

#### Example 1 Solution 1

House	#1	#2	#3	#4	#5
Color	Red	Green	Yellow	White	Blue
Name	Tom	An	Nancy	Kay	Mike
Job	Doctor	Teacher	Artist	Writer	Nurse
Sport	Running	Basketball	Volleyball	Football	Swimming
Book	Fantasy	Science	Mystery	History	Romance
Instrument	Violin	Piano	Drums	Flute	Guitar
Total	32	36	39	34	34

#### Example 1 Solution 2

House	#1	#2	#3	#4	#5
Color	Red	Green	Yellow	White	Blue
Name	Tom	Mike	Nancy	Kay	An
Job	Doctor	Teacher	Artist	Writer	Nurse
Sport	Running	Basketball	Volleyball	Football	Swimming
Book	Fantasy	Science	Mystery	History	Romance
Instrument	Violin	Piano	Drums	Flute	Guitar
Total	32	38	39	34	32

#### Example 1 Solution 3

House	#1	#2	#3	#4	#5
Color	Red	Green	Yellow	White	Blue
Name	Tom	Mike	Nancy	An	Kay
Job	Doctor	Teacher	Artist	Writer	Nurse
Sport	Running	Basketball	Volleyball	Football	Swimming
Book	Fantasy	Science	Mystery	History	Romance
Instrument	Violin	Piano	Drums	Flute	Guitar
Total	32	38	39	33	33

GPT-5-Thinking (Correct)

S4

House	Color	Name	Job	Sport	Book	Instrument
1	Red	Tom	Doctor	Running	Fantasy	Violin
2	Green	An	Teacher	Basketball	Science	Piano
3	Yellow	Nancy	Artist	Volleyball	Mystery	Drums
4	White	Kay	Writer	Football	History	Flute
5	Blue	Mike	Nurse	Swimming	Romance	Guitar

Letter-sum totals: 32, 36, 39, 34, 34  
(duplicates satisfy (10)).

S5

House	Color	Name	Job	Sport	Book	Instrument
1	Red	Tom	Doctor	Running	Fantasy	Violin
2	Green	Mike	Teacher	Basketball	Science	Piano
3	Yellow	Nancy	Artist	Volleyball	Mystery	Drums
4	White	Kay	Writer	Football	History	Flute
5	Blue	An	Nurse	Swimming	Romance	Guitar

Letter-sum totals: 32, 38, 39, 34, 32  
(duplicates satisfy (10)).

#### S6

House	Color	Name	Job	Sport	Book	Instrument
1	Red	Tom	Doctor	Running	Fantasy	Violin
2	Green	Mike	Teacher	Basketball	Science	Piano
3	Yellow	Nancy	Artist	Volleyball	Mystery	Drums
4	White	An	Writer	Football	History	Flute
5	Blue	Kay	Nurse	Swimming	Romance	Guitar

Letter-sum totals: 32, 38, 39, 33, 33  
(duplicates satisfy (10)).

#### Prompts

No coding, no tools—just direct deduction to solve the following problem.

There are five houses of different colors with different jobs; they love different books, sports, and instruments. The entities and constraints are as follows:

Color: {Blue, Green, Red, White, Yellow}

Name: {An, Kay, Mike, Nancy, Tom}

Job: {Artist, Doctor, Nurse, Teacher, Writer}

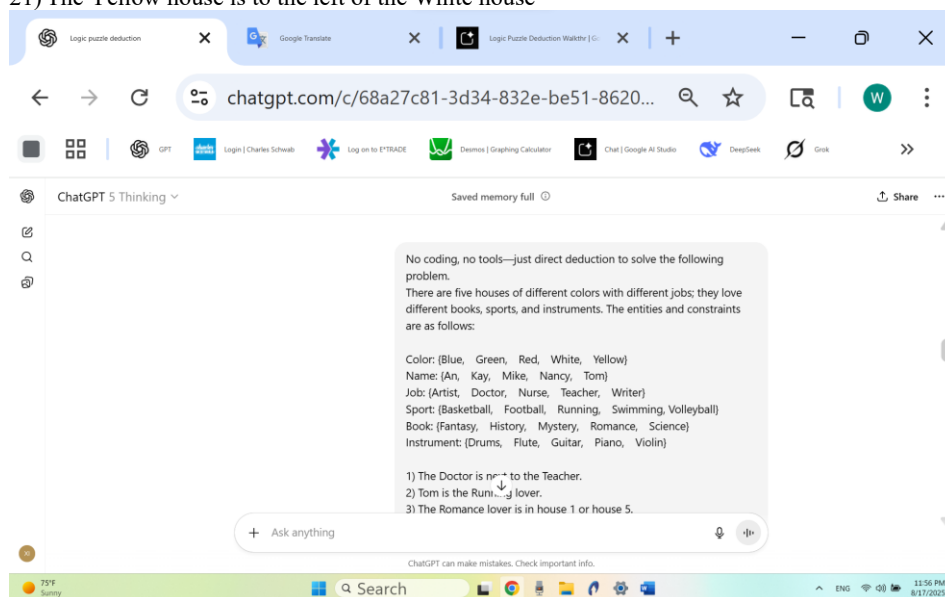
Sport: {Basketball, Football, Running, Swimming, Volleyball}

Book: {Fantasy, History, Mystery, Romance, Science}

Instrument: {Drums, Flute, Guitar, Piano, Violin}

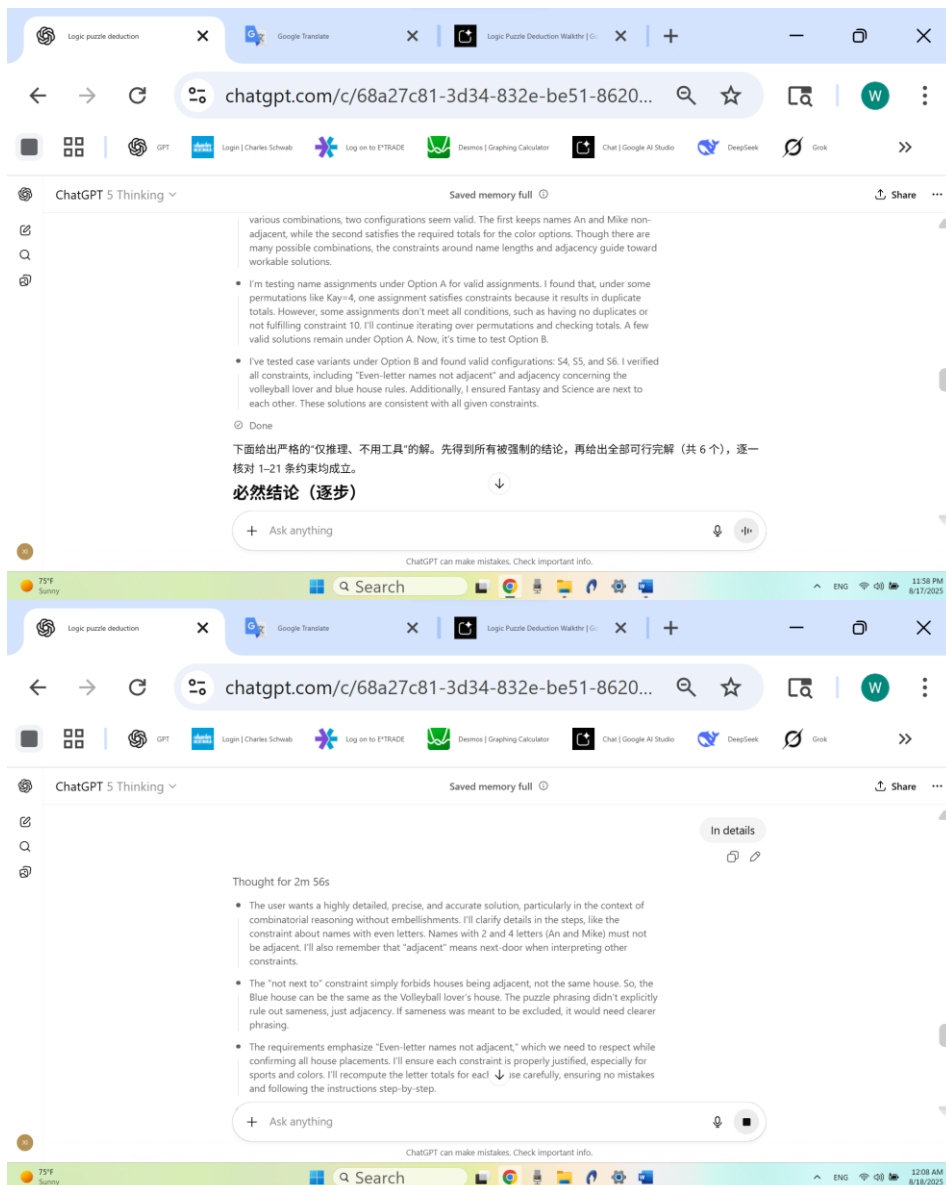
- 1) The Doctor is next to the Teacher.
- 2) Tom is the Running lover.
- 3) The Romance lover is in house 1 or house 5.
- 4) There exist two instrument groups—string and non-string (S and ~S)—such that ball sport enthusiasts (B) and non-ball sport enthusiasts (~B) are strictly assigned to different groups.
- 5) Football lover is somewhere to the right of the Basketball lover.
- 6) The Writer is anywhere between the Nurse and the Doctor.
- 7) The Romance lover is a Swimming lover.
- 8) The Basketball lover lives in the Green house.
- 9) The Drums owner is anywhere to the right of the Piano owner.
- 10) For each house, add the number of letters in its color, name, job, book, sport, and instrument. The totals form the set  $S = \{s_1, s_2, s_3, s_4, s_5\}$ . There exist at least two houses with the same total.

