

Programme 2

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1. The Harmonia theorem represented in Lisp

- 1.(((grandparent x y)) ((parent x z)(parent z y)))
- 2.(((parent x y))((mother x y)))
- 3.(((parent x y))((father x y)))
- 4.(((father zeus ares)) nil)
- 5.(((mother hera ares)) nil)
- 6.(((father ares harmonia) nil)

Question:(((grandparent x harmonia)))

nagation:(nil ((grandparent x harmonia)))

2. Results

Theorem number	Two pointer	Unit preference
1	971	364
2	Taking very long time	2817
3	Cannot parse input	Cannot parse input
4	528	Cannot be proved
5	8389	Cannot be proved

3. My thoughts

Below are some of my thoughts on the difference of the two methods that have resulted in the proving result and steps:

1. The two pointer method takes into account all clauses that are generated from the resolution between any two clauses in the original clause set, each from the assumptions and the negated conclusions, which guarantees to get a proof at the end if the conclusion is provable, while unit preference uses clauses newly generated only if they are short, which from my point of view is a greedy manner that seems to be trying to find a local optimum, but in the meantime can result in the loss of useful information.
2. The unit preference method starts with clauses that are short, which can sometimes reduce the amount of time consumed if we can luckily find the answer in an early stage.

4. Print results

(1) Howling hound

1) Two pointer

- (1) (howl(z)) (hound(z))
- (2) () (have(x y)cat(y)have(x z)mouse(z))

(3) () (ls(w)have(w v)howl(v))
(4) (have(John A)) ()
(5) (cat(A)hound(A)) ()
(6) (mouse(B)) ()
(7) (ls(John)) ()
(8) (have(John B)) ()
(9) () (have(x y)cat(y)have(x B)) Parents: 1, 5
(10) () (have(John v)howl(v)) Parents: 2, 6
(11) () (cat(B)have(John z)mouse(z)) Parents: 1, 7
(12) () (ls(John)howl(B)) Parents: 2, 7
(13) () (cat(A)have(John B)) Parents: 3, 8
(14) (hound(A)) (have(x A)have(x B)) Parents: 4, 8
(15) () (cat(B)have(John B)) Parents: 7, 8
(16) (howl(v)) (hound(v)) Parents: 0, 9
(17) () (howl(A)) Parents: 3, 9
(18) () (howl(B)) Parents: 7, 9
(19) () (cat(B)mouse(A)) Parents: 3, 10
(20) () (cat(B)have(John B)) Parents: 5, 10
(21) () (cat(B)mouse(B)) Parents: 7, 10
(22) () (hound(B)ls(John)) Parents: 0, 11
(23) () (howl(B)) Parents: 6, 11
(24) (hound(A)) (have(John B)) Parents: 4, 12
(25) () (cat(A)) Parents: 7, 12
(26) (howl(A)) (have(x A)have(x B)) Parents: 0, 13
(27) (hound(A)) (have(John B)) Parents: 3, 13
(28) (hound(A)) (have(John A)) Parents: 7, 13
(29) () (cat(B)) Parents: 7, 14
(30) () (ls(w)have(w v)hound(v)) Parents: 2, 15
(31) (howl(A)cat(A)) () Parents: 4, 15
(32) () (have(John v)hound(v)) Parents: 9, 15
(33) () (hound(B)ls(John)) Parents: 11, 15
(34) (howl(A)) (have(x A)have(x B)) Parents: 13, 15
(35) () (hound(A)) Parents: 0, 16
(36) () (hound(A)) Parents: 15, 16
(37) () (hound(B)) Parents: 0, 17
(38) () (hound(B)) Parents: 15, 17
(39) () (cat(B)) Parents: 7, 19
(40) () (cat(B)) Parents: 5, 20
(41) () (hound(B)) Parents: 6, 21
(42) () (hound(B)) Parents: 0, 22
(43) () (hound(B)) Parents: 15, 22
(44) (howl(A)) (have(John B)) Parents: 0, 23
(45) (hound(A)) () Parents: 7, 23

(46) (howl(A)) (have(John B)) Parents: 15, 23
(47) (hound(A)) () Parents: 4, 24
(48) () (ls(w)have(w A)have(x A)have(x B)) Parents: 2, 25
(49) (howl(A)) (have(John B)) Parents: 3, 25
(50) (howl(A)) (have(John A)) Parents: 7, 25
(51) () (have(John A)have(x A)have(x B)) Parents: 9, 25
(52) () (have(x A)have(x B)) Parents: 16, 25
(53) (howl(A)) (have(John B)) Parents: 0, 26
(54) (hound(A)) () Parents: 7, 26
(55) (howl(A)) (have(John B)) Parents: 15, 26
(56) (howl(A)) (have(John A)) Parents: 0, 27
(57) (hound(A)) () Parents: 3, 27
(58) (howl(A)) (have(John A)) Parents: 15, 27
(59) () (ls(John)hound(A)) Parents: 3, 29
(60) (cat(A)) (ls(w)have(w A)) Parents: 4, 29
(61) () (have(John v)hound(v)) Parents: 6, 29
(62) () (ls(John)hound(B)) Parents: 7, 29
(63) () (ls(w)have(w A)have(x A)have(x B)) Parents: 13, 29
(64) () (ls(w)have(w A)have(John B)) Parents: 23, 29
(65) () (ls(w)have(w A)have(John B)) Parents: 26, 29
(66) () (ls(w)have(w A)have(John A)) Parents: 27, 29
(67) (howl(A)) (have(x A)have(x z)mouse(z)) Parents: 1, 30
(68) (cat(A)) (ls(w)have(w A)) Parents: 2, 30
(69) (howl(A)) (have(x A)have(x B)) Parents: 8, 30
(70) (cat(A)) (have(John A)) Parents: 9, 30
(71) (howl(A)) (have(John B)) Parents: 12, 30
(72) (cat(A)) () Parents: 16, 30
(73) (howl(A)) () Parents: 24, 30
(74) () (hound(A)) Parents: 3, 31
(75) (cat(A)) (have(John A)) Parents: 4, 31
(76) () (hound(B)) Parents: 7, 31
(77) () (have(John A)have(x A)have(x B)) Parents: 13, 31
(78) () (have(John A)have(John B)) Parents: 23, 31
(79) () (have(John A)have(John B)) Parents: 26, 31
(80) () (have(John A)have(John A)) Parents: 27, 31
(81) () (hound(B)) Parents: 6, 32
(82) () (ls(w)have(w A)have(x A)have(x B)) Parents: 2, 33
(83) (howl(A)) (have(John B)) Parents: 3, 33
(84) (howl(A)) (have(John A)) Parents: 7, 33
(85) () (have(John A)have(x A)have(x B)) Parents: 9, 33
(86) () (have(x A)have(x B)) Parents: 16, 33
(87) (cat(A)) () Parents: 4, 34
(88) () (have(x A)have(x B)) Parents: 13, 34

