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submission.py 9+ x logic.py graderUtil.py 1 grader.py 9+ examples.py 9+
C:\Users> Laura > Documents > logic > submission.py > ...
6 from logic import *
7
8 #####
9 # Problem 1: propositional logic
10 # Convert each of the following natural language sentences into a propositional
11 # logic formula. See rainWet() in examples.py for a relevant example.
12
13 # Sentence: "If it's summer and we're in California, then it doesn't rain."
14 def formula1a() -> Formula:
15     # Predicates to use:
16     Summer = Atom('Summer') # whether it's summer
17     California = Atom('California') # whether we're in California
18     Rain = Atom('Rain') # whether it's raining
19     # BEGIN_YOUR_CODE (our solution is 1 line of code, but don't worry if you deviate from this)
20     return Implies(And(Summer, California), Not(Rain))
21     # END_YOUR_CODE
22
23 # Sentence: "It's wet if and only if it is raining or the sprinklers are on."
24 def formula1b() -> Formula:
25     # Predicates to use:
26     Rain = Atom('Rain') # whether it is raining
27     Wet = Atom('Wet') # whether it is wet
28     Sprinklers = Atom('Sprinklers') # whether the sprinklers are on
29     # BEGIN_YOUR_CODE (our solution is 1 line of code, but don't worry if you deviate from this)
30     return Equiv(Wet, Or(Rain, Sprinklers))
31     # END_YOUR_CODE
32
33 # Sentence: "Either it's day or night (but not both)."
34 def formula1c() -> Formula:
35     # Predicates to use:
36     Day = Atom('Day') # whether it's day
37     Night = Atom('Night') # whether it's night
38     # BEGIN_YOUR_CODE (our solution is 1 line of code, but don't worry if you deviate from this)
39     return Or(And(Day, Not(Night)), And(Not(Day), Night))
40     # END_YOUR_CODE
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55 # Sentence: "At least one person has no children."
56 def formula2b() -> Formula:
57     # Predicates to use:
58     def Person(x): return Atom('Person', x) # whether x is a person
59     def Child(x, y): return Atom('Child', x, y) # whether x has a child y
60
61     # Note: You do NOT have to enforce that the child is a "person"
62     # BEGIN_YOUR_CODE (our solution is 1 line of code, but don't worry if you deviate from this)
63     return Exists('$x', And(Person('$x'), Not(Exists('$y', Child('$x', '$y')))))
64     # END_YOUR_CODE
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68 # Return a formula which defines Daughter in terms of Female and Child.
69 # See parentChild() in examples.py for a relevant example.
70 def formula2c():
71     # Predicates to use:
72     def Female(x): return Atom('Female', x) # whether x is female
73     def Child(x, y): return Atom('Child', x, y) # whether x has a child y
74     def Daughter(x, y): return Atom('Daughter', x, y) # whether x has a daughter y
75     # BEGIN_YOUR_CODE (around 5 lines of code expected)
76     return Forall('$x', Forall('$y', Equiv(Daughter('$x', '$y'), And(Child('$x', '$y'), Female('$y')))))
77     # END_YOUR_CODE
78
79 # Return a formula which defines Grandmother in terms of Female and Parent.
80 # Note: It is ok for a person to be her own parent
81 def formula2d():
82     # Predicates to use:
83     def Female(x): return Atom('Female', x) # whether x is female
84     def Parent(x, y): return Atom('Parent', x, y) # whether x has a parent y
85     def Grandmother(x, y): return Atom('Grandmother', x, y) # whether x has a grandmother y
86     # BEGIN_YOUR_CODE (around 5 lines of code expected)
87     return Forall('$x', Forall('$z', Equiv(Grandmother('$x', '$z'), Exists('$y', Andlist([Female('$y'), Parent('$x', '$y'), Parent('$y', '$z')])))))
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File Edit Selection View Go Run Terminal Help
submission.py 9+ X logic.py graderUtil.py 1 grader.py 9+ examples.py 9+
C:\Users> Laura > Documents > logic > submission.py > ...
93 # Problem 3: Liar puzzle
94
95 # Facts:
96 # 0. Mark: "It wasn't me!"
97 # 1. John: "It was Nicole!"
98 # 2. Nicole: "No, it was Susan!"
99 # 3. Susan: "Nicole's a liar."
100 # 4. Exactly one person is telling the truth.
101 # 5. Exactly one person crashed the server.
102 # Query: Who did it?
103 # This function returns a list of 6 formulas corresponding to each of the
104 # above facts. Be sure your formulas are exactly in the order specified.
105 # Hint: You might want to use the Equals predicate, defined in logic.py. This
106 # predicate is used to assert that two objects are the same.
107 # In particular, Equals(x,x) = True and Equals(x,y) = False iff x is not equal to y.
108 def liar() -> Tuple[List[Formula], Formula]:
109     def TellTruth(x): return Atom('TellTruth', x)
110     def CrashedServer(x): return Atom('CrashedServer', x)
111     mark = Constant('mark')
112     john = Constant('john')
113     nicole = Constant('nicole')
114     susan = Constant('susan')
115     formulas = []
116     # We provide the formula for fact 0 here.
117     formulas.append(Equiv(TellTruth(mark), Not(CrashedServer(mark))))
118     # You should add 5 formulas, one for each of facts 1-5.
119     # BEGIN_YOUR_CODE (our solution is 11 lines of code, but don't worry if you deviate from this)
120     formulas.append(Equiv(TellTruth(susan), CrashedServer(nicole)))
121     formulas.append(Equiv(TellTruth(mark), CrashedServer(susan)))
122     formulas.append(Equiv(TellTruth(nicole), Not(TellTruth(susan))))
123     formulas.append(Exists('$x', And(TellTruth('$x'), Forall('$y', Implies(Not(Equals('$x', '$y')), Not(TellTruth('$y'))))))))
124     formulas.append(Exists('$x', And(CrashedServer('$x'), Forall('$y', Implies(Not(Equals('$x', '$y')), Not(CrashedServer('$y'))))))))
125     # END_YOUR_CODE
126     query = CrashedServer('$x')
127     return (formulas, query)
128
129 #####
Ln 7, Col 1 Spaces: 4 UTF-8 LF Python
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File Edit Selection View Go Run Terminal Help
submission.py 9+ X logic.py graderUtil.py 1 grader.py 9+ examples.py 9+
C:\Users> Laura > Documents > logic > submission.py > ...
155 # BEGIN_YOUR_CODE (around 25 lines of code expected)
156 # 0. Each number $x$ has a unique successor, which is not equal to $x$.
157 cond1 = Not(Equals('$y', '$x'))
158 cond2 = Forall('$x', Implies(Not(Equals('$y', '$z')), Not(Successor('$x', '$z'))))
159 cond = Exists('$y', AndList([Successor('$x', '$y'), cond1, cond2]))
160 formulas.append(Forall('$x', cond))
161 # 1. Each number is either even or odd, but not both.
162 cond = Or(And(Even('$x'), Not(Odd('$x'))), And(Odd('$x'), Not(Even('$x'))))
163 formulas.append(Forall('$x', cond))
164 # 2. The successor number of an even number is odd.
165 cond = And(Even('$x'), Successor('$x', '$y'))
166 result = Odd('$y')
167 formulas.append(Forall('$x', Forall('$y', Implies(cond, result))))
168 # 3. The successor number of an odd number is even.
169 cond = And(Odd('$x'), Successor('$x', '$y'))
170 result = Even('$y')
171 formulas.append(Forall('$x', Forall('$y', Implies(cond, result))))
172 # 4. For every number $x$, the successor of $x$ is larger than $x$.
173 cond = Successor('$x', '$y')
174 result = Larger('$y', '$x')
175 formulas.append(Forall('$x', Forall('$y', (Implies(cond, result)))))
176 # 5. Larger is a transitive property: if $x$ is larger than $y$ and $y$ is
177 # larger than $z$, then $x$ is larger than $z$.
178 cond1 = Larger('$x', '$y')
179 cond2 = Larger('$y', '$z')
180 result = Larger('$x', '$z')
181 formulas.append(Forall('$x', Forall('$y', Forall('$z', (Implies(And(cond1, cond2), result)))))
182
183 # END_YOUR_CODE
184 # For part (b), your job is to show that adding the following formula
185 # would result in a contradiction for finite domains.
186 formulas.append(Forall('$x', Not(Larger('$x', '$x'))))
187 query = Forall('$x', Exists('$y', And(Even('$y'), Larger('$y', '$x'))))
188 return (formulas, query)
189
190 #####
Ln 7, Col 1 Spaces: 4 UTF-8 LF Python
```

