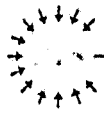
(E83-10057) MAGSAT ANOMALY FIELD INVERSION AND INTERPRETATION FOR THE US Final Report (Business and Technological Systems, Inc.) 67 p HC A04/MF A01 CSCL 08N

Unclas
G3/43 00057

BTS



BUSINESS AND TECHNOLOGICAL SYSTEMS, INC.

BTS33-82-79/rb
1001

December 1, 1982

Business and Technological Systems, Inc.
Aerospace Building, Suite 440
10210 Greenbelt Road
Seabrook, Maryland 20706

FINAL REPORT
MAGSAT ANOMALY FIELD INVERSION AND INTERPRETATION FOR THE U.S.

by
M. A. Mayhew

for

National Aeronautics and Space Administration
Goddard Space Flight Center
Greenbelt, Maryland 20771

ABSTRACT

Long wavelength anomalies in the total magnetic field measured by Magsat over the United States and adjacent areas are inverted to an equivalent layer crustal magnetization distribution. The model is based on an equal area dipole grid at the Earth's surface. Model resolution, defined as the closest dipole spacing giving a solution having physical significance, is about 220 km for Magsat data in the elevation range 300-500 km. The magnetization contours correlate well with large-scale tectonic provinces. A higher resolution (200 km) model based on relatively noise-free synthetic "pseudodata" is also presented.

Magnetic anomaly component data measured by Magsat is compared with synthetic anomaly component fields arising from an equivalent source dipole array at the Earth's surface generated from total field anomaly data alone. It is found that the synthetic components fit the component data regardless of the dipole orientation assigned to the equivalent sources and of the dipole spacing. Tentative conclusions are 1) over the U.S., vector anomaly fields can be determined to the accuracy of the measurements from the total field anomaly data alone, and 2) the equivalent source technique is not useful for determining the direction of large-scale crustal magnetization.

An excellent inverse correlation between apparent magnetization and heat flow in the western U.S. is demonstrated. A new regional heat flow map is presented and compared with published maps. A preliminary model of magnetic crustal thickness and regional heat flow based on the magnetization model is also presented. The heat flow maps derived indirectly from Magsat data "see" nearly all the important thermal anomalies evidenced in previous published maps. Notably, the map predicts high heat flow in Nebraska and the Dakotas, suggesting the presence of a "blind" geothermal area of regional extent.

1.0 INTRODUCTION

This report summarizes the results of experiments in reduction and geologic interpretation of Magsat anomaly data for the United States. Methodologies previously developed and applied to Pogo data (Mayhew et al, 1980; Mayhew, 1982a) were applied to the Magsat data with the expectation that the lower elevation of the latter would lead to higher resolution anomaly maps and magnetization source models. Additionally, investigation was made of the use of Magsat vector component anomaly data.

The analysis proceeds in three phases: 1) data processing, 2) anomaly inversion to source models, and 3) physical interpretation. The central goal of the analysis is to find a magnetization distribution in a thin equivalent layer at the Earth's surface having maximum detail while retaining physical significance, and giving rise to a synthetic anomaly field which makes a best fit to the observed field in a least squares sense. Multiplying the magnetization distribution by the layer thickness gives the distribution of the vertical integral of magnetization in the magnetic crust to within an indeterminant ambiguity in level (Mayhew, 1982b). Such a model can be transformed to a more physically meaningful model given some independent constraints, as described below and in Mayhew (1982b). The apparent magnetization contrast (Δm) in the equivalent layer is approximated using an array of dipoles distributed in equal area at the Earth's surface. In most applications the dipoles are pointed in the direction of the main magnetic field. This carries the implicit assumption that crustal magnetization is dominantly induced or viscous. There are good reasons why this assumption should generally be valid (Wasilewski and Padovani, 1980; Mayhew, 1982a), but an experiment was carried out, and is described in Section 3, involving the hypothesis that large-scale remanent magnetization is of importance in some regions.

The first phase of analysis, data processing, involves 1) selection of a quiet data set based on K_p index, 2) subtraction of a main field model to produce an anomaly data set, 3) fitting and subtracting a quadratic function from each profile to model very long wavelength external field effects in mid-latitudes, and 4) application of a running three-point

weighted filter to the profiles to minimize very high frequency "instrumental" noise in the data. Figure 1 is a track chart of profiles used in the present study; coverage is dense. The vector anomaly data was treated similarly to the scalar data. However, it is noted that of the two vector data sets available on the Investigator-B tapes, the first being a selection of every 80th point from the full data set, the second being an 80-point average, the latter was so very noisy as to be useless.