(89) () (have(John B)) Parents: 23, 34
 (90) () (have(John B)) Parents: 26, 34
 (91) () (have(John A)) Parents: 27, 34
 (92) (cat(A)) () Parents: 4, 35
 (93) () (have(x A)have(x B)) Parents: 13, 35
 (94) () (have(John B)) Parents: 23, 35
 (95) () (have(John B)) Parents: 26, 35
 (96) () (have(John A)) Parents: 27, 35
 (97) () (ls(w)have(w A)have(John B)) Parents: 2, 43
 (98) (howl(A)) () Parents: 7, 43
 (99) () (have(John A)have(John B)) Parents: 9, 43
 (100) () (have(John B)) Parents: 16, 43
 (101) (howl(A)) () Parents: 0, 44
 (102) (howl(A)) () Parents: 15, 44
 (103) () (ls(w)have(w A)) Parents: 29, 44
 (104) () (have(John A)) Parents: 31, 44

2) Unit preference

(1) (have(John A)) ()
 (2) (howl(z)) (hound(z))
 (3) (cat(A)hound(A)) ()
 (4) () (ls(w)have(w v)howl(v))
 (5) () (have(x y)cat(y)have(x z)mouse(z))
 (6) (mouse(B)) ()
 (7) (ls(John)) ()
 (8) (have(John B)) ()
 (9) () (have(x y)cat(y)have(x B)) Parents: 4, 5
 (10) () (have(John v)howl(v)) Parents: 3, 6
 (11) () (ls(John)howl(B)) Parents: 3, 7
 (12) () (cat(B)have(John z)mouse(z)) Parents: 4, 7
 (13) () (cat(A)have(John B)) Parents: 0, 8
 (14) () (cat(B)have(John B)) Parents: 7, 8
 (15) () (howl(A)) Parents: 0, 9
 (16) () (howl(B)) Parents: 7, 9
 (17) () (howl(B)) Parents: 6, 10
 (18) () (cat(B)mouse(A)) Parents: 0, 11
 (19) () (cat(B)have(John B)) Parents: 5, 11
 (20) () (cat(B)mouse(B)) Parents: 7, 11
 (21) () (cat(A)) Parents: 7, 12
 (22) () (cat(B)) Parents: 7, 13
 (23) () (hound(A)) Parents: 1, 14
 (24) () (hound(B)) Parents: 1, 15

- (25) () (hound(B)) Parents: 1, 16
- (26) () (cat(B)) Parents: 7, 18
- (27) () (cat(B)) Parents: 5, 19
- (28) (hound(A)) () Parents: 2, 20
- (29) (cat(A)) () Parents: 2, 22
- (30) (howl(A)) () Parents: 1, 27

(2) Roadrunner

1) Two pointer

Cannot get the answer

2) Unit preference

- (1) (rr(A)) (coyote(y))
- (2) (chase(z A)) (coyote(z))
- (3) (beep(r)) (rr(r))
- (4) (smart(x)) (rr(x)beep(x))
- (5) () (coyote(w)rr(u)catch(w u)smart(u))
- (6) (frustrated(s)catch(s t)) (coyote(s)rr(t)chase(s t))
- (7) (coyote(B)) ()
- (8) () (frustrated(B))
- (9) (rr(A)) () Parents: 0, 6
- (10) (chase(B A)) () Parents: 1, 6
- (11) () (rr(u)catch(B u)smart(u)) Parents: 4, 6
- (12) (frustrated(B)catch(B t)) (rr(t)chase(B t)) Parents: 5, 6
- (13) (catch(B t)) (coyote(B)rr(t)chase(B t)) Parents: 5, 7
- (14) (beep(A)) () Parents: 2, 8
- (15) (smart(A)) (beep(A)) Parents: 3, 8
- (16) () (coyote(w)catch(w A)smart(A)) Parents: 4, 8
- (17) (frustrated(s)catch(s A)) (coyote(s)chase(s A)) Parents: 5, 8
- (18) (frustrated(B)catch(B A)) (coyote(B)rr(A)) Parents: 5, 9
- (19) () (catch(B A)smart(A)) Parents: 8, 10
- (20) (catch(B t)) (rr(t)chase(B t)) Parents: 7, 11
- (21) (frustrated(B)catch(B A)) (chase(B A)) Parents: 8, 11
- (22) (frustrated(B)catch(B A)) (rr(A)) Parents: 9, 11
- (23) () (rr(t)catch(B t)smart(t)) Parents: 10, 11
- (24) (catch(B t)) (rr(t)chase(B t)) Parents: 6, 12
- (25) (catch(B A)) (coyote(B)chase(B A)) Parents: 8, 12
- (26) (catch(B A)) (coyote(B)rr(A)) Parents: 9, 12
- (27) () (rr(t)catch(B t)smart(t)) Parents: 10, 12
- (28) (smart(A)) (rr(A)) Parents: 3, 13
- (29) (smart(A)) () Parents: 13, 14
- (30) () (catch(B A)smart(A)) Parents: 6, 15