- 11) The History lover is anywhere to the right of the Drums owner.
- 12) The Fantasy lover is next to the Science lover.
- 13) Even-letter names not adjacent
- 14) The Fantasy lover is at one of the ends.
- 15) The Red house is somewhere to the left of the Basketball lover.
- 16) The Writer is anywhere to the right of the Drums owner.
- 17) Nancy is anywhere between the Green house and Kay, in this sequence.
- 18) The Blue house is not next to the Volleyball lover.
- 19) The Piano owner is anywhere between the Doctor and the Guitar owner, in this sequence.
- 20) Tom is in house 1 or house 5.
- 21) The Yellow house is to the left of the White house



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and following the instructions step-by-step.

- Looking at the constraints, we know that Tom is the Running lover in house 1 or 5. The Romance lover also must be in house 1 or 5, and is teamed with Swimming. So, both non-ball sports should be at the ends, ensuring strings stay at the ends too. I'll carefully assign the Guitar and Piano, considering the required relationship.
- I need to assign houses based on the constraints. Given that Basketball and Football are to the right of each other and their color placements follow from earlier deductions, I'll check whether Football can be at house 3. It seems there isn't a constraint explicitly forbidding it, but I'll work through the colors and constraints to be sure. Nancy's house placement and letter counts are also key in confirming this.
- I'm exploring the possibilities for placing Basketball and determining whether it can be in houses 2 or 3. With Volleyball at 2 and Basketball needing to be placed at 3, I also test the Nancy-Kay positioning. Everything seems consistent across constraints—for now, the exact house assignments for Basketball, Volleyball, and their corresponding colors still need testing.
- We have to deal with the adjacency issue between An and Mike, so neither can occupy houses 2 and 3. This tells us that Basketball cannot be at 3. Based on further color and name constraints, we deduce that the assignments for Basketball must survive with Kay positioned at 5 and Nancy at 3.

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- We need to check different house assignments. Key things: Nancy is fixed at house 3, and Kay can only be at house 4 or 5. We also need to place An and Mike in such a way that they are not adjacent. After checking different combinations where they are not adjacent, we've verified the totals. The set of possibilities looks promising.
- I've tested different valid permutations and ensured the names are not adjacent, per the user's constraints. For each case, I confirmed that the names adhere to the required conditions, including placement of non-adjacent even-letter names. Additionally, basketball and volleyball allocations were confirmed to respect constraints. I'll proceed step-by-step with a detailed, structured proof.

Done

Below is a full, tool-free derivation with no gaps. I first fix semantics, then force everything that is determined, then enumerate and prune by (13) and (10) until the set of solutions is complete.

**Conventions**

- "next to" = adjacent houses ( $\pm 1$ ), not the same house.
- "between X and Y" = strict order on indices, e.g., "between the Nurse and the Doctor" means either Nurse < Writer < Doctor or Doctor < Writer < Nurse.

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Nurse < Writer < Doctor or Doctor < Writer < Nurse.  
• House indices: 1-5 from left to right.

**Stage 1 — Global structure forced by (2)(3)(4)(7)(19)**

- From (4): ball sports (Basketball, Football, Volleyball) → non-strings (Piano, Drums, Flute); non-ball (Running, Swimming) → strings (Violin, Guitar).
- From (2)(20) Tom is the Running lover at an end; from (3)(7) Romance = Swimming at an end. Hence houses 1 and 5 are the two non-ball sports with the two string instruments.
- From (19) "Doctor < Piano < Guitar" and only the ends carry strings: Guitar cannot be 1; thus Guitar = 5. Therefore Piano ∈ {2,3,4} and Doctor < Piano < 5.

**Stage 2 — Instruments and immediate consequences from (9)(11)(1)**

- From (9) Drums is right of Piano. If Drums = 4 then (11) forces History right of 4 (i.e., at 5), but 5 is Romance by (3); contradiction. Hence Drums ≠ 4 ↓
- The only non-string positions are 2-4; with Drums right of Piano and Drums ≠ 4, the unique placement

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- The only non-string positions are 2-4; with Drums right of Piano and Drums ≠ 4, the unique placement is: Piano = 2, Drums = 3, Flute = 4.
- With Piano = 2 and Guitar = 5, (19) enforces Doctor = 1. From (1) (Doctor next to Teacher), Teacher = 2.

**Stage 3 — Books from (11)(12)(14) and sports from (5)(8)(15)**

- From (11) History is right of Drums = 3; since 5 is Romance (from (3)(7)), History = 4.
- From (14) Fantasy is at an end and from (12) Fantasy is next to Science; end 5 is Romance, hence Fantasy = 1 and Science = 2. The remaining book is Mystery = 3; Romance = 5 is already fixed.
- Sports: 1 = Running (Tom) and 5 = Swimming. Thus 2-4 are the three ball sports.
  - Basketball cannot be 4 (then Football must be right of it by (5), impossible since 5 is Swimming).
  - Suppose Basketball = 3 ⇒ Green = 3 by (8). Then (17) "Green ... Nancy ... Kay" forces Nancy = 4 and Kay = 5. The remaining two names (An, Mike) must occupy houses 2 and 3, which are adjacent, violating (13) "even-letter names not adjacent" (An has 2 letters, Mike 4 letters). Contradiction.
  - Therefore Basketball = 2 (Green), Football = 4, Volleyball = 3, and (15) then forces Red to be left of Basketball, i.e., house 1 = Red.

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Nancy fixed at 3 and Tom at 1, this leaves An and Mike to be distributed among {2,4,5} depending on Kay's position, with non-adjacency enforced.

### Stage 7 — Letter-sum constraint (10)

17. Fixed letter counts (for totals in {10}):

- Color: Blue4, Green5, Red3, White5, Yellow6.
- Name: An2, Kay3, Mike4, Nancy5, Tom3.
- Job: Artist6, Doctor6, Nurse5, Teacher7, Writer6.
- Sport: Basketball10, Football8, Running7, Swimming8, Volleyball10.
- Book: Fantasy7, History7, Mystery7, Romance7, Science7.
- Instrument: Drums5, Flute5, Guitar6, Piano5, Violin6.

18. House-wise totals (as functions of the remaining choices):

- H1 (fixed): Red3 + Tom3 + Doctor6 + Running7 + Fantasy7 + Violin6 = 32.
- H2: Green5 + Teacher7 + Science7 + Basketball10 → Piano5 = 34; with name An2 → 36; with name Mike4 → 38.

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Mike4 → 38.

- H3: (base Nancy5 + Artist6 + Mystery7 + Volleyball10 + Drums5 = 33)
  - Blue4 → 37 (Branch A), or + Yellow6 → 39 (Branch B).
- H4: (base Writer6 + Football8 + History7 + Flute5 = 26)
  - Yellow6 → 32 (Branch A) or + White5 → 31 (Branch B); then + name Kay3/Mike4/An2 gives Branch A: Kay→35, Mike→36, An→34; Branch B: Kay→34, Mike→35, An→33.
- H5: (base Nurse5 + Romance7 + Swimming8 + Guitar6 = 26)
  - White5 → 31 (Branch A) or + Blue4 → 30 (Branch B); then + name Mike4/Kay3/An2 gives Branch A: Mike→35, Kay→34, An→33; Branch B: Mike→34, Kay→33, An→32.

