**Example plus 3 2 square** .
Input term:   $((\lambda$ n .   $\lambda$ x .   $((n$ $@_1$ $(\lambda$ r .   $\lambda$ a .   r $@_2$ $(r$ $@_3$ $a)))$
$@_4$ $(\lambda$ n1 .   $\lambda$ s1 .   $\lambda$ z1 .   $(n1$ $@_5$ $s1)$ $@_6$ $(s1$ $@_7$ $z1)))$ $@_8$ $x)$ $@_9$
$(\lambda$ s3 .   $\lambda$ z3 .   s3 $@_{10}$ $(s3$ $@_{11}$ $z3)))$ $@_{12}$ $(\lambda$ s2 .   $\lambda$ z2 .   s2 $@_{13}$
$(s2$ $@_{14}$ $(s2$ $@_{15}$ $z2)))$

| | | | | | | |
|---|---|---|---|---|---|---|
| 1. | $@_{12}$ | False | LUP | 0 | BIP | 0 |
| 2. | $@_9$ | False | LUP | 1 | LCP | 1 |
| 3. | $\lambda$n | False | CAP | 2 | LCP | 2 |
| 4. | $\lambda$x | False | CAP | 1 | DCP | 3 |
| 5. | $@_8$ | False | LUP | 0 | LCP | 4 |
| 6. | $@_4$ | False | LUP | 5 | LCP | 5 |
| 7. | $@_1$ | False | LUP | 6 | LCP | 6 |
| 8. | n | False | LUP | 7 | BIP | 3 |
| 9. | $\lambda$s3 | False | CAP | 7 | LCP | 2 |
| 10. | $\lambda$z3 | False | CAP | 6 | DCP | 9 |
| 11. | $@_{10}$ | False | LUP | 5 | LCP | 10 |
| 12. | s3 | False | LUP | 11 | BIP | 9 |
| 13. | $\lambda$r | False | CAP | 11 | LCP | 7 |
| 14. | $\lambda$a | False | CAP | 5 | DCP | 13 |
| 15. | $@_2$ | False | LUP | 0 | LCP | 14 |
| 16. | r | False | LUP | 15 | BIP | 13 |
| 17. | $@_{11}$ | False | LUP | 15 | LCP | 11 |
| 18. | s3 | False | LUP | 17 | BIP | 9 |
| 19. | $\lambda$r | False | CAP | 17 | LCP | 7 |
| 20. | $\lambda$a | False | CAP | 15 | DCP | 19 |
| 21. | $@_2$ | False | LUP | 0 | LCP | 20 |
| 22. | r | False | LUP | 21 | BIP | 19 |
| 23. | z3 | False | LUP | 21 | BIP | 10 |
| 24. | $\lambda$n1 | False | CAP | 21 | LCP | 6 |
| 25. | $\lambda$s1 | True | LUP | 0 | DCP | 24 |
| 26. | $\lambda$z1 | True | LUP | 0 | LCP | 25 |
| 27. | $@_6$ | False | LUP | 0 | LCP | 26 |
| 28. | $@_5$ | False | LUP | 27 | LCP | 27 |
| 29. | n1 | False | LUP | 28 | BIP | 24 |
| 30. | $@_3$ | False | LUP | 28 | LCP | 21 |
| 31. | r | False | LUP | 30 | BIP | 19 |
| 32. | z3 | False | LUP | 30 | BIP | 10 |
| 33. | $\lambda$n1 | False | CAP | 30 | LCP | 6 |
| 34. | $\lambda$s1 | False | CAP | 28 | DCP | 33 |
| 35. | $\lambda$z1 | False | CAP | 27 | DCP | 34 |
| 36. | $@_6$ | False | LUP | 0 | LCP | 35 |
| 37. | $@_5$ | False | LUP | 36 | LCP | 36 |
| 38. | n1 | False | LUP | 37 | BIP | 33 |
| 39. | a | False | LUP | 37 | BIP | 20 |
| 40. | $@_3$ | False | LUP | 37 | LCP | 15 |
| 41. | r | False | LUP | 40 | BIP | 13 |

| 42. | $@_{11}$ | False | LUP | 40 | LCP | 11 |
| 43. | s3 | False | LUP | 42 | BIP | 9 |
| 44. | $\lambda r$ | False | CAP | 42 | LCP | 7 |
| 45. | $\lambda a$ | False | CAP | 40 | DCP | 44 |
| 46. | $@_2$ | False | LUP | 37 | LCP | 45 |
| 47. | r | False | LUP | 46 | BIP | 44 |
| 48. | z3 | False | LUP | 46 | BIP | 10 |
| 49. | $\lambda n1$ | False | CAP | 46 | LCP | 6 |
| 50. | $\lambda s1$ | False | CAP | 37 | DCP | 49 |
| 51. | $\lambda z1$ | False | CAP | 36 | DCP | 50 |
| 52. | $@_6$ | False | LUP | 0 | LCP | 51 |
| 53. | $@_5$ | False | LUP | 52 | LCP | 52 |
| 54. | n1 | False | LUP | 53 | BIP | 49 |
| 55. | $@_3$ | False | LUP | 53 | LCP | 46 |
| 56. | r | False | LUP | 55 | BIP | 44 |
| 57. | z3 | False | LUP | 55 | BIP | 10 |
| 58. | $\lambda n1$ | False | CAP | 55 | LCP | 6 |
| 59. | $\lambda s1$ | False | CAP | 53 | DCP | 58 |
| 60. | $\lambda z1$ | False | CAP | 52 | DCP | 59 |
| 61. | $@_6$ | False | LUP | 0 | LCP | 60 |
| 62. | $@_5$ | False | LUP | 61 | LCP | 61 |
| 63. | n1 | False | LUP | 62 | BIP | 58 |
| 64. | a | False | LUP | 62 | BIP | 45 |
| 65. | a | False | LUP | 62 | BIP | 14 |
| 66. | x | False | LUP | 62 | BIP | 4 |
| 67. | $\lambda s2$ | False | CAP | 62 | LCP | 1 |
| 68. | $\lambda z2$ | False | CAP | 61 | DCP | 67 |
| 69. | $@_{13}$ | True | LUP | 0 | LCP | 68 |
| 70. | s2 | False | LUP | 69 | BIP | 67 |
| 71. | s1 | False | LUP | 69 | BIP | 59 |
| 72. | s1 | False | LUP | 69 | BIP | 50 |
| 73. | s1 | False | LUP | 69 | BIP | 34 |
| 74. | s1 | True | LUP | 69 | BIP | 25 |
| 75. | $@_{14}$ | True | PAUSE | 0 | DCP | 69 |
| 76. | s2 | False | LUP | 75 | BIP | 67 |
| 77. | s1 | False | LUP | 75 | BIP | 59 |
| 78. | s1 | False | LUP | 75 | BIP | 50 |
| 79. | s1 | False | LUP | 75 | BIP | 34 |
| 80. | s1 | True | LUP | 75 | BIP | 25 |
| 81. | $@_{15}$ | True | PAUSE | 0 | DCP | 75 |
| 82. | s2 | False | LUP | 81 | BIP | 67 |
| 83. | s1 | False | LUP | 81 | BIP | 59 |
| 84. | s1 | False | LUP | 81 | BIP | 50 |
| 85. | s1 | False | LUP | 81 | BIP | 34 |
| 86. | s1 | True | LUP | 81 | BIP | 25 |
| 87. | z2 | False | PAUSE | 0 | BIP | 68 |

| # | Term | | | | | |
|---|------|------|-------|-----|-----|----|
| 88. | $@_7$ | True | PAUSE | 0 | LCP | 61 |
| 89. | s1 | False | LUP | 88 | BIP | 59 |
| 90. | s1 | False | LUP | 88 | BIP | 50 |
| 91. | s1 | False | LUP | 88 | BIP | 34 |
| 92. | s1 | True | LUP | 88 | BIP | 25 |
| 93. | z1 | False | PAUSE | 0 | BIP | 60 |
| 94. | $@_7$ | True | PAUSE | 0 | LCP | 52 |
| 95. | s1 | False | LUP | 94 | BIP | 50 |
| 96. | s1 | False | LUP | 94 | BIP | 34 |
| 97. | s1 | True | LUP | 94 | BIP | 25 |
| 98. | z1 | False | PAUSE | 0 | BIP | 51 |
| 99. | $@_7$ | True | PAUSE | 0 | LCP | 36 |
| 100. | s1 | False | LUP | 99 | BIP | 34 |
| 101. | s1 | True | LUP | 99 | BIP | 25 |
| 102. | z1 | False | PAUSE | 0 | BIP | 35 |
| 103. | $@_7$ | True | PAUSE | 0 | LCP | 27 |
| 104. | s1 | True | LUP | 103 | BIP | 25 |
| 105. | z1 | True | PAUSE | 0 | BIP | 26 |

**Example plus x n square .**

Input term:  $(\lambda$ n .  $\lambda$ x .  $((n \ @_1 \ (\lambda$ r .  $\lambda$ a .  r $@_2$ (r $@_3$ a)))
$@_4$ $(\lambda$ n1 .  $\lambda$ s1 .  $\lambda$ z1 .  (n1 $@_5$ s1) $@_6$ (s1 $@_7$ z1))) $@_8$ x)

| # | Term | | | | | |
|---|------|------|-------|-----|-----|----|
| 1. | $\lambda$n | True | LUP | 0 | BIP | 0 |
| 2. | $\lambda$x | True | LUP | 0 | LCP | 1 |
| 3. | $@_8$ | True | LUP | 0 | LCP | 2 |
| 4. | $@_4$ | True | LUP | 3 | LCP | 3 |
| 5. | $@_1$ | True | LUP | 4 | LCP | 4 |
| 6. | n | True | LUP | 5 | BIP | 1 |
| 7. | $\lambda$r | True | PAUSE | 4 | DCP | 5 |
| 8. | $\lambda$a | True | PAUSE | 4 | LCP | 7 |
| 9. | $@_2$ | True | PAUSE | 4 | LCP | 8 |
| 10. | r | True | LUP | 9 | BIP | 7 |
| 11. | $@_3$ | True | PAUSE | 4 | DCP | 9 |
| 12. | r | True | LUP | 11 | BIP | 7 |
| 13. | a | True | PAUSE | 4 | BIP | 8 |
| 14. | $\lambda$n1 | True | PAUSE | 3 | DCP | 4 |
| 15. | $\lambda$s1 | True | PAUSE | 3 | LCP | 14 |
| 16. | $\lambda$z1 | True | PAUSE | 3 | LCP | 15 |
| 17. | $@_6$ | True | PAUSE | 3 | LCP | 16 |
| 18. | $@_5$ | True | LUP | 17 | LCP | 17 |
| 19. | n1 | True | LUP | 18 | BIP | 14 |
| 20. | s1 | True | PAUSE | 17 | BIP | 15 |
| 21. | $@_7$ | True | PAUSE | 3 | DCP | 17 |
| 22. | s1 | True | LUP | 21 | BIP | 15 |

3

| 23. | z1 | True | PAUSE | 3 | BIP | 16 |
| 24. | x | True | PAUSE | 0 | BIP | 2 |

