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Foot-and-mouth disease non-structural protein serology in cattle: Use of a Bayesian framework to estimate diagnostic sensitivity and specificity of six ELISA tests and true prevalence in the field

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Abstract

The diagnostic performance of six foot-and-mouth disease (FMD) assays for detection of antibodies to the non-structural proteins (NSP) of the FMD virus (FMDV) was estimated using a Bayesian analysis on field sera from cattle of unknown infection status originating from post-FMDV outbreak situations in Israel and Zimbabwe. Estimations of the disease prevalence in both populations were also obtained. The diagnostic sensitivity estimates did not differ between both field studies, although overall Bayesian estimates were markedly higher than those previously reported based on sera from comparable experimentally infected (vaccinated) cattle populations. All NSP-based assays demonstrated a lower diagnostic specificity when applied to the Zimbabwean sera compared to both published specificities and similar Bayesian specificity estimates derived for the Israeli dataset. In Israel, the disease prevalence was estimated at 23.9% (95% credibility interval: 19.5–28.8%), whereas 65.4% (59.0–72.5%) was found in Zimbabwe. The need for reliable diagnostic test performance estimates and the benefits of Bayesian analysis in obtaining them are also addressed. © 2007 Elsevier Ltd. All rights reserved.

Keywords: Foot-and-mouth disease; Non-structural protein; Bayesian

1. Introduction

Foot-and-mouth disease (FMD) is a highly contagious and devastating disease that affects all species of cloven-hoofed animals, including economically important livestock (cattle, pigs and sheep). The disease is recognised by the World Organisation for Animal Health (OIE) as a major constraint

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to international trade. In outbreak situations, effective control strategies must, thus, be put in place to stop the spread of the causal virus [1]. Following the 2001 epidemic of FMD in the United Kingdom, Ireland, France and the Netherlands, the European Commission and the Member States revised the legislation by putting greater emphasis on the use of emergency vaccination to control future FMD outbreaks within the Community (Council Directive 2003/85/EC). The adopted "vaccinate-to-live" policy greatly reduces reliance on mass pre-emptive culling of at-risk animals. Nevertheless, to regain the favoured FMD-free status, affected countries need to demonstrate absence of disease and of infection by use of

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clinical and serological surveillance in accordance with OIE requirements. These imply that the serological survey be based on the detection of antibodies to the non-structural proteins (NSP) of the FMD virus (FMDV), which are elicited by infection only [2]. Several such NSP-based assays have been and are being developed.

At a recent workshop held at the Istituto Zooprofilattico Sperimentale della Lombardia e dell'Emilia Romagna (IZSLER, Brescia, Italy) in May 2004, six different NSP ELISAs were evaluated for cattle, among which were the OIE-index-test from PANAFTOSA, the IZSLER in-house test and four commercially available assays [3]. The diagnostic specificity (dSp) of each test has been estimated based on test results obtained for 1100 experimental and field sera collected from (vaccinated) non-infected cattle originating in seven different countries. However, the diagnostic sensitivity (dSn) estimates were based solely on test results for sera from experimentally infected (vaccinated) animals, and may not necessarily reflect the performance of the tests in the field. As a result, the true disease prevalence (p) could be wrongly estimated (mainly underestimated) [4].

Ideally, evaluation of the performance of these ELISAs, when used to test field sera derived from animals of unknown (latent) infection status, would involve reference to a "gold standard" test method [5]. Unfortunately, such a gold standard test is lacking for FMD NSP serology. Statistical methods, such as latent class analysis, have been developed to estimate true prevalence, dSn and dSp in the absence of a gold standard. However, without some extraneous constraints, more parameters need to be estimated than the data allows [6], in casu 127 parameters to be estimated versus 63 estimable parameters. Therefore, two basic assumptions, known as the Hui-Walter paradigm [7], are regularly made in previously published analyses [8], namely that assay performance characteristics (dSn and dSp) remain constant across populations and that assays are conditionally independent of each other given the true disease status.

However, when diagnostic tests have a similar biological basis, as is the case for all FMDV NSP ELISAs mentioned, the conditional independence assumption is untenable, as shown by the observed covariance of all methods with respect to dSn [3]. Moreover, the dSn estimates varied according to sampling time post infection [3]. Consequently, restrictions on the parameters, other than the Hui–Walter paradigm, need to be imposed to estimate the performance of these NSP-based tests when using field sera collected from animals of unknown infection status.

Recently, Berkvens et al. [4] described a Bayesian approach using probabilistic constraints for the estimation of true disease prevalence and diagnostic test characteristics. The method was validated on data collected for *Cryptosporidium* and porcine cysticercosis using variable numbers of diagnostic tests [4,9]. In this paper, we apply this Bayesian philosophy to six diagnostic NSP ELISAs, using data from two confirmed FMD outbreak situations, in which cattle were subjected to various vaccination regimes.

2. Materials and methods

2.1. Tests

Six different NSP-based ELISAs were compared, these were: NCPanaftosa-screening from PANAFTOSA [10]; 3ABC trapping-ELISA from IZSLER [11]; Ceditest[®] FMDV-NS (Cedi Diagnostics B.V., Lelystad, The Netherlands) [12,13]; SVANOVIRTM FMDV 3ABC-Ab ELISA (Svanova, Upsala, Sweden) [14]; CHEKIT-FMD-3ABC (Bommeli Diagnostics, Bern, Switzerland) [15,16]; UBI[®] FMDV NS ELISA (United Biomedical Inc., New York, USA) [17]. For a more detailed description of the tests' specifications and methodologies, refer to Brocchi et al. [3].

2.2. Field specimens

In total, 867 serum samples were collected during two post-outbreak surveillance programmes in 2004. Of these, 465 sera were collected from cattle individually sampled between 30 and 80 days post-FMDV type O infection in four feedlot and/or dairy farms in Israel. All cattle were vaccinated against FMD between May and June 2003 and the actual outbreaks occurred in January 2004 [18]. The remaining 402 sera were derived from a field study conducted in Zimbabwe, in which six herds were sampled; FMDV infection was known to have occurred in five of these herds. The FMD vaccination status was unknown for one of the herds, but otherwise varied from never vaccinated to vaccinated approximately 7 months prior to the occurrence of the FMD outbreak (using a trivalent vaccine to FMDV serotypes SAT1, SAT2 and SAT3). All of the outbreaks were confirmed to be due to infection with either FMDV serotype SAT1 or serotype SAT2 and in each case, specimens were collected between 1 and 5 months after the outbreaks had occurred. The sampling protocol was specifically designed to investigate the dSn of NSP ELISAs for detection of FMDV SAT type carrier cattle amongst vaccinated and subsequently infected animals. Therefore, sampling was targeted towards animals that had either been clinically affected or had been in close contact with infected animals (nonrandom sampling). Although the sixth herd sample was presumed not to have been infected, some serological evidence, suggesting previous FMDV infection, was nonetheless found [19].

All sera were tested singly and simultaneously in all six ELISAs. The analysis was based on the initial test results and did not include results obtained on retesting of discordant findings. For those ELISAs that allow for an "inconclusive" or "doubtful" interpretation zone between two threshold values, all test results equal to or greater than the lower threshold value were scored as positive. More details on the testing procedure and the specimen database may be found in Brocchi et al. [3]. Table 1 summarises the observed frequencies for all 64 different test outcome combinations based on the test results for the 465 Israeli and 402 Zimbabwean sera.

Table 1							
Test result frequen	ncies of serum sampl	les collected in 2004	in Israel and in Zim	babwe and tested s	singly and simul	taneously in six NSP E	ELISAs
NCPanaftosa	IZSLER	Ceditest	Svanovir	Chekit	UBI	Israeli total	Zimba

NCPanaftosa	IZSLER	Ceditest	Svanovir	Chekit	UBI	Israeli total	Zimbabwe total
0	0	0	0	0	0	307	92
0	0	0	0	0	1	3	5
0	0	0	0	1	0	9	3
0	0	0	0	1	1	0	0
0	0	0	1	0	1	0	4
0	0	0	1	1	0	0	0
0	0	0	1	1	1	0	0
0	0	1	0	0	0	0	12
0	0	1	0	0	1	0	1
0	0	1	0	1	0	0	0
0	0	1	1	0	0	0	0
0	0	1	1	0	1	0	0
0	0	1	1	1	0	0	0
0	0	1	1	1	1	0	0
0	1	0	0	0	0	12	4
0	1	0	0	0	1	0	1
0	1	0	0	1	1	0	0
0	1	0	1	0	0	2	1
0	1	0	1	0	1	0	0
0	1	0	1	1	0	1	1
0	1	0	1	1	1	0	0
0	1	1	0	0	0	1	4
0	1	1	0	1	0	0	0
0	1	1	0	1	1	0	0
0	1	1	1	0	0	1	0
0	1	1	1	0	1	0	0
0	1	1	1	1	0	0	1
1	0	0	0	0	0	10	10
1	0	0	0	0	1	1	1
1	0	0	0	1	0	0	0
1	0	0	0	1	1	0	0
1	0	0	1	0	0	2	1
1	0	0	1	0	1	0	0
1	0	0	1	1	1	0	0
1	0	1	0	0	0	2	10
1	0	1	0	0	1	1	1
1	0	1	0	1	0	0	0
1	0	1	0	1	1	0	0
1	0	1	1	0	0	1	0
1	0	1	1	1	0	0	0
1	0	1	1	1	1	2	0
1	1	0	0	0	0	3	0
1	1	0	0	0	1	0	0
1	1	0	0	1	0	0	2
1	1	0	0	1	1	0	2
1	1	0	1	0	1	0	0
1	1	0	1	1	0	1	2
1	1	0	1	1	1	0	4
1	1	1	0	0	0	5	14
1	1	1	0	0	1	2	17
1	1	1	0	1	1	3	9 10
1	1	1	1	0	0	2	4
1	1	1	1	0	1	4	22
1	1	1	1	1	0	17	10
1	1	1	1	1	1	57	151

0: negative test result; 1: positive test result.

2.3. Bayesian model

Berkvens et al. [4] described a Bayesian model allowing the integration of field data and expert opinion (prior information), and yielding estimates for true disease prevalence and test characteristics (posterior information) in the absence of a gold standard and assuming conditional dependence of the multiple diagnostic tests involved. The results or frequencies r_i of h diagnostic tests applied to N samples can be assumed to follow a multinomial distribution, namely,

 $r_i \sim \text{Multinomial}(\pi_1, \dots, \pi_k, N)$ $(i = 1, \dots, k)$

The k (=2^h) cell probabilities π_i (i = 1, ..., k) can depend on q (=2^{h+1}) parameters θ_j (j = 1, ..., q), i.e. $\pi_i = \pi_i$ ($\theta_1, ..., \theta_q$).

Two separate models were constructed: one for the Israeli surveillance dataset, the other for the Zimbabwean dataset. The results of the six tests for all sera in each group (Israel and Zimbabwe) were computed together with their corresponding prior information in WinBUGS Version 1.4 (http://www.mrc-bsu.cam.ac.uk/bugs/) [20] and the R programme (http://www.r-project.org/) [21].

The Bayesian analysis was validated on grounds of model identifiability through minimisation of the deviance information criterion (DIC), while ensuring a positive number of effectively estimated parameters (p_D) . Moreover, DIC and p_D were evaluated in the posterior mean of the multinomial probabilities π_i (calculated using the R programme), and in the posterior mean of the parameters θ_i of the model (calculated in WinBUGS). The estimates for both parameters within and outside WinBUGS should closely match for the model to be validated. Additionally, DIC and p_D were used for screening of the prior information in order to ensure the best fit between these constraints and the field data. This Bayesian goodness-of-fit was further evaluated using the Bayesian pvalue without and with severe constraints (i.e. all estimates were severely constrained by a uniform prior on their corresponding model parameters θ to interval [posterior estimate -0.0001%, posterior estimate +0.0001%]). A Bayesian pvalue smaller than or equal to 0.5 and tending to 0 when applying severe constraints signified a model that does not show lack of fit [4,9]. For a more detailed description of the Bayesian measures of complexity and fit (i.e. DIC, p_D and Bayesian *p*-value) and of the Bayesian analysis validation procedure refer to [4,9,22] and Appendices A and B.

Prior information on the 127 $(=2^{h+1}-1) \theta$ parameters to be estimated was derived from a subset of the database described by Brocchi et al. [3] and expressed as truncated uniform distributions. More specifically, data from sera of truly non-infected animals (n = 1100) tested singly and simultaneously in all NSP ELISAs was selected and integrated in the Bayesian models for the Israeli and Zimbabwean field data as prior information on diagnostic specificities and specificity dependencies between the NSP ELISAs. With respect to the diagnostic sensitivities and sensitivity dependencies between tests, a subset of the database corresponding to data on sera from vaccinated cattle experimentally exposed to infection and collected 28-100 days post infection (dpi) (n = 106) was integrated as prior information in modelling the Israeli data, whereas data on sera originating from cattle exposed to experimental infection and collected from 28 dpi onwards (n = 181), regardless of their vaccination status, was selected as prior information for modelling the Zimbabwean data. In this way, the selected cattle populations, of which the data were used as prior information in the Bayesian models for Israel and Zimbabwe, mimicked the field populations as closely as possible with respect to vaccination/infection status and sampling time post infection.

3. Results

The screening of the prior information based on the (experimental) data published by Brocchi et al. [3] showed a lack of fit with the Israeli and the Zimbabwean field data. Consequently, the constraints in each model were screened and refined by experts of the Veterinary and Agrochemical Research Centre and the models were validated based on the procedure described in Appendix B using all p_D , DIC and Bayesian *p*-value criteria (see Appendix C for both models).

More specifically, the values of the p_D and DIC parameters evaluated in the posterior mean of the multinomial probabilities agreed with those evaluated in the posterior mean of the parameters of the model (Table 2). A Bayesian pvalue of 0.32 and of 0.35 for the Israeli and Zimbabwean model, respectively, tended to 0 when severe constraints were applied, indicating a good model fit [4,9].

Tables 3 and 4 show the posterior mean dSn together with the posterior 95% credibility intervals for all six NSP ELISAs based on the dataset for Israel and Zimbabwe, respectively. They further depict the dSn values estimated by Brocchi et al. [3] for comparable cattle populations (i.e. comparable with respect to vaccination/infection status and sampling time post-infection). As is apparent from both tables, higher dSn estimates were obtained for all NSP ELISAs (6.1–26.5% higher) compared to those reported by Brocchi et al. [3]. Moreover, the dSn estimates for each assay were similar between both field studies, with the noted exception of the UBI[®] FMDV NS test where a difference of 14.9% in dSn

Table 2

The p_D and DIC parameters evaluated for the data from the Israeli and Zimbabwean post-FMDV outbreak surveillance sera of 2004

	Parameters evaluated in the posterior mean of the parameters θj of the model	Parameters evaluated in the posterior mean of the multinomial probabilities π_i		
Israel				
$p_{\rm D}$	18.7	20.4		
DIC	146.4	148.1		
Zimbaby	ve			
$p_{\rm D}$	21.1	22.8		
DIC	167.2	168.7		

Table 3

Posterior mean for the tests' sensitivities together with the 95% credibility intervals (in square brackets) for the six NSP ELISAs based on 465 serum samples collected in 2004 in Israel compared to the sensitivity estimates published by Brocchi et al. [3] for experimentally vaccinated, infected cattle

	Brocchi et al. dSn (%), n = 106; 28–100 dpi	Bayesian dSn (%), Israeli data
NCPanaftosa	69.4 [60.1–77.4] ^a	94.3 [84.4–99.5]
IZSLER	64.8 [55.7–73.2]	91.3 [80.7-98.2]
Ceditest	63.6 [54.0-72.2]	87.5 [77.5–94.8]
Svanovir	58.3 [48.7-67.2]	75.9 [66.6-84.1]
Chekit	50.0 [40.8–59.3]	76.4 [66.4-84.7]
UBI	56.1 [46.5-65.1]	62.2 [52.9–70.9]

^a 95% confidence intervals were estimated using the Bayesian "simulation from posterior" approach [29].

Table 4

Posterior mean for the tests' sensitivities together with the 95% credibility intervals (in square brackets) for the six NSP ELISAs based on 402 serum samples collected in 2004 in Zimbabwe compared to the sensitivity estimates published by Brocchi et al. [3] for experimentally infected cattle

	Brocchi et al. dSn (%), $n = 181; \ge 28 \text{ dpi}$	Bayesian dSn (%), Zimbabwean data
NCPanaftosa	74.9 [68.1–80.6] ^a	95.9 [90.6–99.9]
IZSLER	70.0 [63.1–76.2]	91.6 [86.1–96.3]
Ceditest	71.5 [64.4–77.4]	92.5 [86.3-97.4]
Svanovir	63.4 [56.2–70.2]	73.2 [66.8–79.4]
Chekit	53.0 [45.7-60.1]	69.9 [63.6–75.9]
UBI	59.9 [52.7-66.6]	77.1 [71.2–82.8]

^a 95% confidence intervals were estimated using the Bayesian "simulation from posterior" approach [29].

was observed. Additionally, the NCPanaftosa OIE-index test, the IZSLER in-house test and the commercially available Ceditest were consistently more sensitive than the three remaining tests.

Only slight differences in dSp estimates among the different NSP tests were observed within each field study, as shown by the overlapping 95% credibility intervals (Table 5). The estimates originating from the Zimbabwean dataset (ranging from 84.0 to 91.2%) were, nonetheless, lower than those obtained from the Israeli study (from 94.9 to 97.8%) and those published by Brocchi et al. [3]. The Israeli posterior mean dSp estimates of all NSP ELISAs were comparable to the reported specificities by Brocchi et al. [3] (Table 5).

The true disease prevalence in Israel was estimated to be 23.9% with a 95% credibility interval ranging from 19.5 to 28.8%, whereas a 65.4% (59.0–72.5%) true prevalence esti-

Table 6

Apparent prevalence for the six NSP ELISAs as published by Brocchi et al. [3] based on serum samples collected in 2004 in Israel and Zimbabwe

	Apparent prevalence (%), Israeli data	Apparent prevalence (%), Zimbabwean data
NCPanaftosa	25.8	67.7
IZSLER	25.6	65.2
Ceditest	22.4	66.2
Svanovir	21.3	50.5
Chekit	20.9	48.8
UBI	15.7	53.5
Overall (mean)	22.0	58.7

mate was observed for the Zimbabwean dataset. The 95% credibility interval of the true prevalence for the Israeli data encompassed the apparent prevalence value (i.e. ratio of the number of NSP-positive animals and the total number of animals) obtained when the Israeli sera were tested by five of the six NSP ELISAs. However, when they were used to test sera from Zimbabwe, only three NSP ELISAs had apparent prevalence values comparable to the Bayesian true prevalence estimate (Table 6).

4. Discussion

Although several FMDV NSP-based assays have been developed in recent years, there is no gold standard test for the diagnosis of anti-NSP antibody positive sera. At present, it is thus impossible to reliably estimate and compare the diagnostic performance of existing and newly developed NSP-based tests, unless the NSP-seroconvergence status of the animals is known. Moreover, the true prevalence cannot be estimated in an unbiased manner based on the results of a single diagnostic assay as demonstrated by the range of apparent prevalence rates observed in two FMD field outbreak situations (Israel and Zimbabwe). A Bayesian approach has proven useful in circumventing these problems [9,23] and two validated Bayesian models accounting for conditional dependence between tests were applied to FMD NSP serology in the present paper.

In general, the IZSLER in-house 3ABC trapping-ELISA and the commercially available Ceditest[®] FMDV-NS dSn estimates were comparable to the NCPanaftosa-screening OIE-index test dSn estimate, while the three remaining

Table 5

Posterior mean for the tests' specificities together with the 95% credibility intervals (in square brackets) for the six NSP ELISAs based on serum samples collected in 2004 in Israel and Zimbabwe compared to the specificity estimates published by Brocchi et al. [3]

	Brocchi et al. dSp (%), $n = 1100$	Bayesian dSp (%), Israeli data	Bayesian dSp (%), Zimbabwean data
NCPanaftosa	97.2 [96.2–97.9] ^a	95.5 [92.4–98.2]	86.5 [80.4–93.2]
IZSLER	97.4 [96.4–98.0]	94.9 [92.4–97.0]	85.2 [77.2–92.6]
Ceditest	98.1 [97.3–98.7]	97.8 [95.9–99.2]	84.0 [77.6–90.1]
Svanovir	98.5 [97.7–99.0]	95.6 [93.3–97.5]	91.2 [86.3–95.6]
Chekit	97.6 [96.7–98.3]	95.2 [93.0-97.0]	89.7 [83.6–94.8]
UBI	98.5 [97.8–99.0]	96.7 [94.9–98.2]	88.0 [82.9–92.4]

^a 95% confidence intervals were estimated using the Bayesian "simulation from posterior" approach [29].