```
File Edit Selection View Go Run Terminal Help
submission.py 9+ logic.py graderUtil.py 1 grader.py 9+ x examples.py 9+
C:\Users\Laura> Documents > logic > grader.py > ...
1 #!usr/bin/env python3
PROBLEMS 152 OUTPUT TERMINAL PORTS DEBUG CONSOLE
powershell Python Debug Console
PS C:\Users\Laura\Documents\logic> & 'C:\Program Files (x86)\Microsoft Visual Studio\Shared\Python39_64\python.exe' 'c:\Users\Laura\.vscode\extensions\ms-python.python-2024.0.1\pythonFiles\lib\python\debugpy\adapter\..\..\debugpy\launcher' '54914' '--' 'c:\Users\Laura\Documents\logic\grader.py'
('!', 'CrashedServer(mark)', '=', 'True')
('!', 'TellTruth(susan)', '=', 'True')
('!', 'other atoms if any)', '=', 'False')
***** START TESTING *****
----- START PART 1a: Test Formula 1a implementation
You matched the 7 models
Example model: {'California', 'Rain'}
----- END PART-----

----- START PART 1b: Test formula 1b implementation
You matched the 4 models
Example model: {'Wet', 'Sprinklers'}
----- END PART-----

----- START PART 1c: Test Formula 1c implementation
You matched the 2 models
Example model: {'Night'}
----- END PART-----

----- START PART 2a: Test Formula 2a implementation
You matched the 343 models
Example model: {'Mother(o3,o2)', 'Mother(o2,o1)', 'Person(o2)', 'Person(o3)', 'Mother(o1,o3)', 'Person(o1)'}
----- END PART-----

----- START PART 2b: Test formula 2b implementation
You matched the 169 models
Example model: {'Child(o2,o1)', 'Child(o1,o3)', 'Child(o2,o3)', 'Person(o3)', 'Person(o1)'}
----- END PART-----

----- START PART 2c: Test formula 2c implementation
FAIL: Your formula (forall($x,forall($y,And(Implies(Daughter($x,$y),And(Child($x,$y),Female($y))),Implies(And(Child($x,$y),Female($y)),Daughter($x,$y)))))) says the fol
lowing model is FALSE, but it should be TRUE:
Your formula (forall($x,forall($y,And(Implies(Daughter($x,$y),And(Child($x,$y),Female($y))),Implies(And(Child($x,$y),Female($y)),Daughter($x,$y)))))) says the following
model is FALSE, but it should be TRUE:
('!', 'Parent(o3,o1)', '=', 'True')
('!', 'other atoms if any)', '=', 'False')
----- END PART-----
```

```
File Edit Selection View Go Run Terminal Help
submission.py 9+ logic.py graderUtil.py 1 grader.py 9+ x examples.py 9+
C:\Users\Laura> Documents > logic > grader.py > ...
1 #!usr/bin/env python3
PROBLEMS 152 OUTPUT TERMINAL PORTS DEBUG CONSOLE
powershell Python Debug Console
----- START PART 2d: Test formula 2d implementation
FAIL: Your formula (forall($x,forall($z,And(Implies(Grandmother($x,$z),Exists($y,And(And(Female($z),Parent($x,$y)),Parent($y,$z)))),Implies(Exists($y,And(And(Female($z),Parent($x,$y)),Parent($y,$z))),Grandmother($x,$z)))))) says the following model is FALSE, but it should be TRUE:
Your formula (forall($x,forall($z,And(Implies(Grandmother($x,$z),Exists($y,And(And(Female($z),Parent($x,$y)),Parent($y,$z))))),Implies(Exists($y,And(And(Female($z),Parent($x,$y)),Parent($y,$z))),Grandmother($x,$z)))))) says the following model is FALSE, but it should be TRUE:
('!', 'Child(o3,o2)', '=', 'True')
('!', 'other atoms if any)', '=', 'False')
----- END PART-----

----- START PART 3a-0: test implementation of statement 0 for 3a
You matched the 2 models
Example model: {'TellTruth(mark)'}
----- END PART-----

----- START PART 3a-1: test implementation of statement 1 for 3a
FAIL: Your formula (And(Implies(TellTruth(susan),CrashedServer(nicole)),Implies(CrashedServer(nicole),TellTruth(susan)))) says the following model is FALSE, but it should be TRUE:
Your formula (And(Implies(TellTruth(susan),CrashedServer(nicole)),Implies(CrashedServer(nicole),TellTruth(susan)))) says the following model is FALSE, but it should be TRUE:
('!', 'CrashedServer(nicole)', '=', 'True')
('!', 'TellTruth(john)', '=', 'True')
('!', 'other atoms if any)', '=', 'False')
----- END PART-----

----- START PART 3a-2: test implementation of statement 2 for 3a
FAIL: Your formula (And(Implies(TellTruth(mark),CrashedServer(susan)),Implies(CrashedServer(susan),TellTruth(mark)))) says the following model is FALSE, but it should be TRUE:
Your formula (And(Implies(TellTruth(mark),CrashedServer(susan)),Implies(CrashedServer(susan),TellTruth(mark)))) says the following model is FALSE, but it should be TRUE:
('!', 'CrashedServer(susan)', '=', 'True')
('!', 'TellTruth(nicole)', '=', 'True')
('!', 'other atoms if any)', '=', 'False')
----- END PART-----

----- START PART 3a-3: test implementation of statement 3 for 3a
You matched the 2 models
Example model: {'TellTruth(susan)'}
----- END PART-----