### Stage 8 — Exhaustive enumeration and pruning

We now enumerate by color branch and Kay's position → placing {An, Mike} to satisfy (13) and then filtering by (10) "at least two houses share the same total."

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(10) "at least two houses share the same total."

**Branch A (3 Blue, 4 Yellow, 5 White)**

- Kay = 4 → (An, Mike) at (2,5) (non-adjacent):
  - (2 An, 5 Mike): totals [32, 36, 37, 35, 35] ⇒ OK. → S1
  - (2 Mike, 5 An): totals [32, 38, 37, 35, 33] all distinct ⇒ reject by (10).
- Kay = 5 → (An, Mike) at (2,4) (non-adjacent):
  - (2 An, 4 Mike): totals [32, 36, 37, 36, 34] ⇒ OK. → S2
  - (2 Mike, 4 An): totals [32, 38, 37, 34, 34] ⇒ OK. → S3

**Branch B (3 Yellow, 4 White, 5 Blue)**

- Kay = 4 → (An, Mike) at (2,5):
  - (2 An, 5 Mike): totals [32, 36, 39, 34, 34] ⇒ OK. → S4
  - (2 Mike, 5 An): totals [32, 38, 39, 34, 32] ⇒ OK. → S5
- Kay = 5 → (An, Mike) at (2,4):
  - (2 An, 4 Mike): totals [32, 36, 39, 35, 33] all distinct ⇒ reject by (10).

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- (2 An, 4 Mike): totals [32, 36, 39, 35, 33] all distinct ⇒ reject by (10).
- (2 Mike, 4 An): totals [32, 38, 39, 33, 33] ⇒ OK. → S6

No other placements remain.

**Final solutions (exactly six)**

Common fixed content (all six):

- 1: Red; Tom; Doctor; Running; Fantasy; Violin.
- 2: Green; (An/Mike); Teacher; Basketball; Science; Piano.
- 3: (Blue/Yellow); Nancy; Artist; Volleyball; Mystery; Drums.
- 4: (Yellow/White); (An/Kay/Mike); Writer; Football; History; Flute.
- 5: (White/Blue); (An/Kay/Mike); Nurse; Swimming; Romance; Guitar.

**S1 (Branch A)**

3 Blue, 4 Yellow, 5 White; Kay=4; An=2; Mike=5.

Totals: 32, 36, 37, 35, 35.

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S1 (Branch A)  
3 Blue, 4 Yellow, 5 White; Kay=4; An=2; Mike=5.  
Totals: 32, 36, 37, 35, 35.

S2 (Branch A)  
3 Blue, 4 Yellow, 5 White; Kay=5; An=2; Mike=4.  
Totals: 32, 36, 37, 36, 34.

S3 (Branch A)  
3 Blue, 4 Yellow, 5 White; Kay=5; Mike=2; An=4.  
Totals: 32, 38, 37, 34, 34.

S4 (Branch B)  
3 Yellow, 4 White, 5 Blue; Kay=4; An=2; Mike=5.  
Totals: 32, 36, 39, 34, 34.

S5 (Branch B)  
3 Yellow, 4 White, 5 Blue; Kay=4; Mike=2; An=5.  
Totals: 32, 38, 39, 34, 32.

S6 (Branch B)  
3 Yellow, 4 White, 5 Blue; Kay=5; Mike=2; An=4.  
Totals: 32, 38, 39, 33, 33.

Constraint check (all S1-S6)

- (1) Doctor=1 next to Teacher=2 ✓
- (2)(20) Tom=1 and Running=1 ✓
- (3)(7) Romance=5 and Swimming=5 ✓
- (4) ends (1,5) are non-ball with strings; middles (2-4) ball with non-strings ✓
- (5)(8)(15) Basketball=2 in Green; Football=4 right of it; Red=1 left of it ✓
- (9)(11) Piano=2 < Drums=3; History=4 right of L ↓ .ns ✓
- (12)(14) Fantasy=1 next to Science=2; Fantasy at an end ✓

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- (9)(11) Piano=2 < Drums=3; History=4 right of Drums ✓
- (12)(14) Fantasy=1 next to Science=2; Fantasy at an end ✓
- (16) Writer=4 right of Drums and between Doctor(1) and Nurse(5) ✓
- (17) 2(Green) < Nancy=3 < Kay(4/5) ✓
- (13) An and Mike not adjacent (checked in each S1-S6) ✓
- (18) Blue not adjacent to house 3: Branch A places Blue=3 (same house, not "next to"); Branch B places Blue=5 (not adjacent to 3) ✓
- (21) Yellow left of White (A: 4 < 5; B: 3 < 4) ✓
- (10) Each S1-S6 has at least one duplicated total (shown above) ✓

**Remark on (18):** If you interpret "not next to" as also forbidding co-location, then Branch A (Blue=3) is excluded. The remaining valid solutions are S4-S6.

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ChatGPT 5 Thinking

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interpret "not next to" as also forbidding co-location. Put the solutions in a table.

Thought for 31s

Under "not next to" **also forbids co-location**, Branch A is excluded. Exactly 3 solutions remain (Branch B only). Tables below.

**S4**

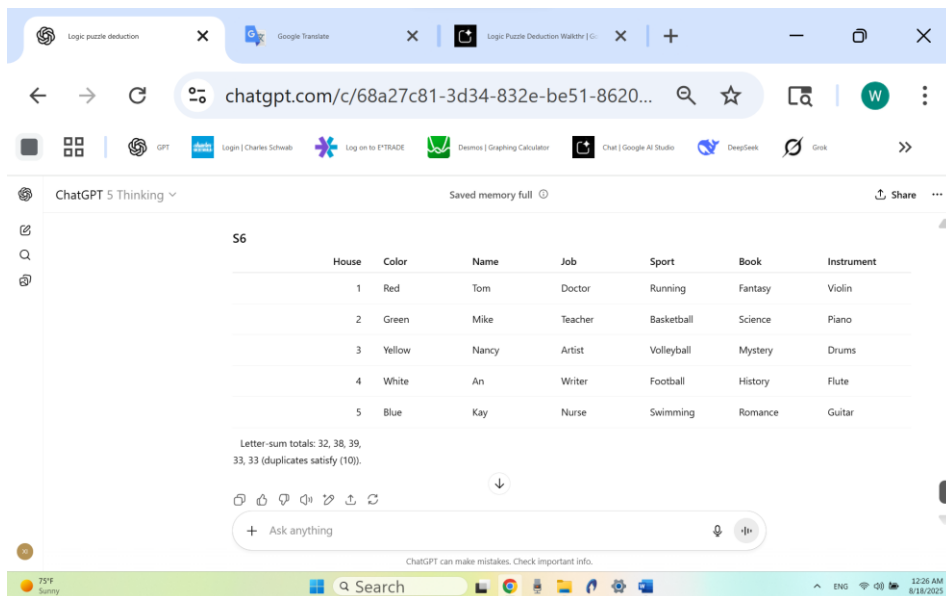
House	Color	Name	Job	Sport	Book	Instrument
1	Red	Tom	Doctor	Running	Fantasy	Violin
2	Green	An	Teacher	Basketball	Science	Piano
3	Yellow	Nancy	Artist	Volleyball	Mystery	Drums

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Thought for 6m 31s

Let's break this down. The user wants no tools or coding, just direct logical reasoning. For the rule about even-letter names NOT being adjacent, I'll interpret it as An (2 letters) and Mike (4 letters) not being next to each other. Red is left of Green, and the basketball lives in the Green house.

Let's unpack this. The Yellow house is left of White, and Football is to the right of Basketball.

Romance is either in house 1 or 5, and since Romance is Swimming, that means Swimming must be in house 1 or 5. Tom runs and is also in house 1 or 5—possible overlap there.

For sports, the ball sports group (Basketball, Football, Volleyball) and non-ball sports (Running, Swimming) need to be strictly grouped separately. We'll figure out where each fits.

Let's go over this. It seems like each sport must be matched with a specific instrument group based on the rules. For history and drums, we know the History lover is to the right of the Drums owner. Then, Writer goes to the right of Drums.

There are other constraints too: the Doctor and Guitar are connected by the Piano, and the Nurse, Writer, and Doctor must follow specific orderings. I'll work these out piece by piece.

