```
Last login: Wed Feb 23 21:40:05 on ttys001
(base) yunyicheng@Yunyi-Cheng-Macbook-Pro ~ % ssh cheng122@teach.cs.utoronto.ca
cheng122@teach.cs.utoronto.ca's password:
*** DOWNTIME: All teach.cs remote-access systems will be rebooted ***
***    on Friday 2022-02-25, sometime between 08h00 and 09h00    ***

    Type "faq" to view FAQ, and "rules" to view usage policy.
    Report system problems by sending email to <sysadmin@teach.cs.toronto.edu>.

The Teaching Labs are: BA2200 BA2210 BA2220 BA2240 BA2270 BA3175 BA3185 BA3195 BA3200

WINTER 2022 Teaching Labs updates available https://www.teach.cs.toronto.edu/winter2022

This is a shared Linux system. By using this system, you acknowledge that
some information about your computer account (e.g. login name, process data,
etc.) will be available to other users sharing this system, in ways
typical of shared Linux systems.

Last login: Wed Feb 23 21:37:55 2022 from ip-38-34-39-55.fibre.fibrestream.ca
wolf:~$ LS
-bash: LS: command not found
wolf:~$ ls
2020-03-10-170413_1920x1080_scrot.png  Documents     q5.sql
2020-03-10-170500_1920x1080_scrot.png  Downloads     q6.sql
2020-03-10-171504_1920x1080_scrot.png  greybox_tmp   schema.ddl
2020-03-10-171605_1920x1080_scrot.png  group_0566    server.1
2020-03-10-171610_1920x1080_scrot.png  loadTest.sql  superstore.csv
2020-03-10-171705_1920x1080_scrot.png  Music         t51
2020-03-10-172023_1920x1080_scrot.png  Pictures      Templates
a2_schema.sql                          practice      Thunderbird_Folders
client.1                               Public        transcript
cp                                     q1.sql        u1.sql
csc343a2                               q2.sql        u2.sql
csc343db                               q3.sql        u3.sql
Desktop                                q4.sql        Videos
wolf:~$ cd Desktop
wolf:~/Desktop$ ls
cheng122  CSC148  CSC258  CSC384_A3  DE1_SoC.qsf  search
wolf:~/Desktop$ cd CSC384_A3
wolf:~/Desktop/CSC384_A3$ ls
autograder.py  cspbase.py  propagators.py  tenner_csp.py
wolf:~/Desktop/CSC384_A3$ exit
logout
Connection to teach.cs.utoronto.ca closed.
(base) yunyicheng@Yunyi-Cheng-Macbook-Pro ~ % scp -r Downloads/csp cheng122@teach.cs.utoro
nto.ca:Desktop
cheng122@teach.cs.utoronto.ca's password:
csc384w22_a2.pdf                              100%  162KB   1.8MB/s   00:00
tester.py                                     100% 1646    29.2KB/s   00:00
.DS_Store                                     100% 6148    92.3KB/s   00:00
propagators.py                                100% 6065    92.5KB/s   00:00
csp_sample_run.py                             100% 3052    40.8KB/s   00:00
acknowledgment_form.pdf                       100%   45KB 701.3KB/s   00:00
cspbase.cpython-39.pyc                        100%   19KB 315.6KB/s   00:00
puzzle_csp.cpython-39.pyc                     100% 6476   103.2KB/s   00:00
propagators.cpython-39.pyc                    100% 4802    78.0KB/s   00:00
cspbase.py                                    100%   20KB 303.2KB/s   00:00
puzzle_csp.py                                 100% 9318   138.1KB/s   00:00
sample_boards.py                              100% 1834    24.3KB/s   00:00
```

```
propagators_test.py                           100% 5607    84.7KB/s   00:00
profiles_settings.xml                         100%  174     3.5KB/s   00:00
Project_Default.xml                           100%  410     7.7KB/s   00:00
.gitignore                                    100%  176     2.9KB/s   00:00
workspace.xml                                 100%   10KB 142.4KB/s   00:00
modules.xml                                   100%  258     4.0KB/s   00:00
csp.iml                                       100%  441     6.2KB/s   00:00
misc.xml                                      100%  185     2.6KB/s   00:00
(base) yunyicheng@Yunyi-Cheng-Macbook-Pro ~ % ssh cheng122@teach.cs.utoronto.ca
cheng122@teach.cs.utoronto.ca's password:
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some information about your computer account (e.g. login name, process data,
etc.) will be available to other users sharing this system, in ways
typical of shared Linux systems.