The least squares mathematics involved in inversion of the anomaly data is described briefly in the references given above and in some detail in Mayhew and Estes (1980a,b). A key element of this phase is the determination of the closest possible dipole spacing giving a "stable" inversion to a solution having physical significance. This is accomplished by plotting the standard deviation of the solution parameters (i.e. the magnetization values associated with the dipoles) against their spatial separation for a series of solutions. At separations closer than some critical one, the magnetization values become large (positive and negative) and no longer contour systematically. Figure 2 shows such a graph for Pogo data, implying a resolution limit at about 300 km separation. This is to be compared with a similar graph based on Magsat data given later in this report which implies a resolution limit approaching 200 km for this lower data. Mayhew (1982a) shows how to find a magnetization distribution on a grid twice as fine as that at the resolution limit, and this technique has been used in the present work. Again, for comparison with Magsat results, Figures 3 and 4 show a $\Delta\hat{m}$ distribution derived from Pogo and the associated magnetic anomaly field at 450 km. It will be seen that the Magsat results show considerably more detail in both kinds of maps.

For the interpretive phase, one of the most straightforward approaches is to attempt to convert the equivalent layer Δm models to models of thickness variation in a layer of constant magnetization. This is applicable, for example, to the case in which magnetic field variations reflect undulations of the Curie isotherm within the crust (this is our working hypothesis for the western U.S., as described in Section 4). The methodology is described in Mayhew (1982b), and is reiterated briefly here. The vertical integral of magnetization implied by the Δm model is $H(M+\Delta m)$, where H

is the equivalent layer thickness (arbitrarily taken to be 40km), and M is the level ambiguity in the solution, assumed to be constant. For the case of thickness variation h in a layer of constant magnetization μ, the vertical integral of magnetization is $h\mu$. These two cases are indistinguishable in the anomaly field at satellite elevation, so equating the two gives a basic equation

$$H(M+\Delta m) = \mu h. \qquad (1)$$

For the Curie depth problem, if its depth can be estimated at at least two places (by use of thermal models or spectral estimates) the unknown M and μ can be estimated, and h determined for the whole region from the Δm distribution. The implied Curie depth configuration can then be used to constrain a regional crustal geothermal model. Results of this type are given in Section 4.

To summarize the principal elements of the statement of work for this project, they are to develop preliminary and final magnetization models for the whole of the U.S., use these to constrain thermal models for the western U.S., and investigate the implications of such models in a resource context.

2.0 MAPS

Figure 5 shows a "trade-off" graph for Magsat data analogous to that of Figure 2 for Pogo data. The plot of magnetization parameter standard deviation against dipole spacing suggests a resolution limit in the vicinity of 200 km. Note that around this spacing the standard deviation of the fit of synthetic and observed (scalar) fields quickly approaches diminishing returns at a fit around .75 nT. Figure 6 shows the synthetic anomaly in the total field at 320 km due to a 136 km dipole spacing. For this spacing the fit of model field and data is about as good as can be achieved by the equivalent layer approach; it will subsequently be shown that the difference is almost entirely due to very high frequency measurement noise.

2.1 Interim Magnetization Maps

Our original magnetization map was made at a dipole spacing of 200 km, and was presented at an AGU Magsat symposium by Mayhew (1980). The large-scale features of this map can be seen in the earlier maps derived from Pogo data, but much more detail is present; some of the detail is clearly spurious, however, and it was decided that the resolution limit had been pushed too far. We subsequently backed off to 220 km, and obtained a much better map (Figure 7) which we believe represents a valid representation of magnetization variation with the maximum detail achievable with the scalar data. Good correlations with regional geology are present, as noted in the caption of Figure 7. Figure 8 is a free-air gravity anomaly map made by averaging data on a 300 km grid, and it is noted that good inverse correlations exist between the magnetization and gravity anomaly maps over much of the U.S.