ELISAs were less sensitive in detecting anti-NSP antibody positive sera. No marked differences in dSp among the tests in each field study were observed, although dSp differed between different cattle populations. Targeted sampling of convalescent and in-contact cattle during the Zimbabwean field study may explain the high estimate for true prevalence of 65.4% (59.0-72.5%) and the relatively low estimates for dSp, as there were few truly negative animals present in the study (only 22.9% of the samples tested negative in all six NSP ELISAs). This "sampling issue" raises questions about the reliability or statistical validity of such estimates irrespective of how the data is analysed. Other explanations for these low dSp estimates include (i) remaining anti-NSP antibodies resulting from previous FMDV infections, (ii) the systematic use of a trivalent vaccine against FMDV types SAT1, SAT2 and SAT3, which may increase the probability of inducing anti-NSP antibodies [24], and (iii) the presence of crossreacting antibodies due to pathogens other than FMDV, a common problem when evaluating the performance of diagnostic tests in Africa [25].

Even though vaccination coverage in the Zimbabwean herds is hardly comparable to an emergency vaccination policy as envisaged in Europe and less protected (e.g. unvaccinated) animals develop higher anti-NSP antibody levels, the dSn estimates for the vast majority of tests did not differ from those resulting from the Israeli dataset, where the serosurvey was aimed at detecting subclinically and low grade infected animals in a cattle population vaccinated three or more times during their lifetime. This annual vaccination programme does not have an apparent effect on the dSp of the NSP ELISAs, and might induce anti-FMDV antibody levels comparable to those found following a one-time highly potent emergency vaccination. This could suggest that a similar within-herd prevalence of approximately 25% may be found in Europe in infected cattle herds where emergency vaccination has been applied and NSP testing is used in the interest of detecting subclinical and/or low-grade infection.

Furthermore, based on our findings, the conventional analytical approach on sera of experimentally infected (vaccinated) animals underestimated the true prevalence and the dSn of the NSP-based assays for comparable cattle populations. Reliable figures on the performance of these tests are, nonetheless, a prerequisite in any sampling design to demonstrate/substantiate freedom from infection [26]. In a recent paper, Paton et al. [27] described the problems, which may be encountered when applying NSP-based test systems that are imperfect with regard to dSn and dSp in substantiating freedom from FMDV infection after emergency vaccination. Based on the data resulting from the 2004 workshop on primovaccinated cattle sampled 28-100 days post exposure to experimental infection, a herd size of at least 30 cattle would be necessary to detect the commonly used within-herd design prevalence of infection of 5%, with 95% confidence, when using a test system comprised of initial testing by the Ceditest, retesting of positives by the Ceditest and confirmation of the retest positives with the PANAFTOSA test. Increasing

either the dSn and/or the dSp of the test system that is used may significantly reduce the herd size at which this "small herd problem" arises. The Bayesian analyses reported here would provide higher test system sensitivity estimates than was apparent on conventional analyses of the test results. Even with the slightly lower Bayesian estimate for the dSp of this test system (based on the analysis of the Zimbabwean data), the revised estimates for dSn suggest that the "small herd problem" is only likely to arise for very small herds, in which case vaccination may not be the best control policy [27].

In conclusion, in the absence of a gold standard, a validated Bayesian approach provides the most reliable estimates of diagnostic sensitivity and specificity and true prevalence in the field (i.e. based on specimens from animals of unknown infection status) and should be considered when comparing the performance of diagnostic tests in such cases. Comparable analyses are feasible using less than six tests as long as enough prior information based on conditional probabilities can be provided [9,23]. At present, none of the available assays able to discriminate FMDV vaccinated from infected cattle combine 100% diagnostic sensitivity with 100% diagnostic specificity. It is, thus, desirable in Europe to develop new and improved discriminatory tests either as screening or confirmatory system, similar to the approach taken by PANAFTOSA in South America - where 3ABC-ELISA positives are confirmed in an enzyme-linked immunoelectrotransfer blot assay [28] - but preferably based on a quantitative assay.

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Appendix A. Bayesian measures of complexity and fit

DIC, p_D and the Bayesian *p*-value are three Bayesian measures of model complexity and fit. Model comparison generally takes place by defining a measure of fit, typically a deviance statistic, and a measure of complexity (i.e. the number of free parameter in the model) [22].

 $p_{\rm D}$ is defined as the number of effectively estimated parameters and represents the posterior mean of the deviance (Dbar) minus the deviance of the posterior means (Dhat) [20]:

 $p_{\rm D} = {\rm Dbar} - {\rm Dhat}$

Dbar can be used as a Bayesian measure of fit or "adequacy". The sum of Dbar and p_D equals the deviance information criterion (DIC), which is used for assessing the goodness-of-fit of the model [4,22]:

$$DIC = Dbar + p_D = Dhat + 2 \times p_D$$

The Bayesian *p*-value further allows the assessment of the goodness-of-fit and is calculated as the posterior mean of the step function of the difference between the deviance of the observed values and the deviance of values sampled from the multinomial probabilities at each iteration [4].

Appendix B. Bayesian analysis validation procedure

Users guide for the validation criteria [4].

To compare different models and validate the Bayesian analysis on grounds of the Bayesian goodness-of-fit and model complexity, a three-steps procedure should be followed:

- The models are analysed using non informative prior information and the values of *p*_D and DIC are calculated in the posterior mean of the multinomial probabilities *π_i* (using the R programme).
- (2) The models are analysed using prior information. The correspondence between the p_D and DIC parameters calculated in the posterior mean of the multinomial probabilities (using the R programme) and in the posterior mean of the model parameters (using WinBUGS) and the Bayesian *p*-value are used to screen the best model fit and complexity. The p_D parameter must be positive and smaller than or equal to the maximal number of estimable parameter. The DIC parameter must be positive and small. The Bayesian *p*-value has to be smaller than or equal to 0.5.
- (3) All estimates are severely constrained by a uniform prior on their corresponding model parameters θ to interval (posterior estimate -0.0001%, posterior estimate +0.0001%). The Bayesian *p*-value must tend to 0 showing a perfect fit between the prior information and the data.

Appendix C. Models for WinBUGS 1.4

WinBUGS 1.4 Model for Israel $fmd[1:64] \sim dmulti(p[1:64], n)$ p[1] < th[2] * th[2] * th[4] * th[8] * th[16] * th[32] * th[64] + (1 - th[1]) * (1 - th[3]) * (1 - th[7]) * (1 - th[15]) * (th[31])*(1-th[63])*(1-th[127]) p[2] <-th[1]*th[2]*th[4]*th[8]*th[16]*th[32]*(1-th[64])+(1-th[1])*(1-th[3])*(1-th[7])*(1-th[15])*th[31])*(1-th[63])*th[127] p[3] < -th[1]*th[2]*th[4]*th[8]*th[16]*(1-th[32])*th[65]+(1-th[1])*(1-th[3])*(1-th[7])*(1-th[15])th[31])*th[63]*(1-th[126]) p[4] <-th[1]*th[2]*th[4]*th[8]*th[16]*(1-th[32])*(1-th[65])+(1-th[1])*(1-th[3])*(1-th[7])*(1-tth[15])*(1-th[31])*th[63]*th[126] p[5] <-th[1]*th[2]*th[4]*th[8]*(1-th[16])*th[33]*th[66]+(1-th[1])*(1-th[3])*(1-th[7]th[15] th[31] (1-th[62]) (1-th[125])p[6] <-th[1]*th[2]*th[4]*th[8]*(1-th[16])*th[33]*(1-th[66])+(1-th[1])*(1-th[3])*(1-th[7])*(1-tth[15])*th[31]*(1-th[62])*th[125] p[7] < -th[1]*th[2]*th[4]*th[8]*(1-th[16])*(1-th[33])*th[67]+(1-th[1])*(1-th[3])*(1-th[7])*(1th[15] th[31] th[62] (1-th[124])p[8] <-th[1]*th[2]*th[4]*th[8]*(1-th[16])*(1-th[33])*(1-th[67])+(1-th[1])*(1-th[3])*(1-th[7])*th[15])*th[31]*th[62]*th[124] p[9] <-th[1]*th[2]*th[4]*(1-th[8])*th[17]*th[35]*th[68]+(1-th[1])*(1-th[3])*(1-th[7])*th[15]*(1-th[15])*(1-th[7])*th[15]*(1-th[15])*(1-th[7])*th[15]*(1-th[15])*(1-th[7])*th[15]*(1-th[15])*(1-th[7])*th[15]*(1-th[15])*(1-th[7])*th[15]*(1-th[15])*(1-th[7])*th[15]*(1-th[7])*th[15th[30])*(1-th[61])*(1-th[123]) p[10] <-th[1]*th[2]*th[4]*(1-th[8])*th[17]*th[35]*(1-th[68])+(1-th[1])*(1-th[3])*(1-th[7])*th[15]*(1-th[68])+(1-th[7])*th[15]*(1-th[68])+(1-th[7])*th[15]*(1-th[68])+(1-th[7])*th[15]*(1-th[68])+(1-th[7])*th[15]*(1-th[68])+(1-th[7])*th[15]*(1-th[68])+(1-th[7])*th[15]*(1-th[68])+(1-th[7])*th[15]*(1-th[68])+(1-th[7])*th[15]*(1-th[68])+(1-th[7])*th[15]*(1-th[68])+(1-th[7])*th[15]*(1-th[68])+(1-th[7])*th[15]*(1-th[68])+(1-th[7])*th[15]*(1-th[7])*th[15]*(1-th[68])+(1-th[7])*th[15]*(1-th[7])*th[15]*(1-th[7])*th[15]*(1-th[68])+(1-th[7])*th[15]*(1-th[7])*th[15]*(1-th[68])+(1-th[7])*th[15]*(1-th[68])+(1-th[7])*th[15]*(1th[30])*(1-th[61])*th[123] p[11] <-th[1]*th[2]*th[4]*(1-th[8])*th[17]*(1-th[35])*th[69]+(1-th[1])*(1-th[3])*(1-th[7])*th[15]*(1-th[15])*(1-th[7])*th[15]*(1-th[15])*(1-th[7])*th[15]*(1-th[15])*(1-th[7])*th[15]*(1-th[15])*(1-th[7])*(1-th[7])*th[15]*(1-th[7])*(1-tth[30])*th[61]*(1-th[122]) $p[12] \le th[1] th[2] th[4] (1-th[8]) th[17] (1-th[35]) (1-th[69]) + (1-th[1]) (1-th[3]) (1-th[3$ th[7] th[15] (1 - th[30]) th[61] th[122]p[13] <-th[1]*th[2]*th[4]*(1-th[8])*(1-th[17])*th[36]*th[70]+(1-th[1])*(1-th[3])*(1th[7] th [15] th [30] * (1-th[60]) * (1-th[121])p[14] <-th[1]*th[2]*th[4]*(1-th[8])*(1-th[17])*th[36]*(1-th[70])+(1-th[1])*(1-th[3])*(1-th[32))*(th[7])*th[15]*th[30]*(1-th[60])*th[121] p[15] <-th[1] th[2] th[4] (1-th[8]) (1-th[17]) (1-th[36]) th[71] + (1-th[1]) (1-th[3]) (1-th[36]) th[71] + (1-th[1]) (1-th[36]) th[71] + (1-th[36]) th[71] th[71] + (1-th[36]) th[71] tth[7])*th[15]*th[30]*th[60]*(1-th[120]) p[16] <-th[1]*th[2]*th[4]*(1-th[8])*(1-th[17])*(1-th[36])*(1-th[71])+(1-th[1])*(1-th[3])*(1-th[37th[7])*th[15]*th[30]*th[60]*th[120] $p[17] \le th[1] th[2] (1-th[4]) th[9] th[18] th[36] th[72] + (1-th[1]) (1-th[3]) th[7] (1-th[14]) (1-th[14]) th[74] th[74$ th[29])*(1-th[59])*(1-th[119]) p[18] <-th[1]*th[2]*(1-th[4])*th[9]*th[18]*th[36]*(1-th[72])+(1-th[1])*(1-th[3])*th[7]*(1-th[14])th[29])*(1-th[59])*th[119] p[19] <-th[1]*th[2]*(1-th[4])*th[9]*th[18]*(1-th[36])*th[73]+(1-th[1])*(1-th[3])*th[7]*(1-th[14])th[29])*th[59]*(1-th[118]) $p[20] \le th[1] th[2] (1-th[4]) th[9] th[18] (1-th[36]) (1-th[73]) + (1-th[1]) (1-th[3]) th[7] (1-th[3]) th[7]$ th[14])*(1-th[29])*th[59]*th[118]p[21] <-th[1]*th[2]*(1-th[4])*th[9]*(1-th[18])*th[37]*th[74]+(1-th[1])*(1-th[3])*th[7]*(1-thth[14] th[29] (1-th[58]) (1-th[117])p[22] <-th[1]*th[2]*(1-th[4])*th[9]*(1-th[18])*th[37]*(1-th[74])+(1-th[1])*(1-th[3])*th[7]*(1-th[74])+(1-th[74])*th[7]*(1-th[74])+(1-th[74])*th[7]*(1-th[74])+(1-th[74])*th[7]*(1-th[74])+(1-th[74])*th[7]*(1-th[74])+(1-th[74])*th[7]*(1-th[74])+(1-th[74])*th[7]*(1-th[74])+(1-th[74])*th[7]*(1-th[74])+(1-th[74])*th[7]*(1-th[74])+(1-th[74])*th[7]*(1-th[74])+(1-th[74])*th[7]*(1-th[74])+(1-th[74])*th[7]*(1-th[74])+(1-th[74])*th[7]*(1-th[74])+(1-th[74])*th[7]*(1-th[74])+(1-th[74])*th[74])+(1-th[74])*th[74])+(1-th[74])*th[74])+(1-th[74])*th[74])+(1-th[74])*th[74])+(1-th[74])*th[74])+(1-th[74])*th[74])+(1-th[74])*th[74])+(1-th[74])*th[74])+(1-th[74])*th[74])+(1-th[74])*th[74])+(1-thth[14])*th[29]*(1-th[58])*th[117] p[23] <-th[1]*th[2]*(1-th[4])*th[9]*(1-th[18])*(1-th[37])*th[75]+(1-th[1])*(1-th[3])*th[7]*(th[14] th [29] * th [58] * (1-th [116]) p[24] <-th[1]*th[2]*(1-th[4])*th[9]*(1-th[18])*(1-th[37])*(1-th[75])+(1-th[1])*(1-th[3])*th[7]*(1-th[75])+(1-th[1])*(1-th[3])*th[7]*(1-th[18])*(1-th[18]th[14])*th[29]*th[58]*th[116] p[25] <-th[1]*th[2]*(1-th[4])*(1-th[9])*th[19]*th[38]*th[76]+(1-th[1])*(1-th[3])*th[7]*th[14]*(1-th[1])*th[28])*(1-th[57])*(1-th[115]) p[26] <- th[1]*th[2]*(1-th[4])*(1-th[9])*th[19]*th[38]*(1-th[76])+(1-th[1])*(1-th[3])*th[7]*th[14]*(1-th[3])*th[7]*th[14]*(1-th[3])*th[7]*th[14]*(1-th[3])*th[7]*th[14]*(1-th[3])*th[7]*th[14]*(1-th[3])*th[7]*th[14]*(1-th[3])*th[7]*th[14]*(1-th[3])*th[7]*th[14]*(1-th[3])*th[7]*th[14]*(1-th[3])*th[7]*th[7]*th[14]*(1-th[3])*th[7]*th[28])*(1-th[57])*th[115]

p[27] <- th[1]*th[2]*(1-th[4])*(1-th[9])*th[19]*(1-th[38])*th[77]+(1-th[1])*(1-th[3])*th[7]*th[14]*(1-th[38])*th[77]+(th[28])*th[57]*(1-th[114]) p[28] <-th[1]*th[2]*(1-th[4])*(1-th[9])*th[19]*(1-th[38])*(1-th[77])+(1-th[1])*(1-th[19])*(1-th[1th[3] th[7] th[14] (1-th[28]) th[57] th[114]p[29] <-th[1]*th[2]*(1-th[4])*(1-th[9])*(1-th[19])*th[39]*th[78]+(1-th[1])*(1-th[19])*th[78]+(1-th[19])*(1-th[19])*th[78]+(1-th[19])*(1-th[19])*th[78]+(1-th[19])*(1-th[19])*th[78]+(1-th[19])th[3] th[7] th[14] th[28] (1-th[56]) (1-th[113])p[30] <-th[1]*th[2]*(1-th[4])*(1-th[9])*(1-th[19])*th[39]*(1-th[78])+(1-th[1])*(1-th[19])*th[39]*(1-th[78])+(1-th[19])*(1-th[19])*(1-th[19])*th[39]*(1-th[78])+(1-th[19])*(1-th[19])*th[39]*(1-th[78])+(1-th[19])*(1-th[19])*th[39]*(1-th[78])+(1-th[19])*(1-th[19])*th[39]*(1-th[78])+(1-th[19])*(1-th[19])*th[39]*(1-th[78])+(1-th[19])*(1-th[19])*th[39]*(1-th[78])+(1-th[19])*(1-th[19])*th[39]*(1-th[78])+(1-th[19])*(1-th[19])*th[39]*(1-th[78])+(1-th[19])*th[39]*(1-th[78])+(1-th[19])*(1-th[78])+(1-th[19])*th[39]*(1-th[78])+(1-th[19])*th[39]*(1-th[78])+(1-th[19])*th[39]*(1-th[78])+(1-th[19])*th[39]*(1-th[78])+(1-th[19])*th[39]*(1-th[78])+(1-th[19])*th[39]*(1-th[78])+(1-th[19])*th[39]*(1-th[78])+(1-th[19])*th[39]*(1-th[78])+(1-th[19])*th[39]*(1-th[78])+(1-th[th[3] th[7] th[14] th[28] (1-th[56]) th[113] p[31] < -th[1] * th[2] * (1-th[4]) * (1-th[9]) * (1-th[19]) * (1-th[39]) * th[79] + (1-th[1]) * (1-th[19]) * (1-th[19])th[3])*th[7]*th[14]*th[28]*th[56]*(1-th[112]) p[32]
<-th[1]*th[2]*(1-th[4])*(1-th[9])*(1-th[19])*(1-th[39])*(1-th[79])+(1-th[1])*(1-th[19])*(1th[3])*th[7]*th[14]*th[28]*th[56]*th[112] p[33] <-th[1]*(1-th[2])*th[5]*th[10]*th[20]*th[40]*th[80]+(1-th[1])*th[3]*(1-th[6])*(1-th[13])*(1th[27])*(1-th[55])*(1-th[111]) p[34] <-th[1]*(1-th[2])*th[5]*th[10]*th[20]*th[40]*(1-th[80])+(1-th[1])*th[3]*(1-th[6])*(1-th[13]th[27])*(1-th[55])*th[111] p[35] <-th[1]*(1-th[2])*th[5]*th[10]*th[20]*(1-th[40])*th[81]+(1-th[1])*th[3]*(1-th[6])*(1-th[13]th[27])*th[55]*(1-th[110]) $p[36] \le
th[1]*(1-th[2])*th[5]*th[10]*th[20]*(1-th[40])*(1-th[81])+(1-th[1])*th[3]*(1-th[6])*(1$ th[13])*(1-th[27])*th[55]*th[110] p[37] <-th[1]*(1-th[2])*th[5]*th[10]*(1-th[20])*th[41]*th[82]+(1-th[1])*th[3]*(1-th[6])*(1-th[6])*(1-th[6])*th[6th[13])*th[27]*(1-th[54])*(1-th[109]) p[38] <-th[1]*(1-th[2])*th[5]*th[10]*(1-th[20])*th[41]*(1-th[82])+(1-th[1])*th[3]*(1-th[6])*(1th[13])*th[27]*(1-th[54])*th[109] p[39] <-th[1]*(1-th[2])*th[5]*th[10]*(1-th[20])*(1-th[41])*th[83]+(1-th[1])*th[3]*(1-th[6])*(1th[13])*th[27]*th[54]*(1-th[108]) p[40]
<-th[1]*(1-th[2])*th[5]*th[10]*(1-th[20])*(1-th[41])*(1-th[83])+(1-th[1])*th[3]*(1-th[6])*(1-th[6]th[13])*th[27]*th[54]*th[108] $p[41] \le th[1]*(1-th[2])*th[5]*(1-th[10])*th[21]*th[42]*th[84]+(1-th[1])*th[3]*(1-th[6])*th[13]*th[13]*(1-th[6])*th[13]*t$ th[26])*(1-th[53])*(1-th[107]) p[42] <-th[1]*(1-th[2])*th[5]*(1-th[10])*th[21]*th[42]*(1-th[84])+(1-th[1])*th[3]*(1-th[6])*th[13]*(1-th[6])*th[13]*(1-th[6])*th[13]*(1-th[6])*th[13]*(1-th[6])*th[13]*(1-th[6])*th[6])*th[13]*(1-th[6])*th[6])*th[6])*th[6] + th[6] + th[6]th[26])*(1-th[53])*th[107] p[43] <-th[1]*(1-th[2])*th[5]*(1-th[10])*th[21]*(1-th[42])*th[85]+(1-th[1])*th[3]*(1-th[6])*th[13]*(1-th[6])*th[6])*th[13]*(1-th[6])*th[6])*th[6]*(1-th[6])*th[6]*(1-th[6])*th[6])*th[6]*(1-th[6])*th[th[26])*th[53]*(1-th[106]) p[44] <-th[1]*(1-th[2])*th[5]*(1-th[10])*th[21]*(1-th[42])*(1-th[85])+(1-th[1])*th[3]*(1-th[12])*th[3]*th[3]*(1-th[12])*th[3]*(1-th[12])*th[3]th[6])*th[13]*(1-th[26])*th[53]*th[106] p[45]
<-th[1]*(1-th[2])*th[5]*(1-th[10])*(1-th[21])*th[43]*th[86]+(1-th[1])*th[3]*th[3]*th[6] th[13] th[26] (1-th[52]) (1-th[105])p[46] < -th[1]*(1-th[2])*th[5]*(1-th[10])*(1-th[21])*th[43]*(1-th[86])+(1-th[1])*th[3]*(1-th[86])+(1-th[1])*th[3]*(1-th[86])+(1-th[1])*th[3]*(1-th[86])+th[6])*th[13]*th[26]*(1-th[52])*th[105] p[47] <-th[1]*(1-th[2])*th[5]*(1-th[10])*(1-th[21])*(1-th[43])*th[87]+(1-th[1])*th[3]*(1-th[12))*th[3]*(1th[6])*th[13]*th[26]*th[52]*(1-th[104]) $p[48] \le th[1]*(1-th[2])*th[5]*(1-th[10])*(1-th[21])*(1-th[43])*(1-th[87])+(1-th[1])*th[3]*(1-th[10])*(1-th[1$ th[6])*th[13]*th[26]*th[52]*th[104] p[49] <-
th[1]*(1-th[2])*(1-th[5])*th[11]*th[22]*th[44]*th[88]+(1-th[1])*th[3]*th[6]*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*th[12])*th[12]*th[th[25])*(1-th[51])*(1-th[103]) p[50] <-th[1]*(1-th[2])*(1-th[5])*th[11]*th[22]*th[44]*(1-th[88])+(1-th[1])*th[3]*th[6]*(1-th[12])*(1-th[12]th[25])*(1-th[51])*th[103] p[51] <-th[1]*(1-th[2])*(1-th[5])*th[11]*th[22]*(1-th[44])*th[89]+(1-th[1])*th[3]*th[6]*(1-th[12])*(1-th[12]th[25])*th[51]*(1-th[102]) p[52] <-th[1]*(1-th[2])*(1-th[5])*th[11]*th[22]*(1-th[44])*(1-th[89])+(1-th[1])*th[3]*th[6]*(1-th[6])*(1-th[6])*(1-th[6])*(1-th[6])*th[6]*(1-th[6])*th[6])*th[6]*(1-th[6])*th[6])*th[6]*(1-th[6])*th[6])*th[6]*(1-th[6])*th[6])*th[6]*(1-th[6])*th[6])*th[6]*(1-th[6])*th[6])*th[6]*(1-th[6])*th[6])*th[6]*(1-th[6])*th[6])*th[6]*(1-th[6])*th[6])*th[6]*(1-th[6])*th[6])*th[6])*th[6]*(1-th[6])*th[6])*th[6])*th[6]*(1-th[6])*th[6])*th[6])*th[6]*(1-th[6])*th[6])*th[6])*th[6]*(1-th[6])*th[6])*th[6])*th[6]*(1-th[6])*th[6])*th[6])*th[6]*(1-th[6])*th[6])*th[6])*th[6]*(1-th[6])*th[6])*th[6])*th[6])*th[6]*(1-th[6])*th[12])*(1-th[25])*th[51]*th[102] p[53] <
-th[1]*(1-th[2])*(1-th[5])*th[11]*(1-th[22])*th[45]*th[90]+(1-th[1])*th[3]*th[6]*th[6]*(1-th[1])*th[3]*th[6]*tth[12])*th[25]*(1-th[50])*(1-th[101]) p[54] <-th[1]*(1-th[2])*(1-th[5])*th[11]*(1-th[22])*th[45]*(1-th[90])+(1-th[1])*th[3]*th[6]*(1-th[90])+(1-th[1])*th[3]*th[6]*(1-th[90])+(1-th[1])*th[3]*th[6]*(1-th[90])+(1-th[1])*th[3]*th[6]*(1-th[90])+(1-thth[12])*th[25]*(1-th[50])*th[101]