**Example ack three .**
Input term: $(\lambda$ m . (m $@_1$ ($\lambda$ g. $\lambda$ n . (n $@_2$ g) $@_3$ (g $@_4$ ($\lambda$ s1 . $\lambda$ z1. s1 $@_5$ z1)))) $@_6$ ($\lambda$ n2 . $\lambda$ s2 . $\lambda$ z2 . (n2 $@_7$ s2) $@_8$ (s2 $@_9$ z2))) $@_{10}$ ($\lambda$ s . $\lambda$ z . s $@_{11}$ (s $@_{12}$ (s $@_{13}$ z)))

| | | | | | | |
|---|---|---|---|---|---|---|
| 1. | $@_{10}$ | False | LUP | 0 | BIP | 0 |
| 2. | $\lambda$m | False | CAP | 1 | LCP | 1 |
| 3. | $@_6$ | False | LUP | 0 | LCP | 2 |
| 4. | $@_1$ | False | LUP | 3 | LCP | 3 |
| 5. | m | False | LUP | 4 | BIP | 2 |
| 6. | $\lambda$s | False | CAP | 4 | LCP | 1 |
| 7. | $\lambda$z | False | CAP | 3 | DCP | 6 |
| 8. | $@_{11}$ | False | LUP | 0 | LCP | 7 |
| 9. | s | False | LUP | 8 | BIP | 6 |
| 10. | $\lambda$g | False | CAP | 8 | LCP | 4 |
| 11. | $\lambda$n | True | LUP | 0 | DCP | 10 |
| 12. | $@_3$ | True | LUP | 0 | LCP | 11 |
| 13. | $@_2$ | True | LUP | 12 | LCP | 12 |
| 14. | n | True | LUP | 13 | BIP | 11 |
| 15. | g | False | PAUSE | 12 | BIP | 10 |
| 16. | $@_{12}$ | False | PAUSE | 12 | LCP | 8 |
| 17. | s | False | LUP | 16 | BIP | 6 |
| 18. | $\lambda$g | False | CAP | 16 | LCP | 4 |
| 19. | $\lambda$n | True | PAUSE | 12 | DCP | 18 |
| 20. | $@_3$ | True | PAUSE | 12 | LCP | 19 |
| 21. | $@_2$ | True | LUP | 20 | LCP | 20 |
| 22. | n | True | LUP | 21 | BIP | 19 |
| 23. | g | False | PAUSE | 20 | BIP | 18 |
| 24. | $@_{13}$ | False | PAUSE | 20 | LCP | 16 |
| 25. | s | False | LUP | 24 | BIP | 6 |
| 26. | $\lambda$g | False | CAP | 24 | LCP | 4 |
| 27. | $\lambda$n | True | PAUSE | 20 | DCP | 26 |
| 28. | $@_3$ | True | PAUSE | 20 | LCP | 27 |
| 29. | $@_2$ | True | LUP | 28 | LCP | 28 |
| 30. | n | True | LUP | 29 | BIP | 27 |
| 31. | g | False | PAUSE | 28 | BIP | 26 |
| 32. | z | False | PAUSE | 28 | BIP | 7 |
| 33. | $\lambda$n2 | True | PAUSE | 28 | LCP | 3 |
| 34. | $\lambda$s2 | True | PAUSE | 28 | LCP | 33 |
| 35. | $\lambda$z2 | True | PAUSE | 28 | LCP | 34 |
| 36. | $@_8$ | True | PAUSE | 28 | LCP | 35 |
| 37. | $@_7$ | True | LUP | 36 | LCP | 36 |

| # | Symbol | | | | | |
|---|---|---|---|---|---|---|
| 38. | n2 | True | LUP | 37 | BIP | 33 |
| 39. | s2 | True | PAUSE | 36 | BIP | 34 |
| 40. | $@_9$ | True | PAUSE | 28 | DCP | 36 |
| 41. | s2 | True | LUP | 40 | BIP | 34 |
| 42. | z2 | True | PAUSE | 28 | BIP | 35 |
| 43. | $@_4$ | False | PAUSE | 20 | DCP | 28 |
| 44. | g | False | LUP | 43 | BIP | 26 |
| 45. | z | False | LUP | 43 | BIP | 7 |
| 46. | $\lambda$n2 | False | CAP | 43 | LCP | 3 |
| 47. | $\lambda$s2 | True | PAUSE | 20 | DCP | 46 |
| 48. | $\lambda$z2 | True | PAUSE | 20 | LCP | 47 |
| 49. | $@_8$ | False | PAUSE | 20 | LCP | 48 |
| 50. | $@_7$ | False | LUP | 49 | LCP | 49 |
| 51. | n2 | False | LUP | 50 | BIP | 46 |
| 52. | $\lambda$s1 | False | CAP | 50 | LCP | 43 |
| 53. | $\lambda$z1 | False | CAP | 49 | DCP | 52 |
| 54. | $@_5$ | True | PAUSE | 20 | LCP | 53 |
| 55. | s1 | False | LUP | 54 | BIP | 52 |
| 56. | s2 | True | LUP | 54 | BIP | 47 |
| 57. | z1 | False | PAUSE | 20 | BIP | 53 |
| 58. | $@_9$ | True | PAUSE | 20 | LCP | 49 |
| 59. | s2 | True | LUP | 58 | BIP | 47 |
| 60. | z2 | True | PAUSE | 20 | BIP | 48 |
| 61. | $@_4$ | False | PAUSE | 12 | DCP | 20 |
| 62. | g | False | LUP | 61 | BIP | 18 |
| 63. | $@_{13}$ | False | LUP | 61 | LCP | 16 |
| 64. | s | False | LUP | 63 | BIP | 6 |
| 65. | $\lambda$g | False | CAP | 63 | LCP | 4 |
| 66. | $\lambda$n | False | CAP | 61 | DCP | 65 |
| 67. | $@_3$ | False | PAUSE | 12 | LCP | 66 |
| 68. | $@_2$ | False | LUP | 67 | LCP | 67 |
| 69. | n | False | LUP | 68 | BIP | 66 |
| 70. | $\lambda$s1 | False | CAP | 68 | LCP | 61 |
| 71. | $\lambda$z1 | False | CAP | 67 | DCP | 70 |
| 72. | $@_5$ | False | PAUSE | 12 | LCP | 71 |
| 73. | s1 | False | LUP | 72 | BIP | 70 |
| 74. | g | False | LUP | 72 | BIP | 65 |
| 75. | z | False | LUP | 72 | BIP | 7 |
| 76. | $\lambda$n2 | False | CAP | 72 | LCP | 3 |
| 77. | $\lambda$s2 | True | PAUSE | 12 | DCP | 76 |
| 78. | $\lambda$z2 | True | PAUSE | 12 | LCP | 77 |
| 79. | $@_8$ | False | PAUSE | 12 | LCP | 78 |
| 80. | $@_7$ | False | LUP | 79 | LCP | 79 |
| 81. | n2 | False | LUP | 80 | BIP | 76 |
| 82. | z1 | False | LUP | 80 | BIP | 71 |
| 83. | $@_4$ | False | LUP | 80 | LCP | 67 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 84. | g | False | LUP | 83 | BIP | 65 |
| 85. | z | False | LUP | 83 | BIP | 7 |
| 86. | $\lambda$n2 | False | CAP | 83 | LCP | 3 |
| 87. | $\lambda$s2 | False | CAP | 80 | DCP | 86 |
| 88. | $\lambda$z2 | False | CAP | 79 | DCP | 87 |
| 89. | $@_8$ | False | PAUSE | 12 | LCP | 88 |
| 90. | $@_7$ | False | LUP | 89 | LCP | 89 |
| 91. | n2 | False | LUP | 90 | BIP | 86 |
| 92. | $\lambda$s1 | False | CAP | 90 | LCP | 83 |
| 93. | $\lambda$z1 | False | CAP | 89 | DCP | 92 |
| 94. | $@_5$ | True | PAUSE | 12 | LCP | 93 |
| 95. | s1 | False | LUP | 94 | BIP | 92 |
| 96. | s2 | False | LUP | 94 | BIP | 87 |
| 97. | s2 | True | LUP | 94 | BIP | 77 |
| 98. | z1 | False | PAUSE | 12 | BIP | 93 |
| 99. | $@_9$ | True | PAUSE | 12 | LCP | 89 |
| 100. | s2 | False | LUP | 99 | BIP | 87 |
| 101. | s2 | True | LUP | 99 | BIP | 77 |
| 102. | z2 | False | PAUSE | 12 | BIP | 88 |
| 103. | $@_9$ | True | PAUSE | 12 | LCP | 79 |
| 104. | s2 | True | LUP | 103 | BIP | 77 |
| 105. | z2 | True | PAUSE | 12 | BIP | 78 |
| 106. | $@_4$ | False | PAUSE | 0 | DCP | 12 |
| 107. | g | False | LUP | 106 | BIP | 10 |
| 108. | $@_{12}$ | False | LUP | 106 | LCP | 8 |
| 109. | s | False | LUP | 108 | BIP | 6 |
| 110. | $\lambda$g | False | CAP | 108 | LCP | 4 |
| 111. | $\lambda$n | False | CAP | 106 | DCP | 110 |
| 112. | $@_3$ | False | PAUSE | 0 | LCP | 111 |
| 113. | $@_2$ | False | LUP | 112 | LCP | 112 |
| 114. | n | False | LUP | 113 | BIP | 111 |
| 115. | $\lambda$s1 | False | CAP | 113 | LCP | 106 |
| 116. | $\lambda$z1 | False | CAP | 112 | DCP | 115 |
| 117. | $@_5$ | False | PAUSE | 0 | LCP | 116 |
| 118. | s1 | False | LUP | 117 | BIP | 115 |
| 119. | g | False | LUP | 117 | BIP | 110 |
| 120. | $@_{13}$ | False | LUP | 117 | LCP | 108 |
| 121. | s | False | LUP | 120 | BIP | 6 |
| 122. | $\lambda$g | False | CAP | 120 | LCP | 4 |
| 123. | $\lambda$n | False | CAP | 117 | DCP | 122 |
| 124. | $@_3$ | False | PAUSE | 0 | LCP | 123 |
| 125. | $@_2$ | False | LUP | 124 | LCP | 124 |
| 126. | n | False | LUP | 125 | BIP | 123 |
| 127. | z1 | False | LUP | 125 | BIP | 116 |
| 128. | $@_4$ | False | LUP | 125 | LCP | 112 |
| 129. | g | False | LUP | 128 | BIP | 110 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 130. | $@_{13}$ | False | LUP | 128 | LCP | 108 |
| 131. | s | False | LUP | 130 | BIP | 6 |
| 132. | $\lambda$g | False | CAP | 130 | LCP | 4 |
| 133. | $\lambda$n | False | CAP | 128 | DCP | 132 |
| 134. | $@_3$ | False | LUP | 125 | LCP | 133 |
| 135. | $@_2$ | False | LUP | 134 | LCP | 134 |
| 136. | n | False | LUP | 135 | BIP | 133 |
| 137. | $\lambda$s1 | False | CAP | 135 | LCP | 128 |
| 138. | $\lambda$z1 | False | CAP | 134 | DCP | 137 |
| 139. | $@_5$ | False | LUP | 125 | LCP | 138 |
| 140. | s1 | False | LUP | 139 | BIP | 137 |
| 141. | g | False | LUP | 139 | BIP | 132 |
| 142. | z | False | LUP | 139 | BIP | 7 |
| 143. | $\lambda$n2 | False | CAP | 139 | LCP | 3 |
| 144. | $\lambda$s2 | False | CAP | 125 | DCP | 143 |
| 145. | $\lambda$z2 | False | CAP | 124 | DCP | 144 |
| 146. | $@_8$ | False | PAUSE | 0 | LCP | 145 |
| 147. | $@_7$ | False | LUP | 146 | LCP | 146 |
| 148. | n2 | False | LUP | 147 | BIP | 143 |
| 149. | z1 | False | LUP | 147 | BIP | 138 |
| 150. | $@_4$ | False | LUP | 147 | LCP | 134 |
| 151. | g | False | LUP | 150 | BIP | 132 |
| 152. | z | False | LUP | 150 | BIP | 7 |
| 153. | $\lambda$n2 | False | CAP | 150 | LCP | 3 |
| 154. | $\lambda$s2 | False | CAP | 147 | DCP | 153 |
| 155. | $\lambda$z2 | False | CAP | 146 | DCP | 154 |
| 156. | $@_8$ | False | PAUSE | 0 | LCP | 155 |
| 157. | $@_7$ | False | LUP | 156 | LCP | 156 |
| 158. | n2 | False | LUP | 157 | BIP | 153 |
| 159. | $\lambda$s1 | False | CAP | 157 | LCP | 150 |
| 160. | $\lambda$z1 | False | CAP | 156 | DCP | 159 |
| 161. | $@_5$ | False | PAUSE | 0 | LCP | 160 |
| 162. | s1 | False | LUP | 161 | BIP | 159 |
| 163. | s2 | False | LUP | 161 | BIP | 154 |
| 164. | s2 | False | LUP | 161 | BIP | 144 |
| 165. | g | False | LUP | 161 | BIP | 122 |
| 166. | z | False | LUP | 161 | BIP | 7 |
| 167. | $\lambda$n2 | False | CAP | 161 | LCP | 3 |
| 168. | $\lambda$s2 | True | PAUSE | 0 | DCP | 167 |
| 169. | $\lambda$z2 | True | PAUSE | 0 | LCP | 168 |
| 170. | $@_8$ | False | PAUSE | 0 | LCP | 169 |
| 171. | $@_7$ | False | LUP | 170 | LCP | 170 |
| 172. | n2 | False | LUP | 171 | BIP | 167 |
| 173. | z1 | False | LUP | 171 | BIP | 160 |
| 174. | $@_9$ | False | LUP | 171 | LCP | 156 |
| 175. | s2 | False | LUP | 174 | BIP | 154 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 176. | s2 | False | LUP | 174 | BIP | 144 |
| 177. | g | False | LUP | 174 | BIP | 122 |
| 178. | z | False | LUP | 174 | BIP | 7 |
| 179. | $\lambda$n2 | False | CAP | 174 | LCP | 3 |
| 180. | $\lambda$s2 | False | CAP | 171 | DCP | 179 |
| 181. | $\lambda$z2 | False | CAP | 170 | DCP | 180 |
| 182. | $@_8$ | False | PAUSE | 0 | LCP | 181 |
| 183. | $@_7$ | False | LUP | 182 | LCP | 182 |
| 184. | n2 | False | LUP | 183 | BIP | 179 |
| 185. | z2 | False | LUP | 183 | BIP | 155 |
| 186. | $@_9$ | False | LUP | 183 | LCP | 146 |
| 187. | s2 | False | LUP | 186 | BIP | 144 |
| 188. | g | False | LUP | 186 | BIP | 122 |
| 189. | z | False | LUP | 186 | BIP | 7 |
| 190. | $\lambda$n2 | False | CAP | 186 | LCP | 3 |
| 191. | $\lambda$s2 | False | CAP | 183 | DCP | 190 |
| 192. | $\lambda$z2 | False | CAP | 182 | DCP | 191 |
| 193. | $@_8$ | False | PAUSE | 0 | LCP | 192 |
| 194. | $@_7$ | False | LUP | 193 | LCP | 193 |
| 195. | n2 | False | LUP | 194 | BIP | 190 |
| 196. | z2 | False | LUP | 194 | BIP | 145 |
| 197. | $@_4$ | False | LUP | 194 | LCP | 124 |
| 198. | g | False | LUP | 197 | BIP | 122 |
| 199. | z | False | LUP | 197 | BIP | 7 |
| 200. | $\lambda$n2 | False | CAP | 197 | LCP | 3 |
| 201. | $\lambda$s2 | False | CAP | 194 | DCP | 200 |
| 202. | $\lambda$z2 | False | CAP | 193 | DCP | 201 |
| 203. | $@_8$ | False | PAUSE | 0 | LCP | 202 |
| 204. | $@_7$ | False | LUP | 203 | LCP | 203 |
| 205. | n2 | False | LUP | 204 | BIP | 200 |
| 206. | $\lambda$s1 | False | CAP | 204 | LCP | 197 |
| 207. | $\lambda$z1 | False | CAP | 203 | DCP | 206 |
| 208. | $@_5$ | True | PAUSE | 0 | LCP | 207 |
| 209. | s1 | False | LUP | 208 | BIP | 206 |
| 210. | s2 | False | LUP | 208 | BIP | 201 |
| 211. | s2 | False | LUP | 208 | BIP | 191 |
| 212. | s2 | False | LUP | 208 | BIP | 180 |
| 213. | s2 | True | LUP | 208 | BIP | 168 |
| 214. | z1 | False | PAUSE | 0 | BIP | 207 |
| 215. | $@_9$ | True | PAUSE | 0 | LCP | 203 |
| 216. | s2 | False | LUP | 215 | BIP | 201 |
| 217. | s2 | False | LUP | 215 | BIP | 191 |
| 218. | s2 | False | LUP | 215 | BIP | 180 |
| 219. | s2 | True | LUP | 215 | BIP | 168 |
| 220. | z2 | False | PAUSE | 0 | BIP | 202 |
| 221. | $@_9$ | True | PAUSE | 0 | LCP | 193 |

