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CS 360 – 002
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Lab 4

OS: macOS X Catalina ver. 10.15.6
Serial Number (system): C02NLN90G3QJ
Hardware UUID: 793DBFBA-8B38-5104-9E39-7BBF399D3196
Tested GNU Prolog ver. 1.4.5, Scheme ver. 10.1.10 and, implemented in Tux.
Path Files for all Tux files "/home/ml3546/CS360/lab_4".

1.

i. gcd.pl

```
ml3546@tux5:~/CS360/lab_4$ prolog
GNU Prolog 1.4.5 (64 bits)
Compiled Feb 23 2020, 20:14:50 with gcc
By Daniel Diaz
Copyright (C) 1999-2020 Daniel Diaz
| ?- [gcd].
compiling /home2/home-m/ml3546/CS360/lab_4/gcd.pl for byte code...
/home2/home-m/ml3546/CS360/lab_4/gcd.pl compiled, 6 lines read - 2103 bytes written, 20 ms

(2 ms) yes
| ?- gcd(36,21,X).

X = 3

yes
```

Euclid's Algorithm
Method: gcd(a, b)
Time Complexity: O(log(a,b) = O(log a + log b) = O (log n)

Prolog Algorithm
Method: Similar to Prime Factorization
Time Complexity: O(n log n)

ii. last.pl

```
ml3546@tux5:~/CS360/lab_4$ prolog
GNU Prolog 1.4.5 (64 bits)
Compiled Feb 23 2020, 20:14:50 with gcc
By Daniel Diaz
Copyright (C) 1999-2020 Daniel Diaz
| ?- [last].
compiling /home2/home-m/ml3546/CS360/lab_4/last.pl for byte code...
/home2/home-m/ml3546/CS360/lab_4/last.pl:1: warning: singleton variables [X] for last1/2
/home2/home-m/ml3546/CS360/lab_4/last.pl compiled, 0 lines read - 610 bytes written, 50 ms

(1 ms) yes
| ?- last([1,2,3],5).

no
| ?- last([1,2,3,4],5).

no
| ?- last([1,2,3,4,5],5).

yes
| ?- last([5,4,3,2,1],5).

no
| ?- last([5,4,3,2,1],4).

no
| ?- last([5,4,3,2,1],3).

no
| ?- last([5,4,3,2,1],2).

no
| ?- last([5,4,3,2,1],1).

yes
```

iii. merge.pl

```
ml3546@tux5:~/CS360/lab_4$ prolog
GNU Prolog 1.4.5 (64 bits)
Compiled Feb 23 2020, 20:14:50 with gcc
By Daniel Diaz
Copyright (C) 1999-2020 Daniel Diaz
| ?- [merge].
compiling /home2/home-m/ml3546/CS360/lab_4/merge.pl for byte code...
/home2/home-m/ml3546/CS360/lab_4/merge.pl:1: warning: singleton variables [X] for size/2
/home2/home-m/ml3546/CS360/lab_4/merge.pl:1: warning: singleton variables [X] for take/3
/home2/home-m/ml3546/CS360/lab_4/merge.pl compiled, 1 lines read - 4000 bytes written, 23 ms

yes
| ?- mergesort([],[]).

yes
| ?- mergesort([1,2,3],[1,2,3]).

true ?

yes
| ?- mergesort([9,3,8],Y).

Y = [3,8,9] ?

yes
```

2. Function min

```
ml3546@tux2:~/CS360/lab_4$ prolog
GNU Prolog 1.4.5 (64 bits)
Compiled Feb 23 2020, 20:14:50 with gcc
By Daniel Diaz
Copyright (C) 1999-2020 Daniel Diaz
| ?- [min].
compiling /home2/home-m/ml3546/CS360/lab_4/min.pl for byte code...
/home2/home-m/ml3546/CS360/lab_4/min.pl compiled, 4 lines read - 1070 bytes written, 5 ms

(1 ms) yes
| ?- min(10,[1,2,3,4,5]).

no
| ?- min(1,[1,2,3]).

true ?

yes
| ?- min(X,[2,5,1,4,2]).

X = 1 ?

yes
```

Function sentence

```
ml3546@tux2:~/CS360/lab_4$ prolog
GNU Prolog 1.4.5 (64 bits)
Compiled Feb 23 2020, 20:14:50 with gcc
By Daniel Diaz
Copyright (C) 1999-2020 Daniel Diaz
| ?- [sentence].
compiling /home2/home-m/ml3546/CS360/lab_4/sentence.pl for byte code...
/home2/home-m/ml3546/CS360/lab_4/sentence.pl compiled, 11 lines read - 1908 bytes written, 5 ms

(2 ms) yes
| ?- sentence([the,boy,pets,a,dog]).

yes
| ?- sentence([the,girl,sees,a,dog]).

yes
| ?- sentence([girl,pets,boy]).

no
```

3. (load "ch4-query")
   (initialize-data-base microshaft-data-base)
   (query-driver-loop)
   (job ?x (computer technician))
   (job ?x (computer wizard))
   (job ?x (computer programmer))
   (address ?x ?y)
   (supervisor ?x ?y)
   (and (job ?person (computer wizard))(address ?person ?where))

   Output:

```
[ml3546@tux2:~/CS360/lab_4$ scheme
MIT/GNU Scheme running under GNU/Linux
Type `^C' (control-C) followed by `H' to obtain information about interrupts.

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This is free software; see the source for copying conditions. There is NO warranty; not even for MERCHANTABILITY or
FITNESS FOR A PARTICULAR PURPOSE.

Image saved on Thursday September 5, 2019 at 11:51:46 AM
  Release 10.1.10 || Microcode 15.3 || Runtime 15.7 || SF 4.41 || LIAR/x86-64 4.118

1 ]=> (load "ch4-query")
(initialize-data-base microshaft-data-base)
(query-driver-loop)
(job ?x (computer technician))
(job ?x (computer wizard))
(job ?x (computer programmer))
(address ?x ?y)
(supervisor ?x ?y)
(and (job ?person (computer wizard))(address ?person ?where))
;Loading "ch4-query.scm"... done
;Value: microshaft-data-base

1 ]=>
;Value: done

1 ]=>

;;; Query input:

;;; Query results:
(job (tweakit lem e) (computer technician))

;;; Query input:

;;; Query results:
(job (bitdiddle ben) (computer wizard))

;;; Query input:

;;; Query results:
(job (fect cy d) (computer programmer))
(job (hacker alyssa p) (computer programmer))

;;; Query input:

;;; Query results:
(address (aull dewitt) (slumerville (onion square) 5))
(address (cratchet robert) (allston (n harvard street) 16))
(address (scrooge eben) (weston (shady lane) 10))
(address (warbucks oliver) (swellesley (top heap road)))
(address (reasoner louis) (slumerville (pine tree road) 80))
(address (tweakit lem e) (boston (bay state road) 22))
(address (fect cy d) (cambridge (ames street) 3))
(address (hacker alyssa p) (cambridge (mass ave) 78))
(address (bitdiddle ben) (slumerville (ridge road) 10))

;;; Query input:

;;; Query results:
(supervisor (aull dewitt) (warbucks oliver))
(supervisor (cratchet robert) (scrooge eben))
(supervisor (scrooge eben) (warbucks oliver))
(supervisor (bitdiddle ben) (warbucks oliver))
(supervisor (reasoner louis) (hacker alyssa p))
(supervisor (tweakit lem e) (bitdiddle ben))
(supervisor (fect cy d) (bitdiddle ben))
(supervisor (hacker alyssa p) (bitdiddle ben))
```