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RefactoringAndTestingAssignment :

Part 1: Refactoring

1_Move Refactoring :

Apply this technique to the following functions

IsOppositeGender , **hasAppropriateAge** , **hasSameMajor** ,
HasOneInterestInCommon , **match** With change of number of
parametr

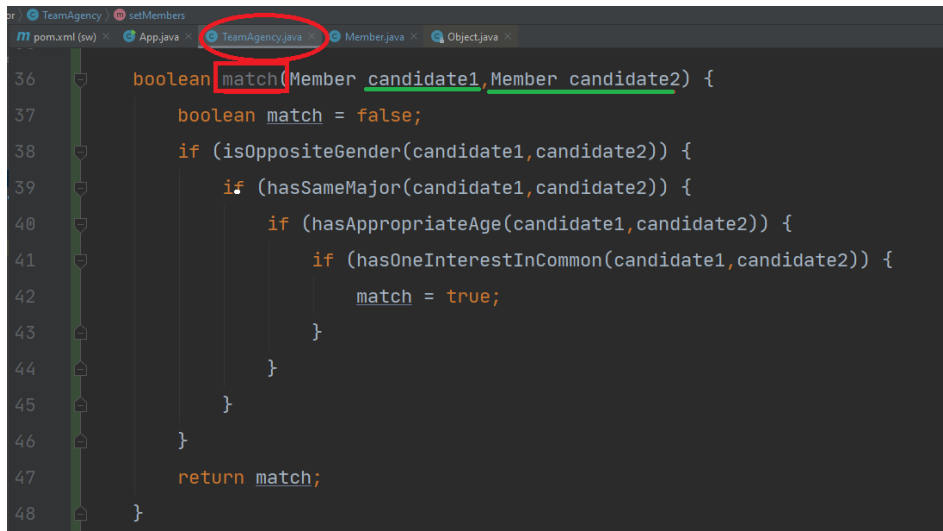
Move this methods from class Member to class TeamAgency to reduces
dependency between classes ,and Because this functrios fouced on the
logic and not the structure of date so I move it from Member to TeamAgency

A)Method match :

Code before apply move Refactor

```
@ boolean match(Member candidate) {
    boolean match = false;
    if (candidate.isOppositeGender(candidate: this)) {
        if (candidate.hasSameMajor(candidate: this)) {
            if (candidate.hasAppropriateAge(candidate: this)) {
                if (hasOneInterestInCommon(candidate)) {
                    match = true;
                }
            }
        }
    }
    return match;
}
```

Code after Refactoring :



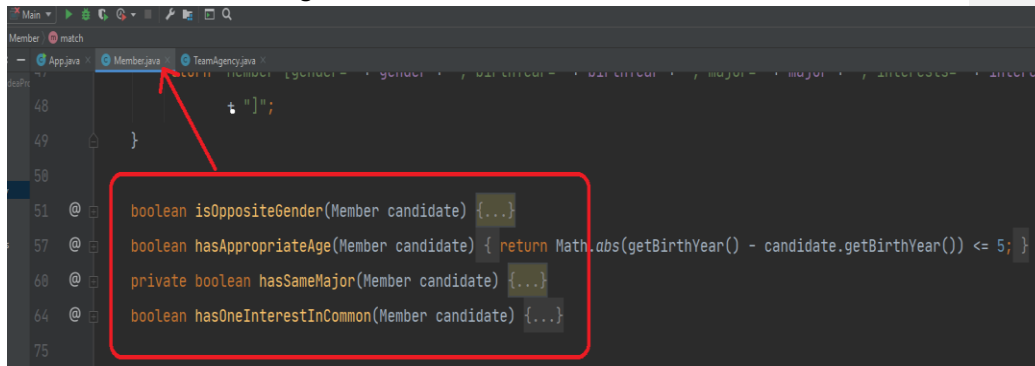
The screenshot shows the TeamAgency.java file in an IDE. The 'match' method is highlighted with a red circle. The code is as follows:

```
36 boolean match(Member candidate1, Member candidate2) {
37     boolean match = false;
38     if (isOppositeGender(candidate1, candidate2)) {
39         if (hasSameMajor(candidate1, candidate2)) {
40             if (hasAppropriateAge(candidate1, candidate2)) {
41                 if (hasOneInterestInCommon(candidate1, candidate2)) {
42                     match = true;
43                 }
44             }
45         }
46     }
47     return match;
48 }
```

