

# Example use of EDSTools

Load the script.

```
attach('edstools.sage')
```

Create an elliptic divisibility sequence from the initial four terms.

```
eds = EDS([1,2,5,6]); eds
```

```
An elliptic divisibility sequence with first terms 1, 2, 5, 6
```

Display terms or a given term. The computation of term  $m$  takes  $\log m$  time, using a double-and-add approach (Shipsey).

```
eds.terms(5)
```

```
[0, 1, 2, 5, 6, -77]
```

```
eds.term(5)
```

```
-77
```

```
eds.term(70)
```

```
92124760843887779407091797168668468939554918287393982924043772016333\  
65614173377701697764470238874055698174684706930575009451462096495396\  
15358465088898205625945008306867454732296183586525062861979168754744\  
55321354609327586494219093702658398206969759988898993558271148334336\  
59407598324079467556232328691611705857480612168387037463098136534229\  
399787255794486639259189232928801545945623731314344607835320798
```

Check for the rank (i.e. the first zero) up to a given bound. This sequence has infinite rank (no zeroes).

```
eds.rank(100)
```

```
'Rank not found'
```

Find a curve and point that correspond to the sequence. You can ask just for given coefficients using functions `a`, `b`, `c` (usual Weierstrass coefficients).

```
curve = eds.curve(); curve
```

```
[9/10, 39/20, 2, 1, 0]
```

```
eds.a(2)
```

```
39/20
```

```
point = eds.point(); point
```

```
[0, 0]
```

You can also create a sequence from a curve and point. If we use the curve and point we got above, we get back the original sequence.

```
eds
```

```
An elliptic divisibility sequence with first terms 1, 2, 5, 6
```

```
edstwo = EDS(curve, point); edstwo
```

```
An elliptic divisibility sequence with first terms 1, 2, 5, 6
```

You can ask for j-invariant and discriminant.

```
eds.j_invariant()  
4972104743956839/63788500000000
```

```
E = EllipticCurve(curve); E.j_invariant()  
4972104743956839/63788500000000
```

You can create a sequence from twice the point, directly or using the function subsequence.

```
P = E(point); 2*P  
(-5/4 : -1/4 : 1)
```

```
edsthree = EDS(E, 2*P); edsthree  
An elliptic divisibility sequence with first terms 1, 3/8, -215/128,  
-50037/32768
```

```
edssub = eds.subsequence(2); edssub  
An elliptic divisibility sequence with first terms 1, 3/8, -215/128,  
-50037/32768
```

You can take an equivalent sequence (i.e. scale by  $a^{(n^2-1)}$ ).

```
eds  
An elliptic divisibility sequence with first terms 1, 2, 5, 6
```

```
eds.equivalent(2)  
An elliptic divisibility sequence with first terms 1, 16, 1280,  
196608
```