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0.1 Knots Notation

Below a notation to aid in the tying of knots is introduced. The concise notation, adapted from the work of Thomas Fink and Yong Mao, describes the moves required to tie a given knot.

What is sought here is not merely a notation, but it is desired to extract patterns from the provided notation as was done with the box dot notation. First we must introduce our notation.

Knot Notation and Definitions:

- R - *right turn*: A turn just shy of 270 degrees
- L - *left turn*: A turn just shy of 270 degrees
- S - *penetration through loop*: S is for stabilize
- B - *penetration through bend*: A bend is a loop that does not cross
- 2 - double-up rope
- ⊙ - *up*; in some cases *under*
- ⊗ - *down*; in some cases *over*

In this knot notation, a rope is divided into visible sections by loops, crossings, and bends. These segments are numbered sequentially by subscripts 1 and 2. Instead of keeping track of a high number of rope sections, higher order sections are usually denoted by their occurrence from the last section, e.g. -1, -2, etc.

- R_i, L_i - performed on the i^{th} section
- S_i - performed on the i^{th} loop
- $S_{i,j}$ - performed by the i^{th} section of rope on the j^{th} loop
- R_x, L_x - performed on a stationary object, e.g. a tree limb
- R_{-i}, L_{-i}, S_{-i} - performed on the i^{th} to last turn or loop
- $R_{()^n}, L_{()^n}$ - repeat n number of times section
- B_0 - performed on the loop of an initial bend

When more than one line is present in the knot notation, the first line represents the last section of rope (running end), the second line represents the standing end

Gathered below are a few knots with their respective notations.

Miscellaneous Knots:

Four-in-Hand: $L_{\otimes}R_{\odot 1}L_{\otimes 1}S_{\odot 1}S_{\otimes 2}$
 Icicle Hitch: $R_{(\otimes x \odot x)^5}L_{\otimes 1 \odot x}S_{\otimes 1}$

From *Ashley's Book of Knots*, 1978:

4. Overhand: $R_{\odot}S_{\otimes 1}$
5. Bale Sling Hitch: $L_{\otimes x \odot x}R_{\otimes 1}L_{\otimes x \odot x}S_{\otimes 2}$
7. Marlinespike: $R_{\otimes x}L_{\odot x \otimes 1 \otimes x}R_{\odot x}S_{\otimes 1}$
8. The Noose: $L_{\odot}R_{\otimes 1 \otimes 2}L_{\odot -1}S_{\odot 2}$
11. Clove Hitch: $L_{\otimes x}R_{\odot x \otimes 1 \otimes x}L_{\odot x \odot -1}$
24. Fisherman's Bend: $R_{\odot x \otimes x \odot x \otimes x}L_{\otimes 1}R_{\odot -2 \odot -1}L_{\otimes 1}S_{\otimes 2}$
25. Studding-Sail Halyard Bend: $R_{\odot x \otimes x \odot x \otimes x}L_{\otimes 1}R_{\odot -2 \odot -1}L_{\otimes -1 \odot -2}$
- 39(287). Loop Knot: $R_{\otimes}S_{\odot 1}R_{\odot 1}S_{\otimes 1}$
54. Two-Half Hitches: $L_{\otimes x \odot x}R_{\otimes 1}S_{\odot 1}L_{\otimes -1}R_{\otimes 1}S_{\odot 2}$
55. Buntline: $L_{\otimes x \odot x}R_{\otimes 1}L_{\odot 1}R_{\otimes -1 \otimes 1}S_{\odot 1}R_{\odot -1}$
56. Cow Hitch: $R_{\otimes x \odot x}L_{\otimes 1}R_{\otimes x \odot x}S_{\otimes 2}$
57. Reversed Half Hitches: $L_{\otimes x \odot x}R_{\otimes 1}S_{\odot 1}L_{\otimes -1}R_{\odot 1}S_{\otimes 2}$
60. Double Ring Hitch: $2(S_{\odot 0}S_{\otimes 1})$
61. Magnus Hitch: $R_{\otimes x \odot x \otimes x \odot x}L_{\otimes 1}R_{\otimes x \odot -1}$
62. Midshipman's: $L_{\otimes x \odot x}R_{\otimes 1}S_{\odot 1}R_{\otimes 1}S_{\odot 1}R_{\otimes 2 \otimes 1}S_{\odot 2}$
66. Sheet Bend: L_{\odot}
 $S_{\otimes 1}R_{\otimes 2,1}S_{\odot 1}$
66. Sheet Bend: $L_{\odot}:S_{\otimes 1}R_{\otimes 2,1}S_{\odot 1}$
80. Granny Knot: $R_{\otimes x \odot x \odot 1}L_{\otimes 1}R_{\odot -1 \otimes 1}S_{\odot 1}$
81. Two Half Hitches: $L_{\otimes x \odot x \otimes 1}S_{\otimes 1}L_{\odot 1}S_{\odot 2}$
83. Awning Knot: $L_{\otimes x \odot x}R_{\odot 1}S_{\otimes 1}R_{\odot 1}S_{\otimes 1}$
154. The Picket-Line Hitch:
- 287(39). Bowline: $R_{\otimes}S_{\odot 1}R_{\odot 1}S_{\otimes 1}$

The Bends

- Alpine Butterfly Bend: $R_{\otimes 1,2}L_{\otimes 1,1}R_{\odot 1,2}S_{\odot 1}:R_{\otimes 2,2}L_{\odot 1,1}S_{\odot 1}S_{\odot 2}$
 Carrick Bend: $L_{\odot 1,1}:S_{\odot 1}S_{\otimes 1}R_{\otimes 2,1 \odot 2,1(2)}:S_{\odot 2}$
 Hunter's Bend: $L_{\odot 1,2}R_{\otimes 1,1}L_{\odot 1,1 \odot 1,2}S_{\odot 1}:L_{\odot 2,2}R_{\otimes 2,2}S_{\otimes 2}S_{\otimes 1}$
 Sheet Bend: $R_{\otimes 1,2}:R_{\odot 2,1(2)}S_{\odot 2}$
 Single Carrick Bend: $L_{\odot 1,2}R_{\otimes 1,2}:L_{\odot 2,1}R_{\odot 2,1 \odot 2,2}B_{\odot 1}$
 Zeppelin Bend: $L_{\odot 1,1}R_{\otimes 1,2}S_{\odot 1}:L_{\odot 2,2}S_{\otimes 1}S_{\otimes 2}$