(31) (chase(s A)) (coyote(s)) Parents: 1, 16
(32) (frustrated(B)catch(B A)) (chase(B A)) Parents: 6, 16
(33) (catch(B A)) (coyote(B)chase(B A)) Parents: 7, 16
(34) (frustrated(B)catch(B A)) (coyote(B)) Parents: 9, 16
(35) () (coyote(s)catch(s A)smart(A)) Parents: 15, 16
(36) (frustrated(B)catch(B A)) (rr(A)) Parents: 6, 17
(37) (catch(B A)) (coyote(B)rr(A)) Parents: 7, 17
(38) (frustrated(B)catch(B A)) (coyote(B)) Parents: 8, 17
(39) (catch(B A)) (chase(B A)) Parents: 8, 19
(40) (catch(B A)) (rr(A)) Parents: 9, 19
(41) (catch(B A)) (chase(B A)) Parents: 7, 20
(42) (frustrated(B)catch(B A)) () Parents: 9, 20
(43) (catch(B A)) (rr(A)) Parents: 7, 21
(44) (frustrated(B)catch(B A)) () Parents: 8, 21
(45) () (catch(B A)smart(A)) Parents: 8, 22
(46) (catch(B A)) (chase(B A)) Parents: 8, 23
(47) (catch(B A)) (rr(A)) Parents: 9, 23
(48) (catch(B A)) (chase(B A)) Parents: 6, 24
(49) (catch(B A)) (coyote(B)) Parents: 9, 24
(50) (catch(B A)) (rr(A)) Parents: 6, 25
(51) (catch(B A)) (coyote(B)) Parents: 8, 25
(52) () (catch(B A)smart(A)) Parents: 8, 26
(53) (smart(A)) () Parents: 8, 27
(54) () (coyote(w)rr(A)catch(w A)) Parents: 4, 28
(55) () (rr(A)catch(B A)) Parents: 10, 28
(56) () (coyote(w)catch(w A)) Parents: 15, 28
(57) () (catch(B A)) Parents: 18, 28
(58) () (rr(A)catch(B A)) Parents: 22, 28
(59) () (rr(A)catch(B A)) Parents: 26, 28
(60) () (catch(B A)) Parents: 28, 29
(61) (chase(B A)) () Parents: 6, 30
(62) (catch(B A)) (chase(B A)) Parents: 7, 31
(63) (frustrated(B)catch(B A)) () Parents: 9, 31
(64) (catch(B A)) (chase(B A)) Parents: 6, 32
(65) (catch(B A)) (coyote(B)) Parents: 9, 32
(66) (frustrated(B)catch(B A)) () Parents: 6, 33
(67) (catch(B A)) (coyote(B)) Parents: 7, 33
(68) () (catch(B A)smart(A)) Parents: 6, 34
(69) () (coyote(s)catch(s A)) Parents: 28, 34
(70) (catch(B A)) (rr(A)) Parents: 7, 35
(71) (frustrated(B)catch(B A)) () Parents: 8, 35
(72) (catch(B A)) (rr(A)) Parents: 6, 36
(73) (catch(B A)) (coyote(B)) Parents: 8, 36

(74) (frustrated(B)catch(B A)) () Parents: 6, 37
(75) (catch(B A)) (coyote(B)) Parents: 7, 37
(76) (catch(B A)) () Parents: 9, 38
(77) (catch(B A)) () Parents: 8, 39
(78) (catch(B A)) () Parents: 9, 40
(79) (catch(B A)) () Parents: 7, 41
(80) (catch(B A)) () Parents: 8, 42
(81) (catch(B A)) () Parents: 7, 43
(82) () (catch(B A)) Parents: 28, 44
(83) (catch(B A)) () Parents: 9, 45
(84) (catch(B A)) () Parents: 8, 46
(85) (catch(B A)) () Parents: 9, 47
(86) (catch(B A)) () Parents: 6, 48
(87) (catch(B A)) () Parents: 8, 49
(88) (catch(B A)) () Parents: 6, 50
(89) () (catch(B A)) Parents: 28, 51
(90) () (coyote(w)rr(A)catch(w A)) Parents: 4, 52
(91) () (rr(A)catch(B A)) Parents: 10, 52
(92) () (coyote(w)catch(w A)) Parents: 15, 52
(93) () (catch(B A)) Parents: 18, 52
(94) () (rr(A)catch(B A)) Parents: 22, 52
(95) () (rr(A)catch(B A)) Parents: 26, 52
(96) () (catch(B A)) Parents: 29, 52
(97) () (coyote(s)catch(s A)) Parents: 34, 52
(98) () (catch(B A)) Parents: 44, 52
(99) () (catch(B A)) Parents: 51, 52
(100) () (rr(A)catch(B A)) Parents: 6, 53
(101) () (coyote(w)catch(w A)) Parents: 8, 53
(102) () (catch(B A)) Parents: 8, 54
(103) () (catch(B A)) Parents: 6, 55
(104) (frustrated(B)) (coyote(B)rr(A)chase(B A)) Parents: 5, 56
(105) (frustrated(B)) (rr(A)chase(B A)) Parents: 11, 56
(106) () (coyote(B)rr(A)chase(B A)) Parents: 12, 56
(107) (frustrated(B)) (coyote(B)chase(B A)) Parents: 16, 56
(108) (frustrated(B)) (coyote(B)rr(A)) Parents: 17, 56
(109) () (rr(A)chase(B A)) Parents: 19, 56
(110) (frustrated(B)) (chase(B A)) Parents: 20, 56
(111) (frustrated(B)) (rr(A)) Parents: 21, 56
(112) () (rr(A)chase(B A)) Parents: 23, 56
(113) () (coyote(B)chase(B A)) Parents: 24, 56
(114) () (coyote(B)rr(A)) Parents: 25, 56
(115) (frustrated(B)) (chase(B A)) Parents: 31, 56
(116) () (coyote(B)chase(B A)) Parents: 32, 56

