

## Assignment 1 [4 marks]

Given the attached knowledge base "*data.pl*" containing some "friend" relations, you are required to write a Prolog program that solves the tasks explained below.

### Task 1 [0.25 marks]:

Implement "*is\_friend*" which makes the "friend" relation a symmetric relation (i.e., if X is friends with Y then Y is friends with X).

#### Examples:

```
?- is_friend(ahmed, samy).  
true.  
?- is_friend(samy, ahmed).  
true.
```

**Note:** In the knowledge base, we have only one relation for Ahmed and Samy.

### Task 2 [0.75 marks]:

Get the list of all friends of a given person.

#### Examples:

```
?- friendList(ahmed, L).  
L = [samy, fouad].  
?- friendList(huda, L).  
L = [mariam, aisha, lamia].
```

### Task 3 [0.5 marks]:

Get the number of friends of a given person. (For the "count" rule, use **tail recursion**)

#### Examples:

```
?- friendListCount(ahmed, N).  
N = 2.
```

```
?- friendListCount(huda, N).  
N = 3.
```

#### **Task 4 [0.5 marks]:**

**Suggest possible friends to a person if they have at least one friend in common (at least one mutual friend). Make sure that the suggested friend is not already a friend of the person.**

##### **Examples:**

```
?- peopleYouMayKnow(ahmed, X).  
X = mohammed;  
X = said;  
...  
?- peopleYouMayKnow(huda, X).  
X = hagar;  
X = zainab;  
X = hend;  
X = zainab;  
...
```

#### **Task 5 [1 mark]:**

**Suggest one possible friend to a person if they have at least N mutual friends. Make sure that the suggested friend is not already a friend of the person.**

##### **Examples:**

```
?- peopleYouMayKnow(ahmed, 2, X).  
X = abdullah.
```

**Explanation:** Ahmed is friends with Fouad and Samy and both have Abdullah as a friend, so we can suggest Abdullah to Ahmed.

```
?- peopleYouMayKnow(huda, 3, X).  
X = zainab.
```

**Explanation:** Huda is friends with mariam, lamia and aisha and all of them have Zainab as a friend, so we can suggest Zainab to Huda.

### Task 6 [1 mark]:

Get a list of **all unique** possible friends to a person if they have at least one mutual friend. Make sure that the suggested friends **are not already friends** of the person.

#### *Examples:*

```
?- peopleYouMayKnowList(ahmed, L).  
L = [mohammed, said, omar, abdullah].  
?- peopleYouMayKnowList(huda, L).  
L = [hagar, zainab, hend].
```

### Bonus Task [1 mark]:

Suggest possible friends to a person if there is no direct mutual friend between them but there is a **simple indirect relation** (e.g., X is a friend of Y and Y is a friend of Z and Z is a friend of W, so we can suggest W to X even if there are no direct mutual friends between X and W). Make sure that the suggested friend(s) **is(are) not already a friend** of the person.

#### *Examples:*

```
?- peopleYouMayKnow_indirect(ahmed, X).  
X = khaled;  
X = ibrahim;  
X = khaled;  
...  
?- peopleYouMayKnow_indirect(huda, X).  
X = rokaya;  
X = eman;  
...
```

**Important Notes:** *(Please read these notes carefully to avoid losing grades)*

- **Don't change** the structure of "*data.pl*".
- Write your solution in a **different file** not in "*data.pl*".
- **Don't use any built-in predicates.**
- **Use the cut operator** in the suitable positions when needed.
- Please **submit one .pl file** containing your solution. The file name must follow this structure: **ID1\_ID2\_ID3\_DEPARTMENT\_GROUP**.
- The number of students in a team must be **exactly 3**.
- **Cheaters will be given a NEGATIVE grade and no excuses will be accepted.**
- The deadline is **after 1 week** of the assignment announcement.