

Sample Terminal Sessions

```
?|- makeEmpty(Q1).
```

```
    Q1 = q(X1,X1)
```

```
?|- makeEmpty(Q1),
```

```
    enqueue(a,Q1,Q2).
```

```
    Q2 = q([a|X2], X2)
```

```
?|- makeEmpty(Q1),
```

```
    enqueue(a,Q1,Q2),
```

```
    enqueue(b,Q2,Q3).
```

```
    Q3 = q([a,b|X3], X3)
```

```
?|- makeEmpty(Q1),
```

```
    enqueue(a,Q1,Q2),
```

```
    enqueue(b,Q2,Q3),
```

```
    enqueue(c,Q3,Q4),
```

```
    enqueue(d,Q4,Q5).
```

```
    Q5 = q([a,b,c,d|X5], X5)
```

```
? |- makeEmpty(Q1),
      enqueue(a,Q1,Q2),
      enqueue(b,Q2,Q3),
      enqueue(c,Q3,Q4),
      enqueue(d,Q4,Q5),
      dequeue(A,Q5,Q6).
      A = a
      Q6 = q([b,c,d|X6], X6)
```

```
? |- makeEmpty(Q1),
      enqueue(a,Q1,Q2),
      enqueue(b,Q2,Q3),
      enqueue(c,Q3,Q4),
      enqueue(d,Q4,Q5),
      dequeue(_,Q5,Q6),
      dequeue(A,Q6,Q7).
      A = b
      Q7 = q([c,d|X7], X7)
```

```
? |- makeEmpty(Q1),
      enqueue(a,Q1,Q2),
      enqueue(b,Q2,Q3),
      enqueue(c,Q3,Q4),
      enqueue(d,Q4,Q5),
      dequeue(_,Q5,Q6),
      dequeue(_,Q6,Q7),
      enqueue(e,Q7,Q8).

      Q8 = q([c,d,e|X8], X8)
```

Efficient Queues

Make-Queue Program and Query:

`makeEmpty(q(X,X)).`

`?|- makeEmpty(Q).`
`Q = q(X,X)`

Enqueue Program and Query:

`enqueue(A, q(L,X), q(L,Y)) :- X = [A|Y].`
i.e., replace X by [A|Y] in L.

`?|- enqueue(d, q([a,b,c|X],X), Q).`
`Q = q([a,b,c,d|Y], Y)`

Efficient Queues (Cont'd)

Dequeuing Program and Query:

`dequeue(A, q(L1,Y), q(L2,Y)) :- L1 = [A|L2].`
i.e., extract A and L2 from L1.

`?|- dequeue(A, q([a,b,c,d|Y],Y), Q).`
A = a
Q = q([b,c,d|Y],Y).