
PROGRAMMING ADVICES
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26+ Years of Experience
Mohammed Abu-Hadhoud
MBA, PMOC, PgMP®, PMP®, PMI-RMP®, CSE, ITILF, MCPD, MCSD
لا تنسى الاشتراك في قناتنا على اليوتيوب ومشاركة القناة مع اصدقائك
لتعم الفائدة للجميع وانقاذ الاف الناس من التشتت وجزاكم الله خيرا
لا تنسونا من دعائكم وادعو لوالدي بالرحمة
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مهم جداً
هذا الملف للمراجعة السريعة واخذ الملاحظات عليه فقط ،لانه يحتوي
على اقل من 20٪ مما يتم شرحه في الفيديوهات
الاستعجال والاعتماد عليه فقط سوف يجعلك تخسر كميه معلومات
وخبرات كثيره
يجب عليك مشاهدة فيديو الدرس كاملا
لاتنسى عمل لايك ومشاركة القناة لتعم الفائدة للجميع
لا تنسونا من دعائكم
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STOP
PROGRAMMING
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LEARN THE
RIGHT WAY

Algorithms & Problem Solving
Level 6

Fix Violations
Sub-Sub Case 2.2.1 -
Sibling's far child is red

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Sub Case 2.2:
At least one of the sibling's children is red

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Sub Case 2: Sibling is Black

- Sub Case 2.2: At least one of the sibling's children is red
  - Sub-Sub Case 2.2.1: Sibling's far child is red
  - Sub-Sub Case 2.2.2: Sibling's near child is red

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Sub-Sub Case 2.2.1: Sibling's far child is red

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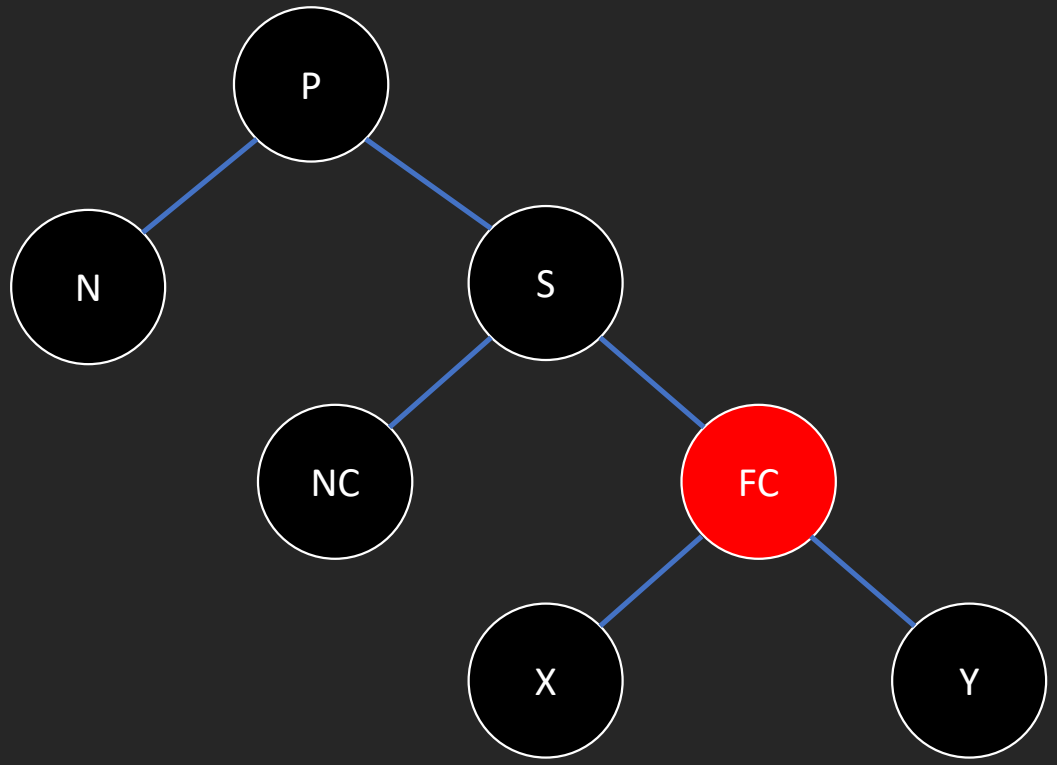
Sub-Sub Case 2.2.1: Sibling's far child is Red.

