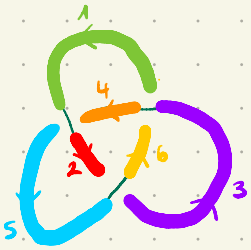
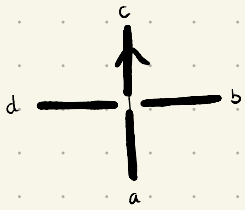
## 3. Planar diagrams and Sage

Need to translate  ⇝ numbers (Note orientation)

- Step 1: break up the link into edges, and label them $1, \dots, n$ following the orientation:




- Step 2: at each crossing, record the four numbers according to the following rule:




$\longmapsto$ [a,b,c,d]

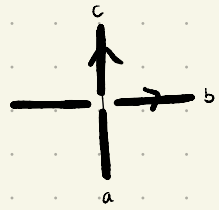
Example:

1, 5, 2, 4

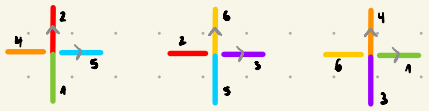
**Result:** [(1, 5, 2, 4), (5, 3, 6, 2), (3, 1, 4, 6)]

### How to get back the link?

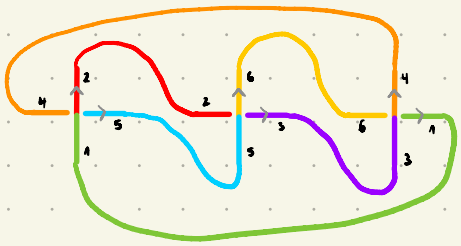
Step 1: Draw a crossing for each group of 4, according to the rule: [a,b,c,d] $\longmapsto$




[(1, 5, 2, 4), (5, 3, 6, 2), (3, 1, 4, 6)]



Step 2: Match the edges:



Task 0: • 
```
1+1
```
• Click Run (or press Shift+Enter):
```
1+1
2
```
Q?

Task 1:

- Start a new cell
- Import SnapPy:

```
import snappy
```

- Write down the Planar Diagram code:

```
PD= [(1, 5, 2, 4), (5, 3, 6, 2), (3, 1, 4, 6)]
```

- Define a SnapPy link:

```
L_snappy = snappy.Link(PD)
```

- Make it a Sage link:

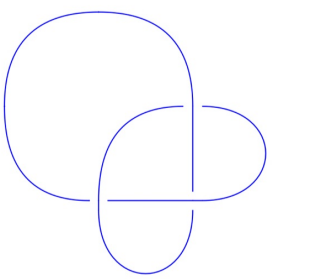
```
L=L_snappy.sage_link()
```

- Plot it:

```
L.plot()
```

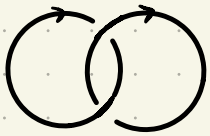
Q?

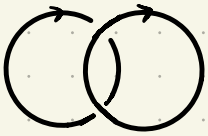
```
import snappy
PD= [(1, 5, 2, 4), (5, 3, 6, 2), (3, 1, 4, 6)]
L_snappy = snappy.Link(PD)
L=L_snappy.sage_link()
L.plot()
```

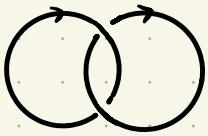


# 3. Planar diagrams and Sage

## 1. Write down the PD code for the following link diagrams:

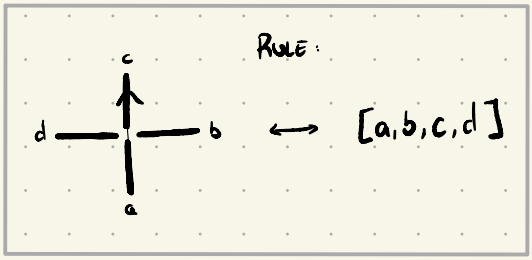
a) 

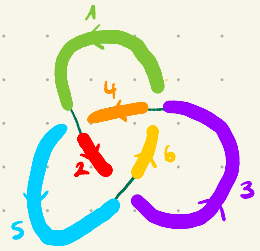
b) 

c) 

Hint: recall the procedure was:

- Step 1: Break into pieces:
- Step 2: Decode using the rule:




⇝ [(1,5,2,4),(5,3,6,2),(3,1,4,6)]

## 2. Draw the link diagrams associated to the following PD codes:

a) [(1,2,2,1)]

b) [(1,1,2,2)]

c) [(4,2,3,1),(1,3,2,4)]

d) [(3,1,4,2),(4,1,3,2)]

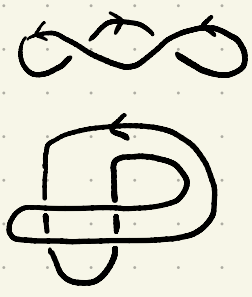
[(1,5,2,4),(5,3,6,2),(3,1,4,6)]

Recall:
- Step 1: draw the crossings you need, anywhere you like:

- Step 2: match the edges accordingly:

## 3. Plot the links you obtained in 1 and 2 in Sage.

## 4. Obtain PD codes for the following link diagrams using SnapPy. Then plot them in Sage.

a) 

b)