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p[55] <-th[1]*(1-th[2])*(1-th[5])*th[11]*(1-th[22])*(1-th[45])*th[91]+(1-th[1])*th[3]*th[6]*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th[12))*(1-th
  th[12])*th[25]*th[50]*(1-th[100])
  p[56] <-th[1]*(1-th[2])*(1-th[5])*th[11]*(1-th[22])*(1-th[45])*(1-th[91])+(1-th[1])*th[3]*th[6]*(1-th[45])*(1-th[91])+(1-th[1])*th[3]*th[6]*(1-th[45])*(1-th[91])+(1-th[1])*th[3]*th[6]*(1-th[45])*(1-th[91])+(1-th[1])*th[3]*th[6]*(1-th[1])*th[3]*th[6]*(1-th[1])*th[3]*th[6]*(1-th[1])*th[3]*th[6]*(1-th[1])*th[3]*th[6]*(1-th[1])*th[3]*th[6]*(1-th[1])*th[3]*th[6]*(1-th[1])*th[3]*th[6]*(1-th[1])*th[3]*th[6]*(1-th[1])*th[3]*th[6]*(1-th[1])*th[3]*th[6]*(1-th[1])*th[3]*th[6]*(1-th[1])*th[3]*th[6]*(1-th[1])*th[3]*th[6]*(1-th[1])*th[3]*th[6]*(1-th[1])*th[3]*th[6]*(1-th[1])*th[3]*th[6]*(1-th[1])*th[3]*th[6]*(1-th[1])*th[3]*th[6]*(1-th[1])*th[3]*th[6]*(1-th[1])*th[3]*th[6]*(1-th[1])*th[3]*th[6]*(1-th[1])*th[3]*th[6]*(1-th[1])*th[3]*th[6]*(1-th[1])*th[3]*th[6]*(1-th[1])*th[3]*th[6]*(1-th[1])*th[3]*th[6]*(1-th[1])*th[3]*th[6]*(1-th[1])*th[3]*th[6]*(1-th[1])*th[3]*th[6]*(1-th[1])*th[3]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6
th[12])*th[25]*th[50]*th[100]
  p[57] <-th[1]*(1-th[2])*(1-th[5])*(1-th[1])*th[23]*th[46]*th[92]+(1-th[1])*th[3]*th[6]*th[12]*(1-th[1])*th[3]*th[6]*th[12]*(1-th[1])*th[3]*th[6]*th[12]*(1-th[1])*th[3]*th[6]*th[12]*(1-th[1])*th[3]*th[6]*th[12]*(1-th[1])*th[3]*th[6]*th[12]*(1-th[1])*th[3]*th[6]*th[12]*(1-th[1])*th[3]*th[6]*th[12]*(1-th[1])*th[3]*th[6]*th[12]*(1-th[1])*th[3]*th[6]*th[12]*(1-th[1])*th[3]*th[6]*th[12]*(1-th[1])*th[3]*th[6]*th[12]*(1-th[1])*th[3]*th[6]*th[12]*(1-th[1])*th[3]*th[6]*th[12]*(1-th[1])*th[3]*th[6]*th[12]*(1-th[1])*th[3]*th[6]*th[12]*(1-th[1])*th[3]*th[6]*th[12]*(1-th[1])*th[3]*th[6]*th[12]*(1-th[1])*th[3]*th[6]*th[12]*(1-th[1])*th[3]*th[6]*th[12]*(1-th[1])*th[3]*th[6]*th[12]*(1-th[1])*th[3]*th[6]*th[12]*(1-th[1])*th[3]*th[6]*th[12]*(1-th[1])*th[3]*th[6]*th[12]*(1-th[1])*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*th[6]*t
  th[24])*(1-th[49])*(1-th[99])
  p[58] <-th[1]*(1-th[2])*(1-th[5])*(1-th[11])*th[23]*th[46]*(1-th[92])+(1-th[1])*th[3]*th[6]*th[12]*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12]
  th[24])*(1-th[49])*th[99]
  p[59] <-th[1]*(1-th[2])*(1-th[5])*(1-th[11])*th[23]*(1-th[46])*th[93]+(1-th[1])*th[3]*th[6]*th[12]*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12]
  th[24] (1-th[98])
  p[60] < -th[1]*(1-th[2])*(1-th[5])*(1-th[11])*th[23]*(1-th[46])*(1-th[93])+(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*
  th[1] th[3] th[6] th[12] (1-th[24]) th[49] th[98]
  p[61] < th[1]*(1-th[2])*(1-th[5])*(1-th[11])*(1-th[23])*th[47]*th[94]+(1-th[23])*th[47]*th[94]+(1-th[23])*th[47]*th[94]+(1-th[23])*th[47]*th[94]+(1-th[23])*th[47]*th[94]+(1-th[23])*th[47]*th[94]+(1-th[23])*th[47]*th[94]+(1-th[23])*th[47]*th[94]+(1-th[23])*th[47]*th[94]+(1-th[23])*th[47]*th[94]+(1-th[23])*th[47]*th[94]+(1-th[23])*th[47]*th[94]+(1-th[23])*th[47]*th[94]+(1-th[23])*th[47]*th[94]+(1-th[23])*th[47]*th[94]+(1-th[23])*th[47]*th[94]+(1-th[23])*th[47]*th[94]+(1-th[23])*th[47]*th[94]+(1-th[23])*th[47]*th[94]+(1-th[23])*th[47]*th[94]+(1-th[23])*th[47]*th[94]+(1-th[23])*th[47]*th[94]+(1-th[23])*th[47]*th[94]+(1-th[23])*th[47]*th[94]+(1-th[23])*th[47]*th[94]+(1-th[23])*th[47]*th[94]+(1-th[23])*th[47]*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])
  th[1] th[3] th[6] th[12] th[24] (1-th[48]) (1-th[97])
  p[62] \le th[1]*(1-th[2])*(1-th[5])*(1-th[11])*(1-th[23])*th[47]*(1-th[94])+(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(
  th[1] th[3] th[6] th[12] th[24] (1-th[48]) th[97]
  p[63] < th[1]*(1-th[2])*(1-th[5])*(1-th[11])*(1-th[23])*(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47
  th[1] th[3] th[6] th[12] th[24] th[48] (1-th[96])
p[64] < th[1]*(1-th[2])*(1-th[5])*(1-th[11])*(1-th[23])*(1-th[47])*(1-th[95])+(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95
th[1])*th[3]*th[6]*th[12]*th[24]*th[48]*th[96]
  for (i in 1:64)
  d[i] \le fmd[i] \log(max(fmd[i],1)/(p[i]*n))
  G0 < -2* sum(d[])
    fmd2[1:64] \sim dmulti(p[1:64],n)
    for (i in 1:64)
  d2[i] \le fmd2[i] \le log(max(fmd2[i],1)/(p[i] \le n))
  Gt \leq 2* \operatorname{sum}(d2[])
  bayesp \le step(G0 - Gt)
  th[1] \sim dbeta(1,1)
  th[2] \sim dbeta(1,1)I(0.8,1)
  th[3] \sim dbeta(1,1)I(0.8,1)
th[4]~dbeta(1,1)I(0.8,1)
th[5]~dbeta(1,1)
  th[6] \sim dbeta(1,1)I(0.8,1)
  th[7] \sim dbeta(1,1)I(0.8,1)
  th[8] \sim dbeta(1,1)I(0.8,1)
  th[9] \sim dbeta(1,1)
  th[10] \sim dbeta(1,1)I(0,0.5)
th[11] \sim db eta(1,1)I(0,0.2)
  th[12] \sim dbeta(1,1)I(0.9,1)
  th[13] \rightarrow dbeta(1,1)I(0.7,1)
  th[14] \sim db eta(1,1)I(0.5,1)
  th[15] \sim dbeta(1,1)
  th[16] \sim dbeta(1,1)I(0.7,1)
  th[17] \sim db eta(1,1)I(0,0.7)
  th[18] \sim db eta(1,1)I(0,0.5)
  th[19] \sim dbeta(1,1)I(0.3,0.7)
  th[20]~dbeta(1,1)
  th[21]~dbeta(1,1)I(0.5,1)
th[22] \sim dbeta(1,1)I(0,0.5)
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 $th[23] \sim dbeta(1,1)I(0,0.3)$ $th[24] \sim dbeta(1,1)I(0.8,1)$ $th[25] \sim dbeta(1,1)$ $th[26] \sim dbeta(1,1)I(0.8,1)$ $th[27] \sim dbeta(1,1)$ $th[28] \sim dbeta(1,1)I(0.8,1)$ th[29]~dbeta(1,1) $th[30] \sim dbeta(1,1)$ $th[31] \sim dbeta(1,1)$ $th[32] \sim db eta(1,1)I(0.8,1)$ $th[33] \sim db eta(1,1)I(0.3,0.8)$ $th[34] \sim db eta(1,1)I(0.4,0.8)$ $th[35] \sim dbeta(1,1)I(0.2,0.7)$ $th[36] \sim dbeta(1,1)I(0,0.5)$ $th[37] \sim dbeta(1,1)I(0,0.3)$ $th[38] \sim dbeta(1,1)I(0,0.5)$ $th[39] \sim dbeta(1,1)I(0,0.5)$ $th[40] \sim dbeta(1,1)$ $th[41] \sim dbeta(1,1)$ $th[42] \sim db eta(1,1)I(0,0.3)$ $th[43] \sim dbeta(1,1)$ $th[44] \sim dbeta(1,1)$ $th[45] \sim dbeta(1,1)I(0,0.3)$ $th[46] \sim db eta(1,1)I(0,0.3)$ $th[47] \sim dbeta(1,1)I(0,0.2)$ $th[48] \sim dbeta(1,1)I(0.8,1)$ $th[49] \sim dbeta(1,1)I(0.8,1)$ $th[50] \sim db eta(1,1)I(0.8,1)$ th[51]~dbeta(1,1) th[52]~dbeta(1,1)I(0.8,1) $th[53] \sim dbeta(1,1)I(0,0.5)$ $th[54] \sim dbeta(1,1)I(0.5,1)$ $th[55] \sim dbeta(1,1)$ $th[56] \sim db eta(1,1)I(0.8,1)$ $th[57] \sim dbeta(1,1)I(0.5,1)$ $th[58] \sim dbeta(1,1)$ $th[59] \sim dbeta(1,1)$ $th[60] \sim dbeta(1,1)$ $th[61] \sim dbeta(1,1)$ $th[62] \sim dbeta(1,1)$ $th[63] \sim dbeta(1,1)$ $th[64] \sim dbeta(1,1)$ $th[65] \sim dbeta(1,1)$ $th[66] \sim dbeta(1,1)$ $th[67] \sim dbeta(1,1)$ th[68]~dbeta(1,1) $th[69] \sim dbeta(1,1)I(0,0.5)$ $th[70] \sim dbeta(1,1)I(0,0.5)$ $th[71] \sim dbeta(1,1)I(0,0.5)$ th[72]~dbeta(1,1) $th[73] \sim dbeta(1,1)I(0.5,1)$ $th[74] \sim dbeta(1,1)$ $th[75] \sim dbeta(1,1)I(0,0.7)$ $th[76] \sim dbeta(1,1)$ $th[77] \sim db eta(1,1)I(0,0.5)$ th[78]~dbeta(1,1) $th[79] \sim dbeta(1,1)I(0,0.5)$

 $th[80] \sim dbeta(1,1)$ th[81]~dbeta(1,1) $th[82] \sim dbeta(1,1)$ $th[83] \sim dbeta(1,1)$ $th[84] \sim dbeta(1,1)$ $th[85] \sim dbeta(1,1)I(0,0.5)$ $th[86] \sim dbeta(1,1)$ $th[87] \sim dbeta(1,1)$ $th[88] \sim dbeta(1,1)$ $th[89] \sim dbeta(1,1)$ $th[90] \sim dbeta(1,1)$ th[91]~dbeta(1,1)I(0,0.5) th[92]~dbeta(1,1) $th[93] \sim dbeta(1,1)I(0,0.5)$ $th[94] \sim dbeta(1,1)$ $th[95] \sim db eta(1,1)I(0,0.3)$ $th[96] \sim dbeta(1,1)I(0.8,1)$ $th[97] \sim dbeta(1,1)I(0.9,1)$ $th[98] \sim dbeta(1,1)I(0.8,1)$ th[99]~dbeta(1,1) th[100]~dbeta(1,1)I(0.8,1) th[101]~dbeta(1,1)I(0.5,1) $th[102] \sim dbeta(1,1)$ $th[103] \sim dbeta(1,1)$ $th[104] \sim dbeta(1,1)I(0.9,1)$ $th[105] \sim dbeta(1,1)I(0.5,1)$ th[106]~dbeta(1,1) th[107]~dbeta(1,1)I(0.5,1) $th[108] \sim dbeta(1,1)I(0.5,1)$ $th[109] \sim dbeta(1,1)I(0,0.5)$ $th[110] \sim dbeta(1,1)$ th[111]~dbeta(1,1) $th[112] \sim dbeta(1,1)I(0.8,1)$ $th[113] \sim dbeta(1,1)I(0,0.5)$ $th[114] \sim dbeta(1,1)I(0.3,0.7)$ $th[115] \sim dbeta(1,1)$ th[116]~dbeta(1,1) th[117]~dbeta(1,1) th[118]~dbeta(1,1) th[119]~dbeta(1,1) th[120]~dbeta(1,1) $th[121] \sim dbeta(1,1)I(0.5,1)$ $th[122] \sim dbeta(1,1)$ th[123]~dbeta(1,1) th[124]~dbeta(1,1) th[125]~dbeta(1,1) th[126]~dbeta(1,1) th[127]~dbeta(1,1) se[1] <- th[2] sp[1] <- th[3] $se[2] \le th[2] th[4] + (1-th[2]) th[5]$ $sp[2] \le th[3] th[6] + (1-th[3]) th[7]$ se[3] <- th[2]*(th[4]*th[8]+(1-th[4])*th[9])+(1-th[2])*(th[5]*th[10]+(1-th[5])*th[11])sp[3] <- th[3]*(th[6]*th[12]+(1-th[6])*th[13])+(1-th[3])*(th[7]*th[14]+(1-th[7])*th[15])