----- START PART 3a-4: test implementation of statement 4 for 3a
```

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File Edit Selection View Go Run Terminal Help
submission.py 9+ logic.py graderUtil.py 1 grader.py 9+ x examples.py 9+
C:\Users\Laura\Documents> logic > grader.py > ...
1 #!usr/bin/env python3
PROBLEMS 152 OUTPUT TERMINAL PORTS DEBUG CONSOLE

----- START PART 3a-4: test implementation of statement 4 for 3a
You matched the 4 models
Example model: {'TellTruth(susan)'}
----- END PART-----

----- START PART 3a-5: test implementation of statement 5 for 3a
You matched the 4 models
Example model: {'CrashedServer(susan)'}
----- END PART-----

----- START PART 3a-all: test implementation of all for 3a
FAIL: Your formula (And(And(And(And(And(Implies(TellTruth(mark),Not(CrashedServer(mark)))),Implies(Not(CrashedServer(mark))),TellTruth(mark))),And(Implies(TellTruth(susan),CrashedServer(nicole)),Implies(CrashedServer(nicole),TellTruth(susan))),And(Implies(TellTruth(mark),CrashedServer(susan)),Implies(CrashedServer(susan),TellTruth(mark))),And(Implies(TellTruth(nicole),Not(TellTruth(susan))),Implies(Not(TellTruth(susan)),TellTruth(nicole)))),Exists($x,And(TellTruth($x),Forall($y,Implies(Not(Equals($x,$y)),Not(TellTruth($y)))))),Exists($x,And(CrashedServer($x),Forall($y,Implies(Not(Equals($x,$y)),Not(CrashedServer($y))))))) says the following model is FALSE, but it should be TRUE:
Your formula (And(And(And(And(And(Implies(TellTruth(mark),Not(CrashedServer(mark))),Implies(Not(CrashedServer(mark))),TellTruth(mark))),And(Implies(TellTruth(susan),CrashedServer(nicole)),Implies(CrashedServer(nicole),TellTruth(susan))),And(Implies(TellTruth(mark),CrashedServer(susan)),Implies(CrashedServer(susan),TellTruth(mark))),And(Implies(TellTruth(nicole),Not(TellTruth(susan))),Implies(Not(TellTruth(susan)),TellTruth(nicole)))),Exists($x,And(TellTruth($x),Forall($y,Implies(Not(Equals($x,$y)),Not(TellTruth($y)))))),Exists($x,And(CrashedServer($x),Forall($y,Implies(Not(Equals($x,$y)),Not(CrashedServer($y))))))) says the following model is FALSE, but it should be TRUE:
({'', 'CrashedServer(mark)', '=', 'True'})
({'', 'TellTruth(susan)', '=', 'True'})
({'', '(other atoms if any)', '=', 'False'})
----- END PART-----

----- START PART 3a-run: test implementation of run for 3a
>>>> I learned something.
Query: TELL[And(Implies(TellTruth(mark),Not(CrashedServer(mark))),Implies(Not(CrashedServer(mark))),TellTruth(mark))), standardized: ['And(Implies(TellTruth(mark),Not(CrashedServer(mark))),Implies(Not(CrashedServer(mark))),TellTruth(mark))']
An example of a model where query is TRUE:
({'', 'CrashedServer(mark)', '=', 'True'})
({'', 'Object(john)', '=', 'True'})
({'', 'Object(mark)', '=', 'True'})
({'', 'Object(nicole)', '=', 'True'})
({'', 'Object(susan)', '=', 'True'})
({'', '(other atoms if any)', '=', 'False'})
An example of a model where query is FALSE:
({'', 'Object(john)', '=', 'True'})
({'', 'Object(mark)', '=', 'True'})
({'', 'Object(nicole)', '=', 'True'})
({'', 'Object(susan)', '=', 'True'})
Ln 1, Col 1 Spaces: 4 UTF-8 LF Python 3.9.7 64-bit
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File Edit Selection View Go Run Terminal Help
submission.py 9+ logic.py graderUtil.py 1 grader.py 9+ x examples.py 9+
C:\Users\Laura\Documents> logic > grader.py > ...
1 #!usr/bin/env python3
PROBLEMS 152 OUTPUT TERMINAL PORTS DEBUG CONSOLE

({'', 'Object(susan)', '=', 'True'})
({'', '(other atoms if any)', '=', 'False'})
>>>> I learned something.
Query: TELL[And(Implies(TellTruth(susan),CrashedServer(nicole)),Implies(CrashedServer(nicole),TellTruth(susan))), standardized: ['And(Implies(TellTruth(susan),CrashedServer(nicole)),Implies(CrashedServer(nicole),TellTruth(susan))']
An example of a model where query is TRUE:
({'', 'CrashedServer(mark)', '=', 'True'})
({'', 'Object(john)', '=', 'True'})
({'', 'Object(mark)', '=', 'True'})
({'', 'Object(nicole)', '=', 'True'})
({'', 'Object(susan)', '=', 'True'})
({'', '(other atoms if any)', '=', 'False'})
An example of a model where query is FALSE:
({'', 'CrashedServer(mark)', '=', 'True'})
({'', 'Object(john)', '=', 'True'})
({'', 'Object(mark)', '=', 'True'})
({'', 'Object(nicole)', '=', 'True'})
({'', 'Object(susan)', '=', 'True'})
({'', 'TellTruth(susan)', '=', 'True'})
({'', '(other atoms if any)', '=', 'False'})
>>>> I learned something.
Query: TELL[And(Implies(TellTruth(mark),CrashedServer(susan)),Implies(CrashedServer(susan),TellTruth(mark))), standardized: ['And(Implies(TellTruth(mark),CrashedServer(susan)),Implies(CrashedServer(susan),TellTruth(mark))']
An example of a model where query is TRUE:
({'', 'CrashedServer(mark)', '=', 'True'})
({'', 'Object(john)', '=', 'True'})
({'', 'Object(mark)', '=', 'True'})
({'', 'Object(nicole)', '=', 'True'})
({'', 'Object(susan)', '=', 'True'})
({'', '(other atoms if any)', '=', 'False'})
An example of a model where query is FALSE:
({'', 'CrashedServer(susan)', '=', 'True'})
({'', 'Object(john)', '=', 'True'})
({'', 'Object(mark)', '=', 'True'})
({'', 'Object(nicole)', '=', 'True'})
({'', 'Object(susan)', '=', 'True'})
({'', '(other atoms if any)', '=', 'False'})
>>>> I learned something.
Query: TELL[And(Implies(TellTruth(nicole),Not(TellTruth(susan))),Implies(Not(TellTruth(susan)),TellTruth(nicole))), standardized: ['And(Implies(TellTruth(nicole),Not(TellTruth(susan))),Implies(Not(TellTruth(susan)),TellTruth(nicole))']
Ln 1, Col 1 Spaces: 4 UTF-8 LF Python 3.9.7 64-bit
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File Edit Selection View Go Run Terminal Help
submission.py 9+ logic.py graderUtil.py 1 grader.py 9+ x examples.py 9+
C: > Users > Laura > Documents > logic > grader.py > ...
1 #!/usr/bin/env python3

PROBLEMS 152 OUTPUT TERMINAL PORTS DEBUG CONSOLE

>>>>> I learned something.
Query: TELL[And(Implies(TellTruth(nicole),Not(TellTruth(susan))),Implies(Not(TellTruth(susan)),TellTruth(nicole))), standardizd: ['And(Implies(TellTruth(nicole),Not(TellTruth(susan))),Implies(Not(TellTruth(susan)),TellTruth(nicole))')]
An example of a model where query is TRUE:
(**, 'CrashedServer(mark)', '=', 'True')
(**, 'Object(john)', '=', 'True')
(**, 'Object(mark)', '=', 'True')
(**, 'Object(nicole)', '=', 'True')
(**, 'Object(susan)', '=', 'True')
(**, 'TellTruth(nicole)', '=', 'True')
(**, '(other atoms if any)', '=', 'False')
An example of a model where query is FALSE:
(**, 'CrashedServer(mark)', '=', 'True')
(**, 'Object(john)', '=', 'True')
(**, 'Object(mark)', '=', 'True')
(**, 'Object(nicole)', '=', 'True')
(**, 'Object(susan)', '=', 'True')
(**, '(other atoms if any)', '=', 'False')
>>>>> I learned something.
Query: TELL[Exists($x,And(TellTruth($x),Forall($y,Implies(Not(Equals($x,$y)),Not(TellTruth($y)))))), standardizd: ['Exists($x,And(TellTruth($x),Forall($y,Implies(Not(Equals($x,$y)),Not(TellTruth($y))))')]
An example of a model where query is TRUE:
(**, 'CrashedServer(mark)', '=', 'True')
(**, 'Object(john)', '=', 'True')
(**, 'Object(mark)', '=', 'True')
(**, 'Object(nicole)', '=', 'True')
(**, 'Object(susan)', '=', 'True')
(**, 'TellTruth(nicole)', '=', 'True')
(**, '(other atoms if any)', '=', 'False')
An example of a model where query is FALSE:
(**, 'CrashedServer(mark)', '=', 'True')
(**, 'Object(john)', '=', 'True')
(**, 'Object(mark)', '=', 'True')
(**, 'Object(nicole)', '=', 'True')
(**, 'Object(susan)', '=', 'True')
(**, 'TellTruth(john)', '=', 'True')
(**, 'TellTruth(nicole)', '=', 'True')
(**, '(other atoms if any)', '=', 'False')
>>>>> I learned something.
Query: TELL[Exists($x,And(CrashedServer($x),Forall($y,Implies(Not(Equals($x,$y)),Not(CrashedServer($y)))))), standardizd: ['Exists($x,And(CrashedServer($x),Forall($y,Implies(Not(Equals($x,$y)),Not(CrashedServer($y))))')]
Ln 1, Col 1 Spaces: 4 UTF-8 LF
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55°F Sunny
File Edit Selection View Go Run Terminal Help
submission.py 9+ logic.py graderUtil.py 1 grader.py 9+ x examples.py 9+
C: > Users > Laura > Documents > logic > grader.py > ...
1 #!/usr/bin/env python3

PROBLEMS 152 OUTPUT TERMINAL PORTS DEBUG CONSOLE

No: ['susan', 'john', 'nicole']
----- END PART-----

----- START PART 4a-0: test implementation of statement 0 for 4a
----- END PART-----

----- START PART 4a-1: test implementation of statement 1 for 4a
