

Pensieve header: A brute force program to compute the width of a knot.

```
In[ ]:= << KnotTheory`
```

```
Loading KnotTheory` version of February 2, 2020, 10:53:45.2097.
Read more at http://katlas.org/wiki/KnotTheory.
```

```
In[ ]:= pd = PD@Knot[8, 17]
```

```
Out[ ]:= PD[X[6, 2, 7, 1], X[14, 8, 15, 7], X[8, 3, 9, 4], X[2, 13, 3, 14],
X[12, 5, 13, 6], X[4, 9, 5, 10], X[16, 12, 1, 11], X[10, 16, 11, 15]]
```

```
In[ ]:= ? FoldList
```

Symbol ?

FoldList[f, x, {a, b, ...}] gives {x, f[x, a], f[f[x, a], b], ...}.

FoldList[f, {a, b, c, ...}] gives {a, f[a, b], f[f[a, b], c], ...}.

FoldList[f] represents an operator form of FoldList that can be applied to expressions.

▼

```
In[ ]:= pd
```

```
Out[ ]:= PD[X[6, 2, 7, 1], X[14, 8, 15, 7], X[8, 3, 9, 4], X[2, 13, 3, 14],
X[12, 5, 13, 6], X[4, 9, 5, 10], X[16, 12, 1, 11], X[10, 16, 11, 15]]
```

```
In[ ]:= FoldList[Complement[#1 ∪ #2, #1 ∩ #2] &, {}, List@@List@@@pd]
```

```
Out[ ]:= {{}, {1, 2, 6, 7}, {1, 2, 6, 8, 14, 15}, {1, 2, 3, 4, 6, 9, 14, 15},
{1, 4, 6, 9, 13, 15}, {1, 4, 5, 9, 12, 15}, {1, 10, 12, 15}, {10, 11, 15, 16}, {}}
```

```
In[ ]:= Max[Length /@ FoldList[Complement[#1 ∪ #2, #1 ∩ #2] &, {}, List@@List@@@pd]]
```

```
Out[ ]:= 8
```

```
In[ ]:= Width[pd_PD] :=
```

```
Max[Length /@ FoldList[Complement[#1 ∪ #2, #1 ∩ #2] &, {}, List@@List@@@pd]]
```

```
In[ ]:= Width[PD@Knot[8, 17]]
```

```
Out[ ]:= 8
```

```
In[ ]:= Min[Width /@ Permutations[PD@Knot[4, 1]]]
```

```
Out[ ]:= 4
```

```
Width[pd_PD] :=
```

```
Max[Length /@ FoldList[Complement[#1 ∪ #2, #1 ∩ #2] &, {}, List@@List@@@pd]];
```

```
Table[Echo[K → Min[Width /@ Permutations[PD@K]], {K, AllKnots[]}]
```

- » Knot[0, 1] → 1
- » Knot[3, 1] → 4
- » Knot[4, 1] → 4
- » Knot[5, 1] → 4
- » Knot[5, 2] → 4

- » Knot [6, 1] → 4
- » Knot [6, 2] → 4
- » Knot [6, 3] → 4
- » Knot [7, 1] → 4
- » Knot [7, 2] → 4
- » Knot [7, 3] → 4
- » Knot [7, 4] → 4
- » Knot [7, 5] → 4
- » Knot [7, 6] → 4
- » Knot [7, 7] → 4
- » Knot [8, 1] → 4
- » Knot [8, 2] → 4
- » Knot [8, 3] → 4
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- » Knot [8, 9] → 4
- » Knot [8, 10] → 6
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- » Knot [8, 19] → 6
- » Knot [8, 20] → 6
- » Knot [8, 21] → 6
- » Knot [9, 1] → 4
- » Knot [9, 2] → 4
- » Knot [9, 3] → 4
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- » Knot [9, 5] → 4

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- » Knot [10, 1] → 4
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- » Knot [10, 165] → 6

KnotTheory: Loading precomputed data in DTCODE4KNOTS TO 11`.

KnotTheory: The GaussCode to PD conversion was written by Siddarth Sankaran at the University of Toronto in the summer of 2005.

- » Knot [11, Alternating, 1] → 6
- » Knot [11, Alternating, 2] → 6
- » Knot [11, Alternating, 3] → 6
- » Knot [11, Alternating, 4] → 6

Out[]= \$Aborted