(117) (frustrated(B)) (coyote(B)) Parents: 33, 56
(118) (frustrated(B)) (rr(A)) Parents: 35, 56
(119) () (coyote(B)rr(A)) Parents: 36, 56
(120) (frustrated(B)) (coyote(B)) Parents: 37, 56
(121) () (chase(B A)) Parents: 38, 56
(122) () (rr(A)) Parents: 39, 56
(123) () (chase(B A)) Parents: 40, 56
(124) (frustrated(B)) () Parents: 41, 56
(125) () (rr(A)) Parents: 42, 56
(126) (frustrated(B)) () Parents: 43, 56
(127) () (chase(B A)) Parents: 45, 56
(128) () (rr(A)) Parents: 46, 56
(129) () (chase(B A)) Parents: 47, 56
(130) () (coyote(B)) Parents: 48, 56
(131) () (rr(A)) Parents: 49, 56
(132) () (coyote(B)) Parents: 50, 56
(133) () (catch(B A)) Parents: 8, 57
(134) () (catch(B A)) Parents: 8, 58
(135) (frustrated(B)) (coyote(B)rr(A)chase(B A)) Parents: 5, 59
(136) (frustrated(B)) (rr(A)chase(B A)) Parents: 11, 59
(137) () (coyote(B)rr(A)chase(B A)) Parents: 12, 59
(138) (frustrated(B)) (coyote(B)chase(B A)) Parents: 16, 59
(139) (frustrated(B)) (coyote(B)rr(A)) Parents: 17, 59
(140) () (rr(A)chase(B A)) Parents: 19, 59
(141) (frustrated(B)) (chase(B A)) Parents: 20, 59
(142) (frustrated(B)) (rr(A)) Parents: 21, 59
(143) () (rr(A)chase(B A)) Parents: 23, 59
(144) () (coyote(B)chase(B A)) Parents: 24, 59
(145) () (coyote(B)rr(A)) Parents: 25, 59
(146) (frustrated(B)) (chase(B A)) Parents: 31, 59
(147) () (coyote(B)chase(B A)) Parents: 32, 59
(148) (frustrated(B)) (coyote(B)) Parents: 33, 59
(149) (frustrated(B)) (rr(A)) Parents: 35, 59
(150) () (coyote(B)rr(A)) Parents: 36, 59
(151) (frustrated(B)) (coyote(B)) Parents: 37, 59
(152) () (chase(B A)) Parents: 38, 59
(153) () (rr(A)) Parents: 39, 59
(154) () (chase(B A)) Parents: 40, 59
(155) (frustrated(B)) () Parents: 41, 59
(156) () (rr(A)) Parents: 42, 59
(157) (frustrated(B)) () Parents: 43, 59
(158) () (chase(B A)) Parents: 45, 59
(159) () (rr(A)) Parents: 46, 59

(160) () (chase(B A)) Parents: 47, 59
(161) () (coyote(B)) Parents: 48, 59
(162) () (rr(A)) Parents: 49, 59
(163) () (coyote(B)) Parents: 50, 59
(164) (frustrated(B)catch(B A)) (coyote(B)rr(A)) Parents: 5, 60
(165) (frustrated(B)catch(B A)) (rr(A)) Parents: 11, 60
(166) (catch(B A)) (coyote(B)rr(A)) Parents: 12, 60
(167) (frustrated(B)catch(B A)) (coyote(B)) Parents: 16, 60
(168) (catch(B A)) (rr(A)) Parents: 19, 60
(169) (frustrated(B)catch(B A)) () Parents: 20, 60
(170) (catch(B A)) (rr(A)) Parents: 23, 60
(171) (catch(B A)) (coyote(B)) Parents: 24, 60
(172) (frustrated(B)catch(B A)) () Parents: 31, 60
(173) (catch(B A)) (coyote(B)) Parents: 32, 60
(174) (catch(B A)) () Parents: 38, 60
(175) (catch(B A)) () Parents: 40, 60
(176) (catch(B A)) () Parents: 45, 60
(177) (catch(B A)) () Parents: 47, 60
(178) (catch(B A)) () Parents: 9, 61
(179) () (chase(B A)) Parents: 56, 61
(180) () (chase(B A)) Parents: 59, 61
(181) (catch(B A)) () Parents: 60, 61
(182) (catch(B A)) () Parents: 7, 62
(183) (frustrated(B)) () Parents: 56, 62
(184) (frustrated(B)) () Parents: 59, 62
(185) (catch(B A)) () Parents: 9, 63
(186) () (chase(B A)) Parents: 56, 63
(187) () (chase(B A)) Parents: 59, 63
(188) (catch(B A)) () Parents: 60, 63
(189) (catch(B A)) () Parents: 6, 64
(190) () (coyote(B)) Parents: 56, 64
(191) () (coyote(B)) Parents: 59, 64
(192) (catch(B A)) () Parents: 7, 65
(193) (frustrated(B)) () Parents: 56, 65
(194) (frustrated(B)) () Parents: 59, 65
(195) (catch(B A)) () Parents: 6, 66
(196) () (coyote(B)) Parents: 56, 66
(197) () (coyote(B)) Parents: 59, 66
(198) () (catch(B A)) Parents: 28, 67
(199) () (catch(B A)) Parents: 52, 67
(200) () (catch(B A)) Parents: 6, 68
(201) (catch(B A)) () Parents: 8, 69
(202) () (rr(A)) Parents: 56, 69