----- END PART-----

----- START PART 4a-2: test implementation of statement 2 for 4a
----- END PART-----

----- START PART 4a-3: test implementation of statement 3 for 4a
----- END PART-----

----- START PART 4a-4: test implementation of statement 4 for 4a
----- END PART-----

----- START PART 4a-5: test implementation of statement 5 for 4a
----- END PART-----

----- START PART 4a-all: test implementation of all for 4a
You matched the 36 models
Example model: {'Larger(o1,o3)', 'Larger(o2,o1)', 'Larger(o3,o1)', 'Successor(o1,o3)', 'Larger(o3,o3)', 'Larger(o2,o3)', 'Successor(o3,o1)', 'Larger(o2,o2)', 'Successor(o2,o1)', 'Odd(o2)', 'Odd(o3)', 'Even(o1)', 'Larger(o3,o2)', 'Larger(o1,o1)', 'Larger(o1,o2)'}
----- END PART-----

----- START PART 4a-run: test implementation of run for 4a
>>>>> I learned something.
Query: TELL[Forall($x,Exists($y,And(And(Successor($x,$y),Not(Equals($y,$x))),Forall($z,Implies(Not(Equals($y,$z)),Not(Successor($x,$z)))))), standardizd: ['Forall($x,Exists($y,And(And(Successor($x,$y),Not(Equals($y,$x))),Forall($z,Implies(Not(Equals($y,$z)),Not(Successor($x,$z))))')]
An example of a model where query is TRUE:
(**, 'Object(o1)', '=', 'True')
(**, 'Object(o2)', '=', 'True')
(**, 'Object(o3)', '=', 'True')
(**, 'Successor(o1,o3)', '=', 'True')
(**, 'Successor(o2,o1)', '=', 'True')
(**, 'Successor(o3,o1)', '=', 'True')
(**, '(other atoms if any)', '=', 'False')
An example of a model where query is FALSE:
Ln 1, Col 1 Spaces: 4 UTF-8 LF Python 3.9.7 64-bit
```

```
File Edit Selection View Go Run Terminal Help
C:\Users> Laura > Documents > logic > grader.py > ...
1 #!usr/bin/env python3

PROBLEMS 152 OUTPUT TERMINAL PORTS DEBUG CONSOLE

----- START PART 4a-run: test implementation of run for 4a
>>>> I learned something.
Query: TELL[Forall($x,Exists($y,And(Not(Successor($x,$y)),Not(Equal($y,$x))),Forall($z,Implies(Not(Equal($y,$z)),Not(Successor($x,$z))))),standardized: ['Forall($x,Exists($y,And(Not(Successor($x,$y)),Not(Equal($y,$x))),Forall($z,Implies(Not(Equal($y,$z)),Not(Successor($x,$z))))')]
An example of a model where query is TRUE:
(**, 'Object(o1)', '=', 'True')
(**, 'Object(o2)', '=', 'True')
(**, 'Object(o3)', '=', 'True')
(**, 'Successor(o1,o3)', '=', 'True')
(**, 'Successor(o2,o3)', '=', 'True')
(**, 'Successor(o3,o1)', '=', 'True')
(**, 'other atoms if any)', '=', 'False')
An example of a model where query is FALSE:
(**, 'Object(o1)', '=', 'True')
(**, 'Object(o2)', '=', 'True')
(**, 'Object(o3)', '=', 'True')
(**, 'other atoms if any)', '=', 'False')
>>>> I learned something.
Query: TELL[Forall($x,Or(And(Even($x),Not(Odd($x))),And(Odd($x),Not(Even($x))))),standardized: ['Forall($x,Or(And(Even($x),Not(Odd($x))),And(Odd($x),Not(Even($x))))')]
An example of a model where query is TRUE:
(**, 'Even(o1)', '=', 'True')
(**, 'Object(o1)', '=', 'True')
(**, 'Object(o2)', '=', 'True')
(**, 'Object(o3)', '=', 'True')
(**, 'Odd(o2)', '=', 'True')
(**, 'Odd(o3)', '=', 'True')
(**, 'Successor(o1,o3)', '=', 'True')
(**, 'Successor(o2,o3)', '=', 'True')
(**, 'Successor(o3,o1)', '=', 'True')
(**, 'other atoms if any)', '=', 'False')
An example of a model where query is FALSE:
(**, 'Object(o1)', '=', 'True')
(**, 'Object(o2)', '=', 'True')
(**, 'Object(o3)', '=', 'True')
(**, 'Successor(o1,o3)', '=', 'True')
(**, 'Successor(o2,o3)', '=', 'True')
(**, 'Successor(o3,o1)', '=', 'True')
(**, 'other atoms if any)', '=', 'False')
Ln 1, Col 1 Spaces: 4 UTF-8 LF Python 3.9.7 64-bit
```

```
File Edit Selection View Go Run Terminal Help
C:\Users> Laura > Documents > logic > grader.py > ...
1 #!usr/bin/env python3

PROBLEMS 152 OUTPUT TERMINAL PORTS DEBUG CONSOLE

An example of a model where query is TRUE:
(**, 'Even(o1)', '=', 'True')
(**, 'Even(o2)', '=', 'True')
(**, 'Object(o1)', '=', 'True')
(**, 'Object(o2)', '=', 'True')
(**, 'Object(o3)', '=', 'True')
(**, 'Odd(o3)', '=', 'True')
(**, 'Successor(o1,o3)', '=', 'True')
(**, 'Successor(o2,o3)', '=', 'True')
(**, 'Successor(o3,o1)', '=', 'True')
(**, 'other atoms if any)', '=', 'False')
An example of a model where query is FALSE:
(**, 'Even(o1)', '=', 'True')
(**, 'Even(o2)', '=', 'True')
(**, 'Object(o1)', '=', 'True')
(**, 'Object(o2)', '=', 'True')
(**, 'Object(o3)', '=', 'True')
(**, 'Odd(o3)', '=', 'True')
(**, 'Successor(o1,o3)', '=', 'True')
(**, 'Successor(o2,o3)', '=', 'True')
(**, 'Successor(o3,o1)', '=', 'True')
(**, 'other atoms if any)', '=', 'False')
>>>> I learned something.
Query: TELL[Forall($x,Forall($y,Implies(And(Odd($x),Successor($x,$y)),Even($y))))),standardized: ['Forall($x,Forall($y,Implies(And(Odd($x),Successor($x,$y)),Even($y))))')]
An example of a model where query is TRUE:
(**, 'Even(o1)', '=', 'True')
(**, 'Even(o2)', '=', 'True')
(**, 'Object(o1)', '=', 'True')
(**, 'Object(o2)', '=', 'True')
(**, 'Object(o3)', '=', 'True')
(**, 'Odd(o3)', '=', 'True')
(**, 'Successor(o1,o3)', '=', 'True')
(**, 'Successor(o2,o3)', '=', 'True')
(**, 'Successor(o3,o1)', '=', 'True')
(**, 'other atoms if any)', '=', 'False')
An example of a model where query is FALSE:
(**, 'Even(o1)', '=', 'True')
(**, 'Object(o1)', '=', 'True')
(**, 'Object(o2)', '=', 'True')
Ln 1, Col 1 Spaces: 4 UTF-8 LF Python 3.9.7 64-bit
```



```
C:\Users\Laura\Documents> logic > grader.py > ...  
1 #!usr/bin/env python3  
PROBLEMS 152 OUTPUT TERMINAL PORTS DEBUG CONSOLE  
+ v ... ^ x  
powershell  
Python Debug Console  
>>>> I learned something.  
Query: TELL[Forall($x,Forall($y,Implies(Successor($x,$y),Larger($y,$x))))], standardized: ['Forall($x,Forall($y,Implies(Successor($x,$y),Larger($y,$x))))']  
An example of a model where query is TRUE:  
(** 'Even(o2)', '=', 'True')  
(** 'Even(o3)', '=', 'True')  
(** 'Larger(o1,o2)', '=', 'True')  
(** 'Larger(o1,o3)', '=', 'True')  
(** 'Larger(o2,o1)', '=', 'True')  
(** 'Object(o1)', '=', 'True')  
(** 'Object(o2)', '=', 'True')  
(** 'Object(o3)', '=', 'True')  
(** 'Odd(o1)', '=', 'True')  
(** 'Successor(o1,o2)', '=', 'True')  
(** 'Successor(o2,o1)', '=', 'True')  
(** 'Successor(o3,o1)', '=', 'True')  
(** '(other atoms if any)', '=', 'False')  
An example of a model where query is FALSE:  
(** 'Even(o2)', '=', 'True')  
(** 'Even(o3)', '=', 'True')  
(** 'Object(o1)', '=', 'True')  
(** 'Object(o2)', '=', 'True')  
(** 'Object(o3)', '=', 'True')  
(** 'Odd(o1)', '=', 'True')  
(** 'Successor(o1,o2)', '=', 'True')  
(** 'Successor(o2,o1)', '=', 'True')  
(** 'Successor(o3,o1)', '=', 'True')  
(** '(other atoms if any)', '=', 'False')  
>>>> I learned something.  
Query: TELL[Forall($x,Forall($y,Forall($z,Implies(And(Larger($x,$y),Larger($y,$z)),Larger($x,$z))))], standardized: ['Forall($x,Forall($y,Forall($z,Implies(And(Larger($x,$y),Larger($y,$z)),Larger($x,$z))))']  
An example of a model where query is TRUE:  
(** 'Even(o2)', '=', 'True')  
(** 'Even(o3)', '=', 'True')  
(** 'Larger(o1,o1)', '=', 'True')  
(** 'Larger(o1,o2)', '=', 'True')  
(** 'Larger(o1,o3)', '=', 'True')  
(** 'Larger(o3,o1)', '=', 'True')  
(** 'Larger(o3,o2)', '=', 'True')  
(** 'Larger(o3,o3)', '=', 'True')  
(** 'Object(o1)', '=', 'True')  
(** 'Object(o2)', '=', 'True')  
(** 'Object(o3)', '=', 'True')  
(** 'Odd(o1)', '=', 'True')  
(** 'Successor(o1,o3)', '=', 'True')  
(** 'Successor(o2,o1)', '=', 'True')  
(** 'Successor(o3,o1)', '=', 'True')  
(** '(other atoms if any)', '=', 'False')  
An example of a model where query is FALSE:  
(** 'Even(o2)', '=', 'True')  
(** 'Even(o3)', '=', 'True')  
(** 'Larger(o1,o2)', '=', 'True')  
(** 'Larger(o1,o3)', '=', 'True')  
(** 'Larger(o2,o1)', '=', 'True')  
(** 'Object(o1)', '=', 'True')  
(** 'Object(o2)', '=', 'True')  
(** 'Object(o3)', '=', 'True')  
(** 'Odd(o1)', '=', 'True')  
(** 'Successor(o1,o2)', '=', 'True')  
(** 'Successor(o2,o1)', '=', 'True')  
(** 'Successor(o3,o1)', '=', 'True')  
(** '(other atoms if any)', '=', 'False')  
>>>> Yes.  
Query: ASK[Forall($x,Exists($y,And(Even($y),Larger($y,$x)))]  
----- END PART-----  
Note that the hidden test cases do not check for correctness.  
They are provided for you to verify that the functions do not crash and run within certain time limit.  
Test Failed. Try again !!!  
===== END TESTING =====  
PS C:\Users\Laura\Documents\logic>  
Ln 1, Col 1 Spaces: 4 UTF-8 LF Python 3.9.7 64-bit
```