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sp[4] \le th[3]*(th[6]*(th[12]*th[24]+(1-th[12])*th[25])+(1-th[6])*(th[13]*th[26]+(1-th[6])*(th[13]*th[26]+(1-th[6])*(th[13]*th[26])+(1-th[6])*(th[13]*th[26])+(1-th[6])*(th[13]*th[26])+(1-th[6])*(th[13]*th[26])+(1-th[6])*(th[13]*th[26])+(1-th[6])*(th[13]*th[26])+(1-th[6])*(th[13]*th[26])+(1-th[6])*(th[13]*th[26])+(1-th[6])*(th[13]*th[26])+(1-th[6])*(th[13]*th[26])+(1-th[6])*(th[13]*th[26])+(1-th[6])*(th[13]*th[26])+(1-th[6])*(th[13]*th[26])+(1-th[6])*(th[13]*th[26])+(1-th[6])*(th[13]*th[26])+(1-th[6])*(th[13]*th[26])+(1-th[6])*(th[13]*th[26])+(1-th[6])*(th[13]*th[26])+(1-th[6])*(th[13]*th[26])+(1-th[6])*(th[13]*th[26])+(1-th[6])*(th[13]*th[26])+(1-th[6])*(th[13]*th[26])+(1-th[6])*(th[6])*(th[6])*(th[6])+(1-th[6])*(th[6])*(th[6])+(1-th[6])*(th[6])+(1-th[6])*(th[6])+(1-th[6])*(th[6])+(1-th[6])*(th[6])+(1-th[6])*(th[6])+(1-th[6])*(th[6])+(1-th[6])*(th[6])+(1-th[6])*(th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-th[6])+(1-
th[13])*th[27])+(1-th[3])*(th[7]*(th[14]*th[28]+(1-th[14])*th[29])+(1-th[7])*(th[15]*th[30]+(1-th[7])*(th[15]*th[30]+(1-th[7])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*(th[15])*
th[15])*th[31]))
se51 <- th[2]*(th[4]*(th[8]*(th[16]*th[32]+(1-th[16])*th[33])+(1-th[8])*(th[17]*th[34]+(1-th[16])*th[33])+(1-th[8])*(th[17]*th[34]+(1-th[16])*th[33])+(1-th[8])*(th[17]*th[34]+(1-th[16])*th[33])+(1-th[8])*(th[17]*th[34])+(1-th[16])*th[33])+(1-th[8])*(th[17]*th[34])+(1-th[16])*th[33])+(1-th[8])*(th[17]*th[34])+(1-th[16])*th[33])+(1-th[8])*(th[17]*th[34])+(1-th[16])*th[33])+(1-th[8])*(th[17]*th[34])+(1-th[16])*th[33])+(1-th[8])*(th[17]*th[34])+(1-th[16])*th[33])+(1-th[8])*(th[17]*th[34])+(1-th[16])*th[33])+(1-th[8])*(th[17]*th[34])+(1-th[16])*th[33])+(1-th[8])*(th[17]*th[34])+(1-th[16])*th[34])+(1-th[16])*th[34])+(1-th[16])*th[34])+(1-th[16])*th[34])+(1-th[16])*th[34])+(1-th[16])*th[34])+(1-th[16])*th[34])+(1-th[16])*th[34])+(1-th[16])*th[34])+(1-th[16])*th[34])+(1-th[16])*th[34])+(1-th[16])*th[34])+(1-th[16])*th[34])+(1-th[16])*th[34])+(1-th[16])*th[34])+(1-th[16])*th[34])+(1-th[16])*th[34])+(1-th[16])*th[34])+(1-th[16])*th[34])+(1-th[16])*th[34])+(1-th[16])*th[34])+(1-th[16])*th[34])+(1-th[16])*th[34])+(1-th[16])*th[34])+(1-th[16])*th[34])+(1-th[16])*th[34])+(1-th[16])*th[34])+(1-th[16])*th[34])+(1-th[16])*th[34])+(1-th[16])*th[34])+(1-th[16])*th[34])+(1-th[16])*th[34])+(1-th[16])*th[34])+(1-th[16])*th[34])+(1-th[16])*th[34])+(1-th[16])*th[34])+(1-th[16])*th[34])+(1-th[16])*th[34])+(1-th[16])*th[34])+(1-th[16])+(1-th[16]))+(1-th[16])+(1-th[16]))+(1-th[16])+(1-th[16]))+(1-th[16])+(1-th[16]))+(1-th[16]))+(1-th[16])+(1-th[16]))+(1-th[16]))+(1-th[16]))+(1-th[16])+(1-th[16]))+(1-th[16]))+(1-th[16]))+(1-th[16]))+(1-th[16]))+(1-th[16]))+(1-th[16]))+(1-th[16]))+(1-th[16]))+(1-th[16]))+(1-th[16]))+(1-th[16]))+(1-th[16]))+(1-th[16]))+(1-th[16]))+(1-th[16]))+(1-th[16]))+(1-th[16]))+(1-th[16]))+(1-th[16]))+(1-th[16]))+(1-th[16]))+(1-th[16]))+(1-th[16]))+(1-th[16]))+(1-th[16]))+(1-th[16]))+(1-th[16]))+(1-th[16]))+(1-th[16]))+(1-th[16]))+(1-th[16]))+(1-th[16]))+(1-th[16]))+(1-th[16]))+(1-th[16]))+(1-th[16]))+(1-th[16]))+(1-th[16]))+(1-th[16]))+(1-th[16]))+(1-th[16]))+(1-th[16]))+(1-th[16]))+(1-th[16]))+(1-th[16]))+(1-th[16]
th[17])*th[35])+(1-th[4])*(th[9]*(th[18]*th[36]+(1-th[18])*th[37])+(1-th[9])*(th[19]*th[38]+(1-th[18])*th[37])+(1-th[9])*(th[19]*th[38])+(1-th[18])*th[37])+(1-th[9])*(th[19]*th[38])+(1-th[18])*th[37])+(1-th[9])*(th[19]*th[38])+(1-th[18])*th[37])+(1-th[9])*(th[19]*th[38])+(1-th[18])*th[37])+(1-th[9])*(th[19]*th[38])+(1-th[18])*th[37])+(1-th[9])*(th[19]*th[38])+(1-th[18])*th[37])+(1-th[9])*(th[19]*th[38])+(1-th[18])*th[37])+(1-th[9])*(th[19]*th[38])+(1-th[18])*th[37])+(1-th[9])*(th[19]*th[38])+(1-th[18])*th[38])+(1-th[18])*th[38])+(1-th[18])*th[38])+(1-th[18])*th[38])+(1-th[18])*th[38])+(1-th[18])*th[38])+(1-th[18])*th[38])+(1-th[18])*th[38])+(1-th[18])*th[38])+(1-th[18])*th[38])+(1-th[18])*th[38])+(1-th[18])*th[38])+(1-th[18])*th[38])+(1-th[18])*th[38])+(1-th[18])*th[38])+(1-th[18])*th[38])+(1-th[18])*th[38])+(1-th[18])*th[38])+(1-th[18])*th[38])+(1-th[18])*th[38])+(1-th[18])*th[38])+(1-th[18])*th[38])+(1-th[18])*th[38])+(1-th[18])*th[38])+(1-th[18])*th[38])+(1-th[18])*th[38])+(1-th[18])*th[38])+(1-th[18])*th[38])+(1-th[18])*th[38])+(1-th[18])*th[38])+(1-th[18])*th[38])+(1-th[18])*th[38])+(1-th[18])*th[38])+(1-th[18])*th[38])+(1-th[18])*th[38])+(1-th[18])*th[38])+(1-th[18])*th[38])+(1-th[18])*th[38])+(1-th[18])*th[38])+(1-th[18])*th[38])+(1-th[18])*th[38])+(1-th[18])*th[38])+(1-th[18])*th[38])+(1-th[18])*th[38])+(1-th[18])*th[38])+(1-th[18])*th[38])+(1-th[18])+(1-th[18])*th[38])+(1-th[18])+(1-th[18])+(1-th[18])+(1-th[18])+(1-th[18])+(1-th[18])+(1-th[18])+(1-th[18])+(1-th[18])+(1-th[18])+(1-th[18])+(1-th[18])+(1-th[18])+(1-th[18])+(1-th[18])+(1-th[18])+(1-th[18])+(1-th[18])+(1-th[18])+(1-th[18])+(1-th[18])+(1-th[18])+(1-th[18])+(1-th[18])+(1-th[18])+(1-th[18])+(1-th[18])+(1-th[18])+(1-th[18])+(1-th[18])+(1-th[18])+(1-th[18])+(1-th[18])+(1-th[18])+(1-th[18])+(1-th[18])+(1-th[18])+(1-th[18])+(1-th[18])+(1-th[18])+(1-th[18])+(1-th[18])+(1-th[18])+(1-th[18])+(1-th[18])+(1-th[18])+(1-th[18])+(1-th[18])+(1-th[18])+(1-th[18])+(1-th[18])+(1-th[18])+(1-th[18])+(1-th[18])+(1-th[18])+(1-th[18])+(1-th[18])+(1-th[18])+(1-th
th[19])*th[39])))
se52 <- (1-th[2])*(th[5]*(th[10]*(th[20]*th[40]+(1-th[20])*th[41])+(1-th[10])*(th[21]*th[42]+(1-th[20])*(th[21]*th[42]+(1-th[20])*(th[21]*th[42])+(1-th[20])*(th[21]*th[42])+(1-th[20])*(th[21]*th[42])+(1-th[20])*(th[21]*th[42])+(1-th[20])*(th[21]*th[42])+(1-th[20])*(th[21]*th[42])+(1-th[20])*(th[21]*th[42])+(1-th[20])*(th[21]*th[42])+(1-th[20])*(th[21]*th[42])+(1-th[20])*(th[21]*th[42])+(1-th[20])*(th[21]*th[42])+(1-th[20])*(th[21]*th[42])+(1-th[20])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21])*(th[21
th[21])*th[43]))+(1-th[5])*(th[11]*(th[22]*th[44]+(1-th[22])*th[45])+(1-th[11])*(th[23]*th[46]+(1-th[21])*(th[23]*th[46])+(1-th[21])*(th[23])*th[46])+(1-th[21])*(th[23])*th[46])+(1-th[21])*(th[23])*th[46])+(1-th[21])*(th[23])*th[46])+(1-th[21])*(th[23])*th[46])+(1-th[21])*(th[23])*th[46])+(1-th[21])*(th[23])*th[46])+(1-th[21])*(th[23])*th[46])+(1-th[21])*(th[23])*th[46])+(1-th[21])*(th[23])*th[46])+(1-th[21])*(th[23])*th[46])+(1-th[23])*th[46])+(1-th[23])*th[46])+(1-th[23])*th[46])+(1-th[23])*th[46])+(1-th[23])*th[46])+(1-th[23])*th[46])+(1-th[23])*th[46])+(1-th[23])*th[46])+(1-th[23])*th[46])+(1-th[23])*th[46])+(1-th[23])*th[46])+(1-th[23])*th[46])+(1-th[23])*th[46])+(1-th[23])*th[46])+(1-th[23])*th[46])+(1-th[23])*th[46])+(1-th[23])*th[46])+(1-th[23])*th[46])+(1-th[23])*th[46])+(1-th[23])*th[46])+(1-th[23])*th[46])+(1-th[23])*th[46])+(1-th[23])*th[46])+(1-th[23])*th[46])+(1-th[23])*th[46])+(1-th[23])*th[46])+(1-th[23])*th[46])+(1-th[23])*th[46])+(1-th[23])*th[46])+(1-th[23])*th[46])+(1-th[23])*th[46])+(1-th[23])*th[46])+(1-th[23])*th[46])+(1-th[23])*th[46])+(1-th[23])*th[46])+(1-th[23])*th[46])+(1-th[23])*th[46])+(1-th[23])*th[46])+(1-th[23])*th[46])+(1-th[23])*th[46])+(1-th[23])*th[46])+(1-th[23])*th[46])+(1-th[23])*th[46])+(1-th[23])*th[46])+(1-th[23])*th[46])+(1-th[23])*th[46])+(1-th[23])*th[46])+(1-th[23])*th[46])+(1-th[23])*th[46])+(1-th[23])*th[46])+(1-th[23])*th[46])+(1-th[23])*th[46])+(1-th[23])*th[46])+(1-th[23])*th[46])+(1-th[23])*th[46])+(1-th[23])*th[46])+(1-th[23])*th[46])+(1-th[23])*th[46])+(1-th[23])*th[46])+(1-th[23])*th[46])+(1-th[23])*th[46])+(1-th[23])*th[46])+(1-th[23])*th[46])+(1-th[23])*th[46])+(1-th[23])*th[46])+(1-th[23])*th[46])+(1-th[23])*th[46])+(1-th[23])*th[46])+(1-th[23])*th[46])+(1-th[23])*th[46])+(1-th[23])*th[46])+(1-th[23])*th[46])+(1-th[23])*th[46])+(1-th[23])*th[46])+(1-th[23])*th[46])+(1-th[23])*th[46])+(1-th[23])*th[46])+(1-th[23])*th[46])+(1-th[23])+(1-th[23])*th[46])+(1-th[23])*th[46])+(1-th[23])*th[46])+(1-th[23])+(1-th[23])+(1-th[23])+(1-th[23])+(1-th[23])+(1-th[23]
th[23])*th[47])))
   se[5] <- se51+se52
sp51 <- th[3]*(th[6]*(th[12]*(th[24]*th[48]+(1-th[24])*th[49])+(1-th[12])*(th[25]*th[50]+(1-th[24])*th[49])+(1-th[12])*(th[25]*th[50]+(1-th[24])*th[49])+(1-th[12])*(th[25]*th[50]+(1-th[24])*th[49])+(1-th[12])*(th[25]*th[50]+(1-th[24])*th[49])+(1-th[12])*(th[25]*th[50]+(1-th[24])*th[49])+(1-th[12])*(th[25]*th[50]+(1-th[24])*th[50]+(1-th[24])*th[50]+(1-th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*(th[50])*
th[25])*th[51]))+(1-th[6])*(th[13]*(th[26])*th[52]+(1-th[26])*th[53])+(1-th[13])*(th[27])*th[54]+(1-th[26])*th[53])+(1-th[13])*(th[27])*th[54]+(1-th[26])*th[53])+(1-th[26])*th[54])+(1-th[26])*th[54])+(1-th[26])*th[54])+(1-th[26])*th[54])+(1-th[26])*th[54])+(1-th[26])*th[54])+(1-th[26])*th[54])+(1-th[26])*th[54])+(1-th[26])*th[54])+(1-th[26])*th[54])+(1-th[26])*th[54])+(1-th[26])*th[54])+(1-th[26])*th[54])+(1-th[26])*th[54])+(1-th[26])*th[54])+(1-th[26])*th[54])+(1-th[26])*th[54])+(1-th[26])*th[54])+(1-th[26])*th[54])+(1-th[26])*th[54])+(1-th[26])*th[54])+(1-th[26])*th[54])+(1-th[26])*th[54])+(1-th[26])*th[54])+(1-th[26])*th[54])+(1-th[26])*th[54])+(1-th[26])*th[54])+(1-th[26])*th[54])+(1-th[26])*th[54])+(1-th[26])*th[54])+(1-th[26])*th[56])+(1-th[26])*th[56])+(1-th[26])*th[56])+(1-th[26])*th[56])+(1-th[26])*th[56])+(1-th[26])*th[56])+(1-th[26])*th[56])+(1-th[26])*th[56])+(1-th[26])*th[56])+(1-th[26])*th[56])+(1-th[26])*th[56])+(1-th[26])*th[56])+(1-th[26])*th[56])+(1-th[26])*th[56])+(1-th[26])*th[56])+(1-th[26])*th[56])+(1-th[26])*th[56])+(1-th[26])*th[56])+(1-th[26])*th[56])+(1-th[26])*th[56])+(1-th[26])*th[56])+(1-th[26])*th[56])+(1-th[26])*th[56])+(1-th[26])*th[56])+(1-th[26])*th[56])+(1-th[26])*th[56])+(1-th[26])*th[56])+(1-th[26])*th[56])+(1-th[26])*th[56])+(1-th[26])*th[56])+(1-th[26])*th[56])+(1-th[26])*th[56])+(1-th[26])*th[56])+(1-th[26])*th[56])+(1-th[26])*th[56])+(1-th[26])*th[56])+(1-th[26])*th[56])+(1-th[26])*th[56])+(1-th[26])*th[56])+(1-th[26])*th[56])+(1-th[26])*th[56])+(1-th[26])*th[56])+(1-th[26])*th[56])+(1-th[26])*th[56])+(1-th[26])*th[56])+(1-th[26])*th[56])+(1-th[26])*th[56])+(1-th[26])*th[56])+(1-th[26])*th[56])+(1-th[26])*th[56])+(1-th[26])+(1-th[26])+(1-th[26]))+(1-th[26]))+(1-th[26]))+(1-th[26]))+(1-th[26]))+(1-th[26]))+(1-th[26]))+(1-th[26]))+(1-th[26]))+(1-th[26]))+(1-th[26]))+(1-th[26]))+(1-th[26]))+(1-th[26]))+(1-th[26]))+(1-th[26]))+(1-th[26]))+(1-th[26]))+(1-th[26]))+(1-th[26]))+(1-th[26]))+(1-th[26]))+(1-th[26]))+(1-th[26]))+(1-th[26]))+(1-th[26]))+(1-th[26]))+(1-th[26]))+(1-t
th[27])*th[55])))
sp52 < -(1-th[3])*(th[7]*(th[14]*(th[28]*th[56]+(1-th[28])*th[57])+(1-th[14])*(th[29]*th[58]+(1-th[28])*th[57])+(1-th[14])*(th[29]*th[58]+(1-th[28])*th[57])+(1-th[14])*(th[29]*th[58]+(1-th[28])*th[57])+(1-th[14])*(th[29]*th[58]+(1-th[28])*th[57])+(1-th[14])*(th[29]*th[58]+(1-th[28])*th[57])+(1-th[14])*(th[29]*th[58]+(1-th[28])*th[57])+(1-th[14])*(th[29]*th[58]+(1-th[28])*th[57])+(1-th[14])*(th[29]*th[58]+(1-th[28])*th[57])+(1-th[14])*(th[29]*th[58]+(1-th[28])*th[57])+(1-th[14])*(th[29]*th[58]+(1-th[28])*th[57])+(1-th[14])*(th[29]*th[58]+(1-th[28])*th[57])+(1-th[14])*(th[29]*th[58]+(1-th[28])*th[57])+(1-th[14])*(th[29]*th[58]+(1-th[28])*th[57])+(1-th[14])*(th[29]*th[58]+(1-th[28])*th[57])+(1-th[28])*th[58]+(1-th[28])*th[58]+(1-th[28])*th[58]+(1-th[28])*th[58]+(1-th[28])*th[58]+(1-th[28])*th[58]+(1-th[28])*th[58]+(1-th[28])*th[58]+(1-th[28])*th[58]+(1-th[28])*th[58]+(1-th[28])*th[58]+(1-th[28])*th[58]+(1-th[28])*th[58]+(1-th[28])*th[58]+(1-th[28])*th[58]+(1-th[28])*th[58]+(1-th[28])*th[58]+(1-th[28])*th[58]+(1-th[28])*th[58]+(1-th[28])*th[58]+(1-th[28])*th[58]+(1-th[28])*th[58]+(1-th[28])*th[58]+(1-th[28])*th[58]+(1-th[28])*th[58]+(1-th[28])*th[58]+(1-th[28])*th[58]+(1-th[28])*th[58]+(1-th[28])*th[58]+(1-th[28])*th[58]+(1-th[28])*th[58]+(1-th[28])*th[58]+(1-th[28])*th[58]+(1-th[28])*th[58]+(1-th[28])*th[58]+(1-th[28])*th[58]+(1-th[28])*th[58]+(1-th[28])*th[58]+(1-th[28])*th[58]+(1-th[28])*th[58]+(1-th[28])*th[58]+(1-th[28])*th[58]+(1-th[28])*th[58]+(1-th[28])*th[58]+(1-th[28])*th[58]+(1-th[28])*th[58]+(1-th[28])*th[58]+(1-th[28])*th[58]+(1-th[28])*th[58]+(1-th[28])*th[58]+(1-th[28])*th[58]+(1-th[28])*th[58]+(1-th[28])*th[58]+(1-th[28])*th[58]+(1-th[28])*th[58]+(1-th[28])*th[58]+(1-th[28])*th[58]+(1-th[28])*th[58]+(1-th[28])*th[58]+(1-th[28])*th[58]+(1-th[28])*th[58]+(1-th[28])*th[58]+(1-th[28])*th[58]+(1-th[28])*th[58]+(1-th[28])*th[58]+(1-th[28])*th[58]+(1-th[28])*th[58]+(1-th[28])*th[58]+(1-th[28])*th[58]+(1-th[28])*th[58]+(1-th[28])*th[58]+(1-th[28])*th[58]+(1-th[28])*th[58]+(1-th[28])*th[58]+(1-th[28])*th[5
th[29])*th[59])+(1-th[7])*(th[15]*(th[30]*th[60]+(1-th[30])*th[61])+(1-th[15])*(th[31]*th[62]+(1-th[15])*(th[31]*th[62]+(1-th[15])*(th[31])*th[62]+(1-th[15])*(th[31])*th[61])+(1-th[15])*(th[31])*th[61])+(1-th[15])*(th[31])*th[61])+(1-th[15])*(th[31])*th[61])+(1-th[15])*(th[31])*th[61])+(1-th[15])*(th[31])*th[61])+(1-th[15])*(th[31])*th[61])+(1-th[15])*(th[31])*th[61])+(1-th[15])*(th[31])*th[61])+(1-th[15])*(th[31])*th[61])+(1-th[15])*(th[31])*th[61])+(1-th[15])*(th[31])*th[61])+(1-th[15])*(th[31])*th[61])+(1-th[15])*(th[31])*th[61])+(1-th[15])*(th[31])*th[61])+(1-th[15])*(th[31])*th[61])+(1-th[15])*(th[31])*th[61])+(1-th[15])*(th[31])*th[61])+(1-th[15])*(th[31])*th[61])+(1-th[15])*(th[31])*th[61])+(1-th[15])*(th[31])*th[61])+(1-th[15])*(th[31])*th[61])+(1-th[15])*(th[31])*th[61])+(1-th[15])*(th[31])*th[61])+(1-th[15])*(th[31])*th[61])+(1-th[15])*(th[31])*th[61])+(1-th[15])*(th[31])*th[61])+(1-th[15])*(th[31])*th[61])+(1-th[15])*(th[31])*th[61])+(1-th[15])*(th[31])*th[61])+(1-th[15])*(th[31])*th[61])+(1-th[15])*(th[31])*th[61])+(1-th[15])*(th[31])*th[61])+(1-th[15])*(th[31])*th[61])+(1-th[15])*(th[31])*th[61])+(1-th[15])*(th[31])*th[61])+(1-th[15])*(th[31])*th[61])+(1-th[15])*(th[31])*th[61])+(1-th[15])*(th[31])*th[61])+(1-th[15])*th[61])+(1-th[15])*th[61])+(1-th[15])*th[61])+(1-th[15])*th[61])+(1-th[15])*th[61])+(1-th[15])*th[61])+(1-th[15])*th[61])+(1-th[15])*th[15])+(1-th[15])*th[15])+(1-th[15])*th[15])+(1-th[15])*th[15])+(1-th[15])*th[15])+(1-th[15])*th[15])+(1-th[15])*th[15])+(1-th[15])*th[15])+(1-th[15])*th[15])+(1-th[15])*th[15])+(1-th[15])*th[15])+(1-th[15])*th[15])+(1-th[15])*th[15])+(1-th[15])*th[15])+(1-th[15])*th[15])+(1-th[15])*th[15])+(1-th[15])*th[15])+(1-th[15])*th[15])+(1-th[15])*th[15])+(1-th[15])*th[15])+(1-th[15])*th[15])+(1-th[15])*th[15])+(1-th[15])*th[15])+(1-th[15])*th[15])+(1-th[15])*th[15])+(1-th[15])*th[15])+(1-th[15])*th[15])+(1-th[15])+(1-th[15])+(1-th[15])+(1-th[15])+(1-th[15])+(1-th[15])+(1-th[15])+(1-th[15])+(1-th[15])+(1-th[15])+(1-th[15])+(1-th[15])+(1-th[15])+(1-th[15])+(1-th
th[31])*th[63])))
sp[5] <- sp51+sp52
   se61 - th[2]*(th[4]*(th[8]*(th[16]*(th[32]*th[64]+(1-th[32])*th[65])+(1-th[16])*(th[33]*th[66]+(1-th[32])*th[65])+(1-th[16])*(th[33]*th[66]+(1-th[32])*th[65])+(1-th[32])*th[65])+(1-th[33]*th[66]+(1-th[33])*th[65])+(1-th[33])*th[66]+(1-th[33])*th[66])+(1-th[33])*th[66])+(1-th[33])*th[66])+(1-th[33])*th[66])+(1-th[33])*th[66])+(1-th[33])*th[66])+(1-th[33])*th[66])+(1-th[33])*th[66])+(1-th[33])*th[66])+(1-th[33])*th[66])+(1-th[33])*th[66])+(1-th[33])*th[66])+(1-th[33])*th[66])+(1-th[33])*th[66])+(1-th[33])*th[66])+(1-th[33])*th[66])+(1-th[33])*th[66])+(1-th[33])*th[66])+(1-th[33])*th[66])+(1-th[33])*th[66])+(1-th[33])*th[66])+(1-th[33])*th[66])+(1-th[33])*th[66])+(1-th[33])*th[66])+(1-th[33])*th[66])+(1-th[33])*th[66])+(1-th[33])*th[66])+(1-th[33])*th[66])+(1-th[33])*th[66])+(1-th[33])*th[66])+(1-th[33])*th[66])+(1-th[33])*th[66])+(1-th[33])*th[66])+(1-th[33])*th[66])+(1-th[33])*th[66])+(1-th[33])*th[66])+(1-th[33])*th[66])+(1-th[33])*th[66])+(1-th[33])*th[66])+(1-th[33])*th[66])+(1-th[33])*th[66])+(1-th[33])*th[66])+(1-th[33])*th[66])+(1-th[33])*th[66])+(1-th[33])*th[66])+(1-th[33])*th[66])+(1-th[33])*th[66])+(1-th[33])*th[66])+(1-th[33])*th[66])+(1-th[33])*th[66])+(1-th[33])*th[66])+(1-th[33])*th[66])+(1-th[33])*th[66])+(1-th[33])*th[66])+(1-th[33])*th[66])+(1-th[33])*th[66])+(1-th[33])*th[66])+(1-th[33])*th[66])+(1-th[33])*th[66])+(1-th[33])*th[66])+(1-th[33])*th[66])+(1-th[33])*th[66])+(1-th[33])*th[66])+(1-th[33])*th[66])+(1-th[33])*th[66])+(1-th[33])*th[66])+(1-th[33])*th[33])*th[33])*th[33])*th[33])+(1-th[33])*th[33])*th[33])*th[33])*th[33])*th[33])*th[33])*th[33])*th[33])*th[33])*th[33])*th[33])*th[33])*th[33])*th[33])*th[33])*th[33])*th[33])*th[33])*th[33])*th[33])*th[33])*th[33])*th[33])*th[33])*th[33])*th[33])*th[33])*th[33])*th[33])*th[33])*th[33])*th[33])*th[33])*th[33])*th[33])*th[33])*th[33])*th[33])*th[33])*th[33])*th[33])*th[33])*th[33])*th[33])*th[33])*th[33])*th[33])*th[33])*th[33])*th[33])*th[33])*th[33])*th[33])*th[33])*th[33])*th[33])*th[33])*th[33])*th[33])*th[33])*th[33])*th[33])*th[33])*
th[33])*th[67]))+(1-th[8])*(th[17]*(th[34])*th[68]+(1-th[34])*th[69])+(1-th[17])*(th[35]*th[70]+(1-th[34])*th[67]))+(1-th[17])*(th[35])*th[70]+(1-th[34])*th[70])+(1-th[34])*th[70])+(1-th[34])*th[70])+(1-th[34])*th[70])+(1-th[34])*th[70])+(1-th[34])*th[70])+(1-th[34])*th[70])+(1-th[34])*th[70])+(1-th[34])*th[70])+(1-th[34])*th[70])+(1-th[34])*th[70])+(1-th[34])*th[70])+(1-th[34])*th[70])+(1-th[34])*th[70])+(1-th[34])*th[70])+(1-th[34])*th[70])+(1-th[34])*th[70])+(1-th[34])*th[70])+(1-th[34])*th[70])+(1-th[34])*th[70])+(1-th[34])*th[70])+(1-th[34])*th[70])+(1-th[34])*th[70])+(1-th[34])*th[70])+(1-th[34])*th[70])+(1-th[34])*th[70])+(1-th[34])*th[70])+(1-th[34])*th[70])+(1-th[34])*th[70])+(1-th[34])*th[70])+(1-th[34])*th[70])+(1-th[34])*th[70])+(1-th[34])*th[70])+(1-th[34])*th[70])+(1-th[34])*th[70])+(1-th[34])*th[70])+(1-th[34])*th[70])+(1-th[34])*th[70])+(1-th[34])*th[70])+(1-th[34])*th[70])+(1-th[34])*th[70])+(1-th[34])*th[70])+(1-th[34])*th[70])+(1-th[34])*th[70])+(1-th[34])*th[70])+(1-th[34])*th[70])+(1-th[34])*th[70])+(1-th[34])*th[70])+(1-th[34])*th[70])+(1-th[34])*th[70])+(1-th[34])*th[70])+(1-th[34])*th[70])+(1-th[34])*th[70])+(1-th[34])*th[70])+(1-th[34])*th[70])+(1-th[34])*th[70])+(1-th[34])*th[70])+(1-th[34])*th[70])+(1-th[34])*th[70])+(1-th[34])*th[70])+(1-th[34])*th[70])+(1-th[34])*th[70])+(1-th[34])*th[70])+(1-th[34])*th[70])+(1-th[34])*th[70])+(1-th[34])*th[70])+(1-th[34])*th[70])+(1-th[34])*th[70])+(1-th[34])*th[70])+(1-th[34])*th[70])+(1-th[34])*th[70])+(1-th[34])*th[70])+(1-th[34])*th[70])+(1-th[34])*th[70])+(1-th[34])*th[70])+(1-th[34])*th[70])+(1-th[34])*th[70])+(1-th[34])*th[70])+(1-th[34])*th[70])+(1-th[34])*th[70])+(1-th[34])+(1-th[34])+(1-th[34])+(1-th[34]))+(1-th[34])+(1-th[34])+(1-th[34]))+(1-th[34]))+(1-th[34]))+(1-th[34]))+(1-th[34]))+(1-th[34]))+(1-th[34])+(1-th[34]))+(1-th[34]))+(1-th[34]))+(1-th[34]))+(1-th[34]))+(1-th[34]))+(1-th[34]))+(1-th[34]))+(1-th[34]))+(1-th[34]))+(1-th[34]))+(1-th[36]))+(1-th[36]))+(1-th[36]))+(1-th[36]))+(1-th[36]))+(1-th[36]))+(1-th[36]))+(1-th[36]))+(1-
th[35])*th[71]))))
se62 \le th[2]*((1-th[4])*(th[9]*(th[18]*(th[36]*th[72]+(1-th[36])*th[73])+(1-th[36])*th[73])+(1-th[36])*th[73])+(1-th[36])*th[73])+(1-th[36])*th[73])+(1-th[36])*th[73])+(1-th[36])*th[73])+(1-th[36])*th[73])+(1-th[36])*th[73])+(1-th[36])*th[73])+(1-th[36])*th[73])+(1-th[36])*th[73])+(1-th[36])*th[73])+(1-th[36])*th[73])+(1-th[36])*th[73])+(1-th[36])*th[73])+(1-th[36])*th[73])+(1-th[36])*th[73])+(1-th[36])*th[73])+(1-th[36])*th[73])+(1-th[36])*th[73])+(1-th[36])*th[73])+(1-th[36])*th[73])+(1-th[36])*th[73])+(1-th[36])*th[73])+(1-th[36])*th[73])+(1-th[36])*th[73])+(1-th[36])*th[73])+(1-th[36])*th[73])+(1-th[36])*th[73])+(1-th[36])*th[73])+(1-th[36])*th[73])+(1-th[36])*th[73])+(1-th[36])*th[73])+(1-th[36])*th[73])+(1-th[36])*th[73])+(1-th[36])*th[73])+(1-th[36])*th[73])+(1-th[36])*th[73])+(1-th[36])*th[73])+(1-th[36])*th[73])+(1-th[36])*th[73])+(1-th[36])*th[73])+(1-th[36])*th[73])+(1-th[36])*th[73])+(1-th[36])*th[73])+(1-th[36])*th[73])+(1-th[36])*th[73])+(1-th[36])*th[73])+(1-th[36])*th[73])+(1-th[36])*th[73])+(1-th[36])*th[73])+(1-th[36])*th[73])+(1-th[36])*th[73])+(1-th[36])*th[73])+(1-th[36])*th[73])+(1-th[36])*th[73])+(1-th[36])*th[73])+(1-th[36])*th[73])+(1-th[36])*th[73])+(1-th[36])*th[73])+(1-th[36])*th[73])+(1-th[36])*th[73])+(1-th[36])*th[73])+(1-th[36])*th[73])+(1-th[36])*th[73])+(1-th[36])*th[73])+(1-th[36])*th[73])+(1-th[36])*th[73])+(1-th[36])+(1-th[36])*th[73])+(1-th[36])+(1-th[36])+(1-th[36])+(1-th[36])+(1-th[36])+(1-th[36])+(1-th[36])+(1-th[36])+(1-th[36])+(1-th[36])+(1-th[36])+(1-th[36])+(1-th[36])+(1-th[36])+(1-th[36])+(1-th[36])+(1-th[36])+(1-th[36])+(1-th[36])+(1-th[36])+(1-th[36])+(1-th[36])+(1-th[36])+(1-th[36])+(1-th[36])+(1-th[36])+(1-th[36])+(1-th[36])+(1-th[36])+(1-th[36])+(1-th[36])+(1-th[36])+(1-th[36])+(1-th[36])+(1-th[36])+(1-th[36])+(1-th[36])+(1-th[36])+(1-th[36])+(1-th[36])+(1-th[36]))+(1-th[36])+(1-th[36])+(1-th[36]))+(1-th[36])+(1-th[36])+(1-th[36])+(1-th[36])+(1-th[36])+(1-th[36])+(1-th[36])+(1-th[36])+(1-th[36])+(1-th[36])+(1-th[36])+(1-th[36]))+(1-th[36])+(1-th[36])+(1-th[36
th[18])^*(th[37]^*th[74]+(1-th[37])^*th[75]))+(1-th[9])^*(th[19]^*(th[38]^*th[76]+(1-th[38])^*th[77])+(1-th[38])^*th[77])+(1-th[38])^*th[77])^*(th[38]^*th[76])^*(th[38])^*th[77])^*(th[38])^*th[77])^*(th[38])^*th[77])^*(th[38])^*th[77])^*(th[38])^*th[77])^*(th[38])^*th[77])^*(th[38])^*th[77])^*(th[38])^*th[77])^*(th[38])^*th[77])^*(th[38])^*th[77])^*(th[38])^*th[77])^*(th[38])^*th[77])^*(th[38])^*th[77])^*(th[38])^*th[77])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38])^*(th[38]
th[19] (th[39] th[78] + (1-th[39]) th[79])))
se63 < -(1-th[2])*(th[5]*(th[10]*(th[20]*(th[40]*th[80]+(1-th[40])*th[81])+(1-th[20])*(th[41]*th[82]+(1-th[20])*(th[41]*th[82]+(1-th[40])*th[81])+(1-th[20])*(th[41]*th[82]+(1-th[40])*th[81])+(1-th[20])*(th[41]*th[82]+(1-th[40])*th[81])+(1-th[20])*(th[41]*th[82]+(1-th[40])*th[81])+(1-th[20])*(th[41]*th[82]+(1-th[40])*th[81])+(1-th[20])*(th[41]*th[82]+(1-th[40])*th[81])+(1-th[20])*(th[41]*th[82]+(1-th[40])*th[81])+(1-th[20])*(th[41]*th[82]+(1-th[40])*th[81])+(1-th[20])*(th[41]*th[82]+(1-th[40])*th[81])+(1-th[20])*(th[41]*th[82]+(1-th[40])*th[81])+(1-th[20])*(th[41]*th[82]+(1-th[40])*th[81])+(1-th[20])*(th[41]*th[82]+(1-th[40])*th[81])+(1-th[20])*(th[41])*th[82]+(1-th[40])*th[81])+(1-th[20])*(th[41])*th[82]+(1-th[40])*th[81])+(1-th[40])*th[81])+(1-th[40])*th[81])+(1-th[40])*th[81])+(1-th[40])*th[81])+(1-th[40])*th[81])+(1-th[40])*th[81])+(1-th[40])*th[81])+(1-th[40])*th[81])+(1-th[40])*th[81])+(1-th[40])*th[81])+(1-th[40])*th[81])+(1-th[40])*th[81])+(1-th[40])*th[81])+(1-th[40])*th[81])+(1-th[40])*th[81])+(1-th[40])*th[81])+(1-th[40])*th[81])+(1-th[40])*th[81])+(1-th[40])*th[81])+(1-th[40])*th[81])+(1-th[40])*th[81])+(1-th[40])*th[81])+(1-th[40])*th[81])+(1-th[40])*th[81])+(1-th[40])*th[81])+(1-th[40])*th[81])+(1-th[40])*th[81])+(1-th[40])*th[81])+(1-th[40])*th[81])+(1-th[40])*th[81])+(1-th[40])*th[81])+(1-th[40])*th[81])+(1-th[40])*th[81])+(1-th[40])*th[81])+(1-th[40])*th[81])+(1-th[40])*th[81])+(1-th[40])*th[81])+(1-th[40])*th[81])+(1-th[40])*th[81])+(1-th[40])*th[81])+(1-th[40])*th[81])+(1-th[40])*th[81])+(1-th[40])*th[81])+(1-th[40])*th[81])+(1-th[40])*th[81])+(1-th[40])*th[81])+(1-th[40])*th[81])+(1-th[40])*th[81])+(1-th[40])*th[81])+(1-th[40])*th[81])+(1-th[40])*th[81])+(1-th[40])*th[81])+(1-th[40])*th[81])+(1-th[40])*th[81])+(1-th[40])+(1-th[40]))+(1-th[40]))+(1-th[40]))+(1-th[40]))+(1-th[40]))+(1-th[40]))+(1-th[40]))+(1-th[40]))+(1-th[40]))+(1-th[40]))+(1-th[40]))+(1-th[40]))+(1-th[40]))+(1-th[40]))+(1-th[40]))+(1-th[40]))+(1-th[40]))+(1-th[40]))+(1-th[40]))+(1-th[40]))+(1-th[40]))+(1-th[40]))+(1-th[40])
(1-th[41])*th[83]))+(1-th[10])*(th[21]*(th[42]*th[84]+(1-th[42])*th[85])+(1-th[42])*th[85])+(1-th[42])*th[85])+(1-th[42])*th[85])+(1-th[42])*th[85])+(1-th[42])*th[85])+(1-th[42])*th[85])+(1-th[42])*th[85])+(1-th[42])*th[85])+(1-th[42])*th[85])+(1-th[42])*th[85])+(1-th[42])*th[85])+(1-th[42])*th[85])+(1-th[42])*th[85])+(1-th[42])*th[85])+(1-th[42])*th[85])+(1-th[42])*th[85])+(1-th[42])*th[85])+(1-th[42])*th[85])+(1-th[42])*th[85])+(1-th[42])*th[85])+(1-th[42])*th[85])+(1-th[42])*th[85])+(1-th[42])*th[85])+(1-th[42])*th[85])+(1-th[42])*th[85])+(1-th[42])*th[85])+(1-th[42])*th[85])+(1-th[42])*th[85])+(1-th[42])*th[85])+(1-th[42])*th[85])+(1-th[42])*th[85])+(1-th[42])*th[85])+(1-th[42])*th[85])+(1-th[42])*th[85])+(1-th[42])*th[85])+(1-th[42])*th[85])+(1-th[42])*th[85])+(1-th[42])*th[85])+(1-th[42])*th[85])+(1-th[42])*th[85])+(1-th[42])*th[85])+(1-th[42])*th[85])+(1-th[42])*th[85])+(1-th[42])*th[85])+(1-th[42])*th[85])+(1-th[42])*th[85])+(1-th[42])*th[85])+(1-th[42])*th[85])+(1-th[42])*th[85])+(1-th[42])*th[85])+(1-th[42])*th[85])+(1-th[42])*th[85])+(1-th[42])*th[85])+(1-th[42])*th[85])+(1-th[42])*th[85])+(1-th[42])*th[85])+(1-th[42])*th[85])+(1-th[42])*th[85])+(1-th[42])*th[85])+(1-th[42])*th[85])+(1-th[42])*th[85])+(1-th[42])*th[85])+(1-th[42])*th[85])+(1-th[42])*th[85])+(1-th[42])*th[85])+(1-th[42])*th[85])+(1-th[42])*th[85])+(1-th[42])*th[85])+(1-th[42])+(1-th[42])*th[85])+(1-th[42])+(1-th[42])+(1-th[42])+(1-th[42])+(1-th[42])+(1-th[42])+(1-th[42])+(1-th[42])+(1-th[42])+(1-th[42])+(1-th[42])+(1-th[42])+(1-th[42])+(1-th[42])+(1-th[42])+(1-th[42])+(1-th[42])+(1-th[42])+(1-th[42])+(1-th[42])+(1-th[42])+(1-th[42])+(1-th[42])+(1-th[42])+(1-th[42])+(1-th[42])+(1-th[42])+(1-th[42])+(1-th[42])+(1-th[42])+(1-th[42])+(1-th[42])+(1-th[42])+(1-th[42])+(1-th[42])+(1-th[42])+(1-th[42])+(1-th[42])+(1-th[42])+(1-th[42])+(1-th[42])+(1-th[42])+(1-th[42])+(1-th[42])+(1-th[42])+(1-th[42])+(1-th[42])+(1-th[42])+(1-th[42])+(1-th[42])+(1-th[42])+(1-th[42])+(1-th[42])+(1-th[42])+(1-th[42])+(1-th[42])+(1-th[42])+(1-th[42])+(1-th[42])+
th[21] (th[43] th[86] + (1-th[43]) th[87])))
