Solving System of Linear Congruences

```
format short
```

GIven Values

```
      % a1 a2 b1 b2 c1 c2 m
      % 7  5  5  3  5  7  7
vals = [7  5  5  3  5  7  7]
```

```
vals = 1×7
     7     5     5     3     5     7     7
```

```
a1 = vals(1); a2 = vals(2); b1 = vals(3); b2 = vals(4); c1 = vals(5); c2 = vals(6);
m = vals(7);
```

Solving using matrix method

```
A = [a1 b1; a2 b2]
```

```
A = 2×2
     7     5
     5     3
```

```
B = [c1 ; c2]
```

```
B = 2×1
     5
     7
```

```
C = mod(A\B, m)
```

```
C = 2×1
    5.0000
    1.0000
```

Extract the numerators

```
[N, D] = rat(C)
```

```
N = 2×1
     5
     1
D = 2×1
     1
     1
```

```
ANS = mod(N, m)
```

```
ANS = 2×1
     5
     1
```

Verification

```
syms k
```

Solutions

```
x = m*k + ANS(1)
```

$$x = 7k + 5$$

```
y = m*k + ANS(2)
```

$$y = 7k + 1$$

Check of Equality

```
eq1 = mod(a1*x + b1*y, m) == mod(c1, m);
logical(eq1)
```

```
ans = logical
   1
```

```
eq2 = mod(a2*x + b2*y, m) == mod(c2, m);
logical(eq2)
```

```
ans = logical
   1
```