8

```
222.  s2                              False   LUP   221   BIP   191
223.  s2                              False   LUP   221   BIP   180
224.  s2                              True    LUP   221   BIP   168
225.  z2                              False   PAUSE   0   BIP   192
```
226.  $@_9$                              True    PAUSE   0   LCP   182
```
227.  s2                              False   LUP   226   BIP   180
228.  s2                              True    LUP   226   BIP   168
229.  z2                              False   PAUSE   0   BIP   181
```
230.  $@_9$                              True    PAUSE   0   LCP   170
```
231.  s2                              True    LUP   230   BIP   168
232.  z2                              True    PAUSE   0   BIP   169
```

**Example p zero .**
Input term:  $(\lambda$ t .  $(((\text{t} @_1 (\lambda$ n .  $\lambda$ a .  $\lambda$ x .  n $@_2 (\lambda$ s .
$\lambda$ z .  (a $@_3$ s) $@_4$ ((x $@_5$ s) $@_6$ z)))) $@_7 (\lambda$ a1 .  a1)) $@_8 (\lambda$ s1
.  $\lambda$ z1 .  z1))) $@_9 (\lambda$ s2 .  $\lambda$ z2 .  z2)

| | | | | | | |
|---|---|---|---|---|---|---|
| 1. | $@_9$ | False | LUP | 0 | BIP | 0 |
| 2. | $\lambda$t | False | CAP | 1 | LCP | 1 |
| 3. | $@_8$ | False | LUP | 0 | LCP | 2 |
| 4. | $@_7$ | False | LUP | 3 | LCP | 3 |
| 5. | $@_1$ | False | LUP | 4 | LCP | 4 |
| 6. | t | False | LUP | 5 | BIP | 2 |
| 7. | $\lambda$s2 | False | CAP | 5 | LCP | 1 |
| 8. | $\lambda$z2 | False | CAP | 4 | DCP | 7 |
| 9. | z2 | False | LUP | 3 | BIP | 8 |
| 10. | $\lambda$a1 | False | CAP | 3 | LCP | 4 |
| 11. | a1 | False | LUP | 0 | BIP | 10 |
| 12. | $\lambda$s1 | True | LUP | 0 | LCP | 3 |
| 13. | $\lambda$z1 | True | LUP | 0 | LCP | 12 |
| 14. | z1 | True | LUP | 0 | BIP | 13 |

**Example p one three .**
Input term:  $((\lambda$ t .  $(((\text{t} @_1 (\lambda$ n .  $\lambda$ a .  $\lambda$ x .  n $@_2 (\lambda$ s .
$\lambda$ z .  (a $@_3$ s) $@_4$ ((x $@_5$ s) $@_6$ z)))) $@_7 (\lambda$ a1 .  a1)) $@_8 (\lambda$ s1
.  $\lambda$ z1 .  z1))) $@_9 (\lambda$ s2 .  $\lambda$ z2 .  s2 $@_{10}$ z2)) $@_{11} (\lambda$ s3 .  $\lambda$ z3
.  s3 $@_{12}$ (s3 $@_{13}$ (s3 $@_{14}$ z3)))

| | | | | | | |
|---|---|---|---|---|---|---|
| 1. | $@_{11}$ | False | LUP | 0 | BIP | 0 |
| 2. | $@_9$ | False | LUP | 1 | LCP | 1 |
| 3. | $\lambda$t | False | CAP | 2 | LCP | 2 |
| 4. | $@_8$ | False | LUP | 1 | LCP | 3 |
| 5. | $@_7$ | False | LUP | 4 | LCP | 4 |
| 6. | $@_1$ | False | LUP | 5 | LCP | 5 |
| 7. | t | False | LUP | 6 | BIP | 3 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 8. | $\lambda$s2 | False | CAP | 6 | LCP | 2 |
| 9. | $\lambda$z2 | False | CAP | 5 | DCP | 8 |
| 10. | $@_{10}$ | False | LUP | 4 | LCP | 9 |
| 11. | s2 | False | LUP | 10 | BIP | 8 |
| 12. | $\lambda$n | False | CAP | 10 | LCP | 6 |
| 13. | $\lambda$a | False | CAP | 4 | DCP | 12 |
| 14. | $\lambda$x | False | CAP | 1 | DCP | 13 |
| 15. | $@_2$ | False | LUP | 0 | LCP | 14 |
| 16. | n | False | LUP | 15 | BIP | 12 |
| 17. | z2 | False | LUP | 15 | BIP | 9 |
| 18. | $\lambda$a1 | False | CAP | 15 | LCP | 5 |
| 19. | a1 | False | LUP | 0 | BIP | 18 |
| 20. | $\lambda$s | True | LUP | 0 | LCP | 15 |
| 21. | $\lambda$z | True | LUP | 0 | LCP | 20 |
| 22. | $@_4$ | False | LUP | 0 | LCP | 21 |
| 23. | $@_3$ | False | LUP | 22 | LCP | 22 |
| 24. | a | False | LUP | 23 | BIP | 13 |
| 25. | $\lambda$s1 | False | CAP | 23 | LCP | 4 |
| 26. | $\lambda$z1 | False | CAP | 22 | DCP | 25 |
| 27. | z1 | False | LUP | 0 | BIP | 26 |
| 28. | $@_6$ | False | LUP | 0 | LCP | 22 |
| 29. | $@_5$ | False | LUP | 28 | LCP | 28 |
| 30. | x | False | LUP | 29 | BIP | 14 |
| 31. | $\lambda$s3 | False | CAP | 29 | LCP | 1 |
| 32. | $\lambda$z3 | False | CAP | 28 | DCP | 31 |
| 33. | $@_{12}$ | True | LUP | 0 | LCP | 32 |
| 34. | s3 | False | LUP | 33 | BIP | 31 |
| 35. | s | True | LUP | 33 | BIP | 20 |
| 36. | $@_{13}$ | True | PAUSE | 0 | DCP | 33 |
| 37. | s3 | False | LUP | 36 | BIP | 31 |
| 38. | s | True | LUP | 36 | BIP | 20 |
| 39. | $@_{14}$ | True | PAUSE | 0 | DCP | 36 |
| 40. | s3 | False | LUP | 39 | BIP | 31 |
| 41. | s | True | LUP | 39 | BIP | 20 |
| 42. | z3 | False | PAUSE | 0 | BIP | 32 |
| 43. | z | True | PAUSE | 0 | BIP | 21 |

