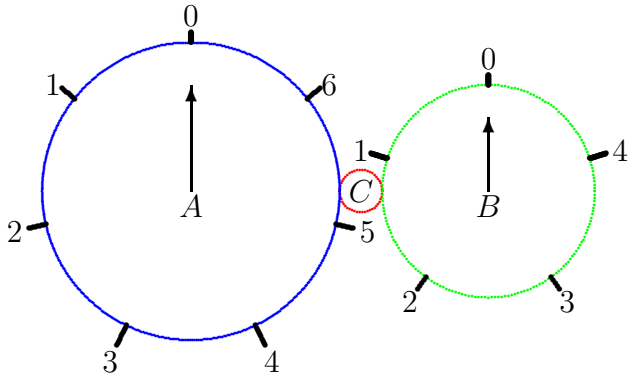
The Wheel Problem

Problem:



Given: 3 wheels:
A : radius $35cm$
B : radius $25cm$
C : radius $5cm$

What is the minimal number of rotations of C that are necessary such that A points to 2 and B points to 3?

Analysis: If C rotates once, a pt. on C moves $5(2\pi)$cm
$\Rightarrow$ a point on A moves $5 \cdot 2\pi = \frac{1}{7}35(2\pi)$cm
$\Rightarrow$ A makes $\frac{1}{7}$ rot'n $\Rightarrow$ A's pointer advances by 1.
Similarly: If C rotates once, a point on B moves $5 \cdot 2\pi = \frac{1}{5}25(2\pi)$cm $\Rightarrow$ B makes $\frac{1}{5}$ rotation
$\Rightarrow$ B's pointer advances by 1.

Thus: if x denotes a fixed number of rotations of C, then for $x = 0, 7, 14, \ldots$, A's pointer is at 0,
and for $x = 2, 9, 16, \ldots$, A's pointer is at 2.
Therefore: $x \equiv 2 \pmod 7 \Leftrightarrow$ A's pointer is at 2.
Similarly: $x \equiv 3 \pmod 5 \Leftrightarrow$ B's pointer is at 3.

Result: $\left\{ \begin{array}{l} A\text{'s pointer is at } 2 \\ B\text{'s pointer is at } 3 \end{array} \right\} \Leftrightarrow \left\{ \begin{array}{l} x \equiv 2 \pmod 7 \\ x \equiv 3 \pmod 5 \end{array} \right\}$