- P is the parent node .
- N is the node being deleted or its replacement.
- S is the sibling of N.
- NC an FC are children of S where NC (Near Child) and FC (Far Child).
- X and Y are children of FC.



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Sub-Sub Case 2.2.1: Sibling’s far child is Red.

Scenario: Sibling’s far child is Red.

Action:

1. When you delete the node, it becomes double black.
2. Perform a rotation on the parent and sibling (if the sibling is a right child, perform a left rotation; if the sibling is a left child, perform a right rotation).
3. Color the far child black.
4. Color the original sibling with the parent's original color.
5. Color the parent black.
6. The double black situation may be resolved, but further steps might be required to ensure it's completely resolved. This could involve moving the double black up the tree and applying the rules from Case 2.1 or Case 2.2 again.

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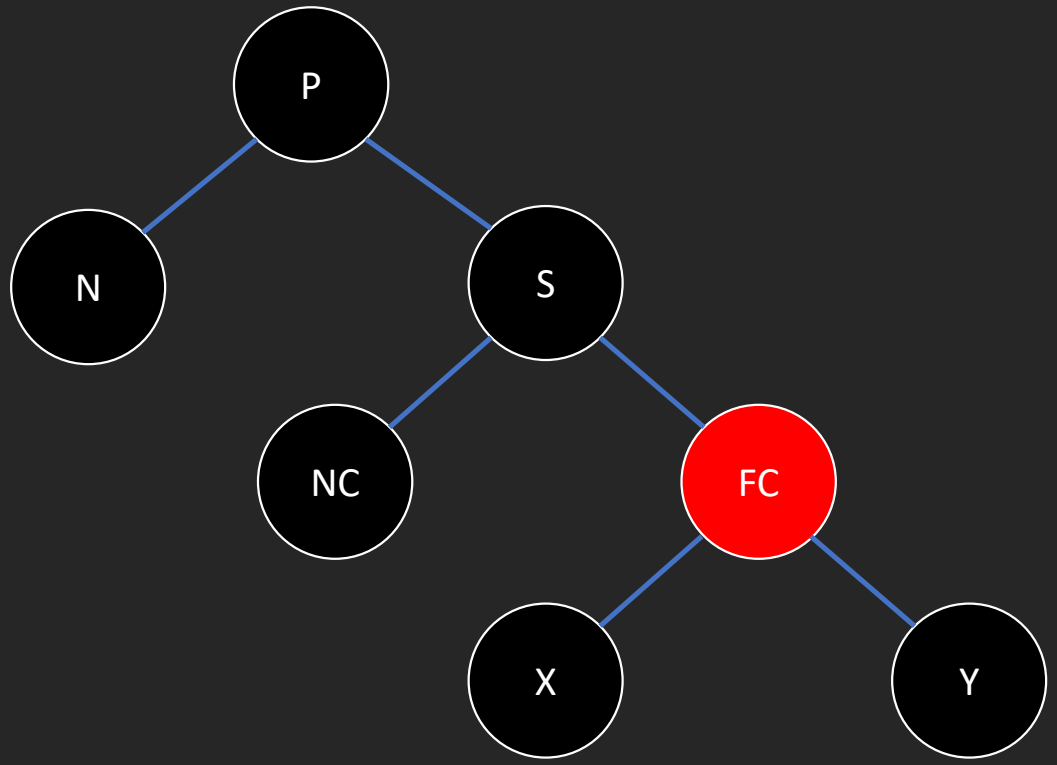