**Example p two three four** .
Input term:  $((( \lambda$ t . $((($ t $@_1$ ($\lambda$ n . $\lambda$ a . $\lambda$ x . n $@_2$ ($\lambda$ s
. $\lambda$ z . (a $@_3$ s) $@_4$ ((x $@_5$ s) $@_6$ z)))) $@_7$ ($\lambda$ a1 . a1)) $@_8$ ($\lambda$
s1 . $\lambda$ z1 . z1))) $@_9$ ($\lambda$ s2 . $\lambda$ z2 . s2 $@_{10}$ (s2 $@_{11}$ z2))) $@_{12}$
($\lambda$ s3 . $\lambda$ z3 . s3 $@_{13}$ (s3 $@_{14}$ (s3 $@_{15}$ z3)))) $@_{16}$ ($\lambda$ s4 . $\lambda$ z4
. s4 $@_{17}$ (s4 $@_{18}$ (s4 $@_{19}$ (s4 $@_{20}$ z4))))

| | | | | | | |
|---|---|---|---|---|---|---|
| 1. | $@_{16}$ | False | LUP | 0 | BIP | 0 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 2. | $@_{12}$ | False | LUP | 1 | LCP | 1 |
| 3. | $@_9$ | False | LUP | 2 | LCP | 2 |
| 4. | $\lambda t$ | False | CAP | 3 | LCP | 3 |
| 5. | $@_8$ | False | LUP | 2 | LCP | 4 |
| 6. | $@_7$ | False | LUP | 5 | LCP | 5 |
| 7. | $@_1$ | False | LUP | 6 | LCP | 6 |
| 8. | t | False | LUP | 7 | BIP | 4 |
| 9. | $\lambda s2$ | False | CAP | 7 | LCP | 3 |
| 10. | $\lambda z2$ | False | CAP | 6 | DCP | 9 |
| 11. | $@_{10}$ | False | LUP | 5 | LCP | 10 |
| 12. | s2 | False | LUP | 11 | BIP | 9 |
| 13. | $\lambda n$ | False | CAP | 11 | LCP | 7 |
| 14. | $\lambda a$ | False | CAP | 5 | DCP | 13 |
| 15. | $\lambda x$ | False | CAP | 2 | DCP | 14 |
| 16. | $@_2$ | False | LUP | 1 | LCP | 15 |
| 17. | n | False | LUP | 16 | BIP | 13 |
| 18. | $@_{11}$ | False | LUP | 16 | LCP | 11 |
| 19. | s2 | False | LUP | 18 | BIP | 9 |
| 20. | $\lambda n$ | False | CAP | 18 | LCP | 7 |
| 21. | $\lambda a$ | False | CAP | 16 | DCP | 20 |
| 22. | $\lambda x$ | False | CAP | 1 | DCP | 21 |
| 23. | $@_2$ | False | LUP | 0 | LCP | 22 |
| 24. | n | False | LUP | 23 | BIP | 20 |
| 25. | z2 | False | LUP | 23 | BIP | 10 |
| 26. | $\lambda a1$ | False | CAP | 23 | LCP | 6 |
| 27. | a1 | False | LUP | 0 | BIP | 26 |
| 28. | $\lambda s$ | True | LUP | 0 | LCP | 23 |
| 29. | $\lambda z$ | True | LUP | 0 | LCP | 28 |
| 30. | $@_4$ | False | LUP | 0 | LCP | 29 |
| 31. | $@_3$ | False | LUP | 30 | LCP | 30 |
| 32. | a | False | LUP | 31 | BIP | 21 |
| 33. | $\lambda s$ | False | CAP | 31 | LCP | 16 |
| 34. | $\lambda z$ | False | CAP | 30 | DCP | 33 |
| 35. | $@_4$ | False | LUP | 0 | LCP | 34 |
| 36. | $@_3$ | False | LUP | 35 | LCP | 35 |
| 37. | a | False | LUP | 36 | BIP | 14 |
| 38. | $\lambda s1$ | False | CAP | 36 | LCP | 5 |
| 39. | $\lambda z1$ | False | CAP | 35 | DCP | 38 |
| 40. | z1 | False | LUP | 0 | BIP | 39 |
| 41. | $@_6$ | False | LUP | 0 | LCP | 35 |
| 42. | $@_5$ | False | LUP | 41 | LCP | 41 |
| 43. | x | False | LUP | 42 | BIP | 15 |
| 44. | $\lambda s3$ | False | CAP | 42 | LCP | 2 |
| 45. | $\lambda z3$ | False | CAP | 41 | DCP | 44 |
| 46. | $@_{13}$ | True | LUP | 0 | LCP | 45 |
| 47. | s3 | False | LUP | 46 | BIP | 44 |

| 48. | s | False | LUP | 46 | BIP | 33 |
|---|---|---|---|---|---|---|
| 49. | s | True | LUP | 46 | BIP | 28 |
| 50. | $@_{14}$ | True | PAUSE | 0 | DCP | 46 |
| 51. | s3 | False | LUP | 50 | BIP | 44 |
| 52. | s | False | LUP | 50 | BIP | 33 |
| 53. | s | True | LUP | 50 | BIP | 28 |
| 54. | $@_{15}$ | True | PAUSE | 0 | DCP | 50 |
| 55. | s3 | False | LUP | 54 | BIP | 44 |
| 56. | s | False | LUP | 54 | BIP | 33 |
| 57. | s | True | LUP | 54 | BIP | 28 |
| 58. | z3 | False | PAUSE | 0 | BIP | 45 |
| 59. | z | False | PAUSE | 0 | BIP | 34 |
| 60. | $@_6$ | False | PAUSE | 0 | LCP | 30 |
| 61. | $@_5$ | False | LUP | 60 | LCP | 60 |
| 62. | x | False | LUP | 61 | BIP | 22 |
| 63. | $\lambda$s4 | False | CAP | 61 | LCP | 1 |
| 64. | $\lambda$z4 | False | CAP | 60 | DCP | 63 |
| 65. | $@_{17}$ | True | PAUSE | 0 | LCP | 64 |
| 66. | s4 | False | LUP | 65 | BIP | 63 |
| 67. | s | True | LUP | 65 | BIP | 28 |
| 68. | $@_{18}$ | True | PAUSE | 0 | DCP | 65 |
| 69. | s4 | False | LUP | 68 | BIP | 63 |
| 70. | s | True | LUP | 68 | BIP | 28 |
| 71. | $@_{19}$ | True | PAUSE | 0 | DCP | 68 |
| 72. | s4 | False | LUP | 71 | BIP | 63 |
| 73. | s | True | LUP | 71 | BIP | 28 |
| 74. | $@_{20}$ | True | PAUSE | 0 | DCP | 71 |
| 75. | s4 | False | LUP | 74 | BIP | 63 |
| 76. | s | True | LUP | 74 | BIP | 28 |
| 77. | z4 | False | PAUSE | 0 | BIP | 64 |
| 78. | z | True | PAUSE | 0 | BIP | 29 |

**Example p three three four five** .
Input term:  $((((\lambda$ t . $(((t @_1 (\lambda$ n . $\lambda$ a . $\lambda$ x . n $@_2 (\lambda$ s . $\lambda$ z . (a $@_3$ s) $@_4$ ((x $@_5$ s) $@_6$ z)))) $@_7 (\lambda$ a1 . a1)) $@_8 (\lambda$ s1 . $\lambda$ z1 . z1))) $@_9 (\lambda$ s2 . $\lambda$ z2 . s2 $@_{10}$ (s2 $@_{11}$ (s2 $@_{12}$ z2)))) $@_{13} (\lambda$ s3 . $\lambda$ z3 . s3 $@_{14}$ (s3 $@_{15}$ (s3 $@_{16}$ z3)))) $@_{17} (\lambda$ s4 . $\lambda$ z4 . s4 $@_{18}$ (s4 $@_{19}$ (s4 $@_{20}$ (s4 $@_{21}$ z4))))) $@_{22} (\lambda$ s5 . $\lambda$ z5. s5 $@_{23}$ (s5 $@_{24}$ (s5 $@_{25}$ (s5 $@_{26}$ (s5 $@_{27}$ z5)))))

| 1. | $@_{22}$ | False | LUP | 0 | BIP | 0 |
|---|---|---|---|---|---|---|
| 2. | $@_{17}$ | False | LUP | 1 | LCP | 1 |
| 3. | $@_{13}$ | False | LUP | 2 | LCP | 2 |
| 4. | $@_9$ | False | LUP | 3 | LCP | 3 |
| 5. | $\lambda$t | False | CAP | 4 | LCP | 4 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 6. | $@_8$ | False | LUP | 3 | LCP | 5 |
| 7. | $@_7$ | False | LUP | 6 | LCP | 6 |
| 8. | $@_1$ | False | LUP | 7 | LCP | 7 |
| 9. | t | False | LUP | 8 | BIP | 5 |
| 10. | $\lambda$s2 | False | CAP | 8 | LCP | 4 |
| 11. | $\lambda$z2 | False | CAP | 7 | DCP | 10 |
| 12. | $@_{10}$ | False | LUP | 6 | LCP | 11 |
| 13. | s2 | False | LUP | 12 | BIP | 10 |
| 14. | $\lambda$n | False | CAP | 12 | LCP | 8 |
| 15. | $\lambda$a | False | CAP | 6 | DCP | 14 |
| 16. | $\lambda$x | False | CAP | 3 | DCP | 15 |
| 17. | $@_2$ | False | LUP | 2 | LCP | 16 |
| 18. | n | False | LUP | 17 | BIP | 14 |
| 19. | $@_{11}$ | False | LUP | 17 | LCP | 12 |
| 20. | s2 | False | LUP | 19 | BIP | 10 |
| 21. | $\lambda$n | False | CAP | 19 | LCP | 8 |
| 22. | $\lambda$a | False | CAP | 17 | DCP | 21 |
| 23. | $\lambda$x | False | CAP | 2 | DCP | 22 |
| 24. | $@_2$ | False | LUP | 1 | LCP | 23 |
| 25. | n | False | LUP | 24 | BIP | 21 |
| 26. | $@_{12}$ | False | LUP | 24 | LCP | 19 |
| 27. | s2 | False | LUP | 26 | BIP | 10 |
| 28. | $\lambda$n | False | CAP | 26 | LCP | 8 |
| 29. | $\lambda$a | False | CAP | 24 | DCP | 28 |
| 30. | $\lambda$x | False | CAP | 1 | DCP | 29 |
| 31. | $@_2$ | False | LUP | 0 | LCP | 30 |
| 32. | n | False | LUP | 31 | BIP | 28 |
| 33. | z2 | False | LUP | 31 | BIP | 11 |
| 34. | $\lambda$a1 | False | CAP | 31 | LCP | 7 |
| 35. | a1 | False | LUP | 0 | BIP | 34 |
| 36. | $\lambda$s | True | LUP | 0 | LCP | 31 |
| 37. | $\lambda$z | True | LUP | 0 | LCP | 36 |
| 38. | $@_4$ | False | LUP | 0 | LCP | 37 |
| 39. | $@_3$ | False | LUP | 38 | LCP | 38 |
| 40. | a | False | LUP | 39 | BIP | 29 |
| 41. | $\lambda$s | False | CAP | 39 | LCP | 24 |
| 42. | $\lambda$z | False | CAP | 38 | DCP | 41 |
| 43. | $@_4$ | False | LUP | 0 | LCP | 42 |
| 44. | $@_3$ | False | LUP | 43 | LCP | 43 |
| 45. | a | False | LUP | 44 | BIP | 22 |
| 46. | $\lambda$s | False | CAP | 44 | LCP | 17 |
| 47. | $\lambda$z | False | CAP | 43 | DCP | 46 |
| 48. | $@_4$ | False | LUP | 0 | LCP | 47 |
| 49. | $@_3$ | False | LUP | 48 | LCP | 48 |
| 50. | a | False | LUP | 49 | BIP | 15 |
| 51. | $\lambda$s1 | False | CAP | 49 | LCP | 6 |