2.2 Final Magnetization Map

Resolution of magnetization maps derived from anomaly data is limited largely by noise in the data. On the other hand, the field itself can be fit extremely well, to within the high-frequency noise level, by an equivalent layer model with closely-spaced dipoles. This suggests that substitution of relatively noise-free synthetic data from such an equivalent layer

model ("pseudodata") for real data might permit inversions to higher resolution magnetization models. Accordingly, a pseudodata set was generated using a 136 km spacing dipole array. This data set was then inverted to a magnetization model involving 200 km dipole arrays. The result was a good-looking map very similar to that of Figure 7, with a bit more detail, but lacking the very questionable contour features of our original 200 km map. A second map was made with dipole locations offset 50 km right and up relative to the first map. The two maps are nearly identical, differing only in very minor detail, which gives one the impression that the whole procedure provides a valid sampling of a continuous magnetization distribution. Finally, the two magnetization grids were averaged on an intermediate grid, giving a nice result: the common features of the two maps are retained, while the very minor differences are simply smoothed. The resulting map is given in Figure 9. Numerous correlations with large-scale geologic features are present. In the western United States, the pattern corresponds to large-scale heat flow provinces (e.g. Lachenbruch and Sass, 1977), and may reflect Curie isotherm undulations. In particular, the Basin and Range and Rio Grande Rift are regions of high heat flow, and are delineated by magnetization lows (possibly indicating a shallow Curie isotherm), while the relatively lower heat flow provinces of the Sierra Nevada and Colorado Plateau correspond to magnetization highs. The boundary between the Appalachian-Ouachita belt and the Precambrian craton is marked by a strong gradient along its length. The Wichita Uplift, flanked on the north by the Anadarko Basin, is marked by a magnetization gradient. It is interesting that in the western midcontinent the boundary between Mesozoic/Cenozoic cover and older rocks marks a distinct change in orientation of the magnetization anomalies. The Anadarko, Denver, Williston, and Michigan Basins all appear to be associated with magnetization positives. Table 1 is a list of the parameters of the final Δm model.

3.0 EXPERIMENT WITH VECTOR DATA

While in principle vector component data can be used as input for inversions to equivalent layer models in which dipole directions are either fixed or solved for, in practice the present component data is too noisy for this purpose. However, an experiment was carried out with the aim of seeing whether the vector data could be used to detect regions of large-scale crustal remanent magnetization. The results are reported in Galliher and Mayhew (1982), and are reviewed in this section.

3.1 Data Treatment

After "fine-attitude" processing to mathematically redefine the components in Earth, rather than spacecraft, coordinates, a 13th degree and order field model containing time terms was removed from the Magsat vector component data. Vector data was used in making the field model. The differences between the field model components and the fine-attitude-corrected components are the anomaly components. The vector sum of the anomaly components we term "delta-F". The anomaly in the total field ("delta-B") is a scalar quantity given by the difference between the magnitude of the vector sum of the measured components of the total field and the magnitude of the field model vector. Delta-B defined this way is very nearly identical with the projection of delta-F in the total field direction. While delta-F is uniquely determined by the anomaly field components, delta-B is not. The delta-B data is corrected before input to the inversion program by fitting and subtracting a quadratic function in the manner described by Mayhew (1982a). The quadratic simulates the very long wavelength fields due to magnetospheric ring currents, which are invariably present to some degree.

3.2 Induced vs. Remanent Crustal Magnetization

Orienting the dipole sources along the main field direction carries the implicit assumption that magnetization by induction (or by viscous build-up) dominates over large-scale remanent magnetization in the crust as a whole. While several compelling arguments can be made for why this should be so, such has not been demonstrated. In applying the equivalent

source technique, the dipoles can be oriented in arbitrary directions, and a good fit to the observed delta-B field can still be achieved. Thus, the delta-B field alone provides no information about the direction of magnetization in the magnetic source layer. There has been considerable speculation, however, that use of both scalar and vector anomaly data might provide such information. We thought that if the assumption that crustal magnetization is dominantly in the main field direction is valid and we inverted delta-B data to a magnetization solution, with sources at the critical spacing (220 km) and oriented in the main field direction, that the associated synthetic vector field should fit the measure vector anomaly components. We found this in fact to be the case: the equivalent source vector components fit the measured components along arbitrarily selected satellite profiles within the noise in the data (Figures 10 and 11), provided an appropriate quadratic function is removed from each component separately. We initially took this to be support for the induction hypotheses. We then tried two experiments in which the dipoles were oriented in odd directions. In the first, all were pointed in declination 45°E, inclination 35°; in the second, all were pointed with declination 45°E, inclination -35°. Again delta-B was inverted to a magnetization distribution. We expected to be able to come back with a fit to delta-B but not the components, but in fact in both cases the fit to the components was very nearly the same as the original fit. As a corollary experiment, we inverted delta-B to a magnetization distribution for a much smaller dipole spacing (136 km, an arbitrary value). Sources were pointed in the main field direction. Because the magnetization values are large and irregular at this spacing, we expected to fit delta-B slightly better than above the critical spacing, but not the components. Again, however, the fit was comparable with previous experiments, although in fact the fit of delta-B is very slightly better at this spacing than at the resolution limit. All experiments were repeated for several groups of profiles over three different areas of the U.S. with the same result. Figures 10 and 11 show two examples of the fits. In each column of these figures is shown, from bottom to top, the z, y and x components, the anomaly in the total field ("delta-B"), and the magnitude of the anomaly vector ("delta-F"). Small dots are raw anomaly data, while the smooth solid line is a quadratic function fit to this data; the scale for these plots is on the right. The