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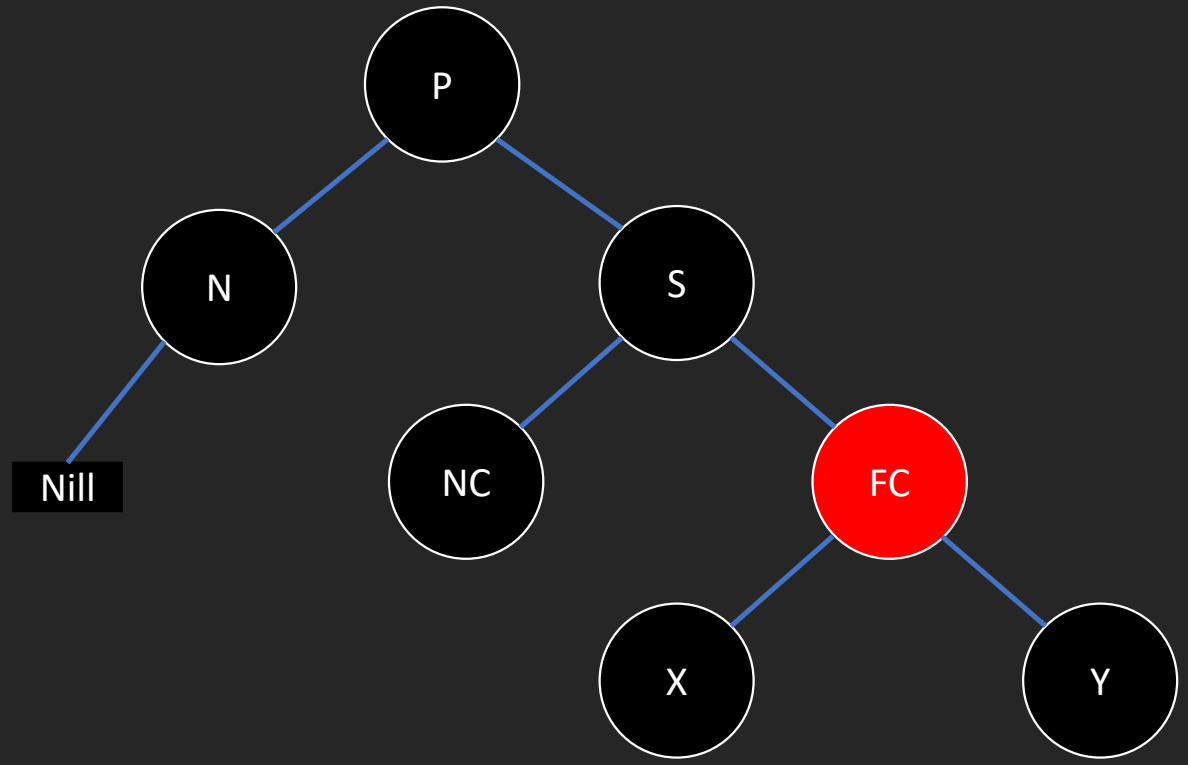
Sub-Sub Case 2.2.1: Sibling's far child is Red.

1- When you delete the node, it becomes double black.