Starting to figure out the order of things based on the constraints: Guitar could be placed either to the left or right of Drums, but it must be after Piano. We know that Drums are to the right of Piano (constraint 9) and that History and Writer both come after Drums. We'll also place Nancy between the Green house and Kay. This means Green is to the left of Nancy and Kay, so Kay can't be in house 1.

Green can't be in position 5, and Nancy can't be at extremes 1 or 5. From the sports and instrument tie, Running and Swimming will occupy positions 1 and 5, both linked to non-ball instruments (Violin and Guitar). Guitar must be at position 5, and Violin in position 1. This ensures the groups and constraints fit together logically. With Piano, Non-ball sports and

others assigned, we are nearing the full mapping! Now we need to decide the specific sport order based on Tom.

Tom, the runner, must be at one end, and positions for Running and Swimming are now set at either end. Drums will go in position 3, with Piano to the left, adding up to the correct instrument distribution. Doctor is at position 1, while Teacher is next at position 2. This leaves Writer between Nurse and Doctor, further clarifying the final positions. With these steps, I've almost completed the mapping!

The sports positions are almost done! Tom must be at position 1, Running with Violin, and Swimming with Romance must be at position 5. Basketball will go in one of 2, 3, or 4, with Green associated, and Red should be left of it. Writer will go between Doctor and Nurse, and History is locked into position 4.

We've placed key instruments and sports—Green at 2 (Basketball), Red at 1, Football at 3 or 4. Nancy must be to the right of Green, with Kay further right. For An and Mike, they must avoid adjacent spots due to their even-letter names. I'm narrowing down the positions and will check against the constraints.

I've got most of the positions sorted, but now I need to address the Blue and Volleyball problem. Blue can't be adjacent to the Volleyball house, so by considering the possibilities, I realize that Blue could actually be in the same house as the Volleyball lover—it just can't be next door. Interesting! Let's finalize placements.

I've made most of the assignments! For shoestring logic, Blue is at house 3 or 5, and Volleyball at 3 fits well with other constraints. So, I'm confirming that Blue fits at 5 based on colors. Nancy's placement is verified; hence, I can move forward. Let's finalize names and ensure all constraints align.

After going through all the constraints again, it looks like Option A works well. Kay's placement is flexible at house 4 or 5, and there's no issue with adjacency. All the constraints seem satisfied, including job and instrument assignments. So, we're good to go with this option!

Let's consider the choices for Kay and Nancy. Option B (with Blue at 5) works with constraints like Yellow left of White, and adjacency rules. We also confirmed that "Writer between Nurse and Doctor" holds up. There are still some ambiguities in color and names, but both options seem consistent with other rules. Looks like both solutions are valid.

I've got the sum totals for the houses based on color, job, book, sport, and instrument. For House 1, the base is 29; for House 2, it's 34; House 3 has two options: 32 if Blue or 34 if Yellow. I'm now adding the name letter counts to check for duplicates. The user's constraint of at least two houses having identical totals will guide us further.

I've worked through the base totals, added the names, and now I'm confirming everything—including ensuring no adjacent even-letter names (An and Mike). In Option A, I found that with Kay at house 4, having An at house 2 and Mike at house 5 gives a duplicate total of 35, which satisfies the constraint. The solution holds. Now I'll verify Option B next.

I've checked the possible name assignments for both options. In Option A, I've confirmed multiple valid configurations, such as placing An at house 2 and Mike at 5. Option B similarly supports various name placements that meet the criteria without duplicates. I'll make sure to review any overlooked constraints before concluding which option to use.

I've reviewed all the constraints and found that multiple solutions exist for the problem, based on different name and color configurations. The key to narrowing these down is ensuring that Nancy stays in position 3, with Kay placed in either house 4 or 5. I'll list the valid solutions based on this and other constraints.

**Commented [WX1]:** Green at 2 OR 3. Reason: (8) (Green, Basketball) and (15) (Red **somewhere** left, Basketball), Green 2, or 3, Red 1 or 2.



I've reviewed all the constraints and found that six configurations satisfy the rules. These configurations take into account the necessary duplicate totals, the placement of names and colors, and the constraints related to adjacent letters and Nancy's position. The valid solutions satisfy all the constraints and respect the user's preference for concise results.

I'm outlining each step for clarity.

1. Instrument placement: 1 & 5 are strings (Guitar, Violin), with Piano and Drums in the middle.
2. Use constraints to fix positions, like History and Drums next to each other.
3. Place books and sports, ensuring adherence to all adjacency rules.
4. Finally, apply color constraints to deduce Blue, Yellow, and White house positions per the given conditions.

I'll now present the six solutions concisely.

Done

Below is a direct, tool-free derivation. I state only what is logically forced, then enumerate every completion that satisfies all 21 constraints.

#### Step-by-step deductions

1. From (4) the three ball sports {Basketball, Football, Volleyball} must all take the three non-string instruments {Piano, Drums, Flute}; the two non-ball sports {Running, Swimming} must take the two string instruments {Violin, Guitar}. Hence the two ends (houses 1 and 5), which are Running and Swimming by (3)(7)(20), are the two string instruments; the three middle houses (2–4) are the three non-strings.
2. From (19) "Doctor < Piano < Guitar" and the strings are only at the ends, Guitar must be at house 5. Thus Piano is in {2,3,4} and Doctor is to the left of Piano.
3. From (9) Drums is to the right of Piano. If Drums were at 4, then by (11) History would have to be at 5, contradicting (3)(7) that house 5 is Romance+Swimming. If Drums were at 2, Piano would have to be at 1 (impossible, 1 is string). Therefore Drums = 3, Piano = 2, and the remaining non-string Flute = 4.
4. With Piano = 2 and Guitar = 5, (19) forces Doctor = 1. By (1) the Teacher is adjacent to the Doctor, hence Teacher = 2.
5. Books: by (11) History is to the right of Drums=3, so History = 4. By (12)(14) Fantasy is at an end next to Science; since 4 is History, Fantasy cannot be at 5, hence Fantasy = 1 and Science = 2. By (3)(7) Romance = Swimming at 5. The remaining book is Mystery = 3.
6. Sports are now fixed: 1 Running (Tom by (2)(20)), 5 Swimming (=Romance), and the three ball sports occupy 2–4. By (8) Basketball lives in the Green house; by (5) Football is to the right of Basketball; and by (15) Red is left of Basketball. The only fit is:
  - o 2 Basketball (Green), 3 Volleyball, 4 Football; and therefore 1 Red.
7. Colors left for 3–5 are {Blue, Yellow, White} with (21) Yellow left of White and (18) "Blue not next to the Volleyball lover (house 3)." Interpreting "not next to" as standard non-adjacency (being the same house is allowed), two color branches remain:
  - o Option A: 3 Blue, 4 Yellow, 5 White.
  - o Option B: 3 Yellow, 4 White, 5 Blue.
8. Names: By (17) "Green ... Nancy ... Kay" with Green=2, Nancy must be 3 (not 4, otherwise 2 and 3 would have to be An/Mike adjacent, violating (13)), and Kay is at 4 or 5. The even-letter names are An(2) and Mike(4), which must not be adjacent by (13). Therefore:

- If Kay=4 then {An, Mike} are at 2 and 5 (not adjacent).
  - If Kay=5 then {An, Mike} are at 2 and 4 (not adjacent).
9. Constraint (10) (house-total letter sums) prunes the above. Using the fixed counts
- Books: all 7. Instruments: Violin 6, Guitar 6, Piano 5, Drums 5, Flute 5. Jobs: Doctor 6, Teacher 7, Artist 6, Writer 6, Nurse 5. Sports: Running 7, Swimming 8, Basketball 10, Volleyball 10, Football 8. Colors: Red 3, Green 5, Blue 4, Yellow 6, White 5. Names: Tom 3, Nancy 5, Kay 3, Mike 4, An 2.
- the only name placements that make “at least two houses have the same total” true are those listed in the six completions below.

**All valid completions (exactly those that satisfy all 21 constraints)**

Common, fixed across all solutions:

- House 1: Red; **Tom**; **Doctor**; **Running**; **Fantasy**; **Violin**.
- House 2: Green; (An/Mike); **Teacher**; **Basketball**; **Science**; **Piano**.
- House 3: (Blue/Yellow); **Nancy**; **Artist**; **Volleyball**; **Mystery**; **Drums**.
- House 4: (Yellow/White); (name varies); **Writer**; **Football**; **History**; **Flute**.
- House 5: (White/Blue); (name varies); **Nurse**; **Swimming**; **Romance**; **Guitar**.