Here is the results if screenshots miss one:

PS C:\Users\Laura\Documents\logic> & 'C:\Program Files (x86)\Microsoft Visual Studio\Shared\Python39_64\python.exe' 'c:\Users\Laura\.vscode\extensions\ms-python.python-

```
2024.0.1\pythonFiles\lib\python\debugpy\adapter\..\..\debugpy\launcher' '54914' '--'
'c:\Users\Laura\Documents\logic\grader.py'
```

```
('*', 'CrashedServer(mark)', '=', 'True')
```

```
('*', 'TellTruth(susan)', '=', 'True')
```

```
('*', '(other atoms if any)', '=', 'False')
```

```
===== START TESTING =====
```

```
----- START PART 1a: Test formula 1a implementation
```

You matched the 7 models

Example model: {'California', 'Rain'}

```
----- END PART-----
```

```
----- START PART 1b: Test formula 1b implementation
```

You matched the 4 models

Example model: {'Wet', 'Sprinklers'}

```
----- END PART-----
```

```
----- START PART 1c: Test formula 1c implementation
```

You matched the 2 models

Example model: {'Night'}

```
----- END PART-----
```

```
----- START PART 2a: Test formula 2a implementation
```

You matched the 343 models

Example model: {'Mother(o3,o2)', 'Mother(o2,o1)', 'Person(o2)', 'Person(o3)', 'Mother(o1,o3)', 'Person(o1)'}

```
----- END PART-----
```

```
----- START PART 2b: Test formula 2b implementation
```

You matched the 169 models

Example model: {'Child(o2,o1)', 'Child(o1,o3)', 'Child(o2,o3)', 'Person(o3)', 'Person(o1)'}

----- END PART-----

----- START PART 2c: Test formula 2c implementation

FAIL: Your formula

(Forall(\$x,Forall(\$y,And(Implies(Daughter(\$x,\$y),And(Child(\$x,\$y),Female(\$y))),Implies(And(Child(\$x,\$y),Female(\$y)),Daughter(\$x,\$y)))))) says the following model is FALSE, but it should be TRUE:

Your formula

(Forall(\$x,Forall(\$y,And(Implies(Daughter(\$x,\$y),And(Child(\$x,\$y),Female(\$y))),Implies(And(Child(\$x,\$y),Female(\$y)),Daughter(\$x,\$y)))))) says the following model is FALSE, but it should be TRUE:

('*', 'Parent(o3,o1)', '=', 'True')

('*', '(other atoms if any)', '=', 'False')

----- END PART-----

----- START PART 2d: Test formula 2d implementation

FAIL: Your formula

(Forall(\$x,Forall(\$z,And(Implies(Grandmother(\$x,\$z),Exists(\$y,And(And(Female(\$z),Parent(\$x,\$y)),Parent(\$y,\$z)))),Implies(Exists(\$y,And(And(Female(\$z),Parent(\$x,\$y)),Parent(\$y,\$z))),Grandmother(\$x,\$z)))))) says the following model is FALSE, but it should be TRUE:

Your formula

(Forall(\$x,Forall(\$z,And(Implies(Grandmother(\$x,\$z),Exists(\$y,And(And(Female(\$z),Parent(\$x,\$y)),Parent(\$y,\$z)))),Implies(Exists(\$y,And(And(Female(\$z),Parent(\$x,\$y)),Parent(\$y,\$z))),Grandmother(\$x,\$z)))))) says the following model is FALSE, but it should be TRUE:

('*', 'Child(o3,o2)', '=', 'True')

('*', '(other atoms if any)', '=', 'False')

----- END PART-----

----- START PART 3a-0: test implementation of statement 0 for 3a

You matched the 2 models

Example model: {'TellTruth(mark)'}

----- END PART-----

----- START PART 3a-1: test implementation of statement 1 for 3a

FAIL: Your formula

(And(Implies(TellTruth(susan),CrashedServer(nicole)),Implies(CrashedServer(nicole),TellTruth(susan))))

says the following model is FALSE, but it should be TRUE:

Your formula

(And(Implies(TellTruth(susan),CrashedServer(nicole)),Implies(CrashedServer(nicole),TellTruth(susan))))

says the following model is FALSE, but it should be TRUE:

('*', 'CrashedServer(nicole)', '=', 'True')

('*', 'TellTruth(john)', '=', 'True')

('*', '(other atoms if any)', '=', 'False')

----- END PART-----

----- START PART 3a-2: test implementation of statement 2 for 3a

FAIL: Your formula

(And(Implies(TellTruth(mark),CrashedServer(susan)),Implies(CrashedServer(susan),TellTruth(mark))))

says the following model is FALSE, but it should be TRUE:

Your formula

(And(Implies(TellTruth(mark),CrashedServer(susan)),Implies(CrashedServer(susan),TellTruth(mark))))

says the following model is FALSE, but it should be TRUE:

('*', 'CrashedServer(susan)', '=', 'True')

('*', 'TellTruth(nicole)', '=', 'True')

('*', '(other atoms if any)', '=', 'False')

----- END PART-----

----- START PART 3a-3: test implementation of statement 3 for 3a

You matched the 2 models

Example model: {'TellTruth(susan)'}

----- END PART-----

----- START PART 3a-4: test implementation of statement 4 for 3a

You matched the 4 models

Example model: {'TellTruth(susan)'}

----- END PART-----

----- START PART 3a-5: test implementation of statement 5 for 3a

You matched the 4 models

Example model: {'CrashedServer(susan)'}

----- END PART-----

----- START PART 3a-all: test implementation of all for 3a

FAIL: Your formula

```
(And(And(And(And(And(And(Implies(TellTruth(mark),Not(CrashedServer(mark))),Implies(Not(CrashedServer(mark)),TellTruth(mark))),And(Implies(TellTruth(susan),CrashedServer(nicole)),Implies(CrashedServer(nicole),TellTruth(susan)))),And(Implies(TellTruth(mark),CrashedServer(susan)),Implies(CrashedServer(susan),TellTruth(mark)))),And(Implies(TellTruth(nicole),Not(TellTruth(susan))),Implies(Not(TellTruth(susan)),TellTruth(nicole)))),Exists($x,And(TellTruth($x),Forall($y,Implies(Not(Equals($x,$y)),Not(TellTruth($y))))),Exists($x,And(CrashedServer($x),Forall($y,Implies(Not(Equals($x,$y)),Not(CrashedServer($y))))))))
```

says the following model is FALSE, but it should be TRUE:

Your formula

```
(And(And(And(And(And(And(Implies(TellTruth(mark),Not(CrashedServer(mark))),Implies(Not(CrashedServer(mark)),TellTruth(mark))),And(Implies(TellTruth(susan),CrashedServer(nicole)),Implies(CrashedServer(nicole),TellTruth(susan)))),And(Implies(TellTruth(mark),CrashedServer(susan)),Implies(CrashedServer(susan),TellTruth(mark)))),And(Implies(TellTruth(nicole),Not(TellTruth(susan))),Implies(Not(TellTruth(susan)),TellTruth(nicole))))),Exists($x,And(TellTruth($x),Forall($y,Implies(Not(Equals($x,$y)),Not(TellTruth($y))))),Exists($x,And(CrashedServer($x),Forall($y,Implies(Not(Equals($x,$y)),Not(CrashedServer($y))))))))
```

says the following model is FALSE, but it should be TRUE:

('*, 'CrashedServer(mark)', '=', 'True')

('*, 'TellTruth(susan)', '=', 'True')

('*, '(other atoms if any)', '=', 'False')

----- END PART-----

----- START PART 3a-run: test implementation of run for 3a

>>>>> I learned something.

Query:

TELL[And(Implies(TellTruth(mark),Not(CrashedServer(mark))),Implies(Not(CrashedServer(mark)),TellTruth(mark))), standardized:

```
['And(Implies(TellTruth(mark),Not(CrashedServer(mark))),Implies(Not(CrashedServer(mark)),TellTruth(mark)))']]
```

An example of a model where query is TRUE:

```
('*, 'CrashedServer(mark)', '=', 'True')
```

```
('*, 'Object(john)', '=', 'True')
```

```
('*, 'Object(mark)', '=', 'True')
```

```
('*, 'Object(nicole)', '=', 'True')
```

```
('*, 'Object(susan)', '=', 'True')
```

```
('*, '(other atoms if any)', '=', 'False')
```

An example of a model where query is FALSE:

```
('*, 'Object(john)', '=', 'True')
```

```
('*, 'Object(mark)', '=', 'True')
```

```
('*, 'Object(nicole)', '=', 'True')
```

```
('*, 'Object(susan)', '=', 'True')
```

```
('*, '(other atoms if any)', '=', 'False')
```

>>>> I learned something.

Query:

```
TELL[And(Implies(TellTruth(susan),CrashedServer(nicole)),Implies(CrashedServer(nicole),TellTruth(susan)))], standardized:
```

```
['And(Implies(TellTruth(susan),CrashedServer(nicole)),Implies(CrashedServer(nicole),TellTruth(susan)))']]
```

An example of a model where query is TRUE:

```
('*, 'CrashedServer(mark)', '=', 'True')
```

```
('*, 'Object(john)', '=', 'True')
```

```
('*, 'Object(mark)', '=', 'True')
```

```
('*, 'Object(nicole)', '=', 'True')
```

```
('*, 'Object(susan)', '=', 'True')
```

```
('*, '(other atoms if any)', '=', 'False')
```

An example of a model where query is FALSE:

```
('*, 'CrashedServer(mark)', '=', 'True')
```

```
('*, 'Object(john)', '=', 'True')
```

```
('*', 'Object(mark)', '=', 'True')
('*', 'Object(nicole)', '=', 'True')
('*', 'Object(susan)', '=', 'True')
('*', 'TellTruth(susan)', '=', 'True')
('*', '(other atoms if any)', '=', 'False')
```

>>>>> I learned something.

