

Проект по Изкуствен интелект

Специалност: “Информатика”, редовно обучение

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Задача от типа родословни дървета – в случая избрах да представя родословното дърво на Крумовата династия, като използвах следната схема, която открих в Wikipedia.

Крумова Династия



Бази данни от факти:

parent(m-unknown, krum).

parent(f-unknown, krum).

parent(m-unknown, sestra-na-krum).

parent(f-unknown, sestra-na-krum).

parent(krum, omurtag).

parent(jena-krum, omurtag).
parent(omurtag, enravota).
parent(jena-omurtag, enravota).
parent(omurtag, zvinitza).
parent(jena-omurtag, zvinitza).
parent(omurtag, malamir).
parent(jena-omurtag, malamir).
parent(zvinitza, persian).
parent(jena-zvinitza, persian).
parent(persian, boris-mixail).
parent(jena-persian, boris-mixail).
parent(persian, doks).
parent(jena-persian, doks).
parent(persian, gavril).
parent(jena-persian, gavril).
parent(doks, tudor).
parent(jena-doks, tudor).
parent(boris-mihail, vladimir-rasate).
parent(maria, vladimir-rasate).
parent(boris-mihail, gavril).
parent(maria, gavril).
parent(boris-mihail, simeon).
parent(maria, simeon).
parent(boris-mihail, qkov).
parent(maria, qkov).
parent(boris-mihail, evpraksia).

parent(maria, evpraksia).
parent(boris-mihail, anna).
parent(maria, anna).
parent(simeon, mihail).
parent(jena-simeon, mihail).
parent(simeon, petar).
parent(jena-simeon, petar).
parent(simeon, ivan).
parent(jena-simeon, ivan).
parent(simeon, boqn).
parent(jena-simeon, boqn).
parent(petar, boris-ii).
parent(irina, boris-ii).
parent(petar, roman).
parent(irina, roman).

Тук показваме роднинските връзки от родословното дърво. Да вземем за пример `parent(krum, omurtag)` - това означава, че Крум е родител на Омуртаг. Целта на програмата е да покаже изход от условията, които са му зададени. В случая те са следните:

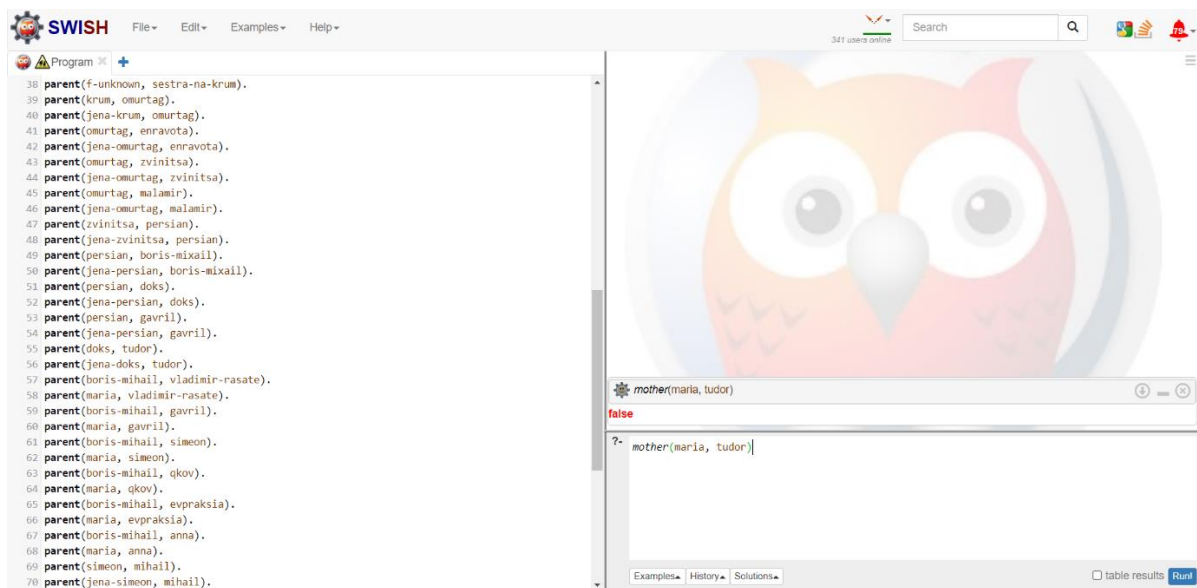
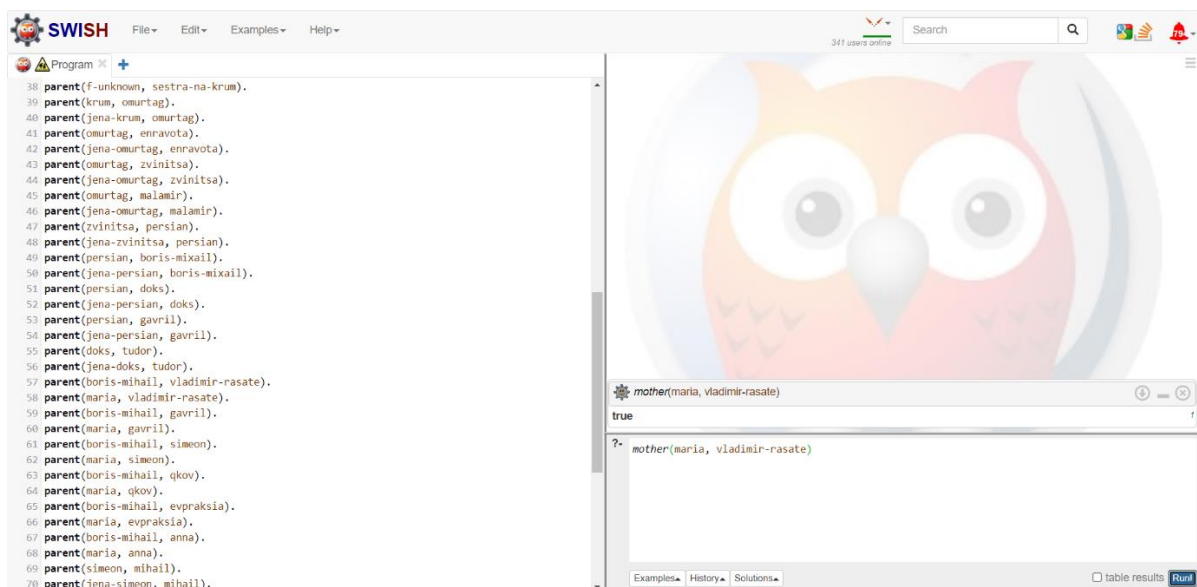
`mother(X,Y):- parent(X,Y),female(X).`
`father(X,Y):- parent(X,Y),male(X).`
`haschild(X):- parent(X,_).`
`brother(X,Y):-parent(Z,X),parent(Z,Y),male(X),X\==Y.`
`sister(X,Y):- parent(Z,X),parent(Z,Y),female(X),X\==Y.`
`grandmother(X,Z) :- mother(X,Y), parent(Y,Z).`
`grandfather(X,Z) :- father(X,Y), parent(Y,Z).`

wife(X,Y) :- parent(X,Z),parent(Y,Z), female(X),male(Y).

uncle(X,Z) :- brother(X,Y), parent(Y,Z).

Например mother(X,Y):- parent(X,Y),female(X) означава, че X е майка на Y, ако X е родител на Y и X е жена. Друг случай е brother(X,Y):- parent(Z,X),parent(Z,Y),male(X),X\==Y дефинира, че X е брат на Y, ако имат общ родител Z, X е мъж и X не е равен на Y. haschild(X):- parent(X, _) проверява дали X има деца и т.н.

Тестване на решението:



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```

58 parent(maria, vladimir-rasate).
59 parent(boris-mihail, gavril).
60 parent(maria, gavril).
61 parent(boris-mihail, simeon).
62 parent(maria, simeon).
63 parent(boris-mihail, qkov).
64 parent(maria, qkov).
65 parent(boris-mihail, evpraksia).
66 parent(maria, evpraksia).
67 parent(boris-mihail, anna).
68 parent(maria, anna).
69 parent(simeon, mihail).
70 parent(jena-simeon, mihail).
71 parent(simeon, petar).
72 parent(jena-simeon, petar).
73 parent(simeon, ivan).
74 parent(jena-simeon, ivan).
75 parent(simeon, boqn).
76 parent(jena-simeon, boqn).
77 parent(petar, boris-ii).
78 parent(irina, boris-ii).
79 parent(petar, roman).
80 parent(irina, roman).
81
82 mother(X,Y):- parent(X,Y),female(X).
83 father(X,Y):- parent(X,Y),male(X).
84 haschild(X):- parent(X,_).
85 brother(X,Y):-parent(Z,X),parent(Z,Y),male(X),X\==Y.
86 sister(X,Y):- parent(Z,X),parent(Z,Y),female(X),X\==Y.
87 grandmother(X,Z) :- mother(X,Y), parent(Y,Z).
88 grandfather(X,Z) :- father(X,Y), parent(Y,Z).
89 wife(X,Y) :- parent(X,Z),parent(Y,Z), female(X),male(Y).
90 uncle(X,Z) :- brother(X,Y), parent(Y,Z).

```

father(krum, omurtag)

true

?- father(krum, omurtag)

Examples History Solutions table results Run

SWISH File Edit Examples Help 340 users online

```

58 parent(maria, vladimir-rasate).
59 parent(boris-mihail, gavril).
60 parent(maria, gavril).
61 parent(boris-mihail, simeon).
62 parent(maria, simeon).
63 parent(boris-mihail, qkov).
64 parent(maria, qkov).
65 parent(boris-mihail, evpraksia).
66 parent(maria, evpraksia).
67 parent(boris-mihail, anna).
68 parent(maria, anna).
69 parent(simeon, mihail).
70 parent(jena-simeon, mihail).
71 parent(simeon, petar).
72 parent(jena-simeon, petar).
73 parent(simeon, ivan).
74 parent(jena-simeon, ivan).
75 parent(simeon, boqn).
76 parent(jena-simeon, boqn).
77 parent(petar, boris-ii).
78 parent(irina, boris-ii).
79 parent(petar, roman).
80 parent(irina, roman).
81
82 mother(X,Y):- parent(X,Y),female(X).
83 father(X,Y):- parent(X,Y),male(X).
84 haschild(X):- parent(X,_).
85 brother(X,Y):-parent(Z,X),parent(Z,Y),male(X),X\==Y.
86 sister(X,Y):- parent(Z,X),parent(Z,Y),female(X),X\==Y.
87 grandmother(X,Z) :- mother(X,Y), parent(Y,Z).
88 grandfather(X,Z) :- father(X,Y), parent(Y,Z).
89 wife(X,Y) :- parent(X,Z),parent(Y,Z), female(X),male(Y).
90 uncle(X,Z) :- brother(X,Y), parent(Y,Z).

```

father(krum, persian)

false

?- father(krum, persian)

Examples History Solutions table results Run

SWISH File Edit Examples Help 344 users online

```

58 parent(maria, vladimir-rasate).
59 parent(boris-mihail, gavril).
60 parent(maria, gavril).
61 parent(boris-mihail, simeon).
62 parent(maria, simeon).
63 parent(boris-mihail, qkov).
64 parent(maria, qkov).
65 parent(boris-mihail, evpraksia).
66 parent(maria, evpraksia).
67 parent(boris-mihail, anna).
68 parent(maria, anna).
69 parent(simeon, mihail).
70 parent(jena-simeon, mihail).
71 parent(simeon, petar).
72 parent(jena-simeon, petar).
73 parent(simeon, ivan).
74 parent(jena-simeon, ivan).
75 parent(simeon, boqn).
76 parent(jena-simeon, boqn).
77 parent(petar, boris-ii).
78 parent(irina, boris-ii).
79 parent(petar, roman).
80 parent(irina, roman).
81
82 mother(X,Y):- parent(X,Y),female(X).
83 father(X,Y):- parent(X,Y),male(X).
84 haschild(X):- parent(X,_).
85 brother(X,Y):-parent(Z,X),parent(Z,Y),male(X),X\==Y.
86 sister(X,Y):- parent(Z,X),parent(Z,Y),female(X),X\==Y.
87 grandmother(X,Z) :- mother(X,Y), parent(Y,Z).
88 grandfather(X,Z) :- father(X,Y), parent(Y,Z).
89 wife(X,Y) :- parent(X,Z),parent(Y,Z), female(X),male(Y).
90 uncle(X,Z) :- brother(X,Y), parent(Y,Z).

```

haschild(boris-mihail)

true

Next 10 100 1,000 Stop

?- haschild(boris-mihail)

Examples History Solutions table results Run

SWISH File Edit Examples Help 349 users online