Last login: Wed Feb 23 21:54:30 2022 from ip-38-34-39-55.fibre.fibrestream.ca
wolf:~$ cd Desktop/csp
wolf:~/Desktop/csp$ ls
acknowledgment_form.pdf  csp_sample_run.py    puzzle_csp.py     tester.py
csc384w22_a2.pdf         propagators.py       __pycache__
cspbase.py               propagators_test.py  sample_boards.py
wolf:~/Desktop/csp$ python3 propagators_test.py
---starting test_simple_FC---

---finished test_simple_FC---

---starting test_simple_GAC---

---finished test_simple_GAC---

---starting three_queen_FC---

---finished three_queen_FC---

---starting three_queen_GAC---

---finished three_queen_GAC---

Total score 4/4

wolf:~/Desktop/csp$ python3 sample_boards.py
Solving board
=====================================================
GAC
CSP caged_csp_model solved. CPU Time used = 0.0019396890000000014
CSP caged_csp_model  Assignments =
Var--11  =  2     Var--12  =  1     Var--13  =  3     Var--21  =  1     Var--22  =  3
Var--23  =  2     Var--31  =  3     Var--32  =  2     Var--33  =  1
bt_search finished
```

```
Search made 9 variable assignments and pruned 16 variable values
FC
CSP caged_csp_model solved. CPU Time used = 0.0004166789999999962
CSP caged_csp_model  Assignments =
Var--11  =  2     Var--12  =  1     Var--13  =  3     Var--21  =  1     Var--22  =  3
Var--23  =  2     Var--31  =  3     Var--32  =  2     Var--33  =  1
bt_search finished
Search made 9 variable assignments and pruned 15 variable values
BT
CSP caged_csp_model solved. CPU Time used = 0.0002187690000000006
CSP caged_csp_model  Assignments =
Var--11  =  2     Var--12  =  1     Var--13  =  3     Var--21  =  1     Var--22  =  3
Var--23  =  2     Var--31  =  3     Var--32  =  2     Var--33  =  1
bt_search finished
Search made 17 variable assignments and pruned 0 variable values
Solution
[2, 1, 3]
[1, 3, 2]
[3, 2, 1]
Solving board
=======================================================
GAC
CSP caged_csp_model solved. CPU Time used = 0.0071716840000000046
CSP caged_csp_model  Assignments =
Var--11  =  3     Var--12  =  1     Var--13  =  2     Var--14  =  4     Var--21  =  2
Var--22  =  4     Var--23  =  3     Var--24  =  1     Var--31  =  1     Var--32  =  2
Var--33  =  4     Var--34  =  3     Var--41  =  4     Var--42  =  3     Var--43  =  1
Var--44  =  2
bt_search finished
Search made 17 variable assignments and pruned 54 variable values
FC
CSP caged_csp_model solved. CPU Time used = 0.0036307640000000016
CSP caged_csp_model  Assignments =
Var--11  =  3     Var--12  =  1     Var--13  =  2     Var--14  =  4     Var--21  =  2
Var--22  =  4     Var--23  =  3     Var--24  =  1     Var--31  =  1     Var--32  =  2
Var--33  =  4     Var--34  =  3     Var--41  =  4     Var--42  =  3     Var--43  =  1
Var--44  =  2
bt_search finished
Search made 57 variable assignments and pruned 168 variable values
BT
CSP caged_csp_model solved. CPU Time used = 0.030682451000000006
CSP caged_csp_model  Assignments =
Var--11  =  3     Var--12  =  1     Var--13  =  2     Var--14  =  4     Var--21  =  2
