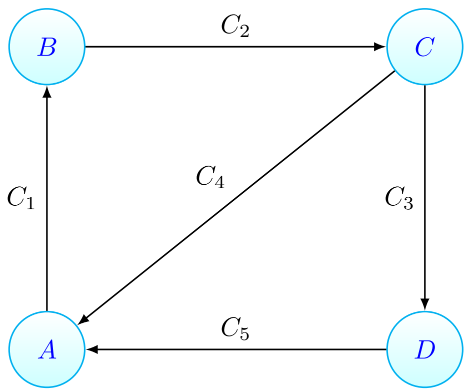
# 1 Part 2

We're composing two sets of vectors for a person traveling between $A \to C$ and $C \to C$. We've already done some work here getting a feel for what the vectors actually mean, so, let's try to describe the sets $S_{AC}$ and $S_{CC}$.

## 1.1 For $S_{AC}$

So. We can break this down. Really. Once we're at $C$ things are the same, so, we can borrow from the work we actually did first... Avoiding drawing a... fine, I'll do it. [1]




We take as the number of moves past each camera $C_n$ the corresponding entry in the column vector

$$\begin{bmatrix} c_1 \\ c_2 \\ c_3 \\ c_4 \\ c_5 \end{bmatrix}$$

**Part A** Going to do the work for B here and restate the answer later, as having shown it here gives us an easy way by which to generate 4 members of the set.

$$S_{AC} = \begin{bmatrix} 1 \\ 1 \\ 0 \\ 0 \\ 0 \end{bmatrix} + c_1 \begin{bmatrix} 1 \\ 1 \\ 0 \\ 1 \\ 0 \end{bmatrix} + c_2 \begin{bmatrix} 1 \\ 1 \\ 1 \\ 0 \\ 1 \end{bmatrix}$$

It doesn't seem worth the effort to illustrate this. We're composing all the possible set of vectors that

1. Go from $A \to B \to C$ to begin with

[1] Borrowing from https://tex.stackexchange.com/questions/57152/how-to-draw-graphs-in-latex

2. Travel from $C$ to $C$ via $C \to D \to A \to B \to C$
3. Travel from $C$ to $C$ via $C \to A \to B \to C$

This composes the set nicely. We can plug in a couple of coefficients for each, giving

1. Letting $c_1 = c_2 = 0$ gives $\langle 1, 1, 0, 0, 0 \rangle \in S_{AC}$
2. Letting $c_1 = 1$ and $c_2 = 0$ gives $\langle 2, 2, 1, 0, 1 \rangle \in S_{AC}$
3. Letting $c_1 = 0$ and $c_2 = 1$ gives $\langle 2, 2, 0, 1, 0 \rangle \in S_{AC}$
4. Letting $c_1 = 1$ and $c_2 = 1$ gives $\langle 3, 3, 1, 1, 1 \rangle \in S_{AC}$

We can understand $\langle 3, 3, 1, 1, 1 \rangle$ as taking each of the separate paths we've defined

**Part B** Restating as above

$$S_{AC} = \begin{bmatrix} 1 \\ 1 \\ 0 \\ 0 \\ 0 \end{bmatrix} + c_1 \begin{bmatrix} 1 \\ 1 \\ 0 \\ 1 \\ 0 \end{bmatrix} + c_2 \begin{bmatrix} 1 \\ 1 \\ 1 \\ 0 \\ 1 \end{bmatrix} \text{ where } c_1, c_2 \in \mathbb{Z}^*$$

we simply need to add a restriction here, as, negative and partial movements are not defined.

## 1.2 For $S_{CC}$

We've already done all the work here, and I think the above explanations are sufficient, so, I'll be brief.

**Part A**

$$S_{CC} = c_1 \begin{bmatrix} 1 \\ 1 \\ 0 \\ 1 \\ 0 \end{bmatrix} + c_2 \begin{bmatrix} 1 \\ 1 \\ 1 \\ 0 \\ 1 \end{bmatrix} \text{ where } c_1, c_2 \in \mathbb{Z}^*$$

1. Letting $c_1 = c_2 = 0$ gives $\langle 0, 0, 0, 0, 0 \rangle \in S_{CC}$, the trivial solution
2. Letting $c_1 = 1$ and $c_2 = 0$ gives $\langle 1, 1, 0, 1, 0 \rangle \in S_{CC}$
3. Letting $c_1 = 0$ and $c_2 = 1$ gives $\langle 1, 1, 1, 0, 1 \rangle \in S_{CC}$
4. Letting $c_1 = 1$ and $c_2 = 1$ gives $\langle 2, 2, 1, 1, 1 \rangle \in S_{CC}$

**Part B** Restating as above

$$S_{CC} = c_1 \begin{bmatrix} 1 \\ 1 \\ 0 \\ 1 \\ 0 \end{bmatrix} + c_2 \begin{bmatrix} 1 \\ 1 \\ 1 \\ 0 \\ 1 \end{bmatrix} \text{ where } c_1, c_2 \in \mathbb{Z}^*$$