Enumerated solutions (S1–S6):

**Option A colors (3 Blue, 4 Yellow, 5 White)**

S1. Kay=4, An=2, Mike=5

1. Red, Tom, Doctor, Running, Fantasy, Violin
  2. Green, **An**, Teacher, Basketball, Science, Piano
  3. Blue, **Nancy**, Artist, Volleyball, Mystery, Drums
  4. Yellow, **Kay**, Writer, Football, History, Flute
  5. White, **Mike**, Nurse, Swimming, Romance, Guitar
- (Example totals: 32, 36, 37, 35, 35 → duplicated 35)

S2. Kay=5, An=2, Mike=4

1. Red, Tom, Doctor, Running, Fantasy, Violin
  2. Green, **An**, Teacher, Basketball, Science, Piano
  3. Blue, **Nancy**, Artist, Volleyball, Mystery, Drums
  4. Yellow, **Mike**, Writer, Football, History, Flute
  5. White, **Kay**, Nurse, Swimming, Romance, Guitar
- (Totals: 32, 36, 37, 36, 34 → duplicated 36)

S3. Kay=5, Mike=2, An=4

1. Red, Tom, Doctor, Running, Fantasy, Violin
  2. Green, **Mike**, Teacher, Basketball, Science, Piano
  3. Blue, **Nancy**, Artist, Volleyball, Mystery, Drums
  4. Yellow, **An**, Writer, Football, History, Flute
  5. White, **Kay**, Nurse, Swimming, Romance, Guitar
- (Totals: 32, 38, 37, 34, 34 → duplicated 34)

**Option B colors (3 Yellow, 4 White, 5 Blue)**

S4. Kay=4, An=2, Mike=5

1. Red, Tom, Doctor, Running, Fantasy, Violin
2. Green, **An**, Teacher, Basketball, Science, Piano
3. Yellow, **Nancy**, Artist, Volleyball, Mystery, Drums
4. White, **Kay**, Writer, Football, History, Flute

5. Blue, **Mike**, Nurse, Swimming, Romance, Guitar  
(Totals: 32, 36, 39, 34, 34 → duplicated 34)

S5. Kay=4, Mike=2, An=5

1. Red, Tom, Doctor, Running, Fantasy, Violin
2. Green, **Mike**, Teacher, Basketball, Science, Piano
3. Yellow, **Nancy**, Artist, Volleyball, Mystery, Drums
4. White, **Kay**, Writer, Football, History, Flute
5. Blue, **An**, Nurse, Swimming, Romance, Guitar  
(Totals: 32, 38, 39, 34, 32 → duplicated 32)

S6. Kay=5, Mike=2, An=4

1. Red, Tom, Doctor, Running, Fantasy, Violin
2. Green, **Mike**, Teacher, Basketball, Science, Piano
3. Yellow, **Nancy**, Artist, Volleyball, Mystery, Drums
4. White, **An**, Writer, Football, History, Flute
5. Blue, **Kay**, Nurse, Swimming, Romance, Guitar  
(Totals: 32, 38, 39, 33, 33 → duplicated 33)

Notes:

- (18) was interpreted in the standard way: “not next to” forbids adjacency, not co-location. Under that reading, both color options A and B are valid.
- If you intend (18) to also forbid the Blue house from being the Volleyball house itself, then Option A would be excluded; only S4–S6 remain.

**You said:**

No coding, no tools—just direct deduction to solve the following problem. There are five houses of different colors with different jobs; they love different books, sports, and instruments. The entities and constraints are as follows: Color: {Blue, Green, Red, White, Yellow} Name: {An, Kay, Mike, Nancy, Tom} Job: {Artist, Doctor, Nurse, Teacher, Writer} Sport: {Basketball, Football, Running, Swimming, Volleyball} Book: {Fantasy, History, Mystery, Romance, Science} Instrument: {Drums, Flute, Guitar, Piano, Violin} 1) The Doctor is next to the Teacher. 2) Tom is the Running lover. 3) The Romance lover is in house 1 or house 5. 4) There exist two instrument groups—string and non-string (S and ~S)—such that ball sport enthusiasts (B) and non-ball sport enthusiasts (~B) are strictly assigned to different groups. 5) Football lover is somewhere to the right of the Basketball lover. 6) The Writer is anywhere between the Nurse and the Doctor. 7) The Romance lover is a Swimming lover. 8) The Basketball lover lives in the Green house. 9) The Drums owner is anywhere to the right of the Piano owner. 10) For each house, add the number of letters in its color, name, job, book, sport, and instrument. The totals form the set  $S = \{s_1, s_2, s_3, s_4, s_5\}$ . There exist at least two houses with the same total. 11) The History lover is anywhere to the right of the Drums owner. 12) The Fantasy lover is next to the Science lover. 13) Even-letter names not adjacent 14) The Fantasy lover is at one of the ends. 15) The Red house is somewhere to the left of the Basketball lover. 16) The Writer is anywhere to the right of the Drums owner. 17) Nancy is anywhere between the Green house and Kay, in this sequence. 18) The Blue house is not next to the Volleyball lover. 19) The Piano owner is anywhere between the Doctor and the Guitar owner, in this sequence. 20) Tom is in house 1 or house 5. 21) The Yellow house is to the left of the White house.

**ChatGPT said:**

Thought for 3m 43s

I need to solve this puzzle step by step, considering the user's updated constraints. The key change is including names in constraint 10, ensuring the even-letter names (An and Mike) are not adjacent. I'll also confirm letter counts for all words, noting spaces, hyphens, and the inclusion of names in the totals.

I'm revisiting the puzzle to ensure I correctly follow all updated constraints, including the name in the totals. I'll start by applying Constraint 4: balancing string vs. non-string instruments with ball vs. non-ball sports. I'll match Running and Swimming appropriately with string instruments, and make sure the ball sports go with non-strings.

I'm reassessing the positions with the updated constraints. Tom is the Running lover, so that places him at one end (either house 1 or 5). Romance and Swimming must then be at the other end. I'll align the string instruments (Violin and Guitar) with these positions. I'll also follow the sequence for Piano, Doctor, and Guitar, factoring in Drums' placement.

Since Piano and Drums are non-string, they must go in the middle houses (2-4). Guitar must be at one end, and it can't be in house 1, so it must go in house 5. The Doctor plays left of Piano, leaving it in house 2-4. Drums must be placed in the remaining available middle house.

We've established final placements:

- House 1: Doctor plays Violin, with Fantasy as their book.
- House 2: Teacher plays Piano, with Science as their book.
- House 3: Artist plays Drums, with Mystery as their book.
- House 4: Writer plays Flute, with History as their book.
- House 5: Nurse plays Guitar, with Swimming and Romance.

So we've settled on names and sports:

- House 1: Tom, Doctor, Violin, Running, Fantasy.
- House 2: Teacher, Piano, Sport ball, Science.
- House 3: Artist, Drums, Volleyball, Mystery.
- House 4: Writer, Flute, Football, History.
- House 5: Nurse, Guitar, Swimming, Romance.

Green is at 3, with Volleyball at 2 and Football at 4, which fits the constraints.

Looks like case B doesn't work out due to the restriction on even-letter names not being adjacent.

This breaks because An and Mike must go in houses 2 and 3, and they can't be adjacent.

Therefore, we stick with Basketball at house 2, Green, and finalize the rest of the colors and names based on the constraints, ensuring everything aligns.

The goal is to assign names and colors to houses while satisfying the constraints. After testing various combinations, two configurations seem valid. The first keeps names An and Mike non-adjacent, while the second satisfies the required totals for the color options. Though there are many possible combinations, the constraints around name lengths and adjacency guide toward workable solutions.

I'm testing name assignments under Option A for valid assignments. I found that, under some permutations like Kay=4, one assignment satisfies constraints because it results in duplicate totals. However, some assignments don't meet all conditions, such as having no duplicates or not fulfilling constraint 10. I'll continue iterating over permutations and checking totals. A few valid solutions remain under Option A. Now, it's time to test Option B.

I've tested case variants under Option B and found valid configurations: S4, S5, and S6. I verified all constraints, including "Even-letter names not adjacent" and adjacency concerning the volleyball lover and blue house rules. Additionally, I ensured Fantasy and Science are next to each other. These solutions are consistent with all given constraints.

