Seating Trouble

Problem

This problem is due to J. B. Parker published in *Eureka* **05** (January, 1941) 20.

Seven men, Messrs. Black, Blue, Brown, Gray, Green, Purple and White sat down at a circular table laid for eight. Each man was wearing a tie and a pair of socks – and also had a car, their colours being three of the names of the other six men. There was a tie, a pair of socks and a car of each of the seven colours.

The original paragraphs are now split and numbered below to facilitate easier referencing in the solution.

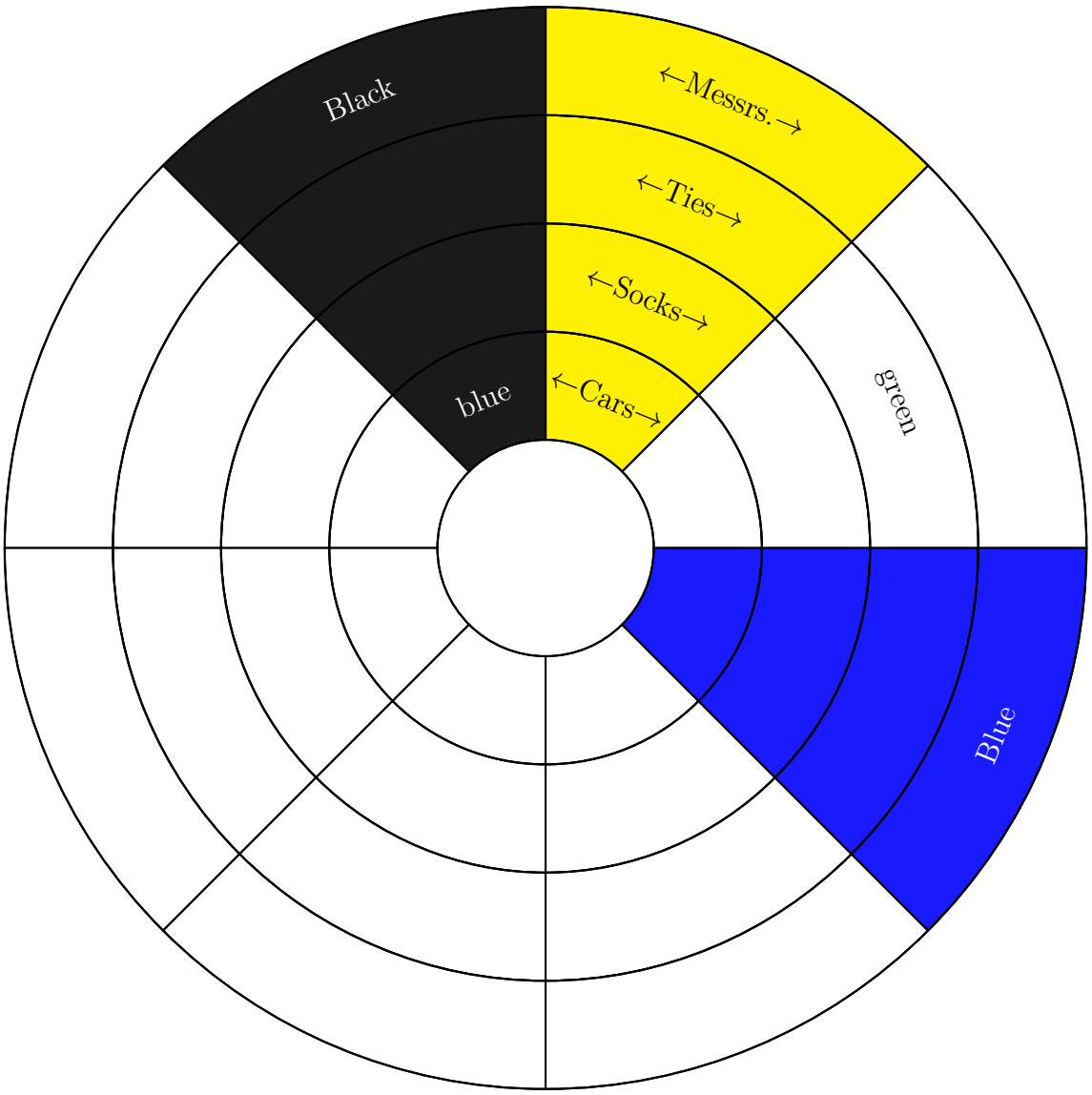
1. Mr. Blue sat next to the man with the green tie;
2. between Mr. Gray and the man with white socks there sat a man wearing a white tie, and opposite him sat Mr. Green.
3. Mr. Brown's socks were of the same colour as the tie of the man who occupied the chair on his right,
4. and Mr. Green wore a brown tie.
5. The empty chair lay between Mr. Black and the man who wore a green tie.
6. The man with black socks had a gray car, and the man with gray socks had a black car.
7. Mr. Purple's car was the same colour as Mr. Gray's tie, and this was of the same colour as Mr. White's socks.
8. The man with the name of the colour of Mr. White's car wore socks of the colour of Mr. Black's car, i.e. blue.
9. Mr. Purple's tie was of the colour of the car of the man who occupied the chair on his right,
10. and Mr. Brown sat opposite the man with the white car.
11. The colour of the socks of the man whose tie was the colour of Mr. Gray's car was the same as that of the tie of the man whose socks were the colour of Mr. Black's car, and this colour was not black.