```

58 parent(maria, vladimir-rasate).
59 parent(boris-mihail, gavril).
60 parent(maria, gavril).
61 parent(boris-mihail, simeon).
62 parent(maria, simeon).
63 parent(boris-mihail, qkov).
64 parent(maria, qkov).
65 parent(boris-mihail, evpraksia).
66 parent(maria, evpraksia).
67 parent(boris-mihail, anna).
68 parent(maria, anna).
69 parent(simeon, mihail).
70 parent(jena-simeon, mihail).
71 parent(simeon, petar).
72 parent(jena-simeon, petar).
73 parent(simeon, ivan).
74 parent(jena-simeon, ivan).
75 parent(simeon, boqn).
76 parent(jena-simeon, boqn).
77 parent(petar, boris-ii).
78 parent(irina, boris-ii).
79 parent(petar, roman).
80 parent(irina, roman).
81
82 mother(X,Y):- parent(X,Y),female(X).
83 father(X,Y):- parent(X,Y),male(X).
84 haschild(X):- parent(X,_).
85 brother(X,Y):-parent(Z,X),parent(Z,Y),male(X),X\==Y.
86 sister(X,Y):- parent(Z,X),parent(Z,Y),female(X),X\==Y.
87 grandmother(X,Z) :- mother(X,Y), parent(Y,Z).
88 grandfather(X,Z) :- father(X,Y), parent(Y,Z).
89 wife(X,Y) :- parent(X,Z),parent(Y,Z), female(X),male(Y).
90 uncle(X,Z) :- brother(X,Y), parent(Y,Z).

```

haschild(gavril)

false

?- haschild(gavril)

Examples History Solutions table results Run

SWISH File Edit Examples Help 347 users online

```

58 parent(maria, vladimir-rasate).
59 parent(boris-mihail, gavril).
60 parent(maria, gavril).
61 parent(boris-mihail, simeon).
62 parent(maria, simeon).
63 parent(boris-mihail, qkov).
64 parent(maria, qkov).
65 parent(boris-mihail, evpraksia).
66 parent(maria, evpraksia).
67 parent(boris-mihail, anna).
68 parent(maria, anna).
69 parent(simeon, mihail).
70 parent(jena-simeon, mihail).
71 parent(simeon, petar).
72 parent(jena-simeon, petar).
73 parent(simeon, ivan).
74 parent(jena-simeon, ivan).
75 parent(simeon, boqn).
76 parent(jena-simeon, boqn).
77 parent(petar, boris-ii).
78 parent(irina, boris-ii).
79 parent(petar, roman).
80 parent(irina, roman).
81
82 mother(X,Y):- parent(X,Y),female(X).
83 father(X,Y):- parent(X,Y),male(X).
84 haschild(X):- parent(X,_).
85 brother(X,Y):-parent(Z,X),parent(Z,Y),male(X),X\==Y.
86 sister(X,Y):- parent(Z,X),parent(Z,Y),female(X),X\==Y.
87 grandmother(X,Z) :- mother(X,Y), parent(Y,Z).
88 grandfather(X,Z) :- father(X,Y), parent(Y,Z).
89 wife(X,Y) :- parent(X,Z),parent(Y,Z), female(X),male(Y).
90 uncle(X,Z) :- brother(X,Y), parent(Y,Z).

```

brother(simeon, qkov)

true

Next 10 100 1,000 Stop

?- brother(simeon, qkov)

Examples History Solutions table results Run

SWISH File Edit Examples Help 344 users online