se64 < -(1-th[2])*((1-th[5])*(th[11]*(th[22]*(th[44]*th[88]+(1-th[44])*th[89])+(1-th[44])*th[89])+(1-th[44])*th[89])+(1-th[44])*th[89])+(1-th[44])*th[89])+(1-th[44])*th[89])+(1-th[44])*th[89])+(1-th[44])*th[89])+(1-th[44])*th[89])+(1-th[44])*th[89])+(1-th[44])*th[89])+(1-th[44])*th[89])+(1-th[44])*th[89])+(1-th[44])*th[89])+(1-th[44])*th[89])+(1-th[44])*th[89])+(1-th[44])*th[89])+(1-th[44])*th[89])+(1-th[44])*th[89])+(1-th[44])*th[89])+(1-th[44])*th[89])+(1-th[44])*th[89])+(1-th[44])*th[89])+(1-th[44])*th[89])+(1-th[44])*th[89])+(1-th[44])*th[80])+(1-th[44])*th[80])+(1-th[44])*th[80])+(1-th[44])*th[80])+(1-th[44])*th[80])+(1-th[44])*th[80])+(1-th[44])*th[80])+(1-th[44])*th[80])+(1-th[44])*th[80])+(1-th[44])*th[80])+(1-th[44])*th[80])+(1-th[44])*th[80])+(1-th[44])*th[80])+(1-th[44])*th[80])+(1-th[44])*th[80])+(1-th[44])*th[80])+(1-th[44])*th[80])+(1-th[44])*th[80])+(1-th[44])*th[80])+(1-th[44])*th[80])+(1-th[44])*th[80])+(1-th[44])*th[80])+(1-th[44])*th[80])+(1-th[44])*th[80])+(1-th[44])*th[80])+(1-th[44])*th[80])+(1-th[44])*th[80])+(1-th[44])*th[80])+(1-th[44])*th[80])+(1-th[44])*th[80])+(1-th[44])*th[80])+(1-th[44])*th[80])+(1-th[44])*th[80])+(1-th[44])*th[80])+(1-th[44])*th[80])+(1-th[44])*th[80])+(1-th[44])*th[80])+(1-th[44])*th[80])+(1-th[44])*th[80])+(1-th[44])*th[80])+(1-th[44])*th[80])+(1-th[44])*th[80])+(1-th[44])*th[80])+(1-th[44])*th[80])+(1-th[44])*th[80])+(1-th[44])*th[80])+(1-th[44])*th[80])+(1-th[44])*th[80])+(1-th[44])+(1-th[44]))+(1-th[44])+(1-th[44]))+(1-th[44])+(1-th[44])+(1-th[44]))+(1-th[44])+(1-th[44]))+(1-th[44])+(1-th[44]))+(1-th[44]))+(1-th[44])+(1-th[44]))+(1-th[44]))+(1-th[44]))+(1-th[44]))+(1-th[44]))+(1-th[44]))+(1-th[44]))+(1-th[44]))+(1-th[44]))+(1-th[44]))+(1-th[44]))+(1-th[44]))+(1-th[44]))+(1-th[44]))+(1-th[44]))+(1-th[44]))+(1-th[44]))+(1-th[44]))+(1-th[44]))+(1-th[44]))+(1-th[44]))+(1-th[44]))+(1-th[44]))+(1-th[44]))+(1-th[44]))+(1-th[44]))+(1-th[44]))+(1-th[44]))+(1-th[44]))+(1-th[44]))+(1-th[44]))+(1-th[44]))+(1-th[44]))+(1-th[44]))+(1-th[44]))+(1-th[44]))+(1-th[44]))+(1-t
th[22])*(th[45]*th[90]+(1-th[45])*th[91]))+(1-th[11])*(th[23]*(th[46]*th[92]+(1-th[46])*th[93])+(1-th[46])*th[93])+(1-th[46])*th[93])+(1-th[46])*th[93])+(1-th[46])*th[93])+(1-th[46])*th[93])+(1-th[46])*th[93])+(1-th[46])*th[93])+(1-th[46])*th[93])+(1-th[46])*th[93])+(1-th[46])*th[93])+(1-th[46])*th[93])+(1-th[46])*th[93])+(1-th[46])*th[93])+(1-th[46])*th[93])+(1-th[46])*th[93])+(1-th[46])*th[93])+(1-th[46])*th[93])+(1-th[46])*th[93])+(1-th[46])*th[93])+(1-th[46])*th[93])+(1-th[46])*th[93])+(1-th[46])*th[93])+(1-th[46])*th[93])+(1-th[46])*th[93])+(1-th[46])*th[93])+(1-th[46])*th[93])+(1-th[46])*th[93])+(1-th[46])*th[93])+(1-th[46])*th[93])+(1-th[46])*th[93])+(1-th[46])*th[93])+(1-th[46])*th[93])+(1-th[46])*th[93])+(1-th[46])*th[93])+(1-th[46])*th[93])+(1-th[46])*th[93])+(1-th[46])*th[93])+(1-th[46])*th[93])+(1-th[46])*th[93])+(1-th[46])*th[93])+(1-th[46])*th[93])+(1-th[46])*th[93])+(1-th[46])*th[93])+(1-th[46])*th[93])+(1-th[46])*th[93])+(1-th[46])*th[93])+(1-th[46])*th[93])+(1-th[46])*th[93])+(1-th[46])*th[93])+(1-th[46])*th[93])+(1-th[46])*th[93])+(1-th[46])*th[93])+(1-th[46])*th[93])+(1-th[46])*th[93])+(1-th[46])*th[93])+(1-th[46])*th[93])+(1-th[46])*th[93])+(1-th[46])*th[93])+(1-th[46])*th[93])+(1-th[46])*th[93])+(1-th[46])*th[93])+(1-th[46])*th[93])+(1-th[46])*th[93])+(1-th[46])*th[93])+(1-th[46])*th[93])+(1-th[46])*th[93])+(1-th[46])*th[93])+(1-th[46])*th[93])+(1-th[46])*th[93])+(1-th[46])*th[93])+(1-th[46])*th[93])+(1-th[46])*th[93])+(1-th[46])*th[93])+(1-th[46])*th[93])+(1-th[46])*th[93])+(1-th[46])+(1-th[46])*th[93])+(1-th[46])*th[93])+(1-th[46])*th[93])+(1-th[46])*th[93])+(1-th[46])*th[93])+(1-th[46])*th[93])+(1-th[46])*th[93])+(1-th[46])*th[93])+(1-th[46])*th[93])+(1-th[46])*th[93])+(1-th[46])*th[93])+(1-th[46])*th[93])+(1-th[46])*th[93])+(1-th[46])*th[93])+(1-th[46])*th[93])+(1-th[46])*th[93])+(1-th[46])*th[93])+(1-th[46]))+(1-th[46]))+(1-th[46]))+(1-th[46]))+(1-th[46]))+(1-th[46]))+(1-th[46]))+(1-th[46]))+(1-th[46]))+(1-th[46]))+(1-th[46]))+(1-th[46]))+(1-th[46]))+(1-th[46]))+(1-th[46]))+(1-th[46]
th[23] (th[47] th[94] + (1-th[47]) th[95]))))
se[6] <- se61+se62+se63+se64
sp61 <- th[3]*(th[6]*(th[12]*(th[24]*(th[48]*th[96]+(1-th[48])*th[97])+(1-th[24])*(th[49]*th[98]+(1-th[24])*(th[49]*th[98]+(1-th[24])*(th[49]*th[98])+(1-th[48])*(th[48])*th[97])+(1-th[24])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(th[48])*(
th[49])*th[99]))+(1-th[12])*(th[25]*(th[50]*th[100]+(1-th[50])*th[101])+(1-th[50])*th[101])+(1-th[50])*th[101])+(1-th[50])*th[101])+(1-th[50])*th[50])*th[50]+(1-th[50])*th[50])*th[50])*th[50]+(1-th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])*th[50])
th[25])*(th[51]*th[102]+(1-th[51])*th[102]))))
sp62 <-th[3]*((1-th[6])*(th[13]*(th[26]*(th[52]*th[104]+(1-th[52])*th[105])+(1-th[52])*th[105])+(1-th[52])*th[105])+(1-th[52])*th[105])+(1-th[52])*th[105])+(1-th[52])*th[105])+(1-th[52])*th[105])+(1-th[52])*th[105])+(1-th[52])*th[105])+(1-th[52])*th[105])+(1-th[52])*th[105])+(1-th[52])*th[105])+(1-th[52])*th[105])+(1-th[52])*th[105])+(1-th[52])*th[105])+(1-th[52])*th[105])+(1-th[52])*th[105])+(1-th[52])*th[105])+(1-th[52])*th[105])+(1-th[52])*th[105])+(1-th[52])*th[105])+(1-th[52])*th[105])+(1-th[52])*th[105])+(1-th[52])*th[105])+(1-th[52])*th[105])+(1-th[52])*th[105])+(1-th[52])*th[105])+(1-th[52])*th[105])+(1-th[52])*th[105])+(1-th[52])*th[105])+(1-th[52])*th[105])+(1-th[52])*th[105])+(1-th[52])*th[105])+(1-th[52])*th[105])+(1-th[52])*th[105])+(1-th[52])*th[105])+(1-th[52])*th[105])+(1-th[52])*th[105])+(1-th[52])*th[105])+(1-th[52])*th[105])+(1-th[52])*th[105])+(1-th[52])*th[105])+(1-th[52])*th[105])+(1-th[52])*th[105])+(1-th[52])*th[105])+(1-th[52])+(1-th[52])+(1-th[52])+(1-th[52])+(1-th[52])+(1-th[52]))+(1-th[52])+(1-th[52])+(1-th[52])+(1-th[52])+(1-th[52])+(1-th[52])+(1-th[52])+(1-th[52])+(1-th[52])+(1-th[52])+(1-th[52])+(1-th[52])+(1-th[52])+(1-th[52])+(1-th[52])+(1-th[52])+(1-th[52])+(1-th[52])+(1-th[52])+(1-th[52])+(1-th[52])+(1-th[52])+(1-th[52])+(1-th[52])+(1-th[52])+(1-th[52])+(1-th[52])+(1-th[52])+(1-th[52])+(1-th[52])+(1-th[52])+(1-th[52])+(1-th[52])+(1-th[52])+(1-th[52])+(1-th[52])+(1-th[52])+(1-th[52])+(1-th[52])+(1-th[52])+(1-th[52])+(1-th[52])+(1-th[52])+(1-th[52])+(1-th[52])+(1-th[52])+(1-th[52])+(1-th[52])+(1-th[52])+(1-th[52])+(1-th[52])+(1-th[52])+(1-th[52])+(1-th[52])+(1-th[52])+(1-th[52])+(1-th[52])+(1-th[52])+(1-th[52])+(1-th[52])+(1-th[52])+(1-th[52])+(1-th[52])+(1-th[52])+(1-th[52])+(1-th[52])+(1-th[52])+(1-th[52])+(1-th[52])+(1-th[52])+(1-th[52])+(1-th[52])+(1-th[52])+(1-th[52])+(1-th[52])+(1-th[52])+(1-th[52])+(1-th[52])+(1-th[52])+(1-th[52])+(1-th[52])+(1-th[52])+(1-th[52])+(1-th[52])+(1-th[52])+(1-th[52])+(1-th[52])+(1-th[52])+(1-th[52])+(1-th[52])+(1-th[52]))+(1-th[52])+(1-th[52
th[26])*(th[53]*th[106]+(1-th[53])*th[107])) +(1-th[13])*(th[27]*(th[54]*th[108]+(1-th[13])*(th[27])*(th[54]*th[108]+(1-th[53])*th[107])) +(1-th[13])*(th[53])*(th[54])*th[108]+(1-th[53])*(th[53])*(th[54])*th[108]+(1-th[53])*(th[53])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(th[54])*(t
th[54] + th[109] + (1-th[27]) + (th[55] + th[110] + (1-th[55]) + th[111] )))
p63 < -(1-th[3])*(th[7]*(th[14]*(th[28]*(th[56]*th[112]+(1-th[56])*th[113])+(1-th[56])*th[113])+(1-th[56])*th[113])+(1-th[56])*th[113])+(1-th[56])*th[113])+(1-th[56])*th[113])+(1-th[56])*th[113])+(1-th[56])*th[113])+(1-th[56])*th[113])+(1-th[56])*th[113])+(1-th[56])*th[113])+(1-th[56])*th[113])+(1-th[56])*th[113])+(1-th[56])*th[113])+(1-th[56])*th[113])+(1-th[56])*th[113])+(1-th[56])*th[113])+(1-th[56])*th[113])+(1-th[56])*th[113])+(1-th[56])*th[113])+(1-th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*th[56])*t
th[28])*(th[57]*th[114]+(1-th[57])*th[115]))+(1-th[14])*(th[29]*(th[58]*th[116]+(1-th[14])*(th[29])*(th[58])*th[116]+(1-th[58])*(th[58])*th[116])+(1-th[58])*(th[58])*th[116])+(1-th[58])*(th[58])*(th[58])*th[116])+(1-th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(th[58])*(t
th[58])*th[117])+(1-th[29])*(th[59]*th[118]+(1-th[59])*th[119]))))\\
sp64 \leq -(1-th[3])*((1-th[7])*(th[15]*(th[30]*(th[60]*th[120]+(1-th[60])*th[121])+(1-th[60])*th[121])+(1-th[60])*th[121])+(1-th[60])*th[121])+(1-th[60])*th[121])+(1-th[60])*th[121])+(1-th[60])*th[121])+(1-th[60])*th[121])+(1-th[60])*th[121])+(1-th[60])*th[121])+(1-th[60])*th[121])+(1-th[60])*th[121])+(1-th[60])*th[121])+(1-th[60])*th[121])+(1-th[60])*th[121])+(1-th[60])*th[121])+(1-th[60])*th[121])+(1-th[60])*th[121])+(1-th[60])*th[121])+(1-th[60])*th[121])+(1-th[60])*th[121])+(1-th[60])*th[121])+(1-th[60])*th[121])+(1-th[60])*th[121])+(1-th[60])*th[121])+(1-th[60])*th[121])+(1-th[60])*th[121])+(1-th[60])*th[121])+(1-th[60])*th[121])+(1-th[60])*th[121])+(1-th[60])*th[121])+(1-th[60])*th[121])+(1-th[60])*th[121])+(1-th[60])*th[121])+(1-th[60])*th[121])+(1-th[60])*th[121])+(1-th[60])*th[121])+(1-th[60])*th[121])+(1-th[60])*th[121])+(1-th[60])*th[121])+(1-th[60])*th[121])+(1-th[60])*th[121])+(1-th[60])*th[121])+(1-th[60])*th[121])+(1-th[60])*th[121])+(1-th[60])*th[121])+(1-th[60])*th[121])+(1-th[60])*th[121])+(1-th[60])*th[121])+(1-th[60])*th[121])+(1-th[60])*th[121])+(1-th[60])*th[121])+(1-th[60])*th[121])+(1-th[60])*th[121])+(1-th[60])*th[121])+(1-th[60])*th[121])+(1-th[60])*th[121])+(1-th[60])*th[120])+(1-th[60])*th[120])+(1-th[60])*th[120])+(1-th[60])*th[120])+(1-th[60])*th[120])+(1-th[60])*th[120])+(1-th[60])*th[120])+(1-th[60])*th[120])+(1-th[60])*th[120])+(1-th[60])*th[120])+(1-th[60])+(1-th[60])+(1-th[60])+(1-th[60])+(1-th[60])+(1-th[60])+(1-th[60])+(1-th[60])+(1-th[60])+(1-th[60])+(1-th[60])+(1-th[60])+(1-th[60])+(1-th[60])+(1-th[60])+(1-th[60])+(1-th[60])+(1-th[60])+(1-th[60])+(1-th[60])+(1-th[60])+(1-th[60])+(1-th[60])+(1-th[60])+(1-th[60])+(1-th[60])+(1-th[60])+(1-th[60])+(1-th[60])+(1-th[60])+(1-th[60])+(1-th[60])+(1-th[60])+(1-th[60])+(1-th[60])+(1-th[60])+(1-th[60])+(1-th[60])+(1-th[60])+(1-th[60])+(1-th[60])+(1-th[60])+(1-th[60])+(1-th[60])+(1-th[60])+(1-th[60])+(1-th[60])+(1-th[60])+(1-th[60])+(1-th[60])+(1-th[60])+(1-th[60])+(1-th[60])+(1-th[60])+(1-th[60])+(1-th[60])+(1-th[60]))+(1-th[60])+(1-t
th[30] (th[61] th[122] + (1-th[61]) th[123])) + (1-th[15]) th[31] th[62] th[124] + (1-th[30]) th[31] th[
th[62])*th[125])+(1-th[31])*(th[63]*th[126]+(1-th[63])*th[127]))))
sp[6] <- sp61+sp62+sp63+sp64
       }
```

12,0,0,0,0,0,0,0,0,0,0,8,0,9,3,307), n=465)

$$\begin{split} & se[4] <- th[2]*(th[4]*(th[8]*th[16]+(1-th[8])*th[17])+(1-th[4])*(th[9]*th[18]+(1-th[9])*th[19]))+(1-th[2])*(th[5]*(th[10]*th[20]+(1-th[10])*th[21])+(1-th[5])*(th[11]*th[22]+(1-th[11])*th[23])) \end{split}$$

WinBUGS 1.4 Model for Zimbabwe $fmd[1:64] \sim dmulti(p[1:64], n)$ p[1] < -th[1]*th[2]*th[4]*th[8]*th[16]*th[32]*th[64]+(1-th[1])*(1-th[3])*(1-th[7])*(1-th[15])*(1th[31])*(1-th[63])*(1-th[127]) p[2] <-th[1]*th[2]*th[4]*th[8]*th[16]*th[32]*(1-th[64])+(1-th[1])*(1-th[3])*(1-th[7])*(1-th[15])*th[31])*(1-th[63])*th[127] p[3] < -th[1]*th[2]*th[4]*th[8]*th[16]*(1-th[32])*th[65]+(1-th[1])*(1-th[3])*(1-th[7])*(1-th[15])th[31])*th[63]*(1-th[126]) p[4] <-th[1]*th[2]*th[4]*th[8]*th[16]*(1-th[32])*(1-th[65])+(1-th[1])*(1-th[3])*(1-th[7])*(1-tth[15])*(1-th[31])*th[63]*th[126] p[5] < th[1]*th[2]*th[4]*th[8]*(1-th[16])*th[33]*th[66]+(1-th[1])*(1-th[3])*(1-th[7]th[15])*th[31]*(1-th[62])*(1-th[125]) p[6] <-th[1]*th[2]*th[4]*th[8]*(1-th[16])*th[33]*(1-th[66])+(1-th[1])*(1-th[3])*(1-th[7])*(1-tth[15])*th[31]*(1-th[62])*th[125] p[7] < -th[1]*th[2]*th[4]*th[8]*(1-th[16])*(1-th[33])*th[67]+(1-th[1])*(1-th[3])*(1-th[7])*(1th[15] th [31] th [62] (1-th [124]) p[8] <-th[1]*th[2]*th[4]*th[8]*(1-th[16])*(1-th[33])*(1-th[67])+(1-th[1])*(1-th[3])*(1-th[7])*th[15])*th[31]*th[62]*th[124] p[9] < -th[1]*th[2]*th[4]*(1-th[8])*th[17]*th[35]*th[68]+(1-th[1])*(1-th[3])*(1-th[7])*th[15]*(1-th[1])*(1-th[7])*th[15]*(1-th[1])*(1-th[7])*th[15]*(1-th[1])*(1-th[th[30])*(1-th[61])*(1-th[123]) p[10] <-th[1] *th[2] *th[4] *(1-th[8]) *th[17] *th[35] *(1-th[68]) +(1-th[1]) *(1-th[3]) *(1-th[7]) *th[15] *th[30])*(1-th[61])*th[123] p[11] <-th[1]*th[2]*th[4]*(1-th[8])*th[17]*(1-th[35])*th[69]+(1-th[1])*(1-th[3])*(1-th[7])*th[15]*(1-th[15])*(1-th[7])*th[15]*(1-th[15])*(1-th[7])*th[15]*(1-th[15])*(1-th[7])*th[15]*(1-th[15])*(1-th[7])*(1-th[7])*th[15]*(1-th[7])*(1-th[7])*th[15]*(1-th[7])*(1-th[7th[30])*th[61]*(1-th[122]) p[12] <-th[1] th[2] th[4] (1-th[8]) th[17] (1-th[35]) (1-th[69]) + (1-th[1]) (1-th[3]) (1-th[3th[7])*th[15]*(1-th[30])*th[61]*th[122] p[13] < -th[1]*th[2]*th[4]*(1-th[8])*(1-th[17])*th[36]*th[70]+(1-th[1])*(1-th[3])*(1th[7] th [15] th [30] * (1-th[60]) * (1-th[121])p[14] <-th[1]*th[2]*th[4]*(1-th[8])*(1-th[17])*th[36]*(1-th[70])+(1-th[1])*(1-th[3])th[7])*th[15]*th[30]*(1-th[60])*th[121] p[15] < th[1] th[2] th[4] (1-th[8]) (1-th[17]) (1-th[36]) th[71] + (1-th[1]) (1-th[3]) (1-th[3]) (1-th[36]) th[71] + (1-th[1]) (1-th[36]) (1-th[36]) th[71] + (1-th[1]) (1-th[36]) (1-th[36]) th[71] + (1-th[1]) (1-th[36]) (1-th[36]) (1-th[36]) th[71] + (1-th[36]) (1-th[36]) (1-th[36]) (1-th[36]) th[71] + (1-th[36]) (1-th[36]) (1-th[36]) (1-th[36]) (1-th[36]) th[71] + (1-th[36]) (1-th[36]) (1-th[36]) (1-th[36]) (1-th[36]) th[71] + (1-th[36]) (1-th[th[7])*th[15]*th[30]*th[60]*(1-th[120]) p[16] <-th[1]*th[2]*th[4]*(1-th[8])*(1-th[17])*(1-th[36])*(1-th[71])+(1-th[1])*(1-th[3])*(1-th[37th[7] th [15] th [30] th [60] th [120]p[17] <- th[1]*th[2]*(1-th[4])*th[9]*th[18]*th[36]*th[72]+(1-th[1])*(1-th[3])*th[7]*(1-th[14])*(1th[29])*(1-th[59])*(1-th[119]) p[18] <-th[1]*th[2]*(1-th[4])*th[9]*th[18]*th[36]*(1-th[72])+(1-th[1])*(1-th[3])*th[7]*(1-th[14])th[29])*(1-th[59])*th[119] p[19] <-th[1]*th[2]*(1-th[4])*th[9]*th[18]*(1-th[36])*th[73]+(1-th[1])*(1-th[3])*th[7]*(1-th[14])th[29])*th[59]*(1-th[118]) $p[20] \le th[1] th[2] (1-th[4]) th[9] th[18] (1-th[36]) (1-th[73]) + (1-th[1]) (1-th[3]) th[7] (1-th[3]) th[7]$ th[14])*(1-th[29])*th[59]*th[118] $p[21] \le th[1] th[2] (1-th[4]) th[9] (1-th[18]) th[37] th[74] + (1-th[1]) (1-th[3]) th[7] (1$ th[14])*th[29]*(1-th[58])*(1-th[117])p[22] <-th[1]*th[2]*(1-th[4])*th[9]*(1-th[18])*th[37]*(1-th[74])+(1-th[1])*(1-th[3])*th[7]*(1-th[18])*th[7]*(1-th[18])*th[7]*(1-th[18])*th[7]*(1-th[18])*th[7]*(1-th[74])+(1-th[18])*th[7]*(1-th[74])+(1-th[18])*th[7]*(1-th[74])+(1-th[18])*th[7]*(1-th[74])+(1-th[74])*th[7]*(1-th[74])*th[7]*(1-th[74])+(1-th[74])*th[7]*(1-th[74])*th[7]*(1-th[74])+(1-th[74])*th[7]*th[14])*th[29]*(1-th[58])*th[117] p[23] <-th[1]*th[2]*(1-th[4])*th[9]*(1-th[18])*(1-th[37])*th[75]+(1-th[1])*(1-th[3])*th[7]*(th[14])*th[29]*th[58]*(1-th[116]) p[24] <-th[1]*th[2]*(1-th[4])*th[9]*(1-th[18])*(1-th[37])*(1-th[75])+(1-th[1])*(1-th[3])*th[7]*(1-th[18])*(1th[14])*th[29]*th[58]*th[116] p[25] <-th[1]*th[2]*(1-th[4])*(1-th[9])*th[19]*th[38]*th[76]+(1-th[1])*(1-th[3])*th[77]*th[14]*(1-th[3])*th[77]*th[14]*(1-th[3])*th[77]*th[14]*(1-th[3])*th[77]*th[14]*(1-th[3])*th[77]*th[14]*(1-th[3])*th[77]*th[14]*(1-th[3])*th[77]th[28])*(1-th[57])*(1-th[115]) p[26] <- th[1] * th[2] * (1-th[4]) * (1-th[9]) * th[19] * th[38] * (1-th[76]) + (1-th[1]) * (1-th[3]) * th[7] * th[14] * (1-th[76]) + (1-th[76]) * th[76]) * th[77] * th[14] * (1-th[76]) + (1-th[76]) * th[77] * th[77] * th[14] * (1-th[76]) + (1-th[76]) * th[77] *th[28])*(1-th[57])*th[115] p[27] <- th[1]*th[2]*(1-th[4])*(1-th[9])*th[19]*(1-th[38])*th[77]+(1-th[1])*(1-th[3])*th[7]*th[14]*(1-th[38])*th[77]+(th[28])*th[57]*(1-th[114])

p[28] <-th[1]*th[2]*(1-th[4])*(1-th[9])*th[19]*(1-th[38])*(1-th[77])+(1-th[1])*(1-th[19])*(1-th[1th[3] th[7] th[14] (1-th[28]) th[57] th[114]p[29] < th[1] th[2] (1-th[4]) (1-th[9]) (1-th[19]) th[39] th[78] (1-th[1]) (1-th[19]) th[39] th[78] (1-th[19]) (1-th[19]) (1-th[19]) (1-th[19]) th[39] th[78] (1-th[19]) (1-thth[3] th[7] th[14] th[28] (1-th[56]) (1-th[113])p[30] <-th[1]*th[2]*(1-th[4])*(1-th[9])*(1-th[19])*th[39]*(1-th[78])+(1-th[1])*(1-th[19])*th[39]*(1-th[78])+(1-th[19])*(1-th[19])*(1-th[19])*th[39]*(1-th[78])+(1-th[19])*(1-th[19])*th[39]*(1-th[78])+(1-th[19])*(1-th[19])*th[39]*(1-th[78])+(1-th[19])*(1-th[19])*th[39]*(1-th[78])+(1-th[19])*(1-th[19])*th[39]*(1-th[78])+(1-th[19])*(1-th[19])*th[39]*(1-th[78])+(1-th[19])*(1-th[19])*th[39]*(1-th[78])+(1-th[19])*(1-th[19])*th[39]*(1-th[78])+(1-th[19])*th[39]*(1-th[78])+(1-th[19])*th[39]*(1-th[78])+(1-th[19])*th[39]*(1-th[78])+(1-th[19])*th[39]*(1-th[78])+(1-th[19])*th[39]*(1-th[78])+(1-th[19])*th[39]*(1-th[78])+(1-th[19])*th[39]*(1-th[78])+(1-th[19])*th[39]*(1-th[78])+(1-th[19])*th[39]*(1-th[78])+(1-th[19])*th[39]*(1-th[78])+(1-th[th[3] th[7] th[14] th[28] (1-th[56]) th[113] p[31] < -th[1] * th[2] * (1-th[4]) * (1-th[9]) * (1-th[19]) * (1-th[39]) * th[79] + (1-th[1]) * (1-th[19]) * (1-th[19])th[3] th[7] th[14] th[28] th[56] (1-th[112])p[32] <-th[1]*th[2]*(1-th[4])*(1-th[9])*(1-th[19])*(1-th[39])*(1-th[79])+(1-th[1])*(1-th[19])*(1th[3])*th[7]*th[14]*th[28]*th[56]*th[112] p[33] <-th[1]*(1-th[2])*th[5]*th[10]*th[20]*th[40]*th[80]+(1-th[1])*th[3]*(1-th[6])*(1-th[13])*(1th[27])*(1-th[55])*(1-th[111]) p[34] <-
th[1]*(1-th[2])*th[5]*th[10]*th[20]*th[40]*(1-th[80])+(1-th[1])*th[3]*(1-th[6])*(1-th[13th[27])*(1-th[55])*th[111] p[35] <-th[1]*(1-th[2])*th[5]*th[10]*th[20]*(1-th[40])*th[81]+(1-th[1])*th[3]*(1-th[6])*(1-th[13]th[27])*th[55]*(1-th[110]) $p[36] \le th[1]*(1-th[2])*th[5]*th[10]*th[20]*(1-th[40])*(1-th[81])+(1-th[1])*th[3]*(1-th[6])*(1$ th[13])*(1-th[27])*th[55]*th[110] $p[37] \le th[1]*(1-th[2])*th[5]*th[10]*(1-th[20])*th[41]*th[82]+(1-th[1])*th[3]*(1-th[6])*(1-th[$ th[13])*th[27]*(1-th[54])*(1-th[109]) p[38]
<-th[1]*(1-th[2])*th[5]*th[10]*(1-th[20])*th[41]*(1-th[82])+(1-th[1])*th[3]*(1-th[6])*(1th[13])*th[27]*(1-th[54])*th[109] p[39] <-th[1]*(1-th[2])*th[5]*th[10]*(1-th[20])*(1-th[41])*th[83]+(1-th[1])*th[3]*(1-th[6])*(1th[13])*th[27]*th[54]*(1-th[108]) p[40] <-th[1]*(1-th[2])*th[5]*th[10]*(1-th[20])*(1-th[41])*(1-th[83])+(1-th[1])*th[3]*(1-th[6])*(1-th[6]th[13])*th[27]*th[54]*th[108] p[41] <-th[1]*(1-th[2])*th[5]*(1-th[10])*th[21]*th[42]*th[84]+(1-th[1])*th[3]*(1-th[6])*th[13]*(1-th[6])*tth[26])*(1-th[53])*(1-th[107]) p[42]
<-th[1]*(1-th[2])*th[5]*(1-th[10])*th[21]*th[42]*(1-th[84])+(1-th[1])*th[3]*(1-th[6])*th[13]*th[13]*(1-th[6])*th[13]*th[13]*th[13]*(1-th[6])*th[13]*th[13]*(1-th[6])*th[13]*(1-th[6])*th[13]*(1-th[6])*th[13]*(1-th[6])*th[13]*(1-th[6])*th[13]*(1-th[6])*th[13]*(1-th[6])*th[13]*(1-th[6])*th[13]*th[13]*th[13]*th[13]*th[13]*th[13]*th[13]*th[13]*th[13]*th[13]*th[13]*th[13]*th[13]*th[13]*th[13]*th[13]*th[13]*th[th[26])*(1-th[53])*th[107] p[43] <-th[1]*(1-th[2])*th[5]*(1-th[10])*th[21]*(1-th[42])*th[85]+(1-th[1])*th[3]*(1-th[6])*th[13]*th[13]*th[13]*th[13]*(1-th[6])*th[13]*th[th[26])*th[53]*(1-th[106]) p[44] < -th[1]*(1-th[2])*th[5]*(1-th[10])*th[21]*(1-th[42])*(1-th[85])+(1-th[1])*th[3]*(1-th[12))*th[3]*(1th[6])*th[13]*(1-th[26])*th[53]*th[106] p[45] <-th[1]*(1-th[2])*th[5]*(1-th[10])*(1-th[21])*th[43]*th[86]+(1-th[1])*th[3]*th[3]*th[6] th[13] th[26] (1-th[52]) (1-th[105])p[46]
<-th[1]*(1-th[2])*th[5]*(1-th[10])*(1-th[21])*th[43]*(1-th[86])+(1-th[1])*th[3]*(1-th[10])*th[3]*(1th[6] th[13] th[26] (1-th[52]) th[105]p[47] < th[1]*(1-th[2])*th[5]*(1-th[10])*(1-th[21])*(1-th[43])*th[87]+(1-th[1])*th[3]*(1-th[th[6])*th[13]*th[26]*th[52]*(1-th[104]) p[48] <-th[1]*(1-th[2])*th[5]*(1-th[10])*(1-th[21])*(1-th[43])*(1-th[87])+(1-th[1])*th[3]*(1-th[10])*th[10])*th[10])*th[10]th[6])*th[13]*th[26]*th[52]*th[104] $p[49] \le th[1]*(1-th[2])*(1-th[5])*th[11]*th[22]*th[44]*th[88]+(1-th[1])*th[3]*th[6]*(1-th[12])*(1$ th[25])*(1-th[51])*(1-th[103]) p[50] <-th[1]*(1-th[2])*(1-th[5])*th[11]*th[22]*th[44]*(1-th[88])+(1-th[1])*th[3]*th[6]*(1-th[12])*(1-th[12]th[25])*(1-th[51])*th[103] p[51]
<-th[1]*(1-th[2])*(1-th[5])*th[11]*th[22]*(1-th[44])*th[89]+(1-th[1])*th[3]*th[6]*(1-th[12])*(1-th[12]th[25])*th[51]*(1-th[102]) p[52] <-th[1]*(1-th[2])*(1-th[5])*th[11]*th[22]*(1-th[44])*(1-th[89])+(1-th[1])*th[3]*th[6]*(1-th[44])*(1-th[89])+(1-th[1])*th[3]*th[6]*(1-th[44])*(1-th[89])+(1-th[1])*th[3]*th[6]*(1-th[89])+(1-th[1])*th[3]*th[6]*(1-th[89])+(1-th[1])*th[3]*th[6]*(1-th[89])+(1-th[1])*th[3]*th[6]*(1-th[89])+(1-th[1])*th[3]*th[6]*(1-th[89])+(1-th[1])*th[3]*th[6]*(1-th[89])+(1-th[1])*th[3]*th[6]*(1-th[89])+(1-th[1])*th[3]*th[6]*(1-th[89])+(1-th[1])*th[3]*th[6]*(1-th[89])+(1-th[1])*th[3]*th[6]*(1-th[89])+(1-th[1])*th[3]*th[6]*(1-th[89])+(1-th[1])*th[3]*th[6]*(1-th[89])+(1-th[1])*th[3]*th[6]*(1-th[89])+(1-th[89])+(1-th[1])*th[3]*th[6]*(1-th[89])+(1-thth[12])*(1-th[25])*th[51]*th[102] p[53] <-th[1]*(1-th[2])*(1-th[5])*th[11]*(1-th[22])*th[45]*th[90]+(1-th[1])*th[3]*th[6]*(1-th[22])*th[45]*th[90]+(1-th[1])*th[3]*th[6]*(1-th[22])*th[45]*th[90]+(1-th[1])*th[3]*th[6]*(1-th[22])*th[45]*th[90]+(1-th[1])*th[3]*th[6]*(1-th[22])*th[45]*th[90]+(1-th[1])*th[3]*th[3]*thth[12])*th[25]*(1-th[50])*(1-th[101]) p[54] <-th[1]*(1-th[2])*(1-th[5])*th[11]*(1-th[22])*th[45]*(1-th[90])+(1-th[1])*th[3]*th[6]*(1-th[90])+(1-th[1])*th[3]*th[6]*(1-th[90])+(1-th[1])*th[3]*th[6]*(1-th[90])+(1-thth[12])*th[25]*(1-th[50])*th[101] p[55]
<-th[1]*(1-th[2])*(1-th[5])*th[11]*(1-th[22])*(1-th[45])*th[91]+(1-th[1])*th[3]*th[6]*(1-th[22])*(1-th[45])*th[91]+(1-th[1])*th[3]*th[6]*(1-th[22])*(1-th[45])*th[91]+(1-th[1])*th[3]*th[6]*(1-th[22])*(1-th[45])*th[91]+(1-th[22])*(1-th[45])*th[91]+(1-th[22])*(1-th[22])*(1-th[45])*th[91]+(1-th[22])*(1th[12])*th[25]*th[50]*(1-th[100])

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p[56] <-th[1]*(1-th[2])*(1-th[5])*th[11]*(1-th[22])*(1-th[45])*(1-th[91])+(1-th[1])*th[3]*th[6]*(1-th[22])*(1-th[45])*(1-th[91])+(1-th[1])*th[3]*th[6]*(1-th[91])*(1-th[91])+(1-th[1])*th[3]*th[6]*(1-th[91])*(1-th[91])+(1-th[1])*th[3]*th[6]*(1-th[91])*(1-th[91])+(1-th[1])*th[3]*th[6]*(1-th[91])*(1-th[91])+(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(1-th[91])*(
  th[12])*th[25]*th[50]*th[100]
  p[57] <-th[1]*(1-th[2])*(1-th[5])*(1-th[11])*th[23]*th[46]*th[92]+(1-th[1])*th[3]*th[6]*th[12]*(1-th[11])*th[3]*th[6]*th[12]*(1-th[11])*th[3]*th[6]*th[12]*(1-th[11])*th[3]*th[6]*th[12]*(1-th[11])*th[3]*th[6]*th[12]*(1-th[11])*th[3]*th[6]*th[12]*(1-th[11])*th[3]*th[6]*th[12]*(1-th[11])*th[3]*th[6]*th[12]*(1-th[11])*th[3]*th[6]*th[12]*(1-th[11])*th[3]*th[6]*th[12]*(1-th[11])*th[3]*th[6]*th[12]*(1-th[11])*th[3]*th[6]*th[12]*(1-th[11])*th[3]*th[6]*th[12]*(1-th[11])*th[3]*th[6]*th[12]*(1-th[11])*th[3]*th[6]*th[12]*(1-th[11])*th[3]*th[6]*th[12]*(1-th[11])*th[3]*th[6]*th[12]*(1-th[11])*th[3]*th[6]*th[12]*(1-th[11])*th[3]*th[6]*th[12]*(1-th[11])*th[3]*th[6]*th[12]*(1-th[11])*th[3]*th[6]*th[12]*(1-th[11])*th[3]*th[6]*th[12]*(1-th[11])*th[3]*th[6]*th[12]*(1-th[11])*th[3]*th[6]*th[12]*(1-th[11])*th[3]*th[6]*th[12]*(1-th[11])*th[3]*th[6]*th[12]*(1-th[11])*th[3]*th[6]*th[12]*(1-th[11])*th[3]*th[6]*th[12]*(1-th[11])*th[3]*th[6]*th[12]*(1-th[11])*th[3]*th[6]*th[12]*(1-th[11])*th[3]*th[6]*th[12]*(1-th[11])*th[3]*th[6]*th[12]*(1-th[11])*th[3]*th[6]*th[12]*(1-th[11])*th[3]*th[6]*th[12]*(1-th[11])*th[6]*th[12]*(1-th[11])*th[6]*th[12]*(1-th[11])*th[6]*th[12]*(1-th[11])*th[6]*th[12]*(1-th[11])*th[6]*th[12]*(1-th[11])*th[6]*th[12]*(1-th[11])*th[6]*th[12]*(1-th[11])*th[6]*th[12]*(1-th[11])*th[6]*th[12]*(1-th[11])*th[6]*th[12]*(1-th[11])*th[6]*th[12]*(1-th[11])*th[6]*th[12]*(1-th[11])*th[6]*th[12]*(1-th[11])*th[6]*th[12]*(1-th[11])*th[6]*th[12]*(1-th[11])*th[12]*(1-th[11])*th[12]*(1-th[11])*th[12]*(1-th[11])*th[12]*(1-th[11])*th[12]*(1-th[11])*th[12]*(1-th[11])*th[12]*(1-th[11])*th[12]*(1-th[11])*th[12]*(1-th[11])*th[12]*(1-th[11])*th[12]*(1-th[11])*th[12]*(1-th[11])*th[12]*(1-th[11])*th[12]*(1-th[11])*th[12]*(1-th[11])*th[12]*(1-th[11])*th[12]*(1-th[11])*th[12]*(1-th[11])*th[12]*(1-th[11])*th[12]*(1-th[11])*th[12]*(1-th[11])*th[12]*(1-th[11])*th[12]*(1-th[11])*th[12]*(1-th[11])*th[12]*(1-th[11])*th[12]*(1-th[11])*th[12]*(1-th[11])*th[12]*(1-th[11])*th[12]*(1-th[11])*th[12]*(1-th[11])*th[12]*(1-th[11])*th[12]*(1-th[11])*th[12]*(1-th
  th[24])*(1-th[49])*(1-th[99])
  p[58] <-th[1]*(1-th[2])*(1-th[5])*(1-th[11])*th[23]*th[46]*(1-th[92])+(1-th[1])*th[3]*th[6]*th[12]*(1-th[92])+(1-th[12])*(1-th[92])+(1-th[12])*(1-th[92])+(1-th[12])*(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92])+(1-th[92]
  th[24])*(1-th[49])*th[99]
  p[59] <-th[1]*(1-th[2])*(1-th[5])*(1-th[11])*th[23]*(1-th[46])*th[93]+(1-th[1])*th[3]*th[6]*th[12]*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12])*(1-th[12]
  th[24])*th[49]*(1-th[98])
  p[60] < th[1]*(1-th[2])*(1-th[5])*(1-th[11])*th[23]*(1-th[46])*(1-th[93])+(1-th[93])*(1-th[93])+(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(1-th[93])*(
  th[1] th[3] th[6] th[12] (1-th[24]) th[49] th[98]
  p[61] < th[1]*(1-th[2])*(1-th[5])*(1-th[11])*(1-th[23])*th[47]*th[94]+(1-th[23])*th[47]*th[94]+(1-th[23])*th[47]*th[94]+(1-th[23])*th[47]*th[94]+(1-th[23])*th[47]*th[94]+(1-th[23])*th[47]*th[94]+(1-th[23])*th[47]*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[23])*th[94]+(1-th[
  th[1] th[3] th[6] th[12] th[24] (1-th[48]) (1-th[97])
  p[62] < th[1]*(1-th[2])*(1-th[5])*(1-th[11])*(1-th[23])*th[47]*(1-th[94])+(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(1-th[94])*(
  th[1] th[3] th[6] th[12] th[24] (1-th[48]) th[97]
  p[63] < th[1]*(1-th[2])*(1-th[5])*(1-th[11])*(1-th[23])*(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47])*th[95]+(1-th[47
  th[1] th[3] th[6] th[12] th[24] th[48] (1-th[96])
  p[64]<-th[1]*(1-th[2])*(1-th[5])*(1-th[11])*(1-th[23])*(1-th[47])*(1-th[95])+(1-th[95])+(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*(1-th[95])*
th[1] th[3] th[6] th[12] th[24] th[48] th[96]
  for (i in 1:64)
    d[i] \le fmd[i] \ \log(max(fmd[i],1)/(p[i] \ n))
  G0 < -2* sum(d[])
    fmd2[1:64] \sim dmulti(p[1:64],n)
  for (i in 1:64)
  d2[i] \le fmd2[i] \log(max(fmd2[i],1)/(p[i]*n))
  Gt \le 2* sum(d2[])
bayesp \le step(G0 - Gt)
  th[1] \sim dbeta(1,1)
  th[2] \sim dbeta(1,1)I(0.9,1)
  th[3] \sim dbeta(1,1)I(0.8,1)
  th[4] \sim dbeta(1,1)I(0.9,1)
  th[5] \sim dbeta(1,1)I(0,0.2)
th[6]~dbeta(1,1)I(0.8,1)
th[7]~dbeta(1,1)
  th[8] \sim dbeta(1,1)I(0.8,1)
  th[9] \sim dbeta(1,1)I(0.7,1)
  th[10] \sim db eta(1,1)I(0,0.8)
  th[11] \sim db eta(1,1)I(0,0.2)
th[12] \sim dbeta(1,1)I(0.8,1)
```