Find the colours of the socks, tie, and car of each man.

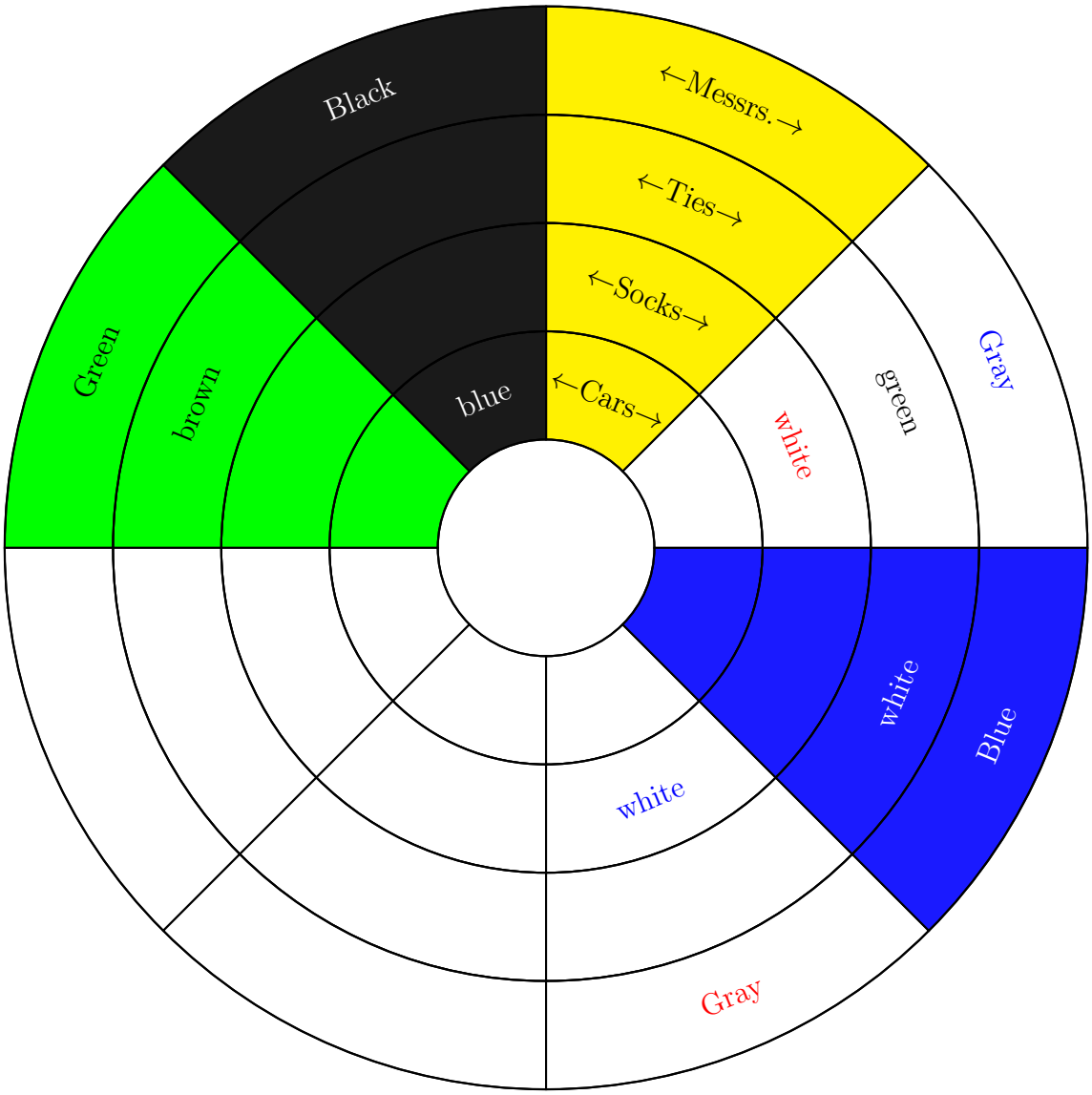
Solution

We will use the notation T[X], S[X], and C[X] to denote colours of the tie, socks, and car of Mr. X, respectively.

Step I: Use 5. (The empty chair lay between Mr. Black and the man who wore a green tie.) to pin down the empty chair, which is assigned yellow colour in the diagrams that follow. We choose Mr. Black's position on a whim. If anything goes wrong, we can always flip this allocation. Then use 1. (Mr. Blue sat next to the man with the green tie;) and the last part of 8. (··· colour of Mr. Black's car, i.e. blue.) to get to the following seating arrangement:

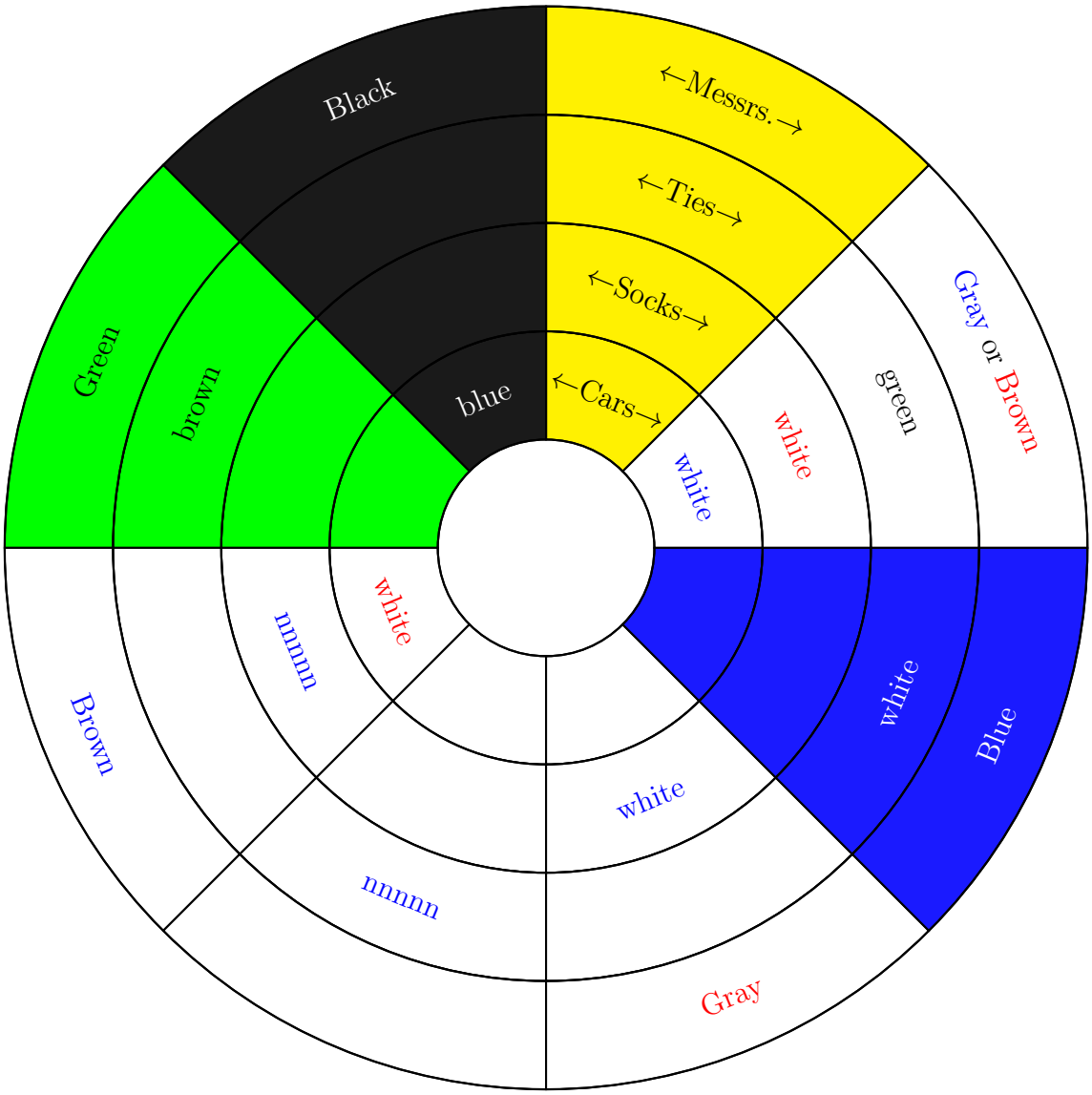


Step II: Deduce from 2. (between Mr. Gray and the man with white socks there sat a man wearing a white tie, and opposite him sat Mr. Green.) that Mr. Green must be next to Mr. Black; and fill in the rest of the details along with 4. (T[G]=brown) to get to the following possible seating arrangement:



Only one of the blue or red possibilities can be true.

Step III: Use 3. (Mr. Brown's socks were of the same colour as the tie of the man who occupied the chair on his right) and 10. (and Mr. Brown sat opposite the man with the white car.) to deduce that Mr. Brown must be next to Mr. Green if our choice of 'right' is correct or next to the empty chair if our choice is incorrect, leading to the following possibilities for the seating arrangement:



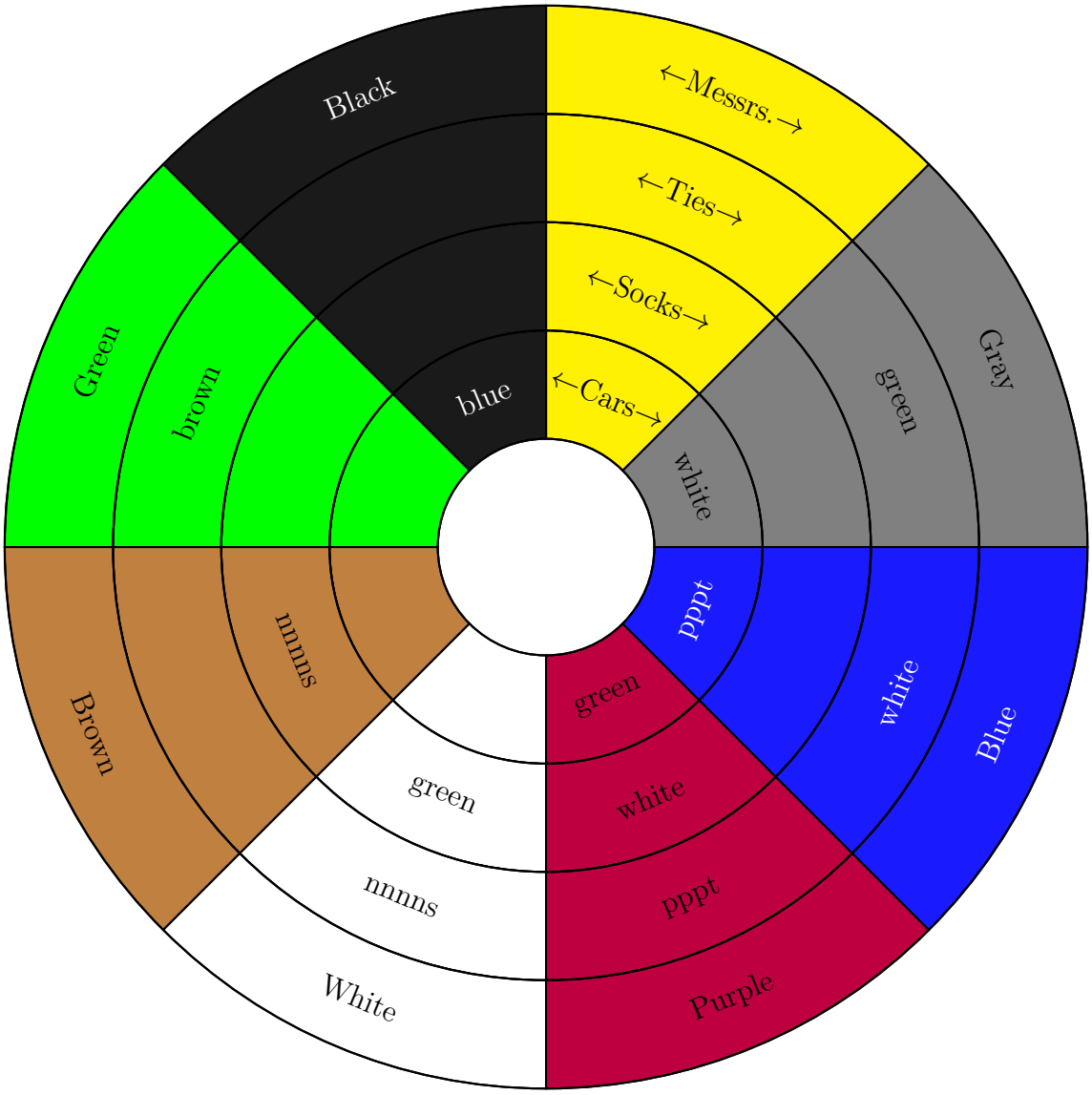
Again, only one of the blue or red possibilities can be true.

Step IV: Use 9. (Mr. Purple's tie was of the colour of the car of the man who occupied the chair on his right,) and 7. (C[Purple]=T[Gray]=S[White].) to deduce that the red possibilities can't be true. Assume Mr. Purple sits