```

58 parent(maria, vladimir-rasate).
59 parent(boris-mihail, gavril).
60 parent(maria, gavril).
61 parent(boris-mihail, simeon).
62 parent(maria, simeon).
63 parent(boris-mihail, qkov).
64 parent(maria, qkov).
65 parent(boris-mihail, evpraksia).
66 parent(maria, evpraksia).
67 parent(boris-mihail, anna).
68 parent(maria, anna).
69 parent(simeon, mihail).
70 parent(jena-simeon, mihail).
71 parent(simeon, petar).
72 parent(jena-simeon, petar).
73 parent(simeon, ivan).
74 parent(jena-simeon, ivan).
75 parent(simeon, boqn).
76 parent(jena-simeon, boqn).
77 parent(petar, boris-ii).
78 parent(irina, boris-ii).
79 parent(petar, roman).
80 parent(irina, roman).
81
82 mother(X,Y):- parent(X,Y),female(X).
83 father(X,Y):- parent(X,Y),male(X).
84 haschild(X):- parent(X,_).
85 brother(X,Y):-parent(Z,X),parent(Z,Y),male(X),X\==Y.
86 sister(X,Y):- parent(Z,X),parent(Z,Y),female(X),X\==Y.
87 grandmother(X,Z) :- mother(X,Y), parent(Y,Z).
88 grandfather(X,Z) :- father(X,Y), parent(Y,Z).
89 wife(X,Y) :- parent(X,Z),parent(Y,Z), female(X),male(Y).
90 uncle(X,Z) :- brother(X,Y), parent(Y,Z).

```

brother(roman, persian)

false

?- brother(roman, persian)

Examples History Solutions table results Run

SWISH File Edit Examples Help 345 users online Search

Program 34

```

58 parent(maria, vladimir-rasate).
59 parent(boris-mihail, gavril).
60 parent(maria, gavril).
61 parent(boris-mihail, simeon).
62 parent(maria, simeon).
63 parent(boris-mihail, qkov).
64 parent(maria, qkov).
65 parent(boris-mihail, evpraksia).
66 parent(maria, evpraksia).
67 parent(boris-mihail, anna).
68 parent(maria, anna).
69 parent(simeon, mihail).
70 parent(jena-simeon, mihail).
71 parent(simeon, petar).
72 parent(jena-simeon, petar).
73 parent(simeon, ivan).
74 parent(jena-simeon, ivan).
75 parent(simeon, boqn).
76 parent(jena-simeon, boqn).
77 parent(petar, boris-ii).
78 parent(irina, boris-ii).
79 parent(petar, roman).
80 parent(irina, roman).
81
82 mother(X,Y):- parent(X,Y),female(X).
83 father(X,Y):- parent(X,Y),male(X).
84 haschild(X):- parent(X,_).
85 brother(X,Y):-parent(Z,X),parent(Z,Y),male(X),X\==Y.
86 sister(X,Y):- parent(Z,X),parent(Z,Y),female(X),X\==Y.
87 grandmother(X,Z) :- mother(X,Y), parent(Y,Z).
88 grandfather(X,Z) :- father(X,Y), parent(Y,Z).
89 wife(X,Y) :- parent(X,Z),parent(Y,Z), female(X),male(Y).
90 uncle(X,Z) :- brother(X,Y), parent(Y,Z).

```

https://swish.swi-prolog.org/#tabbed-tab-1

sister(anna, evpraksia)

true

Next 10 100 1,000 Stop

?- sister(anna, evpraksia)

Examples History Solutions table results Run

SWISH File Edit Examples Help 350 users online Search

Program 34

```

58 parent(maria, vladimir-rasate).
59 parent(boris-mihail, gavril).
60 parent(maria, gavril).
61 parent(boris-mihail, simeon).
62 parent(maria, simeon).
63 parent(boris-mihail, qkov).
64 parent(maria, qkov).
65 parent(boris-mihail, evpraksia).
66 parent(maria, evpraksia).
67 parent(boris-mihail, anna).
68 parent(maria, anna).
69 parent(simeon, mihail).
70 parent(jena-simeon, mihail).
71 parent(simeon, petar).
72 parent(jena-simeon, petar).
73 parent(simeon, ivan).
74 parent(jena-simeon, ivan).
75 parent(simeon, boqn).
76 parent(jena-simeon, boqn).
77 parent(petar, boris-ii).
78 parent(irina, boris-ii).
79 parent(petar, roman).
80 parent(irina, roman).
81
82 mother(X,Y):- parent(X,Y),female(X).
83 father(X,Y):- parent(X,Y),male(X).
84 haschild(X):- parent(X,_).
85 brother(X,Y):-parent(Z,X),parent(Z,Y),male(X),X\==Y.
86 sister(X,Y):- parent(Z,X),parent(Z,Y),female(X),X\==Y.
87 grandmother(X,Z) :- mother(X,Y), parent(Y,Z).
88 grandfather(X,Z) :- father(X,Y), parent(Y,Z).
89 wife(X,Y) :- parent(X,Z),parent(Y,Z), female(X),male(Y).
90 uncle(X,Z) :- brother(X,Y), parent(Y,Z).

```

sister(anna, sestra-na-krum)

false

?- sister(anna, sestra-na-krum)

Examples History Solutions table results Run

SWISH File Edit Examples Help 347 users online Search

Program 34

