

The 8-5-3 Milk Jug Problem

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Question. Can the milkman measure out 4 litres?

Challenge. Draw the state graph of this problem (no spilling allowed!).

Here are all of the possible moves. Given the current state $s = \{a, b, c\}$, $f[x, y, s]$ returns the state after pouring from the x -litre jug to the y -litre jug, where a, b, c is the number of litres in the 8-, 5-, 3-litre jug, respectively.

```
f[8, 5, {a_, b_, c_}] := {a + b - 5, 5, c};
f[8, 3, {a_, b_, c_}] := {a + c - 3, b, 3};
f[5, 8, {a_, b_, c_}] := {a + b, 0, c};
f[5, 3, {a_, b_, c_}] := If[b + c ≥ 3, {a, b + c - 3, 3}, {a, 0, b + c}];
f[3, 8, {a_, b_, c_}] := {a + c, b, 0};
f[3, 5, {a_, b_, c_}] := {a, b + c, 0};
```

Here is the start state s .

```
s = {8, 0, 0};
```

We can make the following moves to get 4 litres

```
s = f[8, 5, s]
```

```
{3, 5, 0}
```

```
s = f[5, 3, s]
```

```
{3, 2, 3}
```

```
s = f[3, 8, s]
```

```
{6, 2, 0}
```

```
s = f[5, 3, s]
```

```
{6, 0, 2}
```

```
s = f[8, 5, s]
```

```
{1, 5, 2}
```

```
s = f[5, 3, s]
```

```
{1, 4, 3}
```

I am stuck on how to get all of the possible outcomes...