 $th[13] \sim dbeta(1,1) \\th[14] \sim dbeta(1,1)I(0.8,1) \\th[15] \sim dbeta(1,1)I(0.3,1) \\th[16] \sim dbeta(1,1)I(0.5,1) \\th[17] \sim dbeta(1,1)I(0.3,1) \\th[18] \sim dbeta(1,1)I(0,3) \\th[19] \sim dbeta(1,1)I(0,3) \\th[20] \sim dbeta(1,1)I(0,0.6) \\th[21] \sim dbeta(1,1)I(0,7,1) \\th[22] \sim dbeta(1,1)I(0,0.3) \\th[23] \sim dbeta(1,1)I(0,0.2) \\th[24] \sim dbeta(1,1)I(0,9,1) \\$

 $th[25] \sim dbeta(1,1)I(0.8,1)$ $th[26] \sim dbeta(1,1)I(0.5,1)$ $th[27] \sim dbeta(1,1)I(0.7,1)$ $th[28] \sim dbeta(1,1)I(0.8,1)$ $th[29] \sim dbeta(1,1)$ $th[30] \sim dbeta(1,1)I(0.4,0.8)$ $th[31] \sim dbeta(1,1)$ $th[32] \sim dbeta(1,1)I(0.7,1)$ $th[33] \sim db eta(1,1)I(0.2,0.8)$ $th[34] \sim db eta(1,1)I(0.2,0.8)$ $th[35] \sim dbeta(1,1)$ $th[36] \sim dbeta(1,1)$ $th[37] \sim db eta(1,1)I(0,0.1)$ $th[38] \sim dbeta(1,1)$ $th[39] \sim dbeta(1,1)$ $th[40] \sim dbeta(1,1)$ $th[41] \sim dbeta(1,1)$ $th[42] \sim dbeta(1,1)$ $th[43] \sim dbeta(1,1)$ th[44]~dbeta(1,1) $th[45] \sim dbeta(1,1)$ $th[46] \sim dbeta(1,1)I(0,0.6)$ $th[47] \sim dbeta(1,1)I(0,0.2)$ $th[48] \sim db eta(1,1)I(0.9,1)$ $th[49] \sim dbeta(1,1)I(0.8,1)$ $th[50] \sim dbeta(1,1)I(0.7,1)$ th[51]~dbeta(1,1) th[52]~dbeta(1,1)I(0.6,1) th[53]~dbeta(1,1) $th[54] \sim db eta(1,1)I(0.6,1)$ $th[55] \sim dbeta(1,1)$ $th[56] \sim dbeta(1,1)I(0.8,1)$ $th[57] \sim dbeta(1,1)$ $th[58] \sim dbeta(1,1)$ $th[59] \sim dbeta(1,1)$ $th[60] \sim db eta(1,1)I(0,0.6)$ $th[61] \sim dbeta(1,1)$ $th[62] \sim dbeta(1,1)$ $th[63] \sim dbeta(1,1)$ $th[64] \sim db eta(1,1)I(0.8,1)$ $th[65] \sim dbeta(1,1)$ $th[66] \sim dbeta(1,1)$ th[67]~dbeta(1,1) $th[68] \sim dbeta(1,1)$ th[69]~dbeta(1,1)I(0.2,0.4) th[70]~dbeta(1,1) th[71]~dbeta(1,1) $th[72] \sim dbeta(1,1)$ th[73]~dbeta(1,1)I(0.4,0.6) th[74]~dbeta(1,1) $th[75] \sim dbeta(1,1)I(0,0.3)$ $th[76] \sim dbeta(1,1)$ $th[77] \sim dbeta(1,1)I(0,0.6)$ $th[78] \sim dbeta(1,1)$ th[79]~dbeta(1,1) $th[80] \sim dbeta(1,1)$ $th[81] \sim dbeta(1,1)$

