Assignment 2
Due date: 1 November 2024
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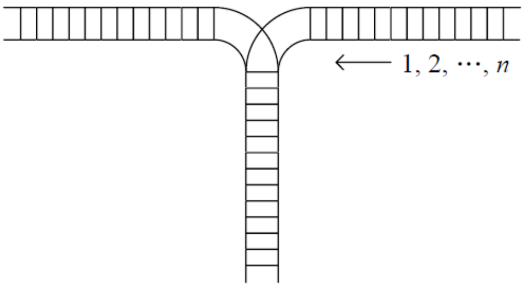
1. (25%) Rewrite `fast_transpose` so that it uses ONLY ONE array rather than the two arrays required to hold row_terms and `starting_pos`.

   Note: You can only submit the C *function* (or *pseudo-code*).

2. (25%) Consider the railroad switching network (Figure below). Railroad cars numbered 0, 1, …, $n-1$ are the right. Each car is brought into the **stack** of **limited capacity 3** and can be popped out **at any time**. For instance, if $n = 3$, we could move in 0, move in 1, move in 2, and then take the cars out, producing the new order 2, 1, 0. For $n = 4$, find out the IMPOSSIBLE permutations of the cars. Submit your answers as well as either your explanations or the C code.

   (*Hint*: Implement the stack and consider all sequences of *n* pushes and *n* pops.)



3. (25%) Prove that the value of `count` in the function below is $\Theta(n \log n)$.

```
double coupon_count(int n) {
     double count = 0;
     for (i=0; i<n; i++) {
          count += n/(n-i);
     }
     return count;
}
```

4. (15%) Compute the postfix and prefix form of the following expressions (assuming unary negation as ~):

   (a). $a * b * c$

   (b). $-a + b - c + d$

   (c). $(a + b) * d + e / (f + a * d) + c$

5. (10%) Evaluate the following expressions.

   (a). $+ / + 2\ 4\ 3 / * 4 + / 6\ 2\ 1\ 8$ (prefix form)

   (b). $4\ 2 - 5 * 6\ 3 / +$ (postfix form)