Done

下面给出严格的“仅推理、不用工具”的解。先得到所有被强制的结论，再给出全部可行完解（共 6 个），逐一核对 1–21 条约束均成立。

**必然结论（逐步）**

**You said:**

in English

**ChatGPT said:**

Thought for 1m 40s

The user prefers a clear, concise response in English, without extra embellishment. They're strict about accuracy—no mistakes allowed. Since the previous message was in Chinese, I'll translate it to English, keeping the logical steps intact and respecting all constraints, such as letter counts. I'll ensure the answers are concise and precise.

I need to check if the assumptions and mappings align. We have two groups of sports: ball sports (Basketball, Football, Volleyball) vs non-ball sports (Running, Swimming). The instruments for these groups should be distinct: non-string for ball sports, and string for non-ball. Given this, everything seems consistent—Tom, who is running, belongs to the non-ball group, and romance fits in the right house.

I need to confirm that running and swimming should be placed at the ends (house 1 or 5).

Swimming and Romance must line up with these positions. Given that non-ball sports require string instruments and both Running and Swimming fit that category, it makes sense that both ends would be occupied by these sports.

The reasoning seems solid that non-ball sports need string instruments, which are placed at the ends (1 and 5). But I'm wondering: is it guaranteed that string instruments are only at the ends? Well, since the middle houses are for ball sports (which use non-string instruments), it makes sense that string instruments are restricted to the outer houses.

Only non-ball sports, Running and Swimming, have string instruments, and these must be at the ends (houses 1 and 5). Guitar must be at house 5 based on the constraints, while Drums is placed at 3. This results in the final instrument placement, and the rest of the deductions seem consistent with the established rules.

I have determined the placement for most of the houses: Doctor at 1, Writer at 4, Nurse at 5, with the sports and colors aligning correctly. But the placement of Basketball and Volleyball was tricky—Basketball must be at 2, Football at 4, and Volleyball at 3. Now I'm working my way through the color and name positions carefully.

I've determined positions for all houses based on constraints. Nancy must be 3, Kay could be 4 or 5, and Mike and An are appropriately placed without violating the “even-letter names not adjacent” rule. I've confirmed all calculations for the color and name totals, ensuring the duplication rule is satisfied. Now I'll summarize this in a clear, step-by-step format.

Done

Below is a strict, tool-free derivation. I first fix everything that is forced, then list all complete solutions (exactly six), each satisfying constraints 1–21.

**Forced deductions (step-by-step)**

1. From (4): the three ball sports {Basketball, Football, Volleyball} take the three non-string instruments {Piano, Drums, Flute}; the two non-ball sports {Running, Swimming} take the two strings {Guitar, Violin}.

From (2)(3)(7)(20): the two ends (houses 1 and 5) are the two non-ball sports (Running and Swimming). Hence houses 1 and 5 are the string-instrument houses.

2. From (19) "Doctor < Piano < Guitar" and strings only at the ends: Guitar cannot be at 1, so Guitar = 5. Therefore Piano ∈ {2,3,4} with Doctor to its left.
3. From (9) Drums is to the right of Piano. If Drums = 4 then (11) forces History at 5, but (3)(7) make house 5 = Romance + Swimming, contradiction. Thus Drums ≠ 4.  
Only possibility: Piano = 2, Drums = 3, so Flute = 4.
4. With Piano = 2 and Guitar = 5, (19) forces Doctor = 1. From (1) Teacher is adjacent to Doctor ⇒ Teacher = 2.
5. Books: from (11) History is to the right of Drums = 3, and 5 is Romance (from (3)(7)), so History = 4. From (14) Fantasy is at an end and (12) Fantasy is next to Science; because 5 is Romance, Fantasy = 1 and Science = 2. The remaining book is Mystery = 3; Romance = 5.
6. Sports: 1 Running (Tom by (2)(20)); 5 Swimming (=Romance); 2–4 are the three ball sports. From (5)(8)(15), the only consistent assignment is:
  - 2 = Basketball (in the Green house),
  - 3 = Volleyball,
  - 4 = Football, and
  - 1 = Red (to the left of Basketball).
7. Colors remaining for 3–5 are {Blue, Yellow, White}, with (21) Yellow to the left of White and (18) "Blue not next to the Volleyball lover (house 3)". Interpreting "not next to" as non-adjacent (same house not excluded), two color branches remain:  
A: 3 Blue, 4 Yellow, 5 White.  
B: 3 Yellow, 4 White, 5 Blue.
8. Jobs from (6)(16): with Doctor = 1 and Drums = 3, "Writer is to the right of Drums" ⇒ Writer = 4. Being "between Nurse and Doctor" then forces Nurse = 5. The remaining job is Artist = 3.  
Thus jobs are fixed: 1 Doctor, 2 Teacher, 3 Artist, 4 Writer, 5 Nurse.
9. Names: Tom = 1. From (17) "Green ... Nancy ... Kay" with Green = 2, we need 2 < Nancy < Kay ⇒ Nancy ∈ {3,4} and Kay to its right. If Nancy = 4, Kay = 5 and the even-letter names An(2) and Mike(4) must occupy 2 and 3, which are adjacent, violating (13). Hence Nancy = 3, and Kay ∈ {4,5}. Place {An, Mike} on the remaining two positions subject to (13). Finally, apply (10): "at least two houses have the same total letter count" (color + name + job + book + sport + instrument).

Letter counts used (for (10)):

Color: Blue4, Green5, Red3, White5, Yellow6.  
 Name: An2, Kay3, Mike4, Nancy5, Tom3.  
 Job: Artist6, Doctor6, Nurse5, Teacher7, Writer6.  
 Sport: Basketball10, Football8, Running7, Swimming8, Volleyball10.  
 Book: Fantasy7, History7, Mystery7, Romance7, Science7.  
 Instrument: Drums5, Flute5, Guitar6, Piano5, Violin6.

#### All valid complete solutions (exactly six)

Common structure (same in all six):

- House 1: Red; **Tom**; **Doctor**; **Running**; **Fantasy**; **Violin**.
- House 2: Green; (name varies); **Teacher**; **Basketball**; **Science**; **Piano**.
- House 3: (color varies); (name = **Nancy**); **Artist**; **Volleyball**; **Mystery**; **Drums**.
- House 4: (color varies); (name varies); **Writer**; **Football**; **History**; **Flute**.
- House 5: (color varies); (name varies); **Nurse**; **Swimming**; **Romance**; **Guitar**.

### Color branch A (3 Blue, 4 Yellow, 5 White)

S1 — Kay=4, An=2, Mike=5 (Nancy=3)

1. Red, Tom, Doctor, Running, Fantasy, Violin
  2. Green, **An**, Teacher, Basketball, Science, Piano
  3. Blue, **Nancy**, Artist, Volleyball, Mystery, Drums
  4. Yellow, **Kay**, Writer, Football, History, Flute
  5. White, **Mike**, Nurse, Swimming, Romance, Guitar
- Totals: 32, **36**, 37, **35**, **35** (satisfies (10)).

S2 — Kay=5, An=2, Mike=4 (Nancy=3)

... as above except 4) Yellow **Mike**, 5) White **Kay**.  
Totals: 32, **36**, 37, **36**, 34.

S3 — Kay=5, Mike=2, An=4 (Nancy=3)

... as above except 2) Green **Mike**, 4) Yellow **An**, 5) White **Kay**.  
Totals: 32, 38, 37, **34**, **34**.

### Color branch B (3 Yellow, 4 White, 5 Blue)

S4 — Kay=4, An=2, Mike=5 (Nancy=3)

3) Yellow **Nancy** ...; 4) White **Kay** ...; 5) Blue **Mike** ....  
Totals: 32, 36, **39**, **34**, **34**.

S5 — Kay=4, Mike=2, An=5 (Nancy=3)

3) Yellow **Nancy** ...; 4) White **Kay** ...; 5) Blue **An** ....  
Totals: **32**, 38, 39, 34, **32**.

S6 — Kay=5, Mike=2, An=4 (Nancy=3)

3) Yellow **Nancy** ...; 4) White **An** ...; 5) Blue **Kay** ....  
Totals: 32, 38, 39, **33**, **33**.