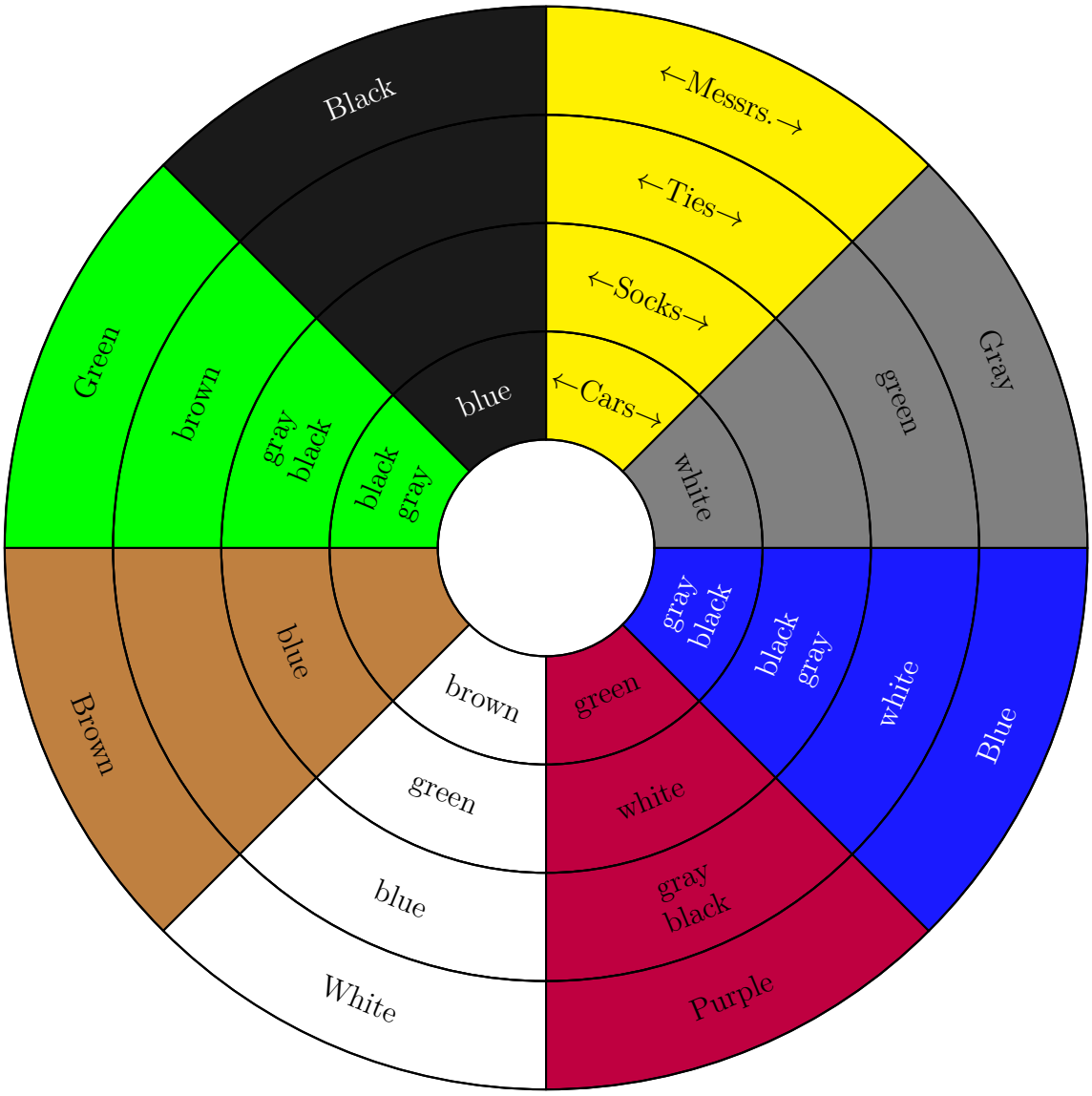
opposite the empty chair: T[Purple]=white=T[Blue], which can't be true! (Recall that now right ↔ left.)

next to Mr. Green: C[Purple]=white=S[White], which also can't be true!

Thus, the blue possibilities are correct and we can now deduce that Mr. Purple has to be next to Mr. Blue. (If he's opposite the empty chair, C[Purple]=S[White]=white=C[Gray], which can't be true!) That leaves Mr. White sitting opposite the empty chair. All this brain-wrecking leads to the following seating arrangement:

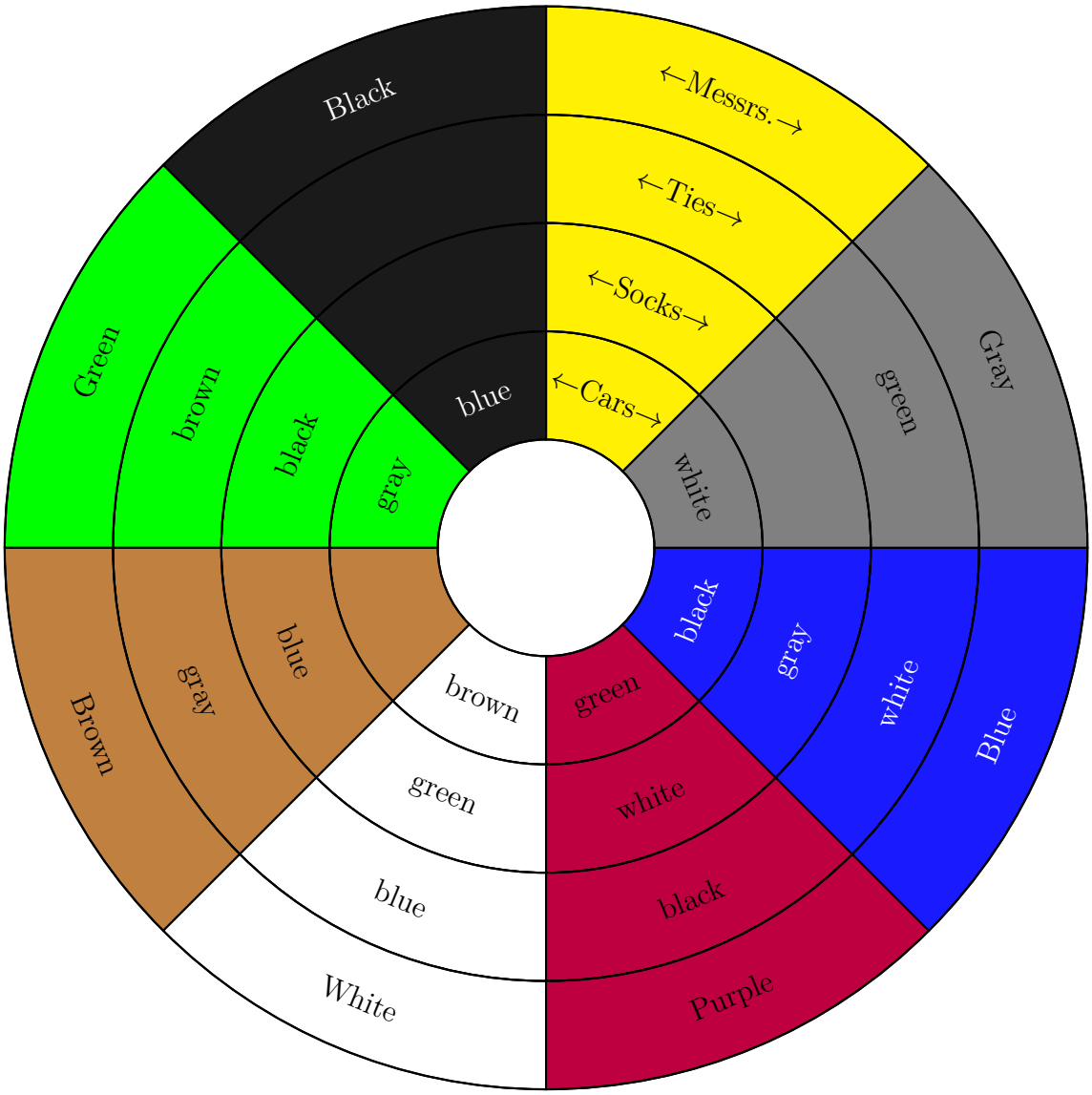


Step V: Use 6. (The man with black socks had a gray car, and the man with gray socks had a black car.) and 8. (The man with the name of the colour of Mr. White's car wore socks of the colour of Mr. Black's car, i.e. blue.) to deduce that nnnns=blue. This follows by deducing from 6 that Mr. White can have either brown or purple car but Mr. Purple wore white socks so compliance with 8 tells us that Mr. Brown wore blue socks. Writing down other possibilities, we have the following seating arrangement:



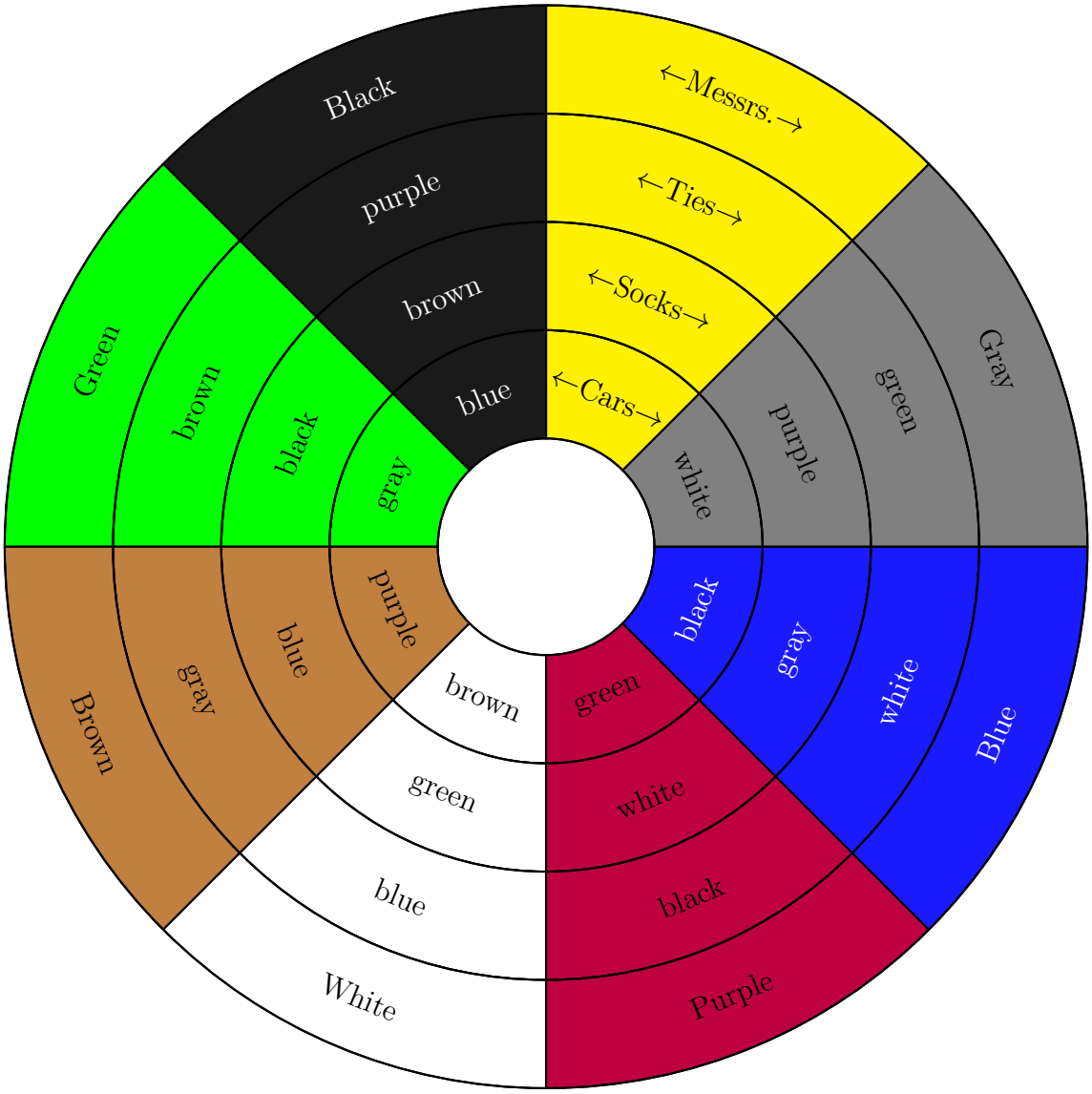
Either the top or the bottom possibility will be true.

Step VI: Now we use the dreaded 11. We write it symbolically as {T[X]=C[Gray](=white); S[Y]=C[Black](=blue); S[X]=T[Y]≠black}, which tells us that X=Mr. Blue and Y=Mr. Brown. This revelation then tells us that S[Blue]=gray(=T[Brown]) and we deduce the bottom possibility to be true, leading to the following seating arrangement:



Step VII: The remaining four entries are easily filled with three purple and one brown colours.

Answer



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