B)for functions

IsOppositeGender , hasAppropriateAge, hasSameMajor,
HasOneInterestInCommon

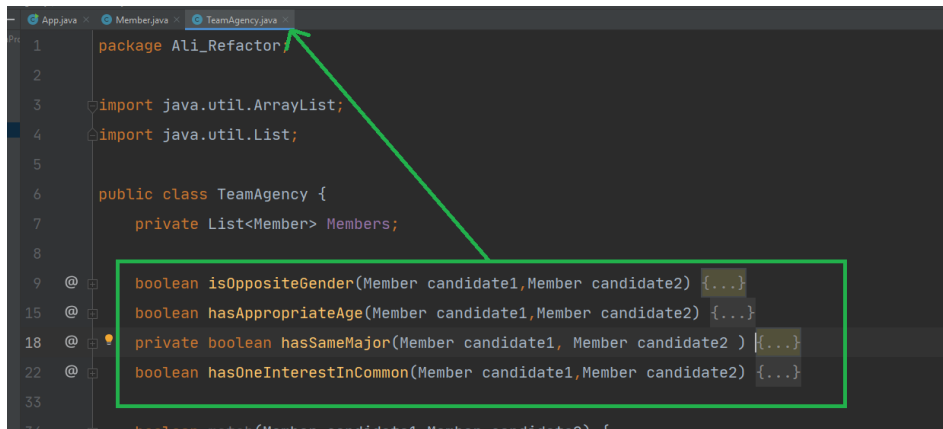
Code before Refactoring :



The screenshot shows the Member.java file in an IDE. The 'match' method is highlighted with a red circle. The code is as follows:

```
48 }
49 }
50
51 @
52 boolean isOppositeGender(Member candidate) {...}
53 @
54 boolean hasAppropriateAge(Member candidate) { return Math.abs(getBirthYear() - candidate.getBirthYear()) <= 5; }
55 @
56 private boolean hasSameMajor(Member candidate) {...}
57 @
58 boolean hasOneInterestInCommon(Member candidate) {...}
59 }
```

Code after Refactoring :



```
1 package Ali_Refactor;
2
3 import java.util.ArrayList;
4 import java.util.List;
5
6 public class TeamAgency {
7     private List<Member> Members;
8
9     @
10    boolean isOppositeGender(Member candidate1, Member candidate2) {...}
11
12    @
13    boolean hasAppropriateAge(Member candidate1, Member candidate2) {...}
14
15    @
16    private boolean hasSameMajor(Member candidate1, Member candidate2 ) {...}
17
18    @
19    boolean hasOneInterestInCommon(Member candidate1, Member candidate2) {...}
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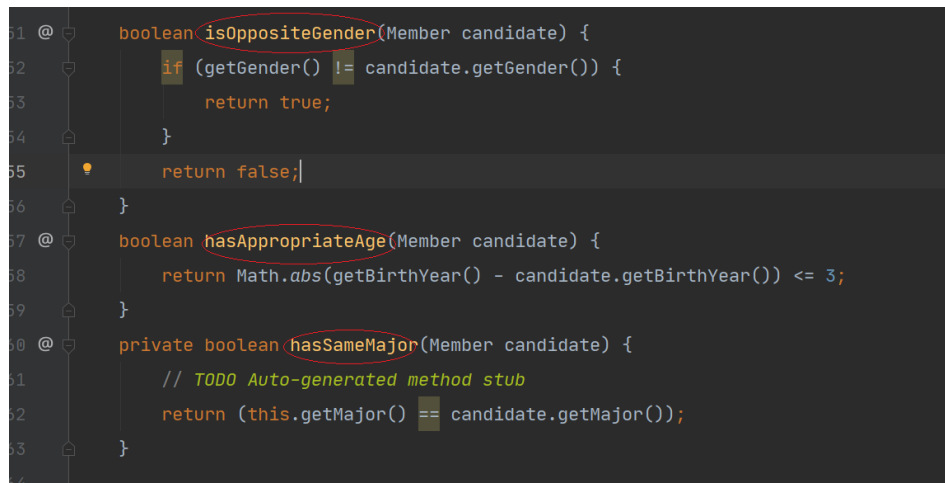
Result : reduces dependency between classes

2_inline method:

the following functions

IsOppositeGender , hasAppropriateAge, hasSameMajor,
HasOneInterestInCommon, I apply inline Refactoring by

Replace calls to the method with the method's content and delete the method



```
61 @ boolean isOppositeGender(Member candidate) {
62     if (getGender() != candidate.getGender()) {
63         return true;
64     }
65     return false;
66 }
67 @ boolean hasAppropriateAge(Member candidate) {
68     return Math.abs(getBirthYear() - candidate.getBirthYear()) <= 3;
69 }
70 @ private boolean hasSameMajor(Member candidate) {
71     // TODO Auto-generated method stub
72     return (this.getMajor() == candidate.getMajor());
73 }
74
```

Code after refactoring:

Step1 : Replace all calls to the method with the method's content:

```
boolean match(Member candidate1, Member candidate2) {  
    boolean match = false;  
    if (candidate1.getGender() != candidate2.getGender() ? true : false) { //isOppositeGender(candidate1, candidate2)  
        if (candidate1.getMajor() == candidate2.getMajor() ? true : false) { //hasSameMajor(candidate1, candidate2)  
            if (Math.abs(candidate1.getBirthYear() - candidate2.getBirthYear()) <= 5) { //hasAppropriateAge(candidate1, candidate2)  
                if (hasOneInterestInCommon(candidate1, candidate2)) { //We cant convert this method to inline  
                    match = true;  
                }  
            }  
        }  
    }  
    return match;  
}
```

Step2 : delete the method

```
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```

The Result for this Refactoring :

By minimizing the number of unneeded methods, you make the code more straightforward.

