King Fahd University of Petroleum & Minerals
Information & Computer Science Department

ICS 410 Programming Languages

Assignment 03

Due Date	Weight	Semester	Section
2nd May 2007	5%	062	2

In this homework, you are asked to implement some Prolog functors (or predicates) and execute them using a Prolog interpreter.

For all the given problems your Prolog code should at least pass those tests given in the problems; of course, you may use more complicated tests to guarantee your function works correctly.

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1. Write the following statements in Prolog:
   a) "The product of any integer **I** and **1** is **I**"
   b) "The volume of a container is the product of its length **L**, width **W** and height **H**.
   c) "If Ali is a male and Ali is Ahmad's parent then Ali is Ahmad's father."

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2. An instructor assigns grades to his students according to the following table:

Score	≥ 90	≥ 85	≥ 75	≥ 70	≥ 65	≥ 60	≥ 55	≥ 45	≤ 44
Grade	A+	A	B+	B	C+	C	D+	D	F

   Write a functor `assignGrade(score,Grade)` that takes a student's score and returns his letter grade.

   Test Cases

```
?- assignGrade(92,Grade).          Grade = A+
?- assignGrade(75,Grade).          Grade = B+
?- assignGrade(-70,Grade).         program error: invalid grade.
```

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3. Define a functor *`product(Num, Pr)`* that computes the *product* of the integers 1*2*3* ... * *Num*, where *Num* ≥ 1.

   Test Cases

```
?- product(1,A).                   A = 1
?- product(5,A).                   A = 120
```

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4. Define a functor *xPowery (X,Y,Power)* which computes the value X^Y (X to the Power Y). You should not use Prolog Power function (**).

   Test Cases

```
xPowery(2,0,Power).                Power = 1
xPowery(4,2,Power).                Power = 16
xPowery(3,3,Power).                Power = 27
```

5. Define a functor *maximum(L,Max)*. The functor will succeed if Max is the maximum integer in the list L, otherwise it will fail.

Test Cases

```
maximum([], Max).                    Max = 'No element in the list'
maximum([31,33,20,10],20).           no
maximum([31,33,20,10],33).           yes
maximum([313,334,202,101],Max).      Max = 334
```

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6. Define the following two functors:
   a. `int2List` that converts an integer into a list containing the digits of the integer in order.
   b. `list2Int` that collapses a list of integers into an integer.

Test cases

```
?- int2List(1,A).                    A = [1]
?- int2List(354,A).                  A = [3,5,4]
?- int2List(72869,A).                A = [7,2,8,6,9]
?- list2Int([1],A).                  A = 1
?- list2Int([3,5,4],A).              A = 354
?- list2Int([7,2,8,6,9],A).          A = 72869
```

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7. Define a functor *drop(X, L, NL)* with three arguments, an element X and two lists L and NL. NL is constructed from the elements of L by removing **all** occurrences of X if it is there.

Test Cases

```
drop(35, [40,35,30,35,20], NS).      NS = [40,30,20]
drop(50, [40,35,30,20], NS).         NS = [40,35,30,20]
```

Submission Requirements

1. Submit a CD (or a floppy disk) containing 7 Prolog files (Q1.pl, assignGrade.pl, product.pl, xPowery.pl, maximum.pl, reverse.pl,……*)* containing the Prolog code for the seven requested problems. Make sure that your CD/floppy is virus-free and has your name and ID # written on it
2. Submit a printed report in MS Word that includes the following:
   - Course title, number, and section number
   - Your Name and ID number
   - The statement of the problem (The text in the previous two pages.)
   - A list of all the functors you developed, 1 through 7 with some description of how they. This will be the documentation of your functors.

Important Notice

1. No assignment will be accepted after the due date
2. Any students who cheat from any other students (even for one problem) will get Zero (0) in the whole assignment.
3. Only working (or partially working) functors will be graded. Do not submit a program that does not run.
4. The assignment will be graded out of (**50**) points distributed as follows:
   - Problems (1) - (4): **5 points each**
     (**3** for the correct code, **1** for the documentation, and **1** for the execution with test cases)
   - Problems (5) - (7): **10 points each**
     (**7** for the correct code, **1** for the documentation, and **2** for the execution with test cases)