(203) () (rr(A)) Parents: 59, 69
 (204) (catch(B A)) () Parents: 7, 70
 (205) (frustrated(B)) () Parents: 56, 70
 (206) (frustrated(B)) () Parents: 59, 70
 (207) (catch(B A)) () Parents: 8, 71
 (208) () (rr(A)) Parents: 56, 71
 (209) () (rr(A)) Parents: 59, 71
 (210) (catch(B A)) () Parents: 6, 72
 (211) () (coyote(B)) Parents: 56, 72
 (212) () (coyote(B)) Parents: 59, 72
 (213) (catch(B A)) () Parents: 7, 73
 (214) (frustrated(B)) () Parents: 56, 73
 (215) (frustrated(B)) () Parents: 59, 73
 (216) (catch(B A)) () Parents: 6, 74
 (217) () (coyote(B)) Parents: 56, 74
 (218) () (coyote(B)) Parents: 59, 74
 (219) () (coyote(B)rr(A)smart(A)) Parents: 4, 75
 (220) () (rr(A)smart(A)) Parents: 10, 75
 (221) () (coyote(B)smart(A)) Parents: 15, 75
 (222) () (smart(A)) Parents: 18, 75
 (223) () (rr(A)smart(A)) Parents: 22, 75
 (224) () (rr(A)smart(A)) Parents: 26, 75
 (225) () (smart(A)) Parents: 29, 75
 (226) () (coyote(B)smart(A)) Parents: 34, 75
 (227) () (smart(A)) Parents: 44, 75
 (228) () (smart(A)) Parents: 51, 75
 (229) () (coyote(B)rr(A)) Parents: 53, 75
 (230) () (rr(A)) Parents: 54, 75
 (231) () (coyote(B)) Parents: 55, 75

(3) Harmonia

1) Two pointer

(1) (Grandparent(x y)) (Parent(x z)Parent(z y))
 (2) (Parent(x y)) (Motner(x y))
 (3) (Parent(x y)) (Father(x y))
 (4) (Father(Zeus Ares)) ()
 (5) (Mother(Hera Ares)) ()
 (6) (Father(Ares Harmonia)) ()
 (7) () (Grandparent(x Harmonia))
 (8) () (Parent(x z)Parent(z Harmonia)) Parents: 0, 6
 (9) (Parent(x z)) (Motner(x z)) Parents: 1, 7
 (10) (Parent(x z)) (Father(x z)) Parents: 2, 7

- (11) (Grandparent(x y)) (Parent(z y)Motner(x z)) Parents: 0, 8
- (12) () (Parent(z Harmonia)Motner(x z)) Parents: 7, 8
- (13) (Grandparent(x y)) (Parent(z y)Father(x z)) Parents: 0, 9
- (14) (Parent(Zeus Ares)) () Parents: 3, 9
- (15) (Parent(Ares Harmonia)) () Parents: 5, 9
- (16) () (Parent(z Harmonia)Father(x z)) Parents: 7, 9
- (17) (Parent(z y)) (Motner(z y)) Parents: 1, 10
- (18) (Parent(z y)) (Father(z y)) Parents: 2, 10
- (19) () (Parent(z Harmonia)Motner(x z)) Parents: 6, 10
- (20) (Parent(z z)) (Motner(z z)) Parents: 8, 10
- (21) (Parent(z z)) (Father(z z)) Parents: 9, 10
- (22) (Parent(z y)) (Motner(z y)) Parents: 1, 11
- (23) (Parent(z y)) (Father(z y)) Parents: 2, 11
- (24) (Parent(z z)) (Motner(z z)) Parents: 8, 11
- (25) (Parent(z z)) (Father(z z)) Parents: 9, 11
- (26) (Parent(z y)) (Motner(z y)) Parents: 1, 12
- (27) (Parent(z y)) (Father(z y)) Parents: 2, 12
- (28) (Grandparent(Zeus y)) (Parent(Ares y)) Parents: 3, 12
- (29) (Grandparent(Ares y)) (Parent(Harmonia y)) Parents: 5, 12
- (30) () (Parent(z Harmonia)Father(x z)) Parents: 6, 12
- (31) (Parent(z z)) (Motner(z z)) Parents: 8, 12
- (32) (Parent(z z)) (Father(z z)) Parents: 9, 12
- (33) (Grandparent(Zeus y)) (Parent(Ares y)) Parents: 0, 13
- (34) () (Parent(Ares Harmonia)) Parents: 7, 13
- (35) (Grandparent(x Ares)) (Motner(x Zeus)) Parents: 10, 13
- (36) (Grandparent(x Ares)) (Father(x Zeus)) Parents: 12, 13
- (37) (Grandparent(Ares y)) (Parent(Harmonia y)) Parents: 0, 14
- (38) () (Parent(Harmonia Harmonia)) Parents: 7, 14
- (39) (Grandparent(x Harmonia)) (Motner(x Ares)) Parents: 10, 14
- (40) () (Motner(x Ares)) Parents: 11, 14
- (41) (Grandparent(x Harmonia)) (Father(x Ares)) Parents: 12, 14
- (42) (Parent(z y)) (Motner(z y)) Parents: 1, 15
- (43) (Parent(z y)) (Father(z y)) Parents: 2, 15
- (44) () (Parent(Ares Harmonia)) Parents: 3, 15
- (45) () (Parent(Harmonia Harmonia)) Parents: 5, 15
- (46) (Parent(z z)) (Motner(z z)) Parents: 8, 15
- (47) (Parent(z z)) (Father(z z)) Parents: 9, 15
- (48) () (Father(x Ares)) Parents: 14, 15
- (49) (Grandparent(z y)) (Parent(z z)Parent(z y)) Parents: 0, 16
- (50) () (Parent(z z)Parent(z Harmonia)) Parents: 7, 16
- (51) (Grandparent(x y)) (Motner(x z)Motner(z y)) Parents: 10, 16
- (52) () (Motner(z Harmonia)Motner(x z)) Parents: 11, 16
- (53) (Grandparent(x y)) (Father(x z)Motner(z y)) Parents: 12, 16

