The number n can be written in base 14 as abc, in base 15 as acb and in base 6 as $acac$ $(a > 0)$. Find the base 10 representation of n.

$$n = c \times 1 + b \times 14 + a \times 14^2$$
$$= c + 14b + 196a \quad (1)$$
] Base 14

$$n = b \times 1 + c \times 15 + a \times 15^2$$
$$= b + 15c + 225a \quad (2)$$
] base 15

$$n = c \times 1 + a \times 6 + c \times 36 + a \times 216$$
$$= 37c + 222a \quad (3)$$
] base 6

Know $a \in \{1, \ldots, 5\}$ · leading digit
· involved in base 6 rep

$b \in \{0, \ldots, 13\}$ · involved in base 14 rep

$c \in \{0, \ldots, 5\}$ · involved in base 6 rep

From (2) and (3):

$$b + 15c + 225a = 37c + 222a$$

$\Rightarrow \quad b = 22c - 3a$

From ① and ②:

$c + 14b + 196a = b + 15c + 225a$

$\Rightarrow \quad 13b = 14c + 29a$

$\Rightarrow \quad 13(22c - 3a) = 14c + 29a$

$\Rightarrow \quad 286c - 39a = 14c + 29a$

$\Rightarrow \quad 272c = 68a$

$\Rightarrow \quad 136c = 34a$

$\Rightarrow \quad 68c = 17a$

$\Rightarrow \quad 4c = a$

Given that $1 \leq a \leq 5$ and $0 \leq c \leq 5$, we must have $c = 1$ and $a = 4$

Hence $n = 37c + 222a$

$= 37 + 888$

$= 925$

Also: $b = 22c - 3a = 22 - 12 = 10$