Query:

```
TELL[And(Implies(TellTruth(mark),CrashedServer(susan)),Implies(CrashedServer(susan),TellTruth(mark)))
, standardized:
['And(Implies(TellTruth(mark),CrashedServer(susan)),Implies(CrashedServer(susan),TellTruth(mark)))']]
```

An example of a model where query is TRUE:

```
('*', 'CrashedServer(mark)', '=', 'True')
('*', 'Object(john)', '=', 'True')
('*', 'Object(mark)', '=', 'True')
('*', 'Object(nicole)', '=', 'True')
('*', 'Object(susan)', '=', 'True')
('*', '(other atoms if any)', '=', 'False')
```

An example of a model where query is FALSE:

```
('*', 'CrashedServer(mark)', '=', 'True')
('*', 'CrashedServer(susan)', '=', 'True')
('*', 'Object(john)', '=', 'True')
('*', 'Object(mark)', '=', 'True')
('*', 'Object(nicole)', '=', 'True')
('*', 'Object(susan)', '=', 'True')
('*', '(other atoms if any)', '=', 'False')
```

>>>>> I learned something.

Query:

```
TELL[And(Implies(TellTruth(nicole),Not(TellTruth(susan))),Implies(Not(TellTruth(susan)),TellTruth(nicole)
)), standardized:
['And(Implies(TellTruth(nicole),Not(TellTruth(susan))),Implies(Not(TellTruth(susan)),TellTruth(nicole)))']]
```

An example of a model where query is TRUE:

('*', 'CrashedServer(mark)', '=', 'True')

('*', 'Object(john)', '=', 'True')

('*', 'Object(mark)', '=', 'True')

('*', 'Object(nicole)', '=', 'True')

('*', 'Object(susan)', '=', 'True')

('*', 'TellTruth(nicole)', '=', 'True')

('*', '(other atoms if any)', '=', 'False')

An example of a model where query is FALSE:

('*', 'CrashedServer(mark)', '=', 'True')

('*', 'Object(john)', '=', 'True')

('*', 'Object(mark)', '=', 'True')

('*', 'Object(nicole)', '=', 'True')

('*', 'Object(susan)', '=', 'True')

('*', '(other atoms if any)', '=', 'False')

>>>> I learned something.

Query: TELL[Exists(\$x,And(TellTruth(\$x),Forall(\$y,Implies(Not(Equals(\$x,\$y)),Not(TellTruth(\$y)))))),

standardized: ['Exists(\$x,And(TellTruth(\$x),Forall(\$y,Implies(Not(Equals(\$x,\$y)),Not(TellTruth(\$y))))))']]

An example of a model where query is TRUE:

('*', 'CrashedServer(mark)', '=', 'True')

('*', 'Object(john)', '=', 'True')

('*', 'Object(mark)', '=', 'True')

('*', 'Object(nicole)', '=', 'True')

('*', 'Object(susan)', '=', 'True')

('*', 'TellTruth(nicole)', '=', 'True')

('*', '(other atoms if any)', '=', 'False')

An example of a model where query is FALSE:

('*', 'CrashedServer(mark)', '=', 'True')

('*', 'Object(john)', '=', 'True')

('*', 'Object(mark)', '=', 'True')

('*', 'Object(nicole)', '=', 'True')
('*', 'Object(susan)', '=', 'True')
('*', 'TellTruth(john)', '=', 'True')
('*', 'TellTruth(nicole)', '=', 'True')
('*', '(other atoms if any)', '=', 'False')

>>>>> I learned something.

Query:

TELL[Exists(\$x,And(CrashedServer(\$x),Forall(\$y,Implies(Not(Equals(\$x,\$y)),Not(CrashedServer(\$y)))))),
standardized:
['Exists(\$x,And(CrashedServer(\$x),Forall(\$y,Implies(Not(Equals(\$x,\$y)),Not(CrashedServer(\$y))))))']]

An example of a model where query is TRUE:

('*', 'CrashedServer(mark)', '=', 'True')
('*', 'Object(john)', '=', 'True')
('*', 'Object(mark)', '=', 'True')
('*', 'Object(nicole)', '=', 'True')
('*', 'Object(susan)', '=', 'True')
('*', 'TellTruth(nicole)', '=', 'True')
('*', '(other atoms if any)', '=', 'False')

An example of a model where query is FALSE:

('*', 'CrashedServer(john)', '=', 'True')
('*', 'CrashedServer(mark)', '=', 'True')
('*', 'Object(john)', '=', 'True')
('*', 'Object(mark)', '=', 'True')
('*', 'Object(nicole)', '=', 'True')
('*', 'Object(susan)', '=', 'True')
('*', 'TellTruth(nicole)', '=', 'True')
('*', '(other atoms if any)', '=', 'False')

Yes: ['mark']

Maybe: []

No: ['susan', 'john', 'nicole']

----- END PART-----

----- START PART 4a-0: test implementation of statement 0 for 4a

----- END PART-----

----- START PART 4a-1: test implementation of statement 1 for 4a

----- END PART-----

----- START PART 4a-2: test implementation of statement 2 for 4a

----- END PART-----

----- START PART 4a-3: test implementation of statement 3 for 4a

----- END PART-----

----- START PART 4a-4: test implementation of statement 4 for 4a

----- END PART-----

----- START PART 4a-5: test implementation of statement 5 for 4a

----- END PART-----

----- START PART 4a-all: test implementation of all for 4a

You matched the 36 models

Example model: {'Larger(o1,o3)', 'Larger(o2,o1)', 'Larger(o3,o1)', 'Successor(o1,o3)', 'Larger(o3,o3)', 'Larger(o2,o3)', 'Successor(o3,o1)', 'Larger(o2,o2)', 'Successor(o2,o1)', 'Odd(o2)', 'Odd(o3)', 'Even(o1)', 'Larger(o3,o2)', 'Larger(o1,o1)', 'Larger(o1,o2)'}

----- END PART-----

----- START PART 4a-run: test implementation of run for 4a

>>>>> I learned something.

Query:

TELL[Forall(\$x,Exists(\$y,And(And(Successor(\$x,\$y),Not(Equals(\$y,\$x))),Forall(\$z,Implies(Not(Equals(\$y,\$z)),Not(Successor(\$x,\$z)))))), standardize:

['Forall(\$x,Exists(\$y,And(And(Successor(\$x,\$y),Not(Equals(\$y,\$x))),Forall(\$z,Implies(Not(Equals(\$y,\$z)),Not(Successor(\$x,\$z))))))']]

An example of a model where query is TRUE:

('*, 'Object(o1)', '=', 'True')

('*, 'Object(o2)', '=', 'True')

('*, 'Object(o3)', '=', 'True')

('*, 'Successor(o1,o3)', '=', 'True')

('*, 'Successor(o2,o1)', '=', 'True')

('*, 'Successor(o3,o1)', '=', 'True')

('*, '(other atoms if any)', '=', 'False')

An example of a model where query is FALSE:

('*, 'Object(o1)', '=', 'True')

('*, 'Object(o2)', '=', 'True')

('*, 'Object(o3)', '=', 'True')

('*, '(other atoms if any)', '=', 'False')

>>>>> I learned something.

