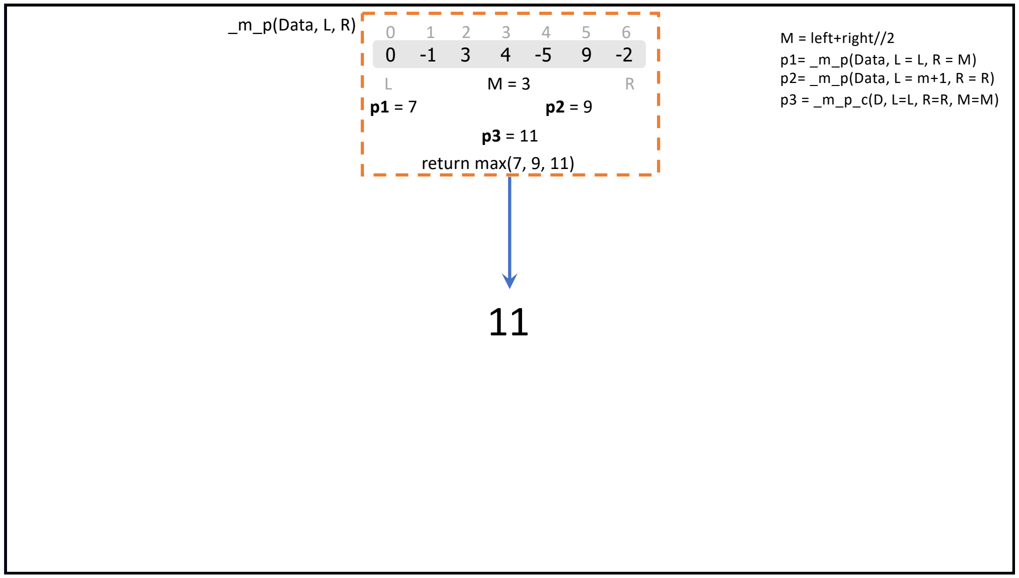
p1 = 7 **p2** = 9

p3 = 11

return max(p1, p2, p3)

M = left+right//2
p1= _m_p(Data, L = L, R = M)
p2= _m_p(Data, L = m+1, R = R)
p3 = _m_p_c(D, L=L, R=R, M=M)

60



_m_p(Data, L, R)

0	1	2	3	4	5	6
0	-1	3	4	-5	9	-2

L M = 3 R

p1 = 7 **p2** = 9

p3 = 11

return max(7, 9, 11)

11

M = left+right//2
p1= _m_p(Data, L = L, R = M)
p2= _m_p(Data, L = m+1, R = R)
p3 = _m_p_c(D, L=L, R=R, M=M)