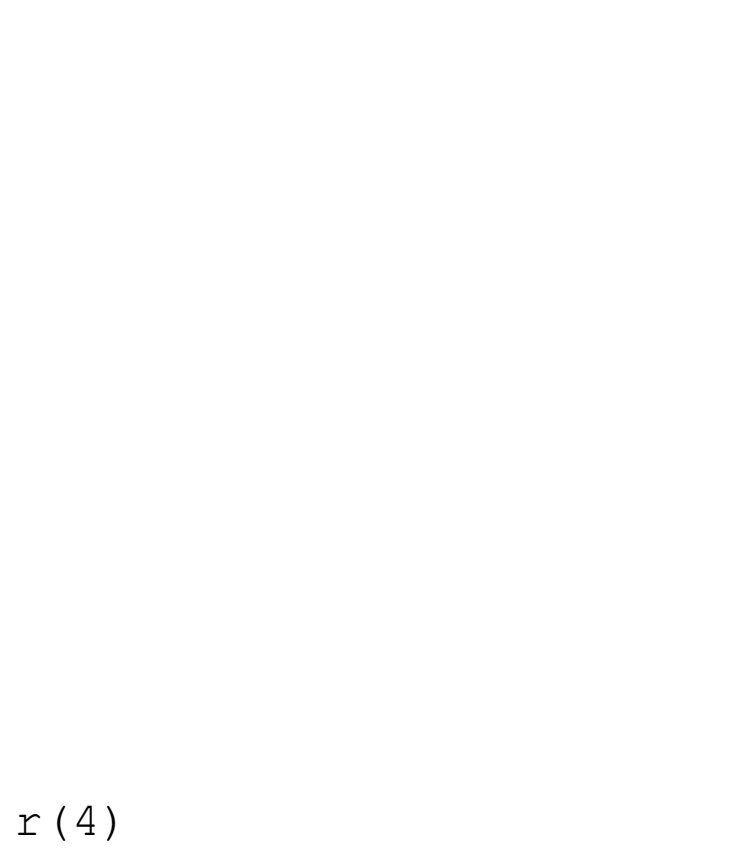


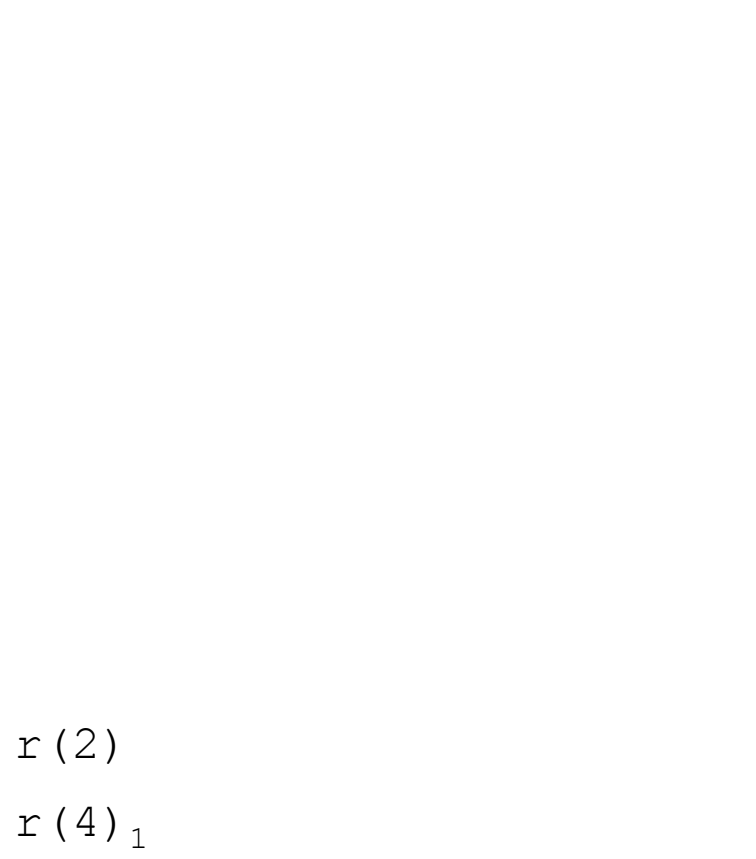
Recursive method tracing
Stack based approach to
2004 AP CS AB Multiple Choice #3

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Method `recur` makes 2 recursive calls.
Label the first Call 1 and the second Call 2.
The initial call is `recur(4)`.



`recur (4)` stops at Call 1 and calls `recur (2)`.



$r(0)$

$r(2)_1$

$r(4)_1$

~~r(0)~~ returns 1

r(2)₁

r(4)₁

`recur(2)` just finished Call 1 and got back 1.
It stops at Call 2 and calls `recur(1)`.

`r(1)`

~~`r(0)`~~ returns 1

`r(2)`_{±2} returns 1 +

`r(4)`₁

~~r(1)~~ returns 1

~~r(0)~~ returns 1

r(2)_{±2} returns 1 +

r(4)₁

~~r(1)~~ returns 1

~~r(0)~~ returns 1

~~r(2)~~₁₂ returns 1 + 1 = 2

r(4)₁

$r(3)$

~~$r(1)$~~ returns 1

~~$r(0)$~~ returns 1

~~$r(2)$~~ _{±2} returns $1 + 1 = 2$

$r(4)$ _{±2} returns $2 + \underline{\quad}$

$r(1)$

$r(3)_1$

~~$r(1)$~~ returns 1

~~$r(0)$~~ returns 1

~~$r(2)$~~ _{±2} returns $1 + 1 = 2$

$r(4)$ _{±2} returns $2 + \underline{\quad}$

~~r(1)~~ returns 1

r(3)₁

~~r(1)~~ returns 1

~~r(0)~~ returns 1

~~r(2)~~_{±2} returns 1 + 1 = 2

r(4)_{±2} returns 2 + ___

$r(2)$

~~$r(1)$~~ returns 1

$r(3)$ returns $1 + \underline{\quad}$

~~$r(1)$~~ returns 1

~~$r(0)$~~ returns 1

~~$r(2)$~~ returns $1 + 1 = 2$

$r(4)$ returns $2 + \underline{\quad}$

recur(2) was called previously and it returned 2.
There is no need to trace recur(2) again.

~~r(2)~~ returns 2

~~r(1)~~ returns 1

r(3)_{±2} returns 1 + ___

~~r(1)~~ returns 1

~~r(0)~~ returns 1

~~r(2)~~_{±2} returns 1 + 1 = 2

r(4)_{±2} returns 2 + ___

recur(2) was called previously and it returned 2.
There is no need to trace recur(2) again.

~~r(2)~~ returns 2

~~r(1)~~ returns 1

~~r(3)~~_{±2} returns 1 + 2 = 3

~~r(1)~~ returns 1

~~r(0)~~ returns 1

~~r(2)~~_{±2} returns 1 + 1 = 2

r(4)_{±2} returns 2 + ___

recur(2) was called previously and it returned 2.
There is no need to trace recur(2) again.

~~r(2)~~ returns 2

~~r(1)~~ returns 1

~~r(3)~~₁₂ returns 1 + 2 = 3

~~r(1)~~ returns 1

~~r(0)~~ returns 1

~~r(2)~~₁₂ returns 1 + 1 = 2

~~r(4)~~₁₂ returns 2 + 3 = 5