| 52. | $\lambda z1$ | False | CAP | 48 | DCP | 51 |
| 53. | z1 | False | LUP | 0 | BIP | 52 |
| 54. | $@_6$ | False | LUP | 0 | LCP | 48 |
| 55. | $@_5$ | False | LUP | 54 | LCP | 54 |
| 56. | x | False | LUP | 55 | BIP | 16 |
| 57. | $\lambda s3$ | False | CAP | 55 | LCP | 3 |
| 58. | $\lambda z3$ | False | CAP | 54 | DCP | 57 |
| 59. | $@_{14}$ | True | LUP | 0 | LCP | 58 |
| 60. | s3 | False | LUP | 59 | BIP | 57 |
| 61. | s | False | LUP | 59 | BIP | 46 |
| 62. | s | False | LUP | 59 | BIP | 41 |
| 63. | s | True | LUP | 59 | BIP | 36 |
| 64. | $@_{15}$ | True | PAUSE | 0 | DCP | 59 |
| 65. | s3 | False | LUP | 64 | BIP | 57 |
| 66. | s | False | LUP | 64 | BIP | 46 |
| 67. | s | False | LUP | 64 | BIP | 41 |
| 68. | s | True | LUP | 64 | BIP | 36 |
| 69. | $@_{16}$ | True | PAUSE | 0 | DCP | 64 |
| 70. | s3 | False | LUP | 69 | BIP | 57 |
| 71. | s | False | LUP | 69 | BIP | 46 |
| 72. | s | False | LUP | 69 | BIP | 41 |
| 73. | s | True | LUP | 69 | BIP | 36 |
| 74. | z3 | False | PAUSE | 0 | BIP | 58 |
| 75. | z | False | PAUSE | 0 | BIP | 47 |
| 76. | $@_6$ | False | PAUSE | 0 | LCP | 43 |
| 77. | $@_5$ | False | LUP | 76 | LCP | 76 |
| 78. | x | False | LUP | 77 | BIP | 23 |
| 79. | $\lambda s4$ | False | CAP | 77 | LCP | 2 |
| 80. | $\lambda z4$ | False | CAP | 76 | DCP | 79 |
| 81. | $@_{18}$ | True | PAUSE | 0 | LCP | 80 |
| 82. | s4 | False | LUP | 81 | BIP | 79 |
| 83. | s | False | LUP | 81 | BIP | 41 |
| 84. | s | True | LUP | 81 | BIP | 36 |
| 85. | $@_{19}$ | True | PAUSE | 0 | DCP | 81 |
| 86. | s4 | False | LUP | 85 | BIP | 79 |
| 87. | s | False | LUP | 85 | BIP | 41 |
| 88. | s | True | LUP | 85 | BIP | 36 |
| 89. | $@_{20}$ | True | PAUSE | 0 | DCP | 85 |
| 90. | s4 | False | LUP | 89 | BIP | 79 |
| 91. | s | False | LUP | 89 | BIP | 41 |
| 92. | s | True | LUP | 89 | BIP | 36 |
| 93. | $@_{21}$ | True | PAUSE | 0 | DCP | 89 |
| 94. | s4 | False | LUP | 93 | BIP | 79 |
| 95. | s | False | LUP | 93 | BIP | 41 |
| 96. | s | True | LUP | 93 | BIP | 36 |
| 97. | z4 | False | PAUSE | 0 | BIP | 80 |

| # | Term | | | | | |
|---|------|------|-------|-----|-----|-----|
| 98. | z | False | PAUSE | 0 | BIP | 42 |
| 99. | $@_6$ | False | PAUSE | 0 | LCP | 38 |
| 100. | $@_5$ | False | LUP | 99 | LCP | 99 |
| 101. | x | False | LUP | 100 | BIP | 30 |
| 102. | $\lambda s5$ | False | CAP | 100 | LCP | 1 |
| 103. | $\lambda z5$ | False | CAP | 99 | DCP | 102 |
| 104. | $@_{23}$ | True | PAUSE | 0 | LCP | 103 |
| 105. | s5 | False | LUP | 104 | BIP | 102 |
| 106. | s | True | LUP | 104 | BIP | 36 |
| 107. | $@_{24}$ | True | PAUSE | 0 | DCP | 104 |
| 108. | s5 | False | LUP | 107 | BIP | 102 |
| 109. | s | True | LUP | 107 | BIP | 36 |
| 110. | $@_{25}$ | True | PAUSE | 0 | DCP | 107 |
| 111. | s5 | False | LUP | 110 | BIP | 102 |
| 112. | s | True | LUP | 110 | BIP | 36 |
| 113. | $@_{26}$ | True | PAUSE | 0 | DCP | 110 |
| 114. | s5 | False | LUP | 113 | BIP | 102 |
| 115. | s | True | LUP | 113 | BIP | 36 |
| 116. | $@_{27}$ | True | PAUSE | 0 | DCP | 113 |
| 117. | s5 | False | LUP | 116 | BIP | 102 |
| 118. | s | True | LUP | 116 | BIP | 36 |
| 119. | z5 | False | PAUSE | 0 | BIP | 103 |
| 120. | z | True | PAUSE | 0 | BIP | 37 |

**Example p one** .
Input term:  $(\lambda\ t\ .\ (((t\ @_1\ (\lambda\ n\ .\ \lambda\ a\ .\ \lambda\ x\ .\ n\ @_2\ (\lambda\ s\ .\ \lambda\ z\ .\ (a\ @_3\ s)\ @_4\ ((x\ @_5\ s)\ @_6\ z)))\ @_7\ (\lambda\ a1\ .\ a1))\ @_8\ (\lambda\ s1\ .\ \lambda\ z1\ .\ z1)))\ @_9\ (\lambda\ s2\ .\ \lambda\ z2\ .\ s2\ @_{10}\ z2)$

| # | Term | | | | | |
|---|------|------|------|-----|-----|-----|
| 1. | $@_9$ | False | LUP | 0 | BIP | 0 |
| 2. | $\lambda t$ | False | CAP | 1 | LCP | 1 |
| 3. | $@_8$ | False | LUP | 0 | LCP | 2 |
| 4. | $@_7$ | False | LUP | 3 | LCP | 3 |
| 5. | $@_1$ | False | LUP | 4 | LCP | 4 |
| 6. | t | False | LUP | 5 | BIP | 2 |
| 7. | $\lambda s2$ | False | CAP | 5 | LCP | 1 |
| 8. | $\lambda z2$ | False | CAP | 4 | DCP | 7 |
| 9. | $@_{10}$ | False | LUP | 3 | LCP | 8 |
| 10. | s2 | False | LUP | 9 | BIP | 7 |
| 11. | $\lambda n$ | False | CAP | 9 | LCP | 5 |
| 12. | $\lambda a$ | False | CAP | 3 | DCP | 11 |
| 13. | $\lambda x$ | True | LUP | 0 | DCP | 12 |
| 14. | $@_2$ | False | LUP | 0 | LCP | 13 |
| 15. | n | False | LUP | 14 | BIP | 11 |
| 16. | z2 | False | LUP | 14 | BIP | 8 |

| 17. | $\lambda a1$ | False | CAP | 14 | LCP | 4 |
|---|---|---|---|---|---|---|
| 18. | a1 | False | LUP | 0 | BIP | 17 |
| 19. | $\lambda s$ | True | LUP | 0 | LCP | 14 |
| 20. | $\lambda z$ | True | LUP | 0 | LCP | 19 |
| 21. | $@_4$ | False | LUP | 0 | LCP | 20 |
| 22. | $@_3$ | False | LUP | 21 | LCP | 21 |
| 23. | a | False | LUP | 22 | BIP | 12 |
| 24. | $\lambda s1$ | False | CAP | 22 | LCP | 3 |
| 25. | $\lambda z1$ | False | CAP | 21 | DCP | 24 |
| 26. | z1 | False | LUP | 0 | BIP | 25 |
| 27. | $@_6$ | True | LUP | 0 | LCP | 21 |
| 28. | $@_5$ | True | LUP | 27 | LCP | 27 |
| 29. | x | True | LUP | 28 | BIP | 13 |
| 30. | s | True | PAUSE | 27 | BIP | 19 |
| 31. | z | True | PAUSE | 0 | BIP | 20 |

**Example p two** .
Input term:   $(\lambda$ t .   $(((t$ $@_1$ $(\lambda$ n .   $\lambda$ a .   $\lambda$ x .   n $@_2$ $(\lambda$ s .
$\lambda$ z .   (a $@_3$ s) $@_4$ ((x $@_5$ s) $@_6$ z)))) $@_7$ $(\lambda$ a1 .   a1)) $@_8$ $(\lambda$ s1
.   $\lambda$ z1 .   z1))) $@_9$ $(\lambda$ s2 .   $\lambda$ z2 .   s2 $@_{10}$ (s2 $@_{11}$ z2))

| 1. | $@_9$ | False | LUP | 0 | BIP | 0 |
|---|---|---|---|---|---|---|
| 2. | $\lambda t$ | False | CAP | 1 | LCP | 1 |
| 3. | $@_8$ | False | LUP | 0 | LCP | 2 |
| 4. | $@_7$ | False | LUP | 3 | LCP | 3 |
| 5. | $@_1$ | False | LUP | 4 | LCP | 4 |
| 6. | t | False | LUP | 5 | BIP | 2 |
| 7. | $\lambda s2$ | False | CAP | 5 | LCP | 1 |
| 8. | $\lambda z2$ | False | CAP | 4 | DCP | 7 |
| 9. | $@_{10}$ | False | LUP | 3 | LCP | 8 |
| 10. | s2 | False | LUP | 9 | BIP | 7 |
| 11. | $\lambda n$ | False | CAP | 9 | LCP | 5 |
| 12. | $\lambda a$ | False | CAP | 3 | DCP | 11 |
| 13. | $\lambda x$ | True | LUP | 0 | DCP | 12 |
| 14. | $@_2$ | False | LUP | 0 | LCP | 13 |
| 15. | n | False | LUP | 14 | BIP | 11 |
| 16. | $@_{11}$ | False | LUP | 14 | LCP | 9 |
| 17. | s2 | False | LUP | 16 | BIP | 7 |
| 18. | $\lambda n$ | False | CAP | 16 | LCP | 5 |
| 19. | $\lambda a$ | False | CAP | 14 | DCP | 18 |
| 20. | $\lambda x$ | True | LUP | 0 | DCP | 19 |
| 21. | $@_2$ | False | LUP | 0 | LCP | 20 |
| 22. | n | False | LUP | 21 | BIP | 18 |
| 23. | z2 | False | LUP | 21 | BIP | 8 |
| 24. | $\lambda a1$ | False | CAP | 21 | LCP | 4 |

| 25. | a1 | False | LUP | 0 | BIP | 24 |
| 26. | $\lambda$s | True | LUP | 0 | LCP | 21 |
| 27. | $\lambda$z | True | LUP | 0 | LCP | 26 |
| 28. | $@_4$ | False | LUP | 0 | LCP | 27 |
| 29. | $@_3$ | False | LUP | 28 | LCP | 28 |
| 30. | a | False | LUP | 29 | BIP | 19 |
| 31. | $\lambda$s | False | CAP | 29 | LCP | 14 |
| 32. | $\lambda$z | False | CAP | 28 | DCP | 31 |
| 33. | $@_4$ | False | LUP | 0 | LCP | 32 |
| 34. | $@_3$ | False | LUP | 33 | LCP | 33 |
| 35. | a | False | LUP | 34 | BIP | 12 |
| 36. | $\lambda$s1 | False | CAP | 34 | LCP | 3 |
| 37. | $\lambda$z1 | False | CAP | 33 | DCP | 36 |
| 38. | z1 | False | LUP | 0 | BIP | 37 |
| 39. | $@_6$ | True | LUP | 0 | LCP | 33 |
| 40. | $@_5$ | True | LUP | 39 | LCP | 39 |
| 41. | x | True | LUP | 40 | BIP | 13 |
| 42. | s | False | PAUSE | 39 | BIP | 31 |
| 43. | s | True | PAUSE | 39 | BIP | 26 |
| 44. | z | False | PAUSE | 0 | BIP | 32 |
| 45. | $@_6$ | True | PAUSE | 0 | LCP | 28 |
| 46. | $@_5$ | True | LUP | 45 | LCP | 45 |
| 47. | x | True | LUP | 46 | BIP | 20 |
| 48. | s | True | PAUSE | 45 | BIP | 26 |
| 49. | z | True | PAUSE | 0 | BIP | 27 |