 $th[82] \sim dbeta(1,1)$ th[83]~dbeta(1,1) $th[84] \sim dbeta(1,1)$ $th[85] \sim dbeta(1,1)$ $th[86] \sim dbeta(1,1)$ $th[87] \sim dbeta(1,1)$ $th[88] \sim dbeta(1,1)$ th[89]~dbeta(1,1) $th[90] \sim dbeta(1,1)$ $th[91] \sim dbeta(1,1)$ $th[92] \sim dbeta(1,1)$ th[93]~dbeta(1,1)I(0,0.3) $th[94] \sim dbeta(1,1)$ $th[95] \sim dbeta(1,1)I(0,0.2)$ $th[96] \sim dbeta(1,1)I(0.9,1)$ $th[97] \sim db eta(1,1)I(0.7,1)$ $th[98] \sim db eta(1,1)I(0.8,1)$ th[99]~dbeta(1,1) $th[100] \sim dbeta(1,1)I(0.8,1)$ $th[101] \sim dbeta(1,1)$ th[102]~dbeta(1,1) $th[103] \sim dbeta(1,1)$ $th[104] \sim dbeta(1,1)I(0.5,1)$ $th[105] \sim dbeta(1,1)I(0.5,1)$ $th[106] \sim dbeta(1,1)$ $th[107] \sim dbeta(1,1)I(0.5,0.7)$ $th[108] \sim dbeta(1,1)I(0.7,1)$ th[109]~dbeta(1,1) th[110]~dbeta(1,1) th[111]~dbeta(1,1) $th[112] \sim dbeta(1,1)I(0.7,1)$ $th[113] \sim dbeta(1,1)$ $th[114] \sim dbeta(1,1)I(0.4,0.7)$ $th[115] \sim dbeta(1,1)$ $th[116] \sim dbeta(1,1)$ $th[117] \sim dbeta(1,1)$ $th[118] \sim dbeta(1,1)$ th[119]~dbeta(1,1) $th[120] \sim dbeta(1,1)$ $th[121] \sim dbeta(1,1)$ th[122]~dbeta(1,1) th[123]~dbeta(1,1) $th[124] \sim dbeta(1,1)$ th[125]~dbeta(1,1) th[126]~dbeta(1,1) th[127]~dbeta(1,1) se[1] <- th[2]sp[1] <- th[3] $se[2] \le th[2] th[4] + (1-th[2]) th[5]$ $sp[2] \le th[3] th[6] + (1-th[3]) th[7]$ $se[3] \le th[2]*(th[4]*th[8]+(1-th[4])*th[9])+(1-th[2])*(th[5]*th[10]+(1-th[5])*th[11])$ $sp[3] \le th[3]*(th[6]*th[12]+(1-th[6])*th[13])+(1-th[3])*(th[7]*th[14]+(1-th[7])*th[15])$