Var--22  =  4     Var--23  =  3     Var--24  =  1     Var--31  =  1     Var--32  =  2
Var--33  =  4     Var--34  =  3     Var--41  =  4     Var--42  =  3     Var--43  =  1
Var--44  =  2
bt_search finished
Search made 2652 variable assignments and pruned 0 variable values
Solution
[3, 1, 2, 4]
[2, 4, 3, 1]
[1, 2, 4, 3]
[4, 3, 1, 2]
Solving board
=======================================================
GAC
CSP caged_csp_model solved. CPU Time used = 0.034426319999999996
CSP caged_csp_model  Assignments =
Var--11  =  5     Var--12  =  2     Var--13  =  1     Var--14  =  4     Var--15  =  3
```

```
Var--21  =  1     Var--22  =  4     Var--23  =  5     Var--24  =  3     Var--25  =  2
Var--31  =  2     Var--32  =  5     Var--33  =  3     Var--34  =  1     Var--35  =  4
Var--41  =  3     Var--42  =  1     Var--43  =  4     Var--44  =  2     Var--45  =  5
Var--51  =  4     Var--52  =  3     Var--53  =  2     Var--54  =  5     Var--55  =  1
bt_search finished
Search made 27 variable assignments and pruned 179 variable values
FC
CSP caged_csp_model solved. CPU Time used = 0.05470966999999999
CSP caged_csp_model  Assignments =
Var--11  =  5     Var--12  =  2     Var--13  =  1     Var--14  =  4     Var--15  =  3
Var--21  =  1     Var--22  =  4     Var--23  =  5     Var--24  =  3     Var--25  =  2
Var--31  =  2     Var--32  =  5     Var--33  =  3     Var--34  =  1     Var--35  =  4
Var--41  =  3     Var--42  =  1     Var--43  =  4     Var--44  =  2     Var--45  =  5
Var--51  =  4     Var--52  =  3     Var--53  =  2     Var--54  =  5     Var--55  =  1
bt_search finished
Search made 589 variable assignments and pruned 2508 variable values
BT
CSP caged_csp_model solved. CPU Time used = 11.695977516000001
CSP caged_csp_model  Assignments =
Var--11  =  5     Var--12  =  2     Var--13  =  1     Var--14  =  4     Var--15  =  3
Var--21  =  1     Var--22  =  4     Var--23  =  5     Var--24  =  3     Var--25  =  2
Var--31  =  2     Var--32  =  5     Var--33  =  3     Var--34  =  1     Var--35  =  4
Var--41  =  3     Var--42  =  1     Var--43  =  4     Var--44  =  2     Var--45  =  5
Var--51  =  4     Var--52  =  3     Var--53  =  2     Var--54  =  5     Var--55  =  1
bt_search finished
Search made 1234730 variable assignments and pruned 0 variable values
Solution
[5, 2, 1, 4, 3]
[1, 4, 5, 3, 2]
[2, 5, 3, 1, 4]
[3, 1, 4, 2, 5]
[4, 3, 2, 5, 1]
Solving board
=====================================================
GAC
CSP caged_csp_model solved. CPU Time used = 0.07513508599999952
CSP caged_csp_model  Assignments =
Var--11  =  5     Var--12  =  6     Var--13  =  3     Var--14  =  4     Var--15  =  1
Var--16  =  2     Var--21  =  6     Var--22  =  1     Var--23  =  4     Var--24  =  5
Var--25  =  2     Var--26  =  3     Var--31  =  4     Var--32  =  5     Var--33  =  2
Var--34  =  3     Var--35  =  6     Var--36  =  1     Var--41  =  3     Var--42  =  4
Var--43  =  1     Var--44  =  2     Var--45  =  5     Var--46  =  6     Var--51  =  2
Var--52  =  3     Var--53  =  6     Var--54  =  1     Var--55  =  4     Var--56  =  5
Var--61  =  1     Var--62  =  2     Var--63  =  5     Var--64  =  6     Var--65  =  3
Var--66  =  4
bt_search finished
Search made 44 variable assignments and pruned 352 variable values
FC
CSP caged_csp_model solved. CPU Time used = 6.895586918999999
CSP caged_csp_model  Assignments =
Var--11  =  5     Var--12  =  6     Var--13  =  3     Var--14  =  4     Var--15  =  1
Var--16  =  2     Var--21  =  6     Var--22  =  1     Var--23  =  4     Var--24  =  5
Var--25  =  2     Var--26  =  3     Var--31  =  4     Var--32  =  5     Var--33  =  2
Var--34  =  3     Var--35  =  6     Var--36  =  1     Var--41  =  3     Var--42  =  4
Var--43  =  1     Var--44  =  2     Var--45  =  5     Var--46  =  6     Var--51  =  2
Var--52  =  3     Var--53  =  6     Var--54  =  1     Var--55  =  4     Var--56  =  5
Var--61  =  1     Var--62  =  2     Var--63  =  5     Var--64  =  6     Var--65  =  3
Var--66  =  4
bt_search finished
```

```
Search made 82469 variable assignments and pruned 408832 variable values
[5, 6, 3, 4, 1, 2]
[6, 1, 4, 5, 2, 3]
[4, 5, 2, 3, 6, 1]
[3, 4, 1, 2, 5, 6]
[2, 3, 6, 1, 4, 5]
[1, 2, 5, 6, 3, 4]
Solving board
=====================================================
GAC
CSP caged_csp_model solved. CPU Time used = 0.4906541769999997
CSP caged_csp_model  Assignments =
Var--11  =  1     Var--12  =  2     Var--13  =  3     Var--14  =  4     Var--15  =  5
Var--16  =  6     Var--17  =  7     Var--18  =  8     Var--21  =  2     Var--22  =  1
Var--23  =  4     Var--24  =  3     Var--25  =  6     Var--26  =  5     Var--27  =  8
Var--28  =  7     Var--31  =  3     Var--32  =  4     Var--33  =  1     Var--34  =  2
Var--35  =  7     Var--36  =  8     Var--37  =  5     Var--38  =  6     Var--41  =  4
Var--42  =  3     Var--43  =  2     Var--44  =  1     Var--45  =  8     Var--46  =  7
Var--47  =  6     Var--48  =  5     Var--51  =  5     Var--52  =  6     Var--53  =  7
Var--54  =  8     Var--55  =  1     Var--56  =  2     Var--57  =  3     Var--58  =  4
Var--61  =  6     Var--62  =  5     Var--63  =  8     Var--64  =  7     Var--65  =  2
Var--66  =  1     Var--67  =  4     Var--68  =  3     Var--71  =  7     Var--72  =  8
Var--73  =  5     Var--74  =  6     Var--75  =  3     Var--76  =  4     Var--77  =  1
Var--78  =  2     Var--81  =  8     Var--82  =  7     Var--83  =  6     Var--84  =  5
Var--85  =  4     Var--86  =  3     Var--87  =  2     Var--88  =  1
bt_search finished
Search made 64 variable assignments and pruned 373 variable values
FC
CSP caged_csp_model solved. CPU Time used = 0.008615910000003169
CSP caged_csp_model  Assignments =
Var--11  =  1     Var--12  =  2     Var--13  =  3     Var--14  =  4     Var--15  =  5
Var--16  =  6     Var--17  =  7     Var--18  =  8     Var--21  =  2     Var--22  =  1
Var--23  =  4     Var--24  =  3     Var--25  =  6     Var--26  =  5     Var--27  =  8
Var--28  =  7     Var--31  =  3     Var--32  =  4     Var--33  =  1     Var--34  =  2
Var--35  =  7     Var--36  =  8     Var--37  =  5     Var--38  =  6     Var--41  =  4
Var--42  =  3     Var--43  =  2     Var--44  =  1     Var--45  =  8     Var--46  =  7
Var--47  =  6     Var--48  =  5     Var--51  =  5     Var--52  =  6     Var--53  =  7
Var--54  =  8     Var--55  =  1     Var--56  =  2     Var--57  =  3     Var--58  =  4
Var--61  =  6     Var--62  =  5     Var--63  =  8     Var--64  =  7     Var--65  =  2
Var--66  =  1     Var--67  =  4     Var--68  =  3     Var--71  =  7     Var--72  =  8
Var--73  =  5     Var--74  =  6     Var--75  =  3     Var--76  =  4     Var--77  =  1
Var--78  =  2     Var--81  =  8     Var--82  =  7     Var--83  =  6     Var--84  =  5
Var--85  =  4     Var--86  =  3     Var--87  =  2     Var--88  =  1
bt_search finished
Search made 64 variable assignments and pruned 349 variable values
[1, 2, 3, 4, 5, 6, 7, 8]
[2, 1, 4, 3, 6, 5, 8, 7]
[3, 4, 1, 2, 7, 8, 5, 6]
[4, 3, 2, 1, 8, 7, 6, 5]
[5, 6, 7, 8, 1, 2, 3, 4]
[6, 5, 8, 7, 2, 1, 4, 3]
[7, 8, 5, 6, 3, 4, 1, 2]
[8, 7, 6, 5, 4, 3, 2, 1]
wolf:~/Desktop/csp$ python3 csp_sample_run.py
Plain Bactracking on simple CSP
CSP SimpleEqs solved. CPU Time used = 0.0006644060000000028
CSP SimpleEqs  Assignments =
Var--X  =  2     Var--Y  =  1     Var--Z  =  1     Var--W  =  4
bt_search finished
```

```
Search made 69 variable assignments and pruned 0 variable values
=========================================================
Forward Checking on simple CSP
CSP SimpleEqs solved. CPU Time used = 0.000273594000000002
CSP SimpleEqs  Assignments =
Var--X  =  2     Var--Y  =  1     Var--Z  =  1     Var--W  =  4
bt_search finished
Search made 11 variable assignments and pruned 14 variable values
=========================================================
GAC on simple CSP
CSP SimpleEqs solved. CPU Time used = 0.000518809000000002
CSP SimpleEqs  Assignments =
Var--X  =  2     Var--Y  =  1     Var--Z  =  1     Var--W  =  4
bt_search finished
Search made 4 variable assignments and pruned 9 variable values
Plain Bactracking on 8-queens
CSP 8-Queens solved. CPU Time used = 0.012397518999999996
CSP 8-Queens  Assignments =
Var--Q1  =  1     Var--Q2  =  5     Var--Q3  =  8     Var--Q4  =  6     Var--Q5  =  3
Var--Q6  =  7     Var--Q7  =  2     Var--Q8  =  4
bt_search finished
Search made 1092 variable assignments and pruned 0 variable values
=========================================================
Forward Checking 8-queens
CSP 8-Queens solved. CPU Time used = 0.006234061000000006
CSP 8-Queens  Assignments =
Var--Q1  =  1     Var--Q2  =  5     Var--Q3  =  8     Var--Q4  =  6     Var--Q5  =  3
Var--Q6  =  7     Var--Q7  =  2     Var--Q8  =  4
bt_search finished
Search made 114 variable assignments and pruned 341 variable values
=========================================================
GAC 8-queens
CSP 8-Queens solved. CPU Time used = 0.030449315000000005
CSP 8-Queens  Assignments =
Var--Q1  =  1     Var--Q2  =  5     Var--Q3  =  8     Var--Q4  =  6     Var--Q5  =  3
Var--Q6  =  7     Var--Q7  =  2     Var--Q8  =  4
bt_search finished
Search made 18 variable assignments and pruned 202 variable values
wolf:~/Desktop/csp$
```