**Example ex_1** .
Input term: (g $@_1$ ($\lambda$ n . n))

| 1. | $@_1$ | True | LUP | 0 | BIP | 0 |
| 2. | g | True | LUP | 1 | LCP | 1 |
| 3. | $\lambda$n | True | PAUSE | 0 | DCP | 1 |
| 4. | n | True | PAUSE | 0 | BIP | 3 |

**Example ex_2** .
Input term: (($\lambda$ h . h) $@_1$ ($\lambda$ f . f)) $@_2$ a

| 1. | $@_2$ | False | LUP | 0 | BIP | 0 |
| 2. | $@_1$ | False | LUP | 1 | LCP | 1 |
| 3. | $\lambda$h | False | CAP | 2 | LCP | 2 |
| 4. | h | False | LUP | 1 | BIP | 3 |
| 5. | $\lambda$f | False | CAP | 1 | LCP | 2 |
| 6. | f | False | LUP | 0 | BIP | 5 |
| 7. | a | True | LUP | 0 | LCP | 1 |

**Example ex_3** .
Input term:  $((\lambda\ h\ .\ h\ @_1\ a)\ @_2\ (\lambda\ f\ .\ f))$

| | | | | | | |
|---|---|---|---|---|---|---|
| 1. | $@_2$ | False | LUP | 0 | BIP | 0 |
| 2. | $\lambda$h | False | CAP | 1 | LCP | 1 |
| 3. | $@_1$ | False | LUP | 0 | LCP | 2 |
| 4. | h | False | LUP | 3 | BIP | 2 |
| 5. | $\lambda$f | False | CAP | 3 | LCP | 1 |
| 6. | f | False | LUP | 0 | BIP | 5 |
| 7. | a | True | LUP | 0 | LCP | 3 |


**Example ex_4** .
Input term:  $\lambda\ f\ .\ \lambda\ y\ .\ (y\ @_1\ f)\ @_2\ y$

| | | | | | | |
|---|---|---|---|---|---|---|
| 1. | $\lambda$f | True | LUP | 0 | BIP | 0 |
| 2. | $\lambda$y | True | LUP | 0 | LCP | 1 |
| 3. | $@_2$ | True | LUP | 0 | LCP | 2 |
| 4. | $@_1$ | True | LUP | 3 | LCP | 3 |
| 5. | y | True | LUP | 4 | BIP | 2 |
| 6. | f | True | PAUSE | 3 | BIP | 1 |
| 7. | y | True | PAUSE | 0 | BIP | 2 |


**Example ex_4'** .
Input term:  $\lambda\ f\ .\ \lambda\ y\ .\ (y\ @_1\ (\lambda\ z\ .\ z))\ @_2\ y$

| | | | | | | |
|---|---|---|---|---|---|---|
| 1. | $\lambda$f | True | LUP | 0 | BIP | 0 |
| 2. | $\lambda$y | True | LUP | 0 | LCP | 1 |
| 3. | $@_2$ | True | LUP | 0 | LCP | 2 |
| 4. | $@_1$ | True | LUP | 3 | LCP | 3 |
| 5. | y | True | LUP | 4 | BIP | 2 |
| 6. | $\lambda$z | True | PAUSE | 3 | DCP | 4 |
| 7. | z | True | PAUSE | 3 | BIP | 6 |
| 8. | y | True | PAUSE | 0 | BIP | 2 |


**Example ex_5** .
Input term:  $\lambda\ y\ .\ \lambda\ f\ .\ (y\ @_1\ f)\ @_2\ y$

| | | | | | | |
|---|---|---|---|---|---|---|
| 1. | $\lambda$y | True | LUP | 0 | BIP | 0 |
| 2. | $\lambda$f | True | LUP | 0 | LCP | 1 |
| 3. | $@_2$ | True | LUP | 0 | LCP | 2 |
| 4. | $@_1$ | True | LUP | 3 | LCP | 3 |
| 5. | y | True | LUP | 4 | BIP | 1 |
| 6. | f | True | PAUSE | 3 | BIP | 2 |
| 7. | y | True | PAUSE | 0 | BIP | 1 |

**Example succ two .**

Input term:  $(\lambda$ n .  $\lambda$ s .  $\lambda$ z .  (n $@_1$ s) $@_2$ (s $@_3$ z)) $@_4$ ($\lambda$ p .  $\lambda$ o .  p $@_5$ (p $@_6$ o))

|     |            |       |       |    |      |    |
|-----|------------|-------|-------|----|------|----|
| 1.  | $@_4$      | False | LUP   | 0  | BIP  | 0  |
| 2.  | $\lambda$n | False | CAP   | 1  | LCP  | 1  |
| 3.  | $\lambda$s | True  | LUP   | 0  | DCP  | 2  |
| 4.  | $\lambda$z | True  | LUP   | 0  | LCP  | 3  |
| 5.  | $@_2$      | False | LUP   | 0  | LCP  | 4  |
| 6.  | $@_1$      | False | LUP   | 5  | LCP  | 5  |
| 7.  | n          | False | LUP   | 6  | BIP  | 2  |
| 8.  | $\lambda$p | False | CAP   | 6  | LCP  | 1  |
| 9.  | $\lambda$o | False | CAP   | 5  | DCP  | 8  |
| 10. | $@_5$      | True  | LUP   | 0  | LCP  | 9  |
| 11. | p          | False | LUP   | 10 | BIP  | 8  |
| 12. | s          | True  | LUP   | 10 | BIP  | 3  |
| 13. | $@_6$      | True  | PAUSE | 0  | DCP  | 10 |
| 14. | p          | False | LUP   | 13 | BIP  | 8  |
| 15. | s          | True  | LUP   | 13 | BIP  | 3  |
| 16. | o          | False | PAUSE | 0  | BIP  | 9  |
| 17. | $@_3$      | True  | PAUSE | 0  | LCP  | 5  |
| 18. | s          | True  | LUP   | 17 | BIP  | 3  |
| 19. | z          | True  | PAUSE | 0  | BIP  | 4  |

**Example ex_9 .**

Input term:  $(\lambda$ x .  x $@_1$ x) $@_2$ ($\lambda$ z .  z)

|    |            |       |     |   |     |   |
|----|------------|-------|-----|---|-----|---|
| 1. | $@_2$      | False | LUP | 0 | BIP | 0 |
| 2. | $\lambda$x | False | CAP | 1 | LCP | 1 |
| 3. | $@_1$      | False | LUP | 0 | LCP | 2 |
| 4. | x          | False | LUP | 3 | BIP | 2 |
| 5. | $\lambda$z | False | CAP | 3 | LCP | 1 |
| 6. | z          | False | LUP | 0 | BIP | 5 |
| 7. | x          | False | LUP | 0 | BIP | 2 |
| 8. | $\lambda$z | True  | LUP | 0 | LCP | 1 |
| 9. | z          | True  | LUP | 0 | BIP | 8 |

**Example ex_11 .**

Input term:  $(\lambda$ x .  $\lambda$ y .  x $@_1$ (x $@_2$ y)) $@_3$ ($\lambda$ p .  q)

|    |            |       |     |   |     |   |
|----|------------|-------|-----|---|-----|---|
| 1. | $@_3$      | False | LUP | 0 | BIP | 0 |
| 2. | $\lambda$x | False | CAP | 1 | LCP | 1 |
| 3. | $\lambda$y | True  | LUP | 0 | DCP | 2 |
| 4. | $@_1$      | False | LUP | 0 | LCP | 3 |
| 5. | x          | False | LUP | 4 | BIP | 2 |
| 6. | $\lambda$p | False | CAP | 4 | LCP | 1 |

```
7.  q                                        True    LUP    0    LCP    6
```

**Example ex_f0** .
Input term:  $(\lambda\ n\ .\ (n\ @_1\ (\lambda\ s\ .\ \lambda\ z\ .\ s\ @_2\ (s\ @_3\ ((n\ @_4\ s)$
$@_5\ z))))\ @_6\ (\lambda\ s1\ .\ \lambda\ z1\ .\ z1))\ @_7\ (\lambda\ s2\ .\ \lambda\ z2\ .\ z2)$

| | | | | | | |
|---|---|---|---|---|---|---|
| 1. | $@_7$ | False | LUP | 0 | BIP | 0 |
| 2. | $\lambda$n | False | CAP | 1 | LCP | 1 |
| 3. | $@_6$ | False | LUP | 0 | LCP | 2 |
| 4. | $@_1$ | False | LUP | 3 | LCP | 3 |
| 5. | n | False | LUP | 4 | BIP | 2 |
| 6. | $\lambda$s2 | False | CAP | 4 | LCP | 1 |
| 7. | $\lambda$z2 | False | CAP | 3 | DCP | 6 |
| 8. | z2 | False | LUP | 0 | BIP | 7 |
| 9. | $\lambda$s1 | True | LUP | 0 | LCP | 3 |
| 10. | $\lambda$z1 | True | LUP | 0 | LCP | 9 |
| 11. | z1 | True | LUP | 0 | BIP | 10 |

**Example ex_f1** .
Input term:  $(\lambda\ n\ .\ (n\ @_1\ (\lambda\ s\ .\ \lambda\ z\ .\ s\ @_2\ (s\ @_3\ ((n\ @_4\ s)$
$@_5\ z))))\ @_6\ (\lambda\ s1\ .\ \lambda\ z1\ .\ z1))\ @_7\ (\lambda\ s2\ .\ \lambda\ z2\ .\ s2\ @_8\ z2)$

| | | | | | | |
|---|---|---|---|---|---|---|
| 1. | $@_7$ | False | LUP | 0 | BIP | 0 |
| 2. | $\lambda$n | False | CAP | 1 | LCP | 1 |
| 3. | $@_6$ | False | LUP | 0 | LCP | 2 |
| 4. | $@_1$ | False | LUP | 3 | LCP | 3 |
| 5. | n | False | LUP | 4 | BIP | 2 |
| 6. | $\lambda$s2 | False | CAP | 4 | LCP | 1 |
| 7. | $\lambda$z2 | False | CAP | 3 | DCP | 6 |
| 8. | $@_8$ | False | LUP | 0 | LCP | 7 |
| 9. | s2 | False | LUP | 8 | BIP | 6 |
| 10. | $\lambda$s | False | CAP | 8 | LCP | 4 |
| 11. | $\lambda$z | True | LUP | 0 | DCP | 10 |
| 12. | $@_2$ | False | LUP | 0 | LCP | 11 |
| 13. | s | False | LUP | 12 | BIP | 10 |
| 14. | z2 | False | LUP | 12 | BIP | 7 |
| 15. | $\lambda$s1 | False | CAP | 12 | LCP | 3 |
| 16. | $\lambda$z1 | True | LUP | 0 | DCP | 15 |
| 17. | z1 | True | LUP | 0 | BIP | 16 |