residual between them is shown as an asterisk. The quadratic is that which brings the residual into best agreement with the equivalent source synthetic field (irregular solid line); the scale for these is at the left. Dipole sources are not placed within about 32° of the magnetic north pole to avoid auroral effects, so that the equivalent source fields tend to zero at the higher latitude.

The rather surprising result described above suggests that, with the equivalent source technique, the vector anomaly field is uniquely determined by delta-B, and that it cannot be used to detect large-scale remanence. We hope at a future time to theoretically verify this empirical result.

3.3 Comments on Data Characteristics

The equivalent source field provides a reference against which the various sources of "noise" in the measured data can be evaluated (Figures 10 and 11). Clearly, the component data is much noisier than the delta-B data, although it is well within the mission specifications. Noise is of several kinds. First is the very long wavelength ring current effect modeled as a quadratic function. The three quadratic functions associated with the three components define a vector which may be of interest in future studies of the ring current field. Second, some of the profiles show a strong perturbation at high latitude approaching the auroral zone. These higher latitudes have been avoided in determining the equivalent source solution, so that the synthetic field goes to zero there. Third, the component data commonly shows local divergence from the synthetic field followed by little jumps. This is due to the accuracy limitations on the fine altitude determination. It is suggested that the equivalent source technique could help improve the accuracy of the attitude determination. Fourth, the component data commonly shows small undulations about the synthetic field which are not consistent from profile to profile and undoubtedly are small-scale external field effects.

4.0 INTERPRETATION

The interpretive phase of the present study was mainly an investigation of the relation between Δm anomalies and heat flow for the western United States. Mayhew (1982b) showed that an inverse relation exists for regionally averaged heat flow and low-resolution Δm variations inferred from Pogo data. In the first part of this section it is shown that a similar relation exists for Magsat data on a finer scale. The second part describes an investigation of whether Δm maps can be used in a more quantitative fashion to accurately predict heat flow and Curie depth.

4.1 Heat Flow Map

The production of regional heat flow maps is problematical for a number of reasons. Heat flow data sets are inherently "noisy" because of various transient, ground water, topographic, and other effects. Measurements are irregularly distributed and of variable quality. Conductive heat flow is difficult to separate from convective effects due to local movements of hydrothermal fluids or magmas in active areas.

Curie isotherm undulations should be reflected in regional heat flow variations. To the extent that Δm anomalies are due to Curie depth variations, they can be used along with heat flow measurements to guide the construction of regional heat flow maps.

An up-to-date heat flow data set was used to make two equal-area average grids slightly offset from one another. Grid spacing is 200 km. The averaging smoothes local anomalies, and the two offset grids gives a kind of running average presentation. The grid average values were printed together on a map and contoured using the Δm anomaly map (Figure 9) as a guide. The result is given in Figure 12. The idea here is that if the above hypothesis is correct it should be possible to contour the average heat flow data in such a way as to be inversely related to Δm. Figure 12 shows that this is indeed possible for nearly the whole of the western U.S., the only problem area being parts of the Basin and Range. The diffi-

culty in this region is likely to be convective effects, hydrothermal in the northern areas, hydrologic in southern Nevada, as discussed by Mayhew (1982b); note that for these problem areas adjacent average heat flow values are inconsistent with each other, probably because the values are biased by local extreme measurements due to convective phenomena. Notable features of the heat flow map of Figure 12 are as follows.