Query: TELL[Forall(\$x,Or(And(Even(\$x),Not(Odd(\$x))),And(Odd(\$x),Not(Even(\$x))))), standardize:

['Forall(\$x,Or(And(Even(\$x),Not(Odd(\$x))),And(Odd(\$x),Not(Even(\$x))))']]

An example of a model where query is TRUE:

('*, 'Even(o1)', '=', 'True')

('*, 'Object(o1)', '=', 'True')

('*, 'Object(o2)', '=', 'True')

('*, 'Object(o3)', '=', 'True')

('*, 'Odd(o2)', '=', 'True')

('*, 'Odd(o3)', '=', 'True')

('*, 'Successor(o1,o3)', '=', 'True')

('*, 'Successor(o2,o1)', '=', 'True')

('*', 'Successor(o3,o1)', '=', 'True')

('*', '(other atoms if any)', '=', 'False')

An example of a model where query is FALSE:

('*', 'Object(o1)', '=', 'True')

('*', 'Object(o2)', '=', 'True')

('*', 'Object(o3)', '=', 'True')

('*', 'Successor(o1,o3)', '=', 'True')

('*', 'Successor(o2,o1)', '=', 'True')

('*', 'Successor(o3,o1)', '=', 'True')

('*', '(other atoms if any)', '=', 'False')

>>>> I learned something.

Query: TELL[Forall(\$x,Forall(\$y,Implies(And(Even(\$x),Successor(\$x,\$y)),Odd(\$y))))], standardized:
['Forall(\$x,Forall(\$y,Implies(And(Even(\$x),Successor(\$x,\$y)),Odd(\$y))))']]

An example of a model where query is TRUE:

('*', 'Even(o1)', '=', 'True')

('*', 'Even(o2)', '=', 'True')

('*', 'Object(o1)', '=', 'True')

('*', 'Object(o2)', '=', 'True')

('*', 'Object(o3)', '=', 'True')

('*', 'Odd(o3)', '=', 'True')

('*', 'Successor(o1,o3)', '=', 'True')

('*', 'Successor(o2,o3)', '=', 'True')

('*', 'Successor(o3,o1)', '=', 'True')

('*', '(other atoms if any)', '=', 'False')

An example of a model where query is FALSE:

('*', 'Even(o1)', '=', 'True')

('*', 'Even(o2)', '=', 'True')

('*', 'Object(o1)', '=', 'True')

('*', 'Object(o2)', '=', 'True')

('*', 'Object(o3)', '=', 'True')
('*', 'Odd(o3)', '=', 'True')
('*', 'Successor(o1,o3)', '=', 'True')
('*', 'Successor(o2,o1)', '=', 'True')
('*', 'Successor(o3,o1)', '=', 'True')
('*', '(other atoms if any)', '=', 'False')

>>>> I learned something.

Query: TELL[Forall(\$x,Forall(\$y,Implies(And(Odd(\$x),Successor(\$x,\$y)),Even(\$y))))], standardized:
['Forall(\$x,Forall(\$y,Implies(And(Odd(\$x),Successor(\$x,\$y)),Even(\$y))))']]

An example of a model where query is TRUE:

('*', 'Even(o1)', '=', 'True')
('*', 'Even(o2)', '=', 'True')
('*', 'Object(o1)', '=', 'True')
('*', 'Object(o2)', '=', 'True')
('*', 'Object(o3)', '=', 'True')
('*', 'Odd(o3)', '=', 'True')
('*', 'Successor(o1,o3)', '=', 'True')
('*', 'Successor(o2,o3)', '=', 'True')
('*', 'Successor(o3,o1)', '=', 'True')
('*', '(other atoms if any)', '=', 'False')

An example of a model where query is FALSE:

('*', 'Even(o1)', '=', 'True')
('*', 'Object(o1)', '=', 'True')
('*', 'Object(o2)', '=', 'True')
('*', 'Object(o3)', '=', 'True')
('*', 'Odd(o2)', '=', 'True')
('*', 'Odd(o3)', '=', 'True')
('*', 'Successor(o1,o3)', '=', 'True')
('*', 'Successor(o2,o1)', '=', 'True')

('*', 'Successor(o3,o2)', '=', 'True')

('*', '(other atoms if any)', '=', 'False')

>>>> I learned something.

Query: TELL[Forall(\$x,Forall(\$y,Implies(Successor(\$x,\$y),Larger(\$y,\$x))))], standardized:
['Forall(\$x,Forall(\$y,Implies(Successor(\$x,\$y),Larger(\$y,\$x))))']]

An example of a model where query is TRUE:

('*', 'Even(o2)', '=', 'True')

('*', 'Even(o3)', '=', 'True')

('*', 'Larger(o1,o2)', '=', 'True')

('*', 'Larger(o1,o3)', '=', 'True')

('*', 'Larger(o2,o1)', '=', 'True')

('*', 'Object(o1)', '=', 'True')

('*', 'Object(o2)', '=', 'True')

('*', 'Object(o3)', '=', 'True')

('*', 'Odd(o1)', '=', 'True')

('*', 'Successor(o1,o2)', '=', 'True')

('*', 'Successor(o2,o1)', '=', 'True')

('*', 'Successor(o3,o1)', '=', 'True')

('*', '(other atoms if any)', '=', 'False')

An example of a model where query is FALSE:

('*', 'Even(o2)', '=', 'True')

('*', 'Even(o3)', '=', 'True')

('*', 'Object(o1)', '=', 'True')

('*', 'Object(o2)', '=', 'True')

('*', 'Object(o3)', '=', 'True')

('*', 'Odd(o1)', '=', 'True')

('*', 'Successor(o1,o2)', '=', 'True')

('*', 'Successor(o2,o1)', '=', 'True')

('*', 'Successor(o3,o1)', '=', 'True')

('*', '(other atoms if any)', '=', 'False')

>>>>> I learned something.

Query: TELL[Forall(\$x,Forall(\$y,Forall(\$z,Implies(And(Larger(\$x,\$y),Larger(\$y,\$z)),Larger(\$x,\$z))))),
standardized: ['Forall(\$x,Forall(\$y,Forall(\$z,Implies(And(Larger(\$x,\$y),Larger(\$y,\$z)),Larger(\$x,\$z))))')]]

An example of a model where query is TRUE:

('*', 'Even(o2)', '=', 'True')

('*', 'Even(o3)', '=', 'True')

('*', 'Larger(o1,o1)', '=', 'True')

('*', 'Larger(o1,o2)', '=', 'True')

('*', 'Larger(o1,o3)', '=', 'True')

('*', 'Larger(o3,o1)', '=', 'True')

('*', 'Larger(o3,o2)', '=', 'True')

('*', 'Larger(o3,o3)', '=', 'True')

('*', 'Object(o1)', '=', 'True')

('*', 'Object(o2)', '=', 'True')

('*', 'Object(o3)', '=', 'True')

('*', 'Odd(o1)', '=', 'True')

('*', 'Successor(o1,o3)', '=', 'True')

('*', 'Successor(o2,o1)', '=', 'True')

('*', 'Successor(o3,o1)', '=', 'True')

('*', '(other atoms if any)', '=', 'False')

An example of a model where query is FALSE:

('*', 'Even(o2)', '=', 'True')

('*', 'Even(o3)', '=', 'True')

('*', 'Larger(o1,o2)', '=', 'True')

('*', 'Larger(o1,o3)', '=', 'True')

('*', 'Larger(o2,o1)', '=', 'True')

('*', 'Object(o1)', '=', 'True')

('*', 'Object(o2)', '=', 'True')

('*', 'Object(o3)', '=', 'True')

('*', 'Odd(o1)', '=', 'True')

('*', 'Successor(o1,o2)', '=', 'True')

('*', 'Successor(o2,o1)', '=', 'True')

('*', 'Successor(o3,o1)', '=', 'True')

('*', '(other atoms if any)', '=', 'False')

>>>> Yes.

Query: ASK[Forall(\$x,Exists(\$y,And(Even(\$y),Larger(\$y,\$x))))], standardized:
['Forall(\$x,Exists(\$y,And(Even(\$y),Larger(\$y,\$x))))']]

----- END PART-----