```

58 parent(maria, vladimir-rasate).
59 parent(boris-mihail, gavril).
60 parent(maria, gavril).
61 parent(boris-mihail, simeon).
62 parent(maria, simeon).
63 parent(boris-mihail, qkov).
64 parent(maria, qkov).
65 parent(boris-mihail, evpraksia).
66 parent(maria, evpraksia).
67 parent(boris-mihail, anna).
68 parent(maria, anna).
69 parent(simeon, mihail).
70 parent(jena-simeon, mihail).
71 parent(simeon, petar).
72 parent(jena-simeon, petar).
73 parent(simeon, ivan).
74 parent(jena-simeon, ivan).
75 parent(simeon, boqn).
76 parent(jena-simeon, boqn).
77 parent(petar, boris-ii).
78 parent(irina, boris-ii).
79 parent(petar, roman).
80 parent(irina, roman).
81
82 mother(X,Y):- parent(X,Y),female(X).
83 father(X,Y):- parent(X,Y),male(X).
84 haschild(X):- parent(X,_).
85 brother(X,Y):-parent(Z,X),parent(Z,Y),male(X),X\==Y.
86 sister(X,Y):- parent(Z,X),parent(Z,Y),female(X),X\==Y.
87 grandmother(X,Z) :- mother(X,Y), parent(Y,Z).
88 grandfather(X,Z) :- father(X,Y), parent(Y,Z).
89 wife(X,Y) :- parent(X,Z),parent(Y,Z), female(X),male(Y).
90 uncle(X,Z) :- brother(X,Y), parent(Y,Z).

```

grandmother(maria, anna)

false

?- grandmother(maria, anna)

Examples History Solutions table results Run

SWISH File Edit Examples Help 341 users online Search

Program

```

58 parent(maria, vladimir-rasate).
59 parent(boris-mihail, gavrill).
60 parent(maria, gavrill).
61 parent(boris-mihail, simeon).
62 parent(maria, simeon).
63 parent(boris-mihail, qkov).
64 parent(maria, qkov).
65 parent(boris-mihail, evpraksia).
66 parent(maria, evpraksia).
67 parent(boris-mihail, anna).
68 parent(maria, anna).
69 parent(simeon, mihail).
70 parent(jena-simeon, mihail).
71 parent(simeon, petar).
72 parent(jena-simeon, petar).
73 parent(simeon, ivan).
74 parent(jena-simeon, ivan).
75 parent(simeon, boqn).
76 parent(jena-simeon, boqn).
77 parent(petar, boris-ii).
78 parent(irina, boris-ii).
79 parent(petar, roman).
80 parent(irina, roman).
81
82 mother(X,Y):- parent(X,Y), female(X).
83 father(X,Y):- parent(X,Y), male(X).
84 haschild(X):- parent(X,_).
85 brother(X,Y):- parent(Z,X), parent(Z,Y), male(X), X\==Y.
86 sister(X,Y):- parent(Z,X), parent(Z,Y), female(X), X\==Y.
87 grandmother(X,Z) :- mother(X,Y), parent(Y,Z).
88 grandfather(X,Z) :- father(X,Y), parent(Y,Z).
89 wife(X,Y) :- parent(X,Z), parent(Y,Z), female(X), male(Y).
90 uncle(X,Z) :- brother(X,Y), parent(Y,Z).

```

grandfather(krum, zvinita)

true

?- grandfather(krum, zvinita)

Examples History Solutions table results Run!

SWISH File Edit Examples Help 344 users online Search

Program

