pseudo code:

```
size = nums.size();
starting_city = 0;
fuel_left = 0;
for (i=0; i<size; i++) {
    cost = fuel[i] * mpg - distance[i];
    fuel_left = fuel_left + cost;
    if( no more fuel) {
        starting_city = next city;
        fuel_left =0;
    }
}
return starting_city
```

// Mathematical Analysis & Big O

integer fuel init = O(1)
integer size init = O(1)
integer starting city init = O(1)
integer cost init = O(1)

} O(1+1+1+1)

for loop from 1 to size = O(n)

} O(n) * O(1+1+1+1)

Calculate cost = O(1)

Calculate fuel_left = O(1)

Comparison = O(1)

Increment starting city = O(1)

reassignment of fuel = O(1)

$O(n) \cdot O(1+1+1+1+1)$

return answer = O(1)

O(1)

Step count function:

$$O(5) + O(n) \cdot O(5) + O(1)$$

$$= O(5) + O(5n) + O(1)$$

$$f(n) = 5n + 6$$

prove $f(n) \leq c \cdot g(n)$ for $n \geq n_0$

Let $g(n) = n$

$\Rightarrow 5n + 6 \leq c \cdot n$

$= 5 + \frac{6}{n} \leq c$

Assume the smallest value for $n_0 = 1$.

$\Rightarrow 5 + \frac{6}{1} \leq c$

$= 5 + \frac{6}{1} \leq c$

$= c \geq 11$

Verify the constant c & n_0 in the original expression

$f(n) \leq c \cdot g(n)$ $n = 1$ $c = 11$

$\Rightarrow 5(1)+6 \leq 11 \cdot (1)$

$11 \leq 11$ ✓

So $f(n) \in O(n)$,