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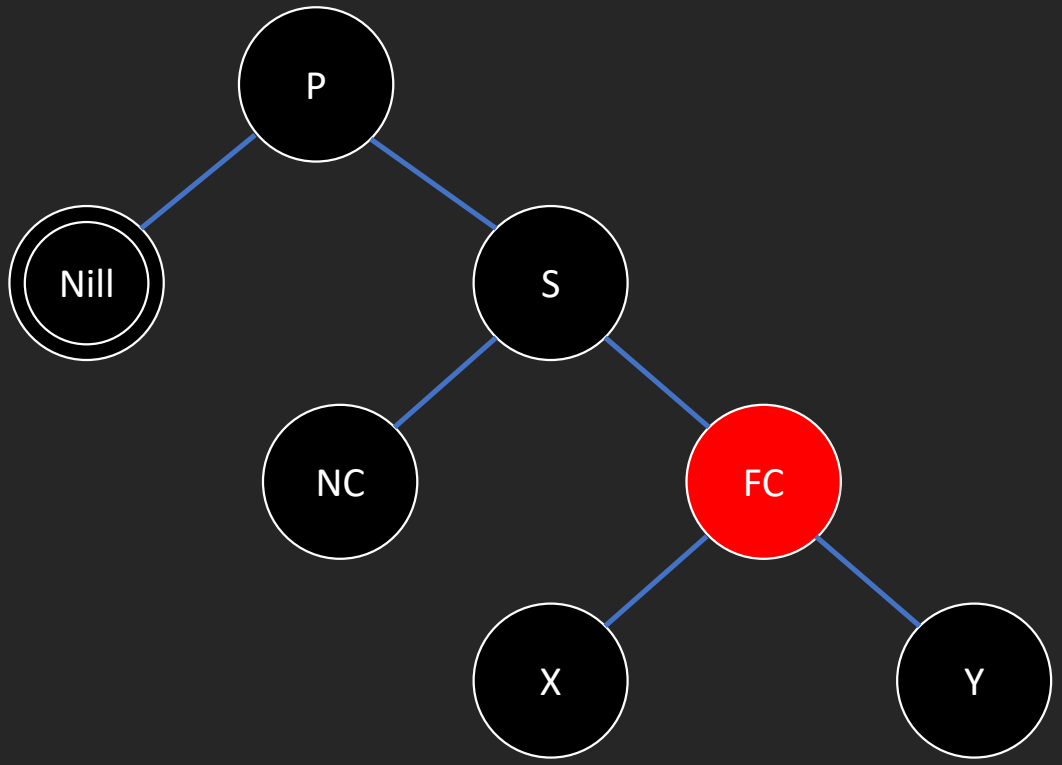

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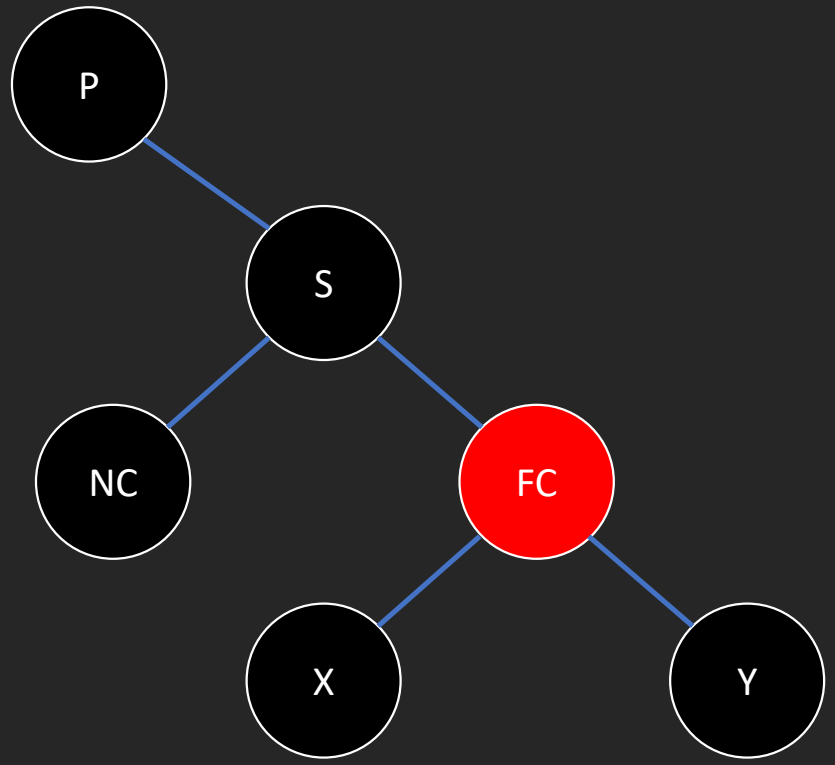
Sub-Sub Case 2.2.1: Sibling's far child is Red.

2- Perform a rotation on the parent and sibling (if the sibling is a right child, perform a left rotation; if the sibling is a left child, perform a right rotation).