```

58 parent(maria, vladimir-rasate).
59 parent(boris-mihail, gavrill).
60 parent(maria, gavrill).
61 parent(boris-mihail, simeon).
62 parent(maria, simeon).
63 parent(boris-mihail, qkov).
64 parent(maria, qkov).
65 parent(boris-mihail, evpraksia).
66 parent(maria, evpraksia).
67 parent(boris-mihail, anna).
68 parent(maria, anna).
69 parent(simeon, mihail).
70 parent(jena-simeon, mihail).
71 parent(simeon, petar).
72 parent(jena-simeon, petar).
73 parent(simeon, ivan).
74 parent(jena-simeon, ivan).
75 parent(simeon, boqn).
76 parent(jena-simeon, boqn).
77 parent(petar, boris-ii).
78 parent(irina, boris-ii).
79 parent(petar, roman).
80 parent(irina, roman).
81
82 mother(X,Y):- parent(X,Y), female(X).
83 father(X,Y):- parent(X,Y), male(X).
84 haschild(X):- parent(X,_).
85 brother(X,Y):- parent(Z,X), parent(Z,Y), male(X), X\==Y.
86 sister(X,Y):- parent(Z,X), parent(Z,Y), female(X), X\==Y.
87 grandmother(X,Z) :- mother(X,Y), parent(Y,Z).
88 grandfather(X,Z) :- father(X,Y), parent(Y,Z).
89 wife(X,Y) :- parent(X,Z), parent(Y,Z), female(X), male(Y).
90 uncle(X,Z) :- brother(X,Y), parent(Y,Z).

```

grandfather(omurtag, doks)

false

?- grandfather(omurtag, doks)

Examples History Solutions table results Run!

SWISH File Edit Examples Help 347 users online Search

Program

```

31 female(jena-persian).
32 female(jena-doks).
33 female(jena-simeon).
34
35 parent(m-unknown, krum).
36 parent(f-unknown, krum).
37 parent(m-unknown, sestra-na-krum).
38 parent(f-unknown, sestra-na-krum).
39 parent(krum, omurtag).
40 parent(jena-krum, omurtag).
41 parent(omurtag, enravota).
42 parent(jena-omurtag, enravota).
43 parent(omurtag, zvinita).
44 parent(jena-omurtag, zvinita).
45 parent(omurtag, malamir).
46 parent(jena-omurtag, malamir).
47 parent(zvinita, persian).
48 parent(jena-zvinita, persian).
49 parent(persian, boris-mixail).
50 parent(jena-persian, boris-mixail).
51 parent(persian, doks).
52 parent(jena-persian, doks).
53 parent(persian, gavrill).
54 parent(jena-persian, gavrill).
55 parent(doks, tudor).
56 parent(jena-doks, tudor).
57 parent(boris-mihail, vladimir-rasate).
58 parent(maria, vladimir-rasate).
59 parent(boris-mihail, gavrill).
60 parent(maria, gavrill).
61 parent(boris-mihail, simeon).
62 parent(maria, simeon).
63 parent(boris-mihail, qkov).

```

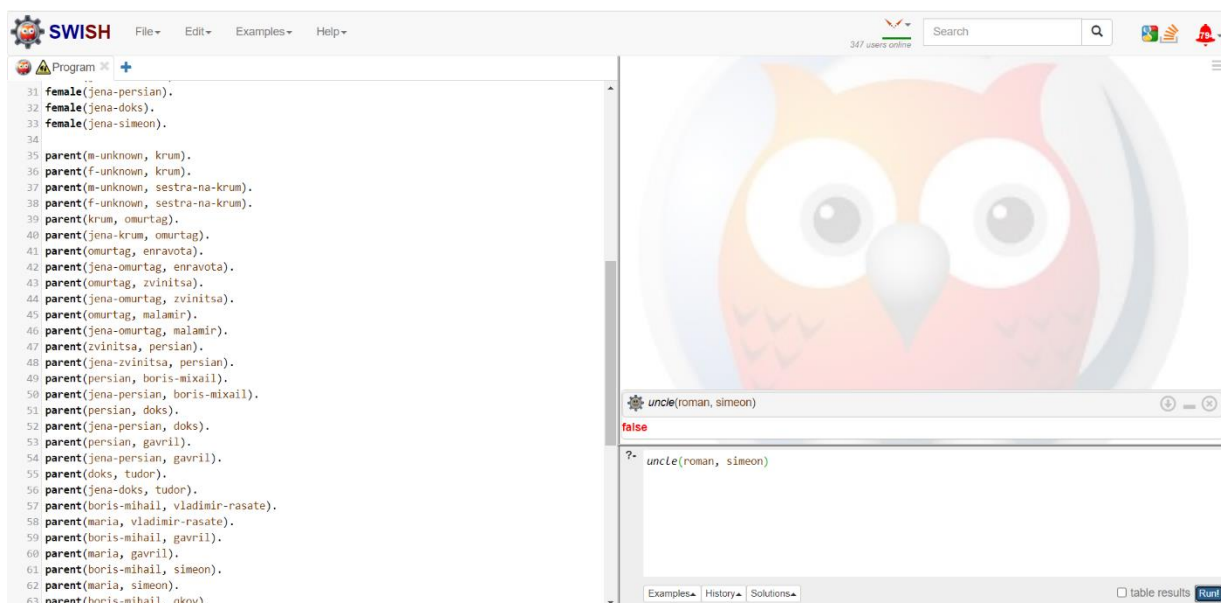
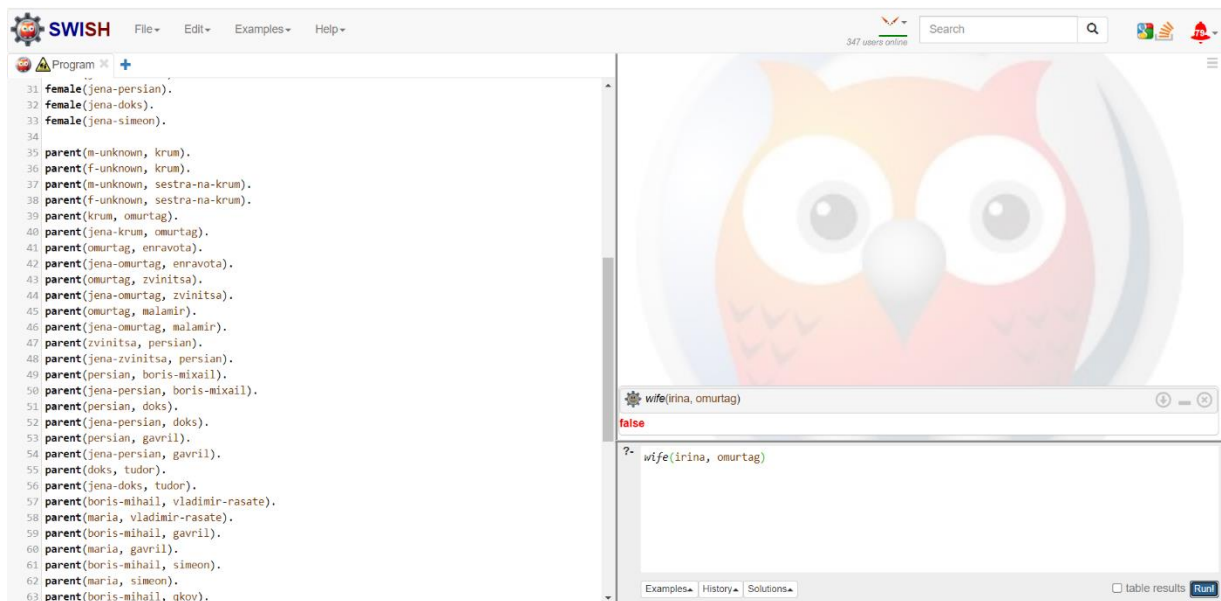
wife(irina, petar)

true

Next 10 100 1,000 Stop

?- wife(irina, petar)

Examples History Solutions table results Run!



Използвана литература:

https://bg.wikipedia.org/wiki/%D0%9A%D1%80%D1%83%D0%BC%D0%BE%D0%B2%D0%B0_%D0%B4%D0%B8%D0%BD%D0%B0%D1%81%D1%82%D0%B8%D1%8F

https://www.uni-vt.bg/userinfo/519/pub/27702/krum_01-40_01.pdf