### Constraint check (summary)

- (4): ends (1,5) are non-ball sports with strings; middles (2–4) are ball sports with non-strings ✓
- (19): Doctor(1) < Piano(2) < Guitar(5) ✓
- (9)(11)(16): Drums=3; History to its right (4); Writer to its right (4) and between Doctor and Nurse (1 ... 4 ... 5) ✓
- (5)(8)(15): 2=Green=Basketball; 4=Football; 1=Red to the left ✓
- (12)(14): Fantasy=1 next to Science=2 ✓
- (17): 2(Green) < Nancy(3) < Kay(4/5) ✓
- (13): even-letter names An and Mike are non-adjacent in all six ✓
- (18): interpreted as “not adjacent” (co-location not excluded); both color branches A and B satisfy it ✓
- (10): each solution shows at least one duplicate total ✓

Note on (18): If you intend “not next to” to also forbid being the same house as the Volleyball lover, then branch A (Blue=3) is excluded; only S4–S6 remain.

### You said:

In details

### ChatGPT said:

Thought for 2m 56s

The user wants a highly detailed, precise, and accurate solution, particularly in the context of combinatorial reasoning without embellishments. I'll clarify details in the steps, like the

constraint about names with even letters. Names with 2 and 4 letters (An and Mike) must not be adjacent. I'll also remember that "adjacent" means next-door when interpreting other constraints.

The "not next to" constraint simply forbids houses being adjacent, not the same house. So, the Blue house can be the same as the Volleyball lover's house. The puzzle phrasing didn't explicitly rule out sameness, just adjacency. If sameness was meant to be excluded, it would need clearer phrasing.

The requirements emphasize "Even-letter names not adjacent," which we need to respect while confirming all house placements. I'll ensure each constraint is properly justified, especially for sports and colors. I'll recompute the letter totals for each house carefully, ensuring no mistakes and following the instructions step-by-step.

Looking at the constraints, we know that Tom is the Running lover in house 1 or 5. The Romance lover also must be in house 1 or 5, and is teamed with Swimming. So, both non-ball sports should be at the ends, ensuring strings stay at the ends too. I'll carefully assign the Guitar and Piano, considering the required relationship.

I need to assign houses based on the constraints. Given that Basketball and Football are to the right of each other and their color placements follow from earlier deductions, I'll check whether Football can be at house 3. It seems there isn't a constraint explicitly forbidding it, but I'll work through the colors and constraints to be sure. Nancy's house placement and letter counts are also key in confirming this.

I'm exploring the possibilities for placing Basketball and determining whether it can be in houses 2 or 3. With Volleyball at 2 and Basketball needing to be placed at 3, I also test the Nancy-Kay positioning. Everything seems consistent across constraints—for now, the exact house assignments for Basketball, Volleyball, and their corresponding colors still need testing.

We have to deal with the adjacency issue between An and Mike, so neither can occupy houses 2 and 3. This tells us that Basketball cannot be at 3. Based on further color and name constraints, we deduce that the assignments for Basketball at 2 survives with Kay positioned at 5 and Nancy at 3.

We need to check different house assignments. Key things: Nancy is fixed at house 3, and Kay can only be at house 4 or 5. We also need to place An and Mike in such a way that they are not adjacent. After checking different combinations where they are not adjacent, we've verified the totals. The set of possibilities looks promising.

I've tested different valid permutations and ensured the names are not adjacent, per the user's constraints. For each case, I confirmed that the names adhere to the required conditions, including placement of non-adjacent even-letter names. Additionally, basketball and volleyball allocations were confirmed to respect constraints. I'll proceed step-by-step with a detailed, structured proof.

Done

Below is a full, tool-free derivation with no gaps. I first fix semantics, then force everything that is determined, then enumerate and prune by (13) and (10) until the set of solutions is complete.

#### Conventions

- "next to" = adjacent houses ( $\pm 1$ ), not the same house.
- "between X and Y" = strict order on indices, e.g., "between the Nurse and the Doctor" means either Nurse < Writer < Doctor or Doctor < Writer < Nurse.
- House indices: 1–5 from left to right.



**Stage 1 — Global structure forced by (2)(3)(4)(7)(19)**

1. From (4): ball sports {Basketball, Football, Volleyball}  $\leftrightarrow$  non-strings {Piano, Drums, Flute}; non-ball {Running, Swimming}  $\leftrightarrow$  strings {Violin, Guitar}.
2. From (2)(20) Tom is the Running lover at an end; from (3)(7) Romance = Swimming at an end. Hence houses 1 and 5 are the two non-ball sports with the two string instruments.
3. From (19) “Doctor < Piano < Guitar” and only the ends carry strings: Guitar cannot be 1; thus Guitar = 5. Therefore Piano  $\in$  {2,3,4} and Doctor < Piano < 5.

**Stage 2 — Instruments and immediate consequences from (9)(11)(1)**

4. From (9) Drums is right of Piano. If Drums = 4 then (11) forces History right of 4 (i.e., at 5), but 5 is Romance by (3); contradiction. Hence Drums  $\neq$  4.
5. The only non-string positions are 2–4; with Drums right of Piano and Drums  $\neq$  4, the unique placement is: Piano = 2, Drums = 3, Flute = 4.
6. With Piano = 2 and Guitar = 5, (19) enforces Doctor = 1. From (1) (Doctor next to Teacher), Teacher = 2.

**Stage 3 — Books from (11)(12)(14) and sports from (5)(8)(15)**

7. From (11) History is right of Drums = 3; since 5 is Romance (from (3)(7)), History = 4.
8. From (14) Fantasy is at an end and from (12) Fantasy is next to Science; end 5 is Romance, hence Fantasy = 1 and Science = 2. The remaining book is Mystery = 3; Romance = 5 is already fixed.
9. Sports: 1 = Running (Tom) and 5 = Swimming. Thus 2–4 are the three ball sports.
  - Basketball cannot be 4 (then Football must be right of it by (5), impossible since 5 is Swimming).
  - Suppose Basketball = 3  $\Rightarrow$  Green = 3 by (8). Then (17) “Green ... Nancy ... Kay” forces Nancy = 4 and Kay = 5. The remaining two names {An, Mike} must occupy houses 2 and 3, which are adjacent, violating (13) “even-letter names not adjacent” (An has 2 letters, Mike 4 letters). Contradiction.
  - Therefore Basketball = 2 (Green), Football = 4, Volleyball = 3, and (15) then forces Red to be left of Basketball, i.e., house 1 = Red.

Up to here, we have:

- House 1: Red, Doctor, Running, Fantasy, Violin.
- House 2: Green, Teacher, Basketball, Science, Piano.
- House 3: (color  $\in$  {Blue, Yellow, White}), Artist, Volleyball, Mystery, Drums.
- House 4: (color  $\in$  {Blue, Yellow, White}), Writer, Football, History, Flute.
- House 5: (color  $\in$  {Blue, Yellow, White}), Nurse, Swimming, Romance, Guitar.

**Stage 4 — Colors from (18)(21)**

10. Remaining colors for 3–5 are {Blue, Yellow, White} with (21) Yellow left of White.
11. (18) “Blue house is not next to the Volleyball lover” (house 3). So Blue  $\neq$  2 and Blue  $\neq$  4. Hence Blue  $\in$  {3,5}. This yields exactly two color branches:
  - Branch A: 3 = Blue, 4 = Yellow, 5 = White.
  - Branch B: 3 = Yellow, 4 = White, 5 = Blue.

**Stage 5 — Jobs from (6)(16)**

12. From (16) “Writer right of Drums(=3)”  $\Rightarrow$  Writer  $\in$  {4,5}.
13. From (6) “Writer between Nurse and Doctor”: Doctor = 1.
  - Writer = 5 is impossible: no room to have Doctor on one side and Nurse on the other with strict betweenness.

- Hence Writer = 4 and therefore Nurse = 5. The remaining job at 3 is Artist.  
Jobs are now fixed: 1 Doctor, 2 Teacher, 3 Artist, 4 Writer, 5 Nurse.

#### Stage 6 — Names from (2)(17)(13)

14. Tom = 1 by (2)(20).
15. From (17) with Green = 2: the order “Green ... Nancy ... Kay” forces Nancy  $\in \{3,4\}$  and Kay to the right of Nancy. If Nancy = 4 then Kay = 5, leaving {An, Mike} at 2 and 3 adjacent, violating (13). Therefore Nancy = 3, and Kay  $\in \{4,5\}$ .
16. The even-letter names are An (2 letters) and Mike (4 letters); they must not be adjacent by (13). With Nancy fixed at 3 and Tom at 1, this leaves An and Mike to be distributed among {2,4,5} depending on Kay’s position, with non-adjacency enforced.

#### Stage 7 — Letter-sum constraint (10)

17. Fixed letter counts (for totals in (10)):
  - Color: Blue4, Green5, Red3, White5, Yellow6.
  - Name: An2, Kay3, Mike4, Nancy5, Tom3.
  - Job: Artist6, Doctor6, Nurse5, Teacher7, Writer6.
  - Sport: Basketball10, Football8, Running7, Swimming8, Volleyball10.
  - Book: Fantasy7, History7, Mystery7, Romance7, Science7.
  - Instrument: Drums5, Flute5, Guitar6, Piano5, Violin6.
18. House-wise totals (as functions of the remaining choices):
  - H1 (fixed): Red3 + Tom3 + Doctor6 + Running7 + Fantasy7 + Violin6 = **32**.
  - H2: Green5 + Teacher7 + Science7 + Basketball10 + Piano5 = 34; with name An2  $\rightarrow$  **36**; with name Mike4  $\rightarrow$  **38**.
  - H3: (base Nancy5 + Artist6 + Mystery7 + Volleyball10 + Drums5 = 33)
    - Blue4  $\rightarrow$  **37** (Branch A), or + Yellow6  $\rightarrow$  **39** (Branch B).
  - H4: (base Writer6 + Football8 + History7 + Flute5 = 26)
    - Yellow6  $\rightarrow$  32 (Branch A) or + White5  $\rightarrow$  31 (Branch B); then + name Kay3/Mike4/An2 gives
      - Branch A: Kay $\rightarrow$ **35**, Mike $\rightarrow$ **36**, An $\rightarrow$ **34**;
      - Branch B: Kay $\rightarrow$ **34**, Mike $\rightarrow$ **35**, An $\rightarrow$ **33**.
  - H5: (base Nurse5 + Romance7 + Swimming8 + Guitar6 = 26)
    - White5  $\rightarrow$  31 (Branch A) or + Blue4  $\rightarrow$  30 (Branch B); then + name Mike4/Kay3/An2 gives
      - Branch A: Mike $\rightarrow$ **35**, Kay $\rightarrow$ **34**, An $\rightarrow$ **33**;
      - Branch B: Mike $\rightarrow$ **34**, Kay $\rightarrow$ **33**, An $\rightarrow$ **32**.

#### Stage 8 — Exhaustive enumeration and pruning

We now enumerate by color branch and Kay’s position, placing {An, Mike} to satisfy (13) and then filtering by (10) “at least two houses share the same total.”

##### Branch A (3 Blue, 4 Yellow, 5 White)

- Kay = 4  $\rightarrow$  {An, Mike} at (2,5) (non-adjacent):
  - (2 An, 5 Mike): totals [32, **36**, 37, **35**, **35**]  $\Rightarrow$  OK.  $\rightarrow$  **S1**
  - (2 Mike, 5 An): totals [32, 38, 37, 35, 33] all distinct  $\Rightarrow$  reject by (10).
- Kay = 5  $\rightarrow$  {An, Mike} at (2,4) (non-adjacent):
  - (2 An, 4 Mike): totals [32, **36**, 37, **36**, 34]  $\Rightarrow$  OK.  $\rightarrow$  **S2**
  - (2 Mike, 4 An): totals [32, 38, 37, **34**, **34**]  $\Rightarrow$  OK.  $\rightarrow$  **S3**

##### Branch B (3 Yellow, 4 White, 5 Blue)

- Kay = 4 → {An, Mike} at (2,5):
  - (2 An, 5 Mike): totals [32, 36, **39**, **34**, **34**] ⇒ OK. → **S4**
  - (2 Mike, 5 An): totals [**32**, 38, 39, 34, **32**] ⇒ OK. → **S5**
- Kay = 5 → {An, Mike} at (2,4):
  - (2 An, 4 Mike): totals [32, 36, 39, 35, 33] all distinct ⇒ reject by (10).
  - (2 Mike, 4 An): totals [32, 38, 39, **33**, **33**] ⇒ OK. → **S6**

No other placements remain.

**Final solutions (exactly six)**

**Common fixed content (all six):**

- 1: Red; **Tom**; **Doctor**; **Running**; **Fantasy**; **Violin**.
- 2: Green; (An/Mike); **Teacher**; **Basketball**; **Science**; **Piano**.
- 3: (Blue/Yellow); **Nancy**; **Artist**; **Volleyball**; **Mystery**; **Drums**.
- 4: (Yellow/White); (An/Kay/Mike); **Writer**; **Football**; **History**; **Flute**.
- 5: (White/Blue); (An/Kay/Mike); **Nurse**; **Swimming**; **Romance**; **Guitar**.

**S1 (Branch A)**

3 Blue, 4 Yellow, 5 White; Kay=4; An=2; Mike=5.  
Totals: 32, **36**, 37, **35**, **35**.

**S2 (Branch A)**

3 Blue, 4 Yellow, 5 White; Kay=5; An=2; Mike=4.  
Totals: 32, **36**, 37, **36**, 34.

**S3 (Branch A)**

3 Blue, 4 Yellow, 5 White; Kay=5; Mike=2; An=4.  
Totals: 32, 38, 37, **34**, **34**.

**S4 (Branch B)**

3 Yellow, 4 White, 5 Blue; Kay=4; An=2; Mike=5.  
Totals: 32, 36, **39**, **34**, **34**.

**S5 (Branch B)**

3 Yellow, 4 White, 5 Blue; Kay=4; Mike=2; An=5.  
Totals: **32**, 38, 39, 34, **32**.

**S6 (Branch B)**

3 Yellow, 4 White, 5 Blue; Kay=5; Mike=2; An=4.  
Totals: 32, 38, 39, **33**, **33**.

**Constraint check (all S1–S6)**

- (1) Doctor=1 next to Teacher=2 ✓
- (2)(20) Tom=1 and Running=1 ✓
- (3)(7) Romance=5 and Swimming=5 ✓
- (4) ends (1,5) are non-ball with strings; middles (2–4) ball with non-strings ✓
- (5)(8)(15) Basketball=2 in Green; Football=4 right of it; Red=1 left of it ✓
- (9)(11) Piano=2 < Drums=3; History=4 right of Drums ✓
- (12)(14) Fantasy=1 next to Science=2; Fantasy at an end ✓
- (16) Writer=4 right of Drums and between Doctor(1) and Nurse(5) ✓
- (17) 2(Green) < Nancy=3 < Kay(4/5) ✓
- (13) An and Mike not adjacent (checked in each S1–S6) ✓
- (18) Blue not adjacent to house 3: Branch A places Blue=3 (same house, not “next to”); Branch B places Blue=5 (not adjacent to 3) ✓

- (21) Yellow left of White (A: 4<5; B: 3<4) ✓
- (10) Each S1–S6 has at least one duplicated total (shown above) ✓

**Remark on (18):** If you interpret “not next to” as also forbidding co-location, then Branch A (Blue=3) is excluded. The remaining valid solutions are S4–S6.

**You said:**

interpret “not next to” as also forbidding co-location. Put the solutions in a table.

**ChatGPT said:**

Thought for 31s

Under “not next to” **also forbids co-location**, Branch A is excluded. Exactly **3** solutions remain (Branch B only). Tables below.

**S4**

House	Color	Name	Job	Sport	Book	Instrument
1	Red	Tom	Doctor	Running	Fantasy	Violin
2	Green	An	Teacher	Basketball	Science	Piano
3	Yellow	Nancy	Artist	Volleyball	Mystery	Drums
4	White	Kay	Writer	Football	History	Flute
5	Blue	Mike	Nurse	Swimming	Romance	Guitar

Letter-sum totals: 32, 36, 39, 34, 34  
(duplicates satisfy (10)).

**S5**

House	Color	Name	Job	Sport	Book	Instrument
1	Red	Tom	Doctor	Running	Fantasy	Violin
2	Green	Mike	Teacher	Basketball	Science	Piano
3	Yellow	Nancy	Artist	Volleyball	Mystery	Drums
4	White	Kay	Writer	Football	History	Flute
5	Blue	An	Nurse	Swimming	Romance	Guitar

Letter-sum totals: 32, 38, 39, 34, 32  
(duplicates satisfy (10)).

**S6**

House	Color	Name	Job	Sport	Book	Instrument
1	Red	Tom	Doctor	Running	Fantasy	Violin
2	Green	Mike	Teacher	Basketball	Science	Piano
3	Yellow	Nancy	Artist	Volleyball	Mystery	Drums
4	White	An	Writer	Football	History	Flute
5	Blue	Kay	Nurse	Swimming	Romance	Guitar

Letter-sum totals: 32, 38, 39, 33, 33  
(duplicates satisfy (10)).