3_ Extract Method :

```
public List<Member> matchMember(Member member) {  
    List<Member> res = new ArrayList<Member>();  
  
    for (Member candidate : Members) {  
        // A matching team partner needs to have the opposite gender  
        if (!candidate.getGender().contentEquals(member.getGender())) {  
            // if both have the same major  
            if (candidate.getMajor().equals(member.getMajor())) {  
                // The age difference should be less than 5  
                int yearDiff = Math.abs(candidate.getBirthYear() - member.getBirthYear());  
                if (yearDiff <= 5) {  
                    for (String interest : candidate.getInterests()) {  
                        // The member and the candidate should have at least one interest  
                        if (member.getInterests().contains(interest)) {  
                            res.add(candidate);  
                            break;  
                        }  
                    }  
                }  
            }  
        }  
    }  
    return res;  
}
```

This condition statements have been checked inside method match

Because there are duplicates between matchMember function with match function so I replace these statements with call match function

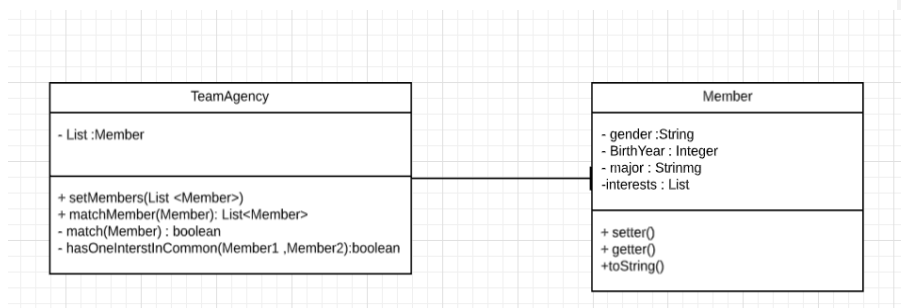
Code after Refactoring :

```
public List<Member> matchMember(Member member) {  
    List<Member> res = new ArrayList<Member>();  
  
    for (Member candidate : Members) {  
        // A matching team partner needs to have the opposite gender  
        if (match(candidate ,member))  
        {  
            res.add(candidate);  
        }  
    }  
    return res;  
}
```

Result :

- More readable code
- Less code duplication
- Isolates independent parts of code

After the refactor UML became :



Part 2 : Testing

Design table to include Test Data Set.

Choice	Input data set	Input property
1 true	A	No numbers
1 false	B	At least one number
2 true	B	Exactly one number
2 false	D	Exactly two number
3 true	D	The second number is greater than the first number
3 false	E	The second number is less than the first number
4 zero times	D	Exactly two number
4 one times	F	Exactly three number
4 more than one times	G	At least four number
5 true	H	The third number is greater than the largest value(ma1)
5 false	F	The third number is smaller than the largest value(ma1)
6 true	F	The third number is greater than the second largest value(ma2)
6 false	Z	The third number is smaller than the second largest value(ma2)

Generate a table of the input data sets based on the above table

Input data set	Contents	Expected out put
A	(no number)	No numbers
B	{2}	2
D	{2 , 3}	3 2
E	{3 ,2 }	3 2
F	{3 ,2 ,1 }	3 2
H	{ 2, 3 ,4}	4 3
G	{5 ,2 ,3,12 }	12 5
z	{5, 4 ,1 }	5 4

Commented [ABJ1]:

1_

erroneous
code

```
41 }  
42  
43 System.out.println("The two largest are " + ma1 + " and " + ma2);  
44 result="ma1,ma2";  
}
```

Test cases All test case except test_Exactly_one_number

Correct
code

```
48 System.out.println(result_of_print);  
49 result=ma1+", "+ma2;  
50 }
```

2_test Second Number less than first Number

erroneous
code

```
28         else {
29             int obs = Integer.parseInt(args[1]);
30             // ma2=obs;
31             if (obs > ma1)                /* 3 */
        
```

```
TestFindTowLargestNumbers.test_SecondNumberLess_than_firstNumber
Tests failed: 1 of 1 test - 17 ms
The two largest are 2 and 0
junit.framework.ComparisonFailure:
Expected :2,0
Actual   :2,1
<Click to see difference>

```

Test cases test_SecondNumberLess_than_firstNumber

Correct
code

```
28         else {
29             int obs = Integer.parseInt(args[1]);
30             ma2=obs;
31             if (obs > ma1)                /* 3 */
32         {
        
```

```
public void test_SecondNumberLess_than_firstNumberand_exactlyTow_number () {
    TestingTask.main(new String[] {"2","1"});
    String res=TestingTask.result;
    assertEquals(res, actual: "2,1");
    assertTrue(TestingTask.result_of_print.equals("The two largest are " + 2 + " and " + 1));
}

TestFindTowLargestNumbers.test_SecondNumberLess_than_firstNumber
Tests passed: 1 of 1 test - 3 ms
"C:\Program Files\Java\jdk-14.0.1\bin\java.exe" -ea -D
The two largest are 2 and 1
Process finished with exit code 0

```