**Example ex_f2** .
Input term:  $(\lambda\ n\ .\ (n\ @_1\ (\lambda\ s\ .\ \lambda\ z\ .\ s\ @_2\ (s\ @_3\ ((n\ @_4\ s)$
$@_5\ z))))\ @_6\ (\lambda\ s1\ .\ \lambda\ z1\ .\ z1))\ @_7\ (\lambda\ s2\ .\ \lambda\ z2\ .\ s2\ @_8\ (s2$
$@_9\ z2))$

| 1. | $@_7$ | False | LUP | 0 | BIP | 0 |
|---|---|---|---|---|---|---|
| 2. | $\lambda$n | False | CAP | 1 | LCP | 1 |
| 3. | $@_6$ | False | LUP | 0 | LCP | 2 |
| 4. | $@_1$ | False | LUP | 3 | LCP | 3 |
| 5. | n | False | LUP | 4 | BIP | 2 |
| 6. | $\lambda$s2 | False | CAP | 4 | LCP | 1 |
| 7. | $\lambda$z2 | False | CAP | 3 | DCP | 6 |
| 8. | $@_8$ | False | LUP | 0 | LCP | 7 |
| 9. | s2 | False | LUP | 8 | BIP | 6 |
| 10. | $\lambda$s | False | CAP | 8 | LCP | 4 |
| 11. | $\lambda$z | True | LUP | 0 | DCP | 10 |
| 12. | $@_2$ | False | LUP | 0 | LCP | 11 |
| 13. | s | False | LUP | 12 | BIP | 10 |
| 14. | $@_9$ | False | LUP | 12 | LCP | 8 |
| 15. | s2 | False | LUP | 14 | BIP | 6 |
| 16. | $\lambda$s | False | CAP | 14 | LCP | 4 |
| 17. | $\lambda$z | False | CAP | 12 | DCP | 16 |
| 18. | $@_2$ | False | LUP | 0 | LCP | 17 |
| 19. | s | False | LUP | 18 | BIP | 16 |
| 20. | z2 | False | LUP | 18 | BIP | 7 |
| 21. | $\lambda$s1 | False | CAP | 18 | LCP | 3 |
| 22. | $\lambda$z1 | True | LUP | 0 | DCP | 21 |
| 23. | z1 | True | LUP | 0 | BIP | 22 |

**Example ex_L01** .
Input term:   $(\lambda$ f .   $\lambda$ x .   f $@_1$ (x $@_2$ ((f $@_3$ x) $@_4$ x))) $@_5$ ($\lambda$ a .  $\lambda$ b .  a)

| 1. | $@_5$ | False | LUP | 0 | BIP | 0 |
|---|---|---|---|---|---|---|
| 2. | $\lambda$f | False | CAP | 1 | LCP | 1 |
| 3. | $\lambda$x | True | LUP | 0 | DCP | 2 |
| 4. | $@_1$ | False | LUP | 0 | LCP | 3 |
| 5. | f | False | LUP | 4 | BIP | 2 |
| 6. | $\lambda$a | False | CAP | 4 | LCP | 1 |
| 7. | $\lambda$b | True | LUP | 0 | DCP | 6 |
| 8. | a | False | LUP | 0 | BIP | 6 |
| 9. | $@_2$ | True | LUP | 0 | LCP | 4 |
| 10. | x | True | LUP | 9 | BIP | 3 |
| 11. | $@_4$ | False | PAUSE | 0 | DCP | 9 |
| 12. | $@_3$ | False | LUP | 11 | LCP | 11 |
| 13. | f | False | LUP | 12 | BIP | 2 |
| 14. | $\lambda$a | False | CAP | 12 | LCP | 1 |
| 15. | $\lambda$b | False | CAP | 11 | DCP | 14 |
| 16. | a | False | PAUSE | 0 | BIP | 14 |
| 17. | x | True | PAUSE | 0 | BIP | 3 |

**Example ex_L02** .
Input term:  ($\lambda$ x .  (x @$_1$ x) @$_2$ x) @$_3$ ($\lambda$ a .  $\lambda$ b .  a)

| | | | | | | |
|---|---|---|---|---|---|---|
| 1. | @$_3$ | False | LUP | 0 | BIP | 0 |
| 2. | $\lambda$x | False | CAP | 1 | LCP | 1 |
| 3. | @$_2$ | False | LUP | 0 | LCP | 2 |
| 4. | @$_1$ | False | LUP | 3 | LCP | 3 |
| 5. | x | False | LUP | 4 | BIP | 2 |
| 6. | $\lambda$a | False | CAP | 4 | LCP | 1 |
| 7. | $\lambda$b | False | CAP | 3 | DCP | 6 |
| 8. | a | False | LUP | 0 | BIP | 6 |
| 9. | x | False | LUP | 0 | BIP | 2 |
| 10. | $\lambda$a | True | LUP | 0 | LCP | 1 |
| 11. | $\lambda$b | True | LUP | 0 | LCP | 10 |
| 12. | a | True | LUP | 0 | BIP | 10 |


**Example ex_L03** .
Input term:  ($\lambda$ x .  x @$_1$ ($\lambda$ y .  y)) @$_2$ ($\lambda$ a .  $\lambda$ b .  b)

| | | | | | | |
|---|---|---|---|---|---|---|
| 1. | @$_2$ | False | LUP | 0 | BIP | 0 |
| 2. | $\lambda$x | False | CAP | 1 | LCP | 1 |
| 3. | @$_1$ | False | LUP | 0 | LCP | 2 |
| 4. | x | False | LUP | 3 | BIP | 2 |
| 5. | $\lambda$a | False | CAP | 3 | LCP | 1 |
| 6. | $\lambda$b | True | LUP | 0 | DCP | 5 |
| 7. | b | True | LUP | 0 | BIP | 6 |


**Example ex_L04** .
Input term:  ($\lambda$ x .  x @$_1$ ($\lambda$ y .  y)) @$_2$ ($\lambda$ a .  $\lambda$ b .  a)

| | | | | | | |
|---|---|---|---|---|---|---|
| 1. | @$_2$ | False | LUP | 0 | BIP | 0 |
| 2. | $\lambda$x | False | CAP | 1 | LCP | 1 |
| 3. | @$_1$ | False | LUP | 0 | LCP | 2 |
| 4. | x | False | LUP | 3 | BIP | 2 |
| 5. | $\lambda$a | False | CAP | 3 | LCP | 1 |
| 6. | $\lambda$b | True | LUP | 0 | DCP | 5 |
| 7. | a | False | LUP | 0 | BIP | 5 |
| 8. | $\lambda$y | True | LUP | 0 | LCP | 3 |
| 9. | y | True | LUP | 0 | BIP | 8 |


**Example ex_1** .
Input term:  (g @$_1$ ($\lambda$ n .  n))

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| 1. | $@_1$ | True | LUP | 0 | BIP | 0 |
| 2. | g | True | LUP | 1 | LCP | 1 |
| 3. | $\lambda n$ | True | PAUSE | 0 | DCP | 1 |
| 4. | n | True | PAUSE | 0 | BIP | 3 |

**Example NPR** .

Input term: $((\lambda\ h\ .\ \lambda\ z\ .\ ((h\ @_1\ (\lambda\ x\ .\ ((h\ @_2\ (\lambda\ q\ .\ x))$ $@_3\ a)))\ @_4\ (z\ @_5\ a)))\ @_6\ (\lambda\ f\ .\ \lambda\ y\ .\ f\ @_7\ ((g\ @_8\ (\lambda\ b\ .\ b))$ $@_9\ y)))\ @_{10}\ (g\ @_{11}\ (\lambda\ n\ .\ n))$

| 1. | $@_{10}$ | False | LUP | 0 | BIP | 0 |
| 2. | $@_6$ | False | LUP | 1 | LCP | 1 |
| 3. | $\lambda h$ | False | CAP | 2 | LCP | 2 |
| 4. | $\lambda z$ | False | CAP | 1 | DCP | 3 |
| 5. | $@_4$ | False | LUP | 0 | LCP | 4 |
| 6. | $@_1$ | False | LUP | 5 | LCP | 5 |
| 7. | h | False | LUP | 6 | BIP | 3 |
| 8. | $\lambda f$ | False | CAP | 6 | LCP | 2 |
| 9. | $\lambda y$ | False | CAP | 5 | DCP | 8 |
| 10. | $@_7$ | False | LUP | 0 | LCP | 9 |
| 11. | f | False | LUP | 10 | BIP | 8 |
| 12. | $\lambda x$ | False | CAP | 10 | LCP | 6 |
| 13. | $@_3$ | False | LUP | 0 | LCP | 12 |
| 14. | $@_2$ | False | LUP | 13 | LCP | 13 |
| 15. | h | False | LUP | 14 | BIP | 3 |
| 16. | $\lambda f$ | False | CAP | 14 | LCP | 2 |
| 17. | $\lambda y$ | False | CAP | 13 | DCP | 16 |
| 18. | $@_7$ | False | LUP | 0 | LCP | 17 |
| 19. | f | False | LUP | 18 | BIP | 16 |
| 20. | $\lambda q$ | False | CAP | 18 | LCP | 14 |
| 21. | x | False | LUP | 0 | BIP | 12 |
| 22. | $@_9$ | True | LUP | 0 | LCP | 10 |
| 23. | $@_8$ | True | LUP | 22 | LCP | 22 |
| 24. | g | True | LUP | 23 | LCP | 23 |
| 25. | $\lambda b$ | True | PAUSE | 22 | DCP | 23 |
| 26. | b | True | PAUSE | 22 | BIP | 25 |
| 27. | y | False | PAUSE | 0 | BIP | 9 |
| 28. | $@_5$ | True | PAUSE | 0 | LCP | 5 |
| 29. | z | False | LUP | 28 | BIP | 4 |
| 30. | $@_{11}$ | True | LUP | 28 | LCP | 1 |
| 31. | g | True | LUP | 30 | LCP | 30 |
| 32. | $\lambda n$ | True | PAUSE | 28 | DCP | 30 |
| 33. | n | True | PAUSE | 28 | BIP | 32 |
| 34. | a | True | PAUSE | 0 | DCP | 28 |