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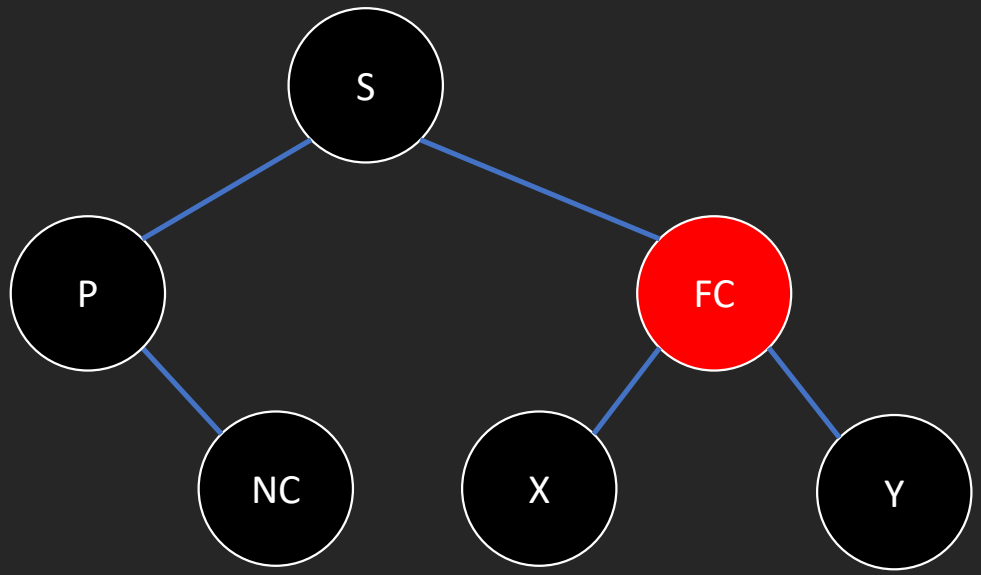
Sub-Sub Case 2.2.1: Sibling's far child is Red.

3- Color the far child black.

After Rotation



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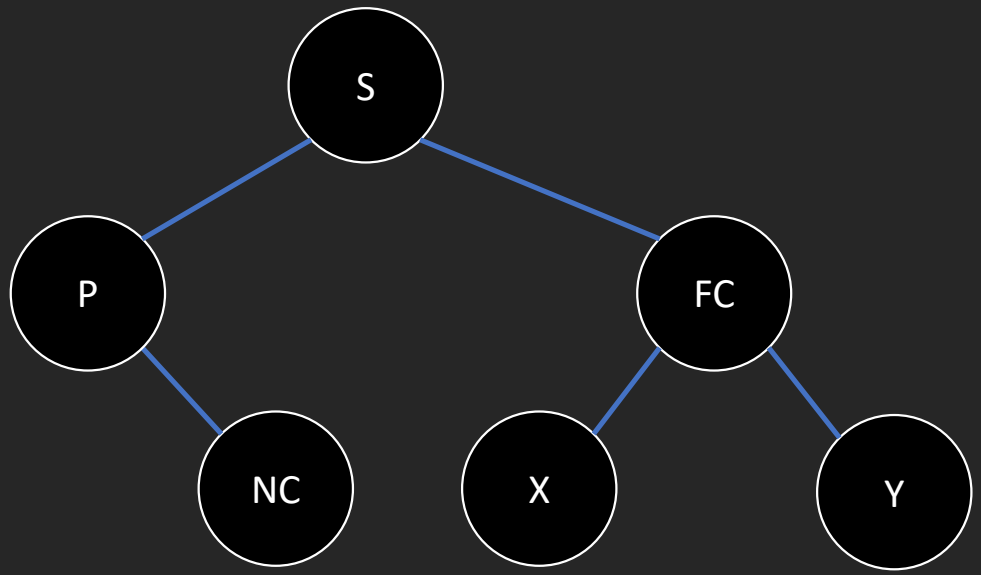
Sub-Sub Case 2.2.1: Sibling’s far child is Red.

After Coloring the far child to Black

4- Color the original sibling with the parent's original color.



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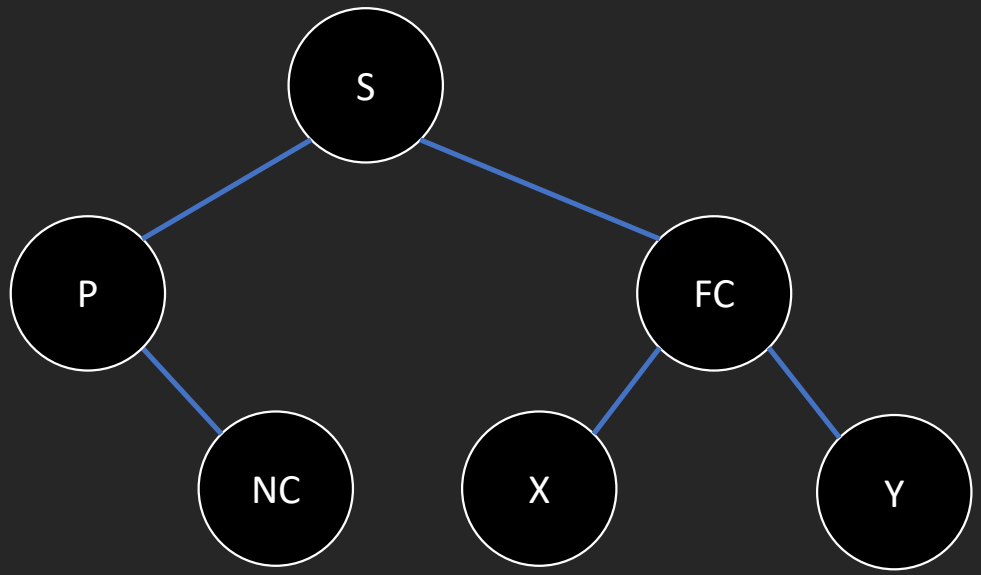
Sub-Sub Case 2.2.1: Sibling’s far child is Red.

5- Color the parent black.

After Coloring the original sibling with the parent's original color.



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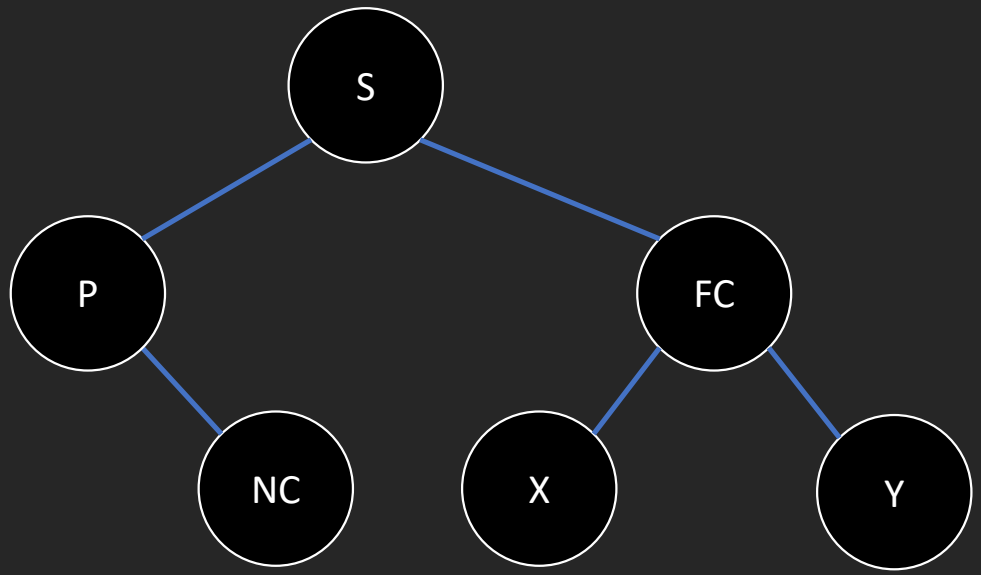
Sub-Sub Case 2.2.1: Sibling's far child is Red.

After Coloring the parent black.

6- The double black situation My be resolved and may be not: further steps are required to resolve the double black, potentially involving moving the double black up the tree and applying the rules from Case 2.1 or Case 2.2 again.



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