The principal heat flow lows are the Sierra Nevada-Baja California belt and the zone extending from the Colorado Plateau north through western Wyoming. The strongest heat flow high is in the Yellowstone area, broadening south to include the whole of the Basin and Range and its extension south of the Colorado Plateau. The "Battle Mountain high" of northern Nevada, a conspicuous feature of all heat flow maps based on measurements is reflected in the contours, but the "Eureka low" of southern Nevada is not; the latter has been attributed to regional ground water movement (Lachenbruch and Sass, 1977). Likewise, the Δm contours suggest much higher regional conductive heat flow along the eastern margin of the Basin and Range than is indicated by measurements. The Yellowstone high is inferred to extend northwest in eastern Idaho and Washington; the heat flow data support this inference.

A significant heat flow high is inferred for Nebraska and South Dakota, possibly extending through North Dakota. While some high heat flow values of the area support this idea, there is no obvious surface expression of tectonic or volcanic activity usually associated with regions of high heat flow, except for the Tertiary volcanics of the Black Hills uplift, suggesting the possible existence of a "blind" geothermal area of regional extent. Hot ground water is known from some parts of the region.

A heat flow high associated with the Rio Grande Rift is strongly expressed in the Δm contours as in previous maps derived from Pogo data (Mayhew, 1982b). The Δm map suggests that the heat flow anomaly extends well into southern Wyoming, but this is not supported by measurements. The Δm contours also suggest higher heat flow in southwestern-most New Mexico than is perhaps suggested by measurements.

The inference by Mayhew (1982b) that the thermal anomaly associated with the rift turns to a southeast trend in northern Mexico is not supported by the Δm contours or the average heat flow values. It is curious that the Δm contours in northern Mexico have a southwest trend quite oblique to regional tectonic trends, but seemingly consistent with the heat flow pattern.

Figures 13a and 13b are two recently published heat flow maps. Figure 13a is taken from Blackwell (1979), and is based on measurements; 13b from Swanberg et al (in press) is based principally on silica geothermometry. There is a remarkable correspondence between features of these maps and the heat flow map presented here. A comparison is tabulated in Table 2.

Figure 14 shows the distribution of major mineral localities in the western U.S. with respect to the Δm distribution. One gross generalization can be made, that with the exception of the Sierran localities, nearly all of the mineral deposits lie within or along the margins of Δm lows. This is to be expected if the lows are associated with elevated heat flow which is in turn related to young magmatic or hydrothermal activity. It is suggested that more detailed investigation of these relationships in local areas might profitably be undertaken.

4.2 Heat Flow/Curie Depth Models

In this section is described a quantitative approach to modeling heat flow and Curie depth variations using the Δm model derived from Magsat data, under the hypothesis that Δm variations reflect variations in depth-to-magnetic bottom. The basic equation is (1), from which variations in magnetic crustal thickness h are computed from variation in Δm. Estimates are needed for the parameters M and μ in equation (1). These are gotten by fitting a line to a plot of estimates of range of h derived from spectral depth estimates, depth to 550°C (the assumed Curie temperature) given by thermal models constrained by surface heat flow measurements, or, in the case of the Sierra Nevada, seismic estimates of depth to mantle, against range of Δm for the corresponding areas. The Moho is

assumed to be the magnetic bottom for the Sierras, since the very low heat flow values measured along the axis of the belt imply depths to 550° well into the mantle, which is assumed to be non-magnetic (Wasilewski et al, 1979). The plot is given as Figure 15. Sources of the values plotted are listed in Table 3. The ranges of values are rather large, but give an overall trend in the right direction. The dashed line shown implies values for M and μ of 0.65 and 1.0 A/m, respectively. These values can be used to compute h for the whole map area, and this is shown for the above model by the contours in Figure 16. Also shown for comparison are estimates of depth to 550°C. given by a one-dimensional thermal model using a set of average heat flow values. The model assumes constant surface heat production decaying exponentially with depth, and constant thermal conductivity. The equation is given by Mayhew (1982b). The agreement is fair of some areas, poor in other, notably much of the Rio Grande Rift. Assuming the model depth values contoured in Figure 16 represent an isothermal surface, the same thermal model can be used to compute predicted heat flow. This is done in Figure 17 (contoured values) and compared with the grid average measurements (printed values). Again, while favorable agreement exists in some areas, there is disagreement in others. The exercise undoubtedly suffers from problems arising from many simplistic assumptions on both sides, data limitations, and blanket treatment of a very large region. In fact it is somewhat remarkable, and even encouraging, that there is any agreement at all. It is worth listing the assumptions inherent in the analysis.

- Magnetization is constant throughout the magnetic crust.
- The Δm model level ambiguity is constant throughout the map area.
- Δm variations reflