For Problem A

Initially, we assume that when only one person is walking on the stairs, the walkway selection for each step remains consistent, meaning they will walk along the same walkway throughout. Based on the formula n from the ...... model and the results obtained from the pseudocode, we can derive the total number of people on each walkway as follows:

\[ K\_i = K\_{Ai} + K\_{Bi} + K\_{Ci} + K\_{Di} \]

Using this expression, we can calculate the total number of people on each path, which is then visually represented using a bar chart (as shown in Figure n).

After calculating the total number of people on each walkway, we further sum these values to obtain the total number of people using the stairs, expressed as:

\[ K\_{\text{total}} = \sum\_{i=1}^n K\_i \]

For Problem A:

The question of "How often were the stairs used?" is quantified as the average usage frequency of the stairs over the total usage time, with the calculation formula as follows:

\[ \text{usage frequency} = \frac{K\_{\text{total}}}{\text{total usage time}} \]

On this basis, the average time interval between uses of the stairs is obtained as .......

For Problem B:

The total number of people descending the stairs can be expressed as:

\[ K\_{\text{downstairs}} = K\_B + K\_D \]

The total number of people ascending the stairs can be expressed as:

\[ K\_{\text{upstairs}} = K\_A + K\_C \]

By comparing the total numbers of ascending and descending, We can draw the following conclusions regarding the direction of travel favored by the people using the stairs:

\begin{itemize}

\item If \(...\), it indicates that the travel direction favored by the people using the stairs is \textbf{ascending}.

\item If \(...\), it indicates that the travel direction favored by the people using the stairs is \textbf{descending}.

\end{itemize}

For problem C:

The Z-scores formula can be used to determine outliers in the data. When the Zi corresponding to the ith data in a data set satisfies the condition Zi>3.5\cite{curtis2016mystery}, it can be considered that there is a peak at that data point. The Z-scores formula is as follows:

\[ Z\_i = \frac{K\_i - \bar{K}}{\sqrt{\text{Var}(K)}} \]

Where Var(k) refers to the variance of the number of people on walkways and represents the mean value of the number of people on walkways.

The Z-scores formula can be used to determine whether a peak exists in the bar graph of the number of people on each walkway:

If a peak exists, it indicates that the number of people on a certain walkway is significantly higher than on other paths, suggesting that people tend to walk in a line;

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If there is no peak, it indicates that the distribution of people across walkways is relatively uniform, suggesting that people prefer to walk side by side.