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**Example mut three two .**
Input term: $((\lambda$ m . $\lambda$ n . $\lambda$ s . $\lambda$ z . (m $@_1$ (n $@_2$ s)) $@_3$ z) $@_4$ ($\lambda$ a . $\lambda$ q . a $@_5$ (a $@_6$ (a $@_7$ q)))) $@_8$ ($\lambda$ d . $\lambda$ e . d $@_9$ (d $@_{10}$ e))

| | | | | | | | |
|----|--------------|-------|------|----|-----|----|
| 1. | $@_8$ | False | LUP | 0 | BIP | 0 |
| 2. | $@_4$ | False | LUP | 1 | LCP | 1 |
| 3. | $\lambda$m | False | CAP | 2 | LCP | 2 |
| 4. | $\lambda$n | False | CAP | 1 | DCP | 3 |
| 5. | $\lambda$s | True | LUP | 0 | DCP | 4 |
| 6. | $\lambda$z | True | LUP | 0 | LCP | 5 |
| 7. | $@_3$ | False | LUP | 0 | LCP | 6 |
| 8. | $@_1$ | False | LUP | 7 | LCP | 7 |
| 9. | m | False | LUP | 8 | BIP | 3 |
| 10. | $\lambda$a | False | CAP | 8 | LCP | 2 |
| 11. | $\lambda$q | False | CAP | 7 | DCP | 10 |
| 12. | $@_5$ | False | LUP | 0 | LCP | 11 |
| 13. | a | False | LUP | 12 | BIP | 10 |
| 14. | $@_2$ | False | LUP | 12 | LCP | 8 |
| 15. | n | False | LUP | 14 | BIP | 4 |
| 16. | $\lambda$d | False | CAP | 14 | LCP | 1 |
| 17. | $\lambda$e | False | CAP | 12 | DCP | 16 |
| 18. | $@_9$ | True | LUP | 0 | LCP | 17 |
| 19. | d | False | LUP | 18 | BIP | 16 |
| 20. | s | True | LUP | 18 | BIP | 5 |
| 21. | $@_{10}$ | True | PAUSE | 0 | DCP | 18 |
| 22. | d | False | LUP | 21 | BIP | 16 |
| 23. | s | True | LUP | 21 | BIP | 5 |
| 24. | e | False | PAUSE | 0 | BIP | 17 |
| 25. | $@_6$ | False | PAUSE | 0 | LCP | 12 |
| 26. | a | False | LUP | 25 | BIP | 10 |
| 27. | $@_2$ | False | LUP | 25 | LCP | 8 |
| 28. | n | False | LUP | 27 | BIP | 4 |
| 29. | $\lambda$d | False | CAP | 27 | LCP | 1 |
| 30. | $\lambda$e | False | CAP | 25 | DCP | 29 |
| 31. | $@_9$ | True | PAUSE | 0 | LCP | 30 |
| 32. | d | False | LUP | 31 | BIP | 29 |
| 33. | s | True | LUP | 31 | BIP | 5 |
| 34. | $@_{10}$ | True | PAUSE | 0 | DCP | 31 |
| 35. | d | False | LUP | 34 | BIP | 29 |
| 36. | s | True | LUP | 34 | BIP | 5 |
| 37. | e | False | PAUSE | 0 | BIP | 30 |
| 38. | $@_7$ | False | PAUSE | 0 | LCP | 25 |
| 39. | a | False | LUP | 38 | BIP | 10 |
| 40. | $@_2$ | False | LUP | 38 | LCP | 8 |
| 41. | n | False | LUP | 40 | BIP | 4 |
| 42. | $\lambda$d | False | CAP | 40 | LCP | 1 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 43. | $\lambda e$ | False | CAP | 38 | DCP | 42 |
| 44. | $@_9$ | True | PAUSE | 0 | LCP | 43 |
| 45. | d | False | LUP | 44 | BIP | 42 |
| 46. | s | True | LUP | 44 | BIP | 5 |
| 47. | $@_{10}$ | True | PAUSE | 0 | DCP | 44 |
| 48. | d | False | LUP | 47 | BIP | 42 |
| 49. | s | True | LUP | 47 | BIP | 5 |
| 50. | e | False | PAUSE | 0 | BIP | 43 |
| 51. | q | False | PAUSE | 0 | BIP | 11 |
| 52. | z | True | PAUSE | 0 | BIP | 6 |

**Example plus 3 $2^2$ .**
Input term: $((\lambda \ n \ . \ \lambda \ x \ . \ ((n \ @_1 \ (\lambda \ r \ . \ \lambda \ a \ . \ r \ @_2 \ (r \ @_3 \ a)))$ $@_4 \ (\lambda \ n1 \ . \ \lambda \ s1 \ . \ \lambda \ z1 \ . \ (n1 \ @_5 \ s1) \ @_6 \ (s1 \ @_7 \ z1))) \ @_8 \ x) \ @_9$ $(\lambda \ s3 \ . \ \lambda \ z3 \ . \ s3 \ @_{10} \ (s3 \ @_{11} \ z3))) \ @_{12} \ (\lambda \ s2 \ . \ \lambda \ z2 \ . \ s2 \ @_{13}$ $(s2 \ @_{14} \ (s2 \ @_{15} \ z2)))$

| | | | | | | |
|---|---|---|---|---|---|---|
| 1. | $@_{12}$ | False | LUP | 0 | BIP | 0 |
| 2. | $@_9$ | False | LUP | 1 | LCP | 1 |
| 3. | $\lambda n$ | False | CAP | 2 | LCP | 2 |
| 4. | $\lambda x$ | False | CAP | 1 | DCP | 3 |
| 5. | $@_8$ | False | LUP | 0 | LCP | 4 |
| 6. | $@_4$ | False | LUP | 5 | LCP | 5 |
| 7. | $@_1$ | False | LUP | 6 | LCP | 6 |
| 8. | n | False | LUP | 7 | BIP | 3 |
| 9. | $\lambda s3$ | False | CAP | 7 | LCP | 2 |
| 10. | $\lambda z3$ | False | CAP | 6 | DCP | 9 |
| 11. | $@_{10}$ | False | LUP | 5 | LCP | 10 |
| 12. | s3 | False | LUP | 11 | BIP | 9 |
| 13. | $\lambda r$ | False | CAP | 11 | LCP | 7 |
| 14. | $\lambda a$ | False | CAP | 5 | DCP | 13 |
| 15. | $@_2$ | False | LUP | 0 | LCP | 14 |
| 16. | r | False | LUP | 15 | BIP | 13 |
| 17. | $@_{11}$ | False | LUP | 15 | LCP | 11 |
| 18. | s3 | False | LUP | 17 | BIP | 9 |
| 19. | $\lambda r$ | False | CAP | 17 | LCP | 7 |
| 20. | $\lambda a$ | False | CAP | 15 | DCP | 19 |
| 21. | $@_2$ | False | LUP | 0 | LCP | 20 |
| 22. | r | False | LUP | 21 | BIP | 19 |
| 23. | z3 | False | LUP | 21 | BIP | 10 |
| 24. | $\lambda n1$ | False | CAP | 21 | LCP | 6 |
| 25. | $\lambda s1$ | True | LUP | 0 | DCP | 24 |
| 26. | $\lambda z1$ | True | LUP | 0 | LCP | 25 |
| 27. | $@_6$ | False | LUP | 0 | LCP | 26 |
| 28. | $@_5$ | False | LUP | 27 | LCP | 27 |

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| | | | | | | |
|---|---|---|---|---|---|---|
| 29. | n1 | False | LUP | 28 | BIP | 24 |
| 30. | $@_3$ | False | LUP | 28 | LCP | 21 |
| 31. | r | False | LUP | 30 | BIP | 19 |
| 32. | z3 | False | LUP | 30 | BIP | 10 |
| 33. | $\lambda$n1 | False | CAP | 30 | LCP | 6 |
| 34. | $\lambda$s1 | False | CAP | 28 | DCP | 33 |
| 35. | $\lambda$z1 | False | CAP | 27 | DCP | 34 |
| 36. | $@_6$ | False | LUP | 0 | LCP | 35 |
| 37. | $@_5$ | False | LUP | 36 | LCP | 36 |
| 38. | n1 | False | LUP | 37 | BIP | 33 |
| 39. | a | False | LUP | 37 | BIP | 20 |
| 40. | $@_3$ | False | LUP | 37 | LCP | 15 |
| 41. | r | False | LUP | 40 | BIP | 13 |
| 42. | $@_{11}$ | False | LUP | 40 | LCP | 11 |
| 43. | s3 | False | LUP | 42 | BIP | 9 |
| 44. | $\lambda$r | False | CAP | 42 | LCP | 7 |
| 45. | $\lambda$a | False | CAP | 40 | DCP | 44 |
| 46. | $@_2$ | False | LUP | 37 | LCP | 45 |
| 47. | r | False | LUP | 46 | BIP | 44 |
| 48. | z3 | False | LUP | 46 | BIP | 10 |
| 49. | $\lambda$n1 | False | CAP | 46 | LCP | 6 |
| 50. | $\lambda$s1 | False | CAP | 37 | DCP | 49 |
| 51. | $\lambda$z1 | False | CAP | 36 | DCP | 50 |
| 52. | $@_6$ | False | LUP | 0 | LCP | 51 |
| 53. | $@_5$ | False | LUP | 52 | LCP | 52 |
| 54. | n1 | False | LUP | 53 | BIP | 49 |
| 55. | $@_3$ | False | LUP | 53 | LCP | 46 |
| 56. | r | False | LUP | 55 | BIP | 44 |
| 57. | z3 | False | LUP | 55 | BIP | 10 |
| 58. | $\lambda$n1 | False | CAP | 55 | LCP | 6 |
| 59. | $\lambda$s1 | False | CAP | 53 | DCP | 58 |
| 60. | $\lambda$z1 | False | CAP | 52 | DCP | 59 |
| 61. | $@_6$ | False | LUP | 0 | LCP | 60 |
| 62. | $@_5$ | False | LUP | 61 | LCP | 61 |
| 63. | n1 | False | LUP | 62 | BIP | 58 |
| 64. | a | False | LUP | 62 | BIP | 45 |
| 65. | a | False | LUP | 62 | BIP | 14 |
| 66. | x | False | LUP | 62 | BIP | 4 |
| 67. | $\lambda$s2 | False | CAP | 62 | LCP | 1 |
| 68. | $\lambda$z2 | False | CAP | 61 | DCP | 67 |
| 69. | $@_{13}$ | True | LUP | 0 | LCP | 68 |
| 70. | s2 | False | LUP | 69 | BIP | 67 |
| 71. | s1 | False | LUP | 69 | BIP | 59 |
| 72. | s1 | False | LUP | 69 | BIP | 50 |
| 73. | s1 | False | LUP | 69 | BIP | 34 |
| 74. | s1 | True | LUP | 69 | BIP | 25 |

| 75. | $@_{14}$ | True | PAUSE | 0 | DCP | 69 |
| 76. | s2 | False | LUP | 75 | BIP | 67 |
| 77. | s1 | False | LUP | 75 | BIP | 59 |
| 78. | s1 | False | LUP | 75 | BIP | 50 |
| 79. | s1 | False | LUP | 75 | BIP | 34 |
| 80. | s1 | True | LUP | 75 | BIP | 25 |
| 81. | $@_{15}$ | True | PAUSE | 0 | DCP | 75 |
| 82. | s2 | False | LUP | 81 | BIP | 67 |
| 83. | s1 | False | LUP | 81 | BIP | 59 |
| 84. | s1 | False | LUP | 81 | BIP | 50 |
| 85. | s1 | False | LUP | 81 | BIP | 34 |
| 86. | s1 | True | LUP | 81 | BIP | 25 |
| 87. | z2 | False | PAUSE | 0 | BIP | 68 |
| 88. | $@_7$ | True | PAUSE | 0 | LCP | 61 |
| 89. | s1 | False | LUP | 88 | BIP | 59 |
| 90. | s1 | False | LUP | 88 | BIP | 50 |
| 91. | s1 | False | LUP | 88 | BIP | 34 |
| 92. | s1 | True | LUP | 88 | BIP | 25 |
| 93. | z1 | False | PAUSE | 0 | BIP | 60 |
| 94. | $@_7$ | True | PAUSE | 0 | LCP | 52 |
| 95. | s1 | False | LUP | 94 | BIP | 50 |
| 96. | s1 | False | LUP | 94 | BIP | 34 |
| 97. | s1 | True | LUP | 94 | BIP | 25 |
| 98. | z1 | False | PAUSE | 0 | BIP | 51 |
| 99. | $@_7$ | True | PAUSE | 0 | LCP | 36 |
| 100. | s1 | False | LUP | 99 | BIP | 34 |
| 101. | s1 | True | LUP | 99 | BIP | 25 |
| 102. | z1 | False | PAUSE | 0 | BIP | 35 |
| 103. | $@_7$ | True | PAUSE | 0 | LCP | 27 |
| 104. | s1 | True | LUP | 103 | BIP | 25 |
| 105. | z1 | True | PAUSE | 0 | BIP | 26 |