Vehicle Routing Problem

Genetic Algorithm

Partially Matched Crossover (PMX)

```
PMX[chr1_, chr2_, pt1_, pt2_] := Module[
   {n, sub1, sub2, sub3, os, i, j, pos},
   n = Length[chr1];
   sub1 = chr1[[1 ;; pt1]];
   sub2 = chr2[[pt1 + 1 ;; pt2]];
   sub3 = chr1[[pt2 + 1 ;; n]];
   For[i = 1, i ≤ Length[sub1], i++,
    For[j = 1, j ≤ Length[sub2], j++,
      pos = Position[sub2, sub1[[i]]];
      If[pos ≠ {}, sub1[[i]] = chr1[[pt1 + pos[[1, 1]]]], Break[]];
     ];
   ];
   os = Join[sub1, sub2];
   For[i = 1, i ≤ Length[sub3], i++,
    For[j = 1, j ≤ Length[os], j++,
      pos = Position[os, sub3[[i]]];
      If[pos ≠ {}, sub3[[i]] = chr1[[pos[[1, 1]]]], Break[]];
     ];
   ];
   os = Join[os, sub3];
   Return[os];
  ];
```

In[12]:=
```
pt1 = 5;
pt2 = 10;
p1 = RandomSample[Range[2, 15], 14];
p2 = RandomSample[Range[2, 15], 14];
os = PMX[p1, p2, pt1, pt2];
p1 = Table[If[i ≤ pt1 || i > pt2, Style[p1[[i]], Purple], p1[[i]]], {i, 1, 14}];
p2 = Table[If[i > pt1 && i ≤ pt2, Style[p2[[i]], Purple], p2[[i]]], {i, 1, 14}];
os = Table[If[i > pt1 && i ≤ pt2, Style[os[[i]], Red], Style[os[[i]], Blue]], {i, 1, 14}];
Grid[{Prepend[p1, "Parent 1"],
  Prepend[p2, "Parent 2"], Prepend[os, "Offspring"]}, Frame → All]
DuplicateFreeQ[
 os]
```

Out[20]=

Parent 1	9	11	10	3	15	13	12	14	6	4	5	8	7	2
Parent 2	15	13	7	8	6	2	11	12	3	14	9	10	4	5
Offspring	9	4	10	6	15	2	11	12	3	14	5	8	7	13

Out[21]=
```
True
```