se[4] <- th[2]*(th[4]*(th[8]*th[16]+(1-th[8])*th[17])+(1-th[4])*(th[9]*th[18]+(1-th[9])*th[19]))+(1-th[4])*(th[9]*th[18]+(1-th[9])*th[19]))+(1-th[4])*(th[9]*th[18]+(1-th[9])*th[19]))+(1-th[4])*(th[9]*th[18]+(1-th[9])*th[19]))+(1-th[4])*(th[9]*th[18]+(1-th[9])*th[19]))+(1-th[4])*(th[9]*th[18]+(1-th[9])*th[19]))+(1-th[4])*(th[9]*th[18]+(1-th[9])*th[19]))+(1-th[4])*(th[9]*th[18]+(1-th[9])*th[19]))+(1-th[4])*(th[9]*th[18]+(1-th[9])*th[19]))+(1-th[4])*(th[9]*th[18]+(1-th[9])*th[19]))+(1-th[4])*(th[9]*th[18]+(1-th[9])*th[19]))+(1-th[4])*(th[9]*th[18]+(1-th[9])*th[19]))+(1-th[4])*(th[9]*th[18]+(1-th[9])*th[19]))+(1-th[4])*(th[9]*th[18]+(1-th[9])*th[19]))+(1-th[4])*(th[9]*th[18]+(1-th[9])*th[19]))+(1-th[18])*(th[9]*th[18]+(1-th[9])*th[18]))+(1-th[18])*(thth[2])*(th[5]*(th[10]*th[20]+(1-th[10])*th[21])+(1-th[5])*(th[11]*th[22]+(1-th[11])*th[23]))sp[4] <- th[3]*(th[6]*(th[12]*th[24]+(1-th[12])*th[25])+(1-th[6])*(th[13]*th[26]+(1-th[6])*(th[13]*th[26]+(1-th[6])*(th[13]*th[26]+(1-th[6])*(th[13]*th[26])+(1-th[13]*th[26])+(1-th[13]*th[26th[13])*th[27]))+(1-th[3])*(th[7]*(th[14]*th[28]+(1-th[14])*th[29])+(1-th[7])*(th[15]*th[30]+(1-th[7])*(th[15th[15])*th[31])) $se51 \le th[2]*(th[4]*(th[8]*(th[16]*th[32]+(1-th[16])*th[33])+(1-th[8])*(th[17]*th[34]+(1-th[16])*th[33])+(1-th[8])*(th[17]*th[34]+(1-th[16])*th[33])+(1-th[8])*(th[17]*th[34]+(1-th[16])*th[33])+(1-th[8])*(th[17]*th[34]+(1-th[16])*th[33])+(1-th[8])*(th[17]*th[34]+(1-th[16])*th[33])+(1-th[8])*(th[17]*th[34]+(1-th[16])*th[33])+(1-th[8])*(th[17]*th[34]+(1-th[16])*th[33])+(1-th[8])*(th[17]*th[34]+(1-th[16])*th[33])+(1-th[8])*(th[17]*th[34]+(1-th[16])*th[33])+(1-th[8])*(th[17]*th[34]+(1-th[16])*th[34])+(1-th[16])*(th[17]*th[34])+(1-th[16])*th[34])+(1-th[16])*th[34]+(1-th[16])*th[34]+(1-th[16])*th[34])+(1-th[16])*th[34]+(1-th[16])*th[34])+(1-th[16])*th[34]+(1-th[16])*th[34])+(1-th[16])*th[34]+(1-th[16])*th[34])+(1-th[16])*th[34]+(1-th[16])*th[34])+(1-th[16])*th[34]+(1-th[16])*th[34])+(1-th[16])*th[34]+(1-th[16])*th[34])+(1-th[16])*th[34]+(1-th[16])*th[34])+(1-th[16])+(1-th[16])*th[34])+(1-th[16])+(1-th[16]))+(1-th[16])+(1-th[16])+(1-th[16]))+(1-th[16])+(1-th[16]))+(1-th[16]))+(1-th[16])+(1-th[16]))+(1-th[16])+(1-th[16]))+(1-th[1$ th[17])*th[35]))+(1-th[4])*(th[9]*(th[18]*th[36]+(1-th[18])*th[37])+(1-th[9])*(th[19]*th[38]+(1-th[18])*th[37])+(1-th[9])*(th[19]*th[38])+(1-th[18])*th[37])+(1-th[9])*(th[19]*th[38])+(1-th[18])*th[37])+(1-th[9])*(th[19]*th[38])+(1-th[18])*th[37])+(1-th[9])*(th[19]*th[38])+(1-th[18])*th[37])+(1-th[9])*(th[19]*th[38])+(1-th[18])*th[37])+(1-th[9])*(th[19]*th[38])+(1-th[18])*th[37])+(1-th[9])*(th[19]*th[38])+(1-th[18])*th[37])+(1-th[9])*(th[19]*th[38])+(1-th[18])*th[37])+(1-th[9])*(th[19]*th[38])+(1-th[18])*th[37])+(1-th[9])*(th[19]*th[38])+(1-th[18])*th[37])+(1-th[9])*(th[19]*th[38])+(1-th[18])+(1-th[18]))+(1-th[18])+(1-thth[19])*th[39]))) $se52 \le (1-th[2])*(th[5]*(th[10]*(th[20]*th[40]+(1-th[20])*th[41])+(1-th[10])*(th[21]*th[42]+(1-th[20])*(th[21]*th[42]+(1-th[20])*(th[21]*th[42]+(1-th[20])*(th[21]*th[42])*(th[21]*th[42])*(th[21]*th[42])*(th[21]*th[42])*(th[21]*th[42])*(th[21]*th[42])*(th[21]*th[42])*(th[21]*th[42])*(th[21]*th[42])*(th[21]*th[42])*(th[21]*th[42])*(th[21]*th[42])*(th[21]*th[42])*(th[21]*th[42])*(th[21]*th[42])*(th[41])*(t$ th[21] + th[43] + (1-th[5]) + (th[11] + (th[22] + th[44] + (1-th[22]) + th[45] + (1-th[11]) + (th[23] + th[46] + (1-th[22]) + th[45] + (1-th[11]) + (th[23] + th[46] + (1-th[22]) + th[45] + (1-th[11]) + (th[23] + th[46] + (1-th[22]) + th[45] + (1-th[11]) + (th[23] + th[46] + (1-th[22]) + th[45] + (1-th[11]) + (th[23] + th[46] + (1-th[22]) + th[45] + (1-th[11]) + (th[23] + th[46] + (1-th[22]) + th[45] + (1-th[11]) + (th[23] + th[46] + (1-th[22]) + th[45] + (1-th[11]) + (th[23] + th[46] + (1-th[22]) + th[46] + (1th[23])*th[47]))) $se[5] \le se51 + se52$ sp51 <- th[3]*(th[6]*(th[12]*(th[24]*th[48]+(1-th[24])*th[49])+(1-th[12])*(th[25]*th[50]+(1-th[24])*(th[25]*th[50]+(1-th[24])*(th[25])*th[51]))+(1-th[6])*(th[13]*(th[26])*th[52]+(1-th[26])*th[53])+(1-th[13])*(th[27]*th[54])+(1-th[26])*th[53])+(1-th[26])*th[54])+(1-th[26])*th[56])+(1-th[26])*th[56])+(1-th[26])*th[56])+(1-th[26])*th[56])+(1-th[26])*th[56])+(1-th[26])*th[56])+(1-th[26])*th[56])+(1-th[26])*th[56])+(1-th[26])*th[56])+(1-th[26])*th[56])+(1-th[26])*th[56])+(1-th[26])*th[56])+(1-th[26])*th[56])+(1-th[26])*th[56])+(1-th[26])*th[56])+(1-th[26])*th[56])+(1-th[26])*th[56])+(1-th[26])*th[26])+(1-th[26])+(1-th[26])*th[26])+(1-th[26])*th[26])+(1-th[26])*th[26])+(1-th[26])*th[26])+(1-th[26])*th[26])+(1-th[26])*th[26])+(1-th[26])*th[26])+(1-th[26])*th[26])+(1-th[26])*th[26])+(1-th[26])*th[26])+(1-th[26])*th[26])+(1-th[26])*th[26])+(1-th[26])*th[26])+(1-th[26])*th[26])+(1-th[26])*th[26])+(1-th[26])*th[26])+(1-th[26])*th[26])+(1-th[26])*th[26])+(1-th[26])+th[27])*th[55]))) sp52 <-(1-th[3])*(th[7]*(th[14]*(th[28]*th[56]+(1-th[28])*th[57])+(1-th[14])*(th[29]*th[58]+(1-th[28])*th[57])+(1-th[14])*(th[29]*th[58]+(1-th[28])*th[57])+(1-th[14])*(th[29]*th[58]+(1-th[28])*th[57])+(1-th[14])*(th[29]*th[58]+(1-th[28])*th[57])+(1-th[14])*(th[29]*th[58]+(1-th[28])*th[57])+(1-th[14])*(th[29]*th[58]+(1-th[28])*th[57])+(1-th[14])*(th[29]*th[58]+(1-th[28])*th[57])+(1-th[14])*(th[29]*th[58]+(1-th[28])*th[57])+(1-th[14])*(th[29]*th[58]+(1-th[28])*th[57])+(1-th[14])*(th[29]*th[58]+(1-th[28])*th[58])+(1-th[28])*th[58]+(1-th[28])*th[58th[29])*th[59])+(1-th[7])*(th[15]*(th[30]*th[60]+(1-th[30])*th[61])+(1-th[15])*(th[31]*th[62]+(1-th[15])*(th[31]*th[62]+(1-th[15])*(th[31])*th[62]+(1-th[15])*(th[31])*th[61])+(1-th[15])*(th[31])*th[61])+(1-th[15])*(th[31])*th[61])+(1-th[15])*(th[31])*th[62]+(1-th[31])*th[61])+(1-th[15])*(th[31])*th[62]+(1-th[31])*th[61])+(1-th[15])*(th[31])*th[62]+(1-th[31])*th[61])+(1-th[31])*th[61])+(1-th[31])*th[62]+(1-th[31])*th[61])+(1-th[31])*th[62]+(1-th[31])*th[61])+(1-th[31])*th[62]+(1-th[31])*th[62]+(1-th[31])*th[61])+(1-th[31])*th[62]+(1-th[31])*th[62]+(1-th[31])*th[62]+(1-th[31])*th[62])+(1-th[31])*th[62]+(1-th[31])*th[31])*th[31]+(1-th[31])*th[31])*th[31]+(1-th[31])*th[31]+(1-th[31])*th[31])*th[31]+(1-th[31])*th[31])*th[31]+(1-th[31])*th[31])*th[31]+(1-th[31])*th[31])*th[31]+(1-th[31])*th[31])*th[31])*th[31])*th[31])*th[31]+(1-th[31])*tth[31])*th[63]))) sp[5] <- sp51+sp52

```
\begin{split} & \text{sef}[3] (\#[65])) \\ & \text{sp}[5] <- \text{sp}51 + \text{sp}52 \\ & \text{sef}[4] (\#[4]) (\#[8]) (\#[16]) (\#[32]) (\#[64]) + (1-\#[32]) (\#[65]) + (1-\#[16])) (\#[33]) (\#[66]) + (1-\#[16])) (\#[33]) (\#[66]) + (1-\#[16])) (\#[33]) (\#[66]) + (1-\#[16])) (\#[33]) (\#[67])) + (1-\#[16]) (\#[35]) (\#[17]) (\#[35]) (\#[17])) (\#[35]) (\#[17]) (\#[35]) (\#[17]) (\#[36]) (\#[17]) (\#[36]) (\#[17]) (\#[16]) (\#[36]) (\#[17]) (\#[36]) (\#[17]) (\#[37]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17]) (\#[17)) (\#[17]) (\#[17)) (\#[17]) (\#[17)) (\#[17)) (\#[17)) (\#[17)) (\#[17)) (\#[17)) (\#[17)) (\#[17)) (\#[17)) (\#[17)) (\#[17)) (\#[17)) (\#[17)) (\#[17)) (\#[17)) (\#[17)) (\#[17)) (\#[17)) (\#[17)) (\#[17)) (\#[17)) (\#[17)) (\#[17)) (\#[17)) (\#[17)) (\#[17)) (\#[17)) (\#[17)) (\#[17)) (\#[17)) (\#[17)) (\#[17)) (\#[17)) (\#[17)) (\#[17)) (\#[17)) (\#[17)) (\#[17)) (\#[17)) (\#[17)) (\#[17)) (\#[17)) (\#[17)) (\#[17)) (\#[17)) (\#[17)) (\#[17)) (\#[17)) (\#[17)) (\#[17)) (\#[17)) (\#[17)) (\#[17)) (\#[17)) (\#[17)) (\#[17)) (\#[17)) (\#[17)) (\#[17)) (\#[17)) (\#[17)) (\#[17)) (\#[17)) (\#[17)) (\#[17)) (\#[17)) (\#[17)) (\#[17)) (\#[17)) (\#[17)) (\#[17)) (\#[17)) (\#[17)) (\#[17)) (\#[17)) (\#[17)) (\#[17)) (\#[17)) (\#[17)) (\#[17)) (\#[17)) (\#[17)) (\#[17)) (\#[17)) (\#[17)) (\#[17)) (\#[17)) (\#[17)) (\#[17)) (\#[17)) (\#[17)) (\#[17)) (\#[17)) (\#[17)) (\#[17)) (
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list(fmd = c(151, 10, 22, 4, 10, 9, 17, 14, 4, 2, 0, 2, 2, 2, 0, 0, 0, 0, 0, 0, 0, 1, 10, 0, 0, 0, 1, 10, 0, 1, 0, 0, 0, 0, 0, 4, 0, 1, 0, 1, 0, 1, 1, 4, 0, 0, 0, 0, 0, 0, 1, 12, 0, 0, 0, 4, 0, 3, 5, 92), n = 402).

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