(54) () (Motner(z Harmonia)Father(x z)) Parents: 15, 16
(55) (Grandparent(z y)) (Parent(z z)Parent(z y)) Parents: 0, 17
(56) (Parent(Zeus Ares)) () Parents: 3, 17
(57) (Parent(Ares Harmonia)) () Parents: 5, 17
(58) () (Parent(z z)Parent(z Harmonia)) Parents: 7, 17
(59) (Grandparent(x y)) (Motner(x z)Father(z y)) Parents: 10, 17
(60) () (Father(z Harmonia)Motner(x z)) Parents: 11, 17
(61) (Grandparent(x y)) (Father(x z)Father(z y)) Parents: 12, 17
(62) () (Father(z Harmonia)Father(x z)) Parents: 15, 17
(63) (Parent(z y)) (Motner(z y)) Parents: 1, 18
(64) (Parent(z y)) (Father(z y)) Parents: 2, 18
(65) (Parent(z z)) (Motner(z z)) Parents: 8, 18
(66) (Parent(z z)) (Father(z z)) Parents: 9, 18
(67) () (Motner(x Ares)) Parents: 14, 18
(68) () (Motner(z Harmonia)Motner(x z)) Parents: 16, 18
(69) () (Father(z Harmonia)Motner(x z)) Parents: 17, 18
(70) (Grandparent(z y)) (Parent(z z)Parent(z y)) Parents: 0, 19
(71) () (Parent(z z)Parent(z Harmonia)) Parents: 7, 19
(72) (Grandparent(x z)) (Parent(z z)Motner(x z)) Parents: 10, 19
(73) () (Motner(x Harmonia)Motner(Harmonia Harmonia)) Parents: 11, 19
(74) (Grandparent(x z)) (Parent(z z)Father(x z)) Parents: 12, 19
(75) () (Father(x Harmonia)Motner(Harmonia Harmonia)) Parents: 15, 19
(76) () (Motner(x Harmonia)Motner(Harmonia Harmonia)) Parents: 18, 19
(77) (Grandparent(z y)) (Parent(z z)Parent(z y)) Parents: 0, 20
(78) () (Parent(z z)Parent(z Harmonia)) Parents: 7, 20
(79) (Grandparent(x z)) (Parent(z z)Motner(x z)) Parents: 10, 20
(80) () (Motner(x Harmonia)Father(Harmonia Harmonia)) Parents: 11, 20
(81) (Grandparent(x z)) (Parent(z z)Father(x z)) Parents: 12, 20
(82) () (Father(x Harmonia)Father(Harmonia Harmonia)) Parents: 15, 20
(83) () (Motner(x Harmonia)Father(Harmonia Harmonia)) Parents: 18, 20
(84) (Grandparent(z y)) (Parent(z z)Parent(z y)) Parents: 0, 21
(85) () (Parent(z z)Parent(z Harmonia)) Parents: 7, 21
(86) (Grandparent(x y)) (Motner(x z)Motner(z y)) Parents: 10, 21
(87) () (Motner(z Harmonia)Motner(x z)) Parents: 11, 21
(88) (Grandparent(x y)) (Father(x z)Motner(z y)) Parents: 12, 21
(89) () (Motner(z Harmonia)Father(x z)) Parents: 15, 21
(90) () (Motner(z Harmonia)Motner(x z)) Parents: 18, 21
(91) (Grandparent(z y)) (Parent(z z)Parent(z y)) Parents: 0, 22
(92) (Parent(Zeus Ares)) () Parents: 3, 22
(93) (Parent(Ares Harmonia)) () Parents: 5, 22
(94) () (Parent(z z)Parent(z Harmonia)) Parents: 7, 22
(95) (Grandparent(x y)) (Motner(x z)Father(z y)) Parents: 10, 22
(96) () (Father(z Harmonia)Motner(x z)) Parents: 11, 22

(97) (Grandparent(x y)) (Father(x z)Father(z y)) Parents: 12, 22
 (98) () (Father(z Harmonia)Father(x z)) Parents: 15, 22
 (99) () (Father(z Harmonia)Motner(x z)) Parents: 18, 22
 (100) (Grandparent(z y)) (Parent(z z)Parent(z y)) Parents: 0, 23
 (101) () (Parent(z z)Parent(z Harmonia)) Parents: 7, 23
 (102) (Grandparent(x z)) (Parent(z z)Motner(x z)) Parents: 10, 23
 (103) () (Motner(x Harmonia)Motner(Harmonia Harmonia)) Parents: 11, 23
 (104) (Grandparent(x z)) (Parent(z z)Father(x z)) Parents: 12, 23
 (105) () (Father(x Harmonia)Motner(Harmonia Harmonia)) Parents: 15, 23
 (106) () (Motner(x Harmonia)Motner(Harmonia Harmonia)) Parents: 18, 23
 (107) (Grandparent(z y)) (Parent(z z)Parent(z y)) Parents: 0, 24
 (108) () (Parent(z z)Parent(z Harmonia)) Parents: 7, 24
 (109) (Grandparent(x z)) (Parent(z z)Motner(x z)) Parents: 10, 24
 (110) () (Motner(x Harmonia)Father(Harmonia Harmonia)) Parents: 11, 24
 (111) (Grandparent(x z)) (Parent(z z)Father(x z)) Parents: 12, 24
 (112) () (Father(x Harmonia)Father(Harmonia Harmonia)) Parents: 15, 24
 (113) () (Motner(x Harmonia)Father(Harmonia Harmonia)) Parents: 18, 24
 (114) (Grandparent(z y)) (Parent(z z)Parent(z y)) Parents: 0, 25
 (115) () (Parent(z z)Parent(z Harmonia)) Parents: 7, 25
 (116) (Grandparent(x y)) (Motner(x z)Motner(z y)) Parents: 10, 25
 (117) () (Motner(z Harmonia)Motner(x z)) Parents: 11, 25
 (118) (Grandparent(x y)) (Father(x z)Motner(z y)) Parents: 12, 25
 (119) () (Motner(z Harmonia)Father(x z)) Parents: 15, 25
 (120) () (Motner(z Harmonia)Motner(x z)) Parents: 18, 25
 (121) (Grandparent(z y)) (Parent(z z)Parent(z y)) Parents: 0, 26
 (122) (Parent(Zeus Ares)) () Parents: 3, 26
 (123) (Parent(Ares Harmonia)) () Parents: 5, 26
 (124) () (Parent(z z)Parent(z Harmonia)) Parents: 7, 26
 (125) (Grandparent(x y)) (Motner(x z)Father(z y)) Parents: 10, 26
 (126) () (Father(z Harmonia)Motner(x z)) Parents: 11, 26
 (127) (Grandparent(x y)) (Father(x z)Father(z y)) Parents: 12, 26
 (128) () (Father(z Harmonia)Father(x z)) Parents: 15, 26
 (129) () (Father(z Harmonia)Motner(x z)) Parents: 18, 26
 (130) (Grandparent(Zeus y)) (Motner(Ares y)) Parents: 1, 27
 (131) (Grandparent(Zeus y)) (Father(Ares y)) Parents: 2, 27
 (132) () (Parent(Ares Harmonia)) Parents: 6, 27
 (133) (Parent(Ares y)) (Motner(Ares y)) Parents: 8, 27
 (134) (Parent(Ares y)) (Father(Ares y)) Parents: 9, 27
 (135) (Grandparent(Zeus Harmonia)) () Parents: 14, 27
 (136) (Grandparent(Zeus y)) (Motner(Ares y)) Parents: 16, 27
 (137) (Grandparent(Zeus y)) (Father(Ares y)) Parents: 17, 27
 (138) (Grandparent(Zeus Ares)) (Motner(Ares Ares)) Parents: 19, 27
 (139) (Grandparent(Zeus Ares)) (Father(Ares Ares)) Parents: 20, 27

(140) (Grandparent(Zeus y)) (Motner(Ares y)) Parents: 21, 27
 (141) (Grandparent(Zeus y)) (Father(Ares y)) Parents: 22, 27
 (142) (Grandparent(Zeus Ares)) (Motner(Ares Ares)) Parents: 23, 27
 (143) (Grandparent(Zeus Ares)) (Father(Ares Ares)) Parents: 24, 27
 (144) (Grandparent(Zeus y)) (Motner(Ares y)) Parents: 25, 27
 (145) (Grandparent(Zeus y)) (Father(Ares y)) Parents: 26, 27
 (146) (Grandparent(Ares y)) (Motner(Harmonia y)) Parents: 1, 28
 (147) (Grandparent(Ares y)) (Father(Harmonia y)) Parents: 2, 28
 (148) () (Parent(Harmonia Harmonia)) Parents: 6, 28
 (149) (Parent(Harmonia y)) (Motner(Harmonia y)) Parents: 8, 28
 (150) (Parent(Harmonia y)) (Father(Harmonia y)) Parents: 9, 28
 (151) (Grandparent(Ares y)) (Motner(Harmonia y)) Parents: 16, 28
 (152) (Grandparent(Ares y)) (Father(Harmonia y)) Parents: 17, 28
 (153) (Grandparent(Ares Harmonia)) (Motner(Harmonia Harmonia))
 Parents: 19, 28
 (154) (Grandparent(Ares Harmonia)) (Father(Harmonia Harmonia))
 Parents: 20, 28
 (155) (Grandparent(Ares y)) (Motner(Harmonia y)) Parents: 21, 28
 (156) (Grandparent(Ares y)) (Father(Harmonia y)) Parents: 22, 28
 (157) (Grandparent(Ares Harmonia)) (Motner(Harmonia Harmonia))
 Parents: 23, 28
 (158) (Grandparent(Ares Harmonia)) (Father(Harmonia Harmonia))
 Parents: 24, 28
 (159) (Grandparent(Ares y)) (Motner(Harmonia y)) Parents: 25, 28
 (160) (Grandparent(Ares y)) (Father(Harmonia y)) Parents: 26, 28
 (161) (Parent(z y)) (Motner(z y)) Parents: 1, 29
 (162) (Parent(z y)) (Father(z y)) Parents: 2, 29
 (163) () (Parent(Ares Harmonia)) Parents: 3, 29
 (164) () (Parent(Harmonia Harmonia)) Parents: 5, 29
 (165) (Parent(z z)) (Motner(z z)) Parents: 8, 29
 (166) (Parent(z z)) (Father(z z)) Parents: 9, 29
 (167) () (Father(x Ares)) Parents: 14, 29
 (168) () (Motner(z Harmonia)Father(x z)) Parents: 16, 29
 (169) () (Father(z Harmonia)Father(x z)) Parents: 17, 29
 (170) () (Father(x Harmonia)Motner(Harmonia Harmonia)) Parents: 19, 29
 (171) () (Father(x Harmonia)Father(Harmonia Harmonia)) Parents: 20, 29
 (172) () (Motner(z Harmonia)Father(x z)) Parents: 21, 29
 (173) () (Father(z Harmonia)Father(x z)) Parents: 22, 29
 (174) () (Father(x Harmonia)Motner(Harmonia Harmonia)) Parents: 23, 29
 (175) () (Father(x Harmonia)Father(Harmonia Harmonia)) Parents: 24, 29
 (176) () (Motner(z Harmonia)Father(x z)) Parents: 25, 29
 (177) () (Father(z Harmonia)Father(x z)) Parents: 26, 29
 (178) (Grandparent(z y)) (Parent(z z)Parent(z y)) Parents: 0, 30

(179) () (Parent(z z)Parent(z Harmonia)) Parents: 7, 30
 (180) (Grandparent(x z)) (Parent(z z)Motner(x z)) Parents: 10, 30
 (181) () (Motner(x Harmonia)Motner(Harmonia Harmonia)) Parents: 11, 30
 (182) (Grandparent(x z)) (Parent(z z)Father(x z)) Parents: 12, 30
 (183) () (Father(x Harmonia)Motner(Harmonia Harmonia)) Parents: 15, 30
 (184) () (Motner(x Harmonia)Motner(Harmonia Harmonia)) Parents: 18, 30
 (185) (Grandparent(Zeus Ares)) (Motner(Ares Ares)) Parents: 27, 30
 (186) (Grandparent(Ares Harmonia)) (Motner(Harmonia Harmonia))
 Parents: 28, 30
 (187) () (Father(x Harmonia)Motner(Harmonia Harmonia)) Parents: 29, 30
 (188) (Grandparent(z y)) (Parent(z z)Parent(z y)) Parents: 0, 31
 (189) () (Parent(z z)Parent(z Harmonia)) Parents: 7, 31
 (190) (Grandparent(x z)) (Parent(z z)Motner(x z)) Parents: 10, 31
 (191) () (Motner(x Harmonia)Father(Harmonia Harmonia)) Parents: 11, 31
 (192) (Grandparent(x z)) (Parent(z z)Father(x z)) Parents: 12, 31
 (193) () (Father(x Harmonia)Father(Harmonia Harmonia)) Parents: 15, 31
 (194) () (Motner(x Harmonia)Father(Harmonia Harmonia)) Parents: 18, 31
 (195) (Grandparent(Zeus Ares)) (Father(Ares Ares)) Parents: 27, 31
 (196) (Grandparent(Ares Harmonia)) (Father(Harmonia Harmonia))
 Parents: 28, 31
 (197) () (Father(x Harmonia)Father(Harmonia Harmonia)) Parents: 29, 31
 (198) (Grandparent(Zeus y)) (Motner(Ares y)) Parents: 1, 32
 (199) (Grandparent(Zeus y)) (Father(Ares y)) Parents: 2, 32
 (200) () (Parent(Ares Harmonia)) Parents: 6, 32
 (201) (Parent(Ares y)) (Motner(Ares y)) Parents: 8, 32
 (202) (Parent(Ares y)) (Father(Ares y)) Parents: 9, 32
 (203) (Grandparent(Zeus Harmonia)) () Parents: 14, 32
 (204) (Grandparent(Zeus y)) (Motner(Ares y)) Parents: 16, 32
 (205) (Grandparent(Zeus y)) (Father(Ares y)) Parents: 17, 32
 (206) (Grandparent(Zeus Ares)) (Motner(Ares Ares)) Parents: 19, 32
 (207) (Grandparent(Zeus Ares)) (Father(Ares Ares)) Parents: 20, 32
 (208) (Grandparent(Zeus y)) (Motner(Ares y)) Parents: 21, 32
 (209) (Grandparent(Zeus y)) (Father(Ares y)) Parents: 22, 32
 (210) (Grandparent(Zeus Ares)) (Motner(Ares Ares)) Parents: 23, 32
 (211) (Grandparent(Zeus Ares)) (Father(Ares Ares)) Parents: 24, 32
 (212) (Grandparent(Zeus y)) (Motner(Ares y)) Parents: 25, 32
 (213) (Grandparent(Zeus y)) (Father(Ares y)) Parents: 26, 32
 (214) (Grandparent(Zeus Ares)) (Motner(Ares Ares)) Parents: 30, 32
 (215) (Grandparent(Zeus Ares)) (Father(Ares Ares)) Parents: 31, 32
 (216) () (Motner(Ares Harmonia)) Parents: 1, 33
 (217) () (Father(Ares Harmonia)) Parents: 2, 33
 (218) () (Motner(Ares Harmonia)) Parents: 8, 33
 (219) () (Father(Ares Harmonia)) Parents: 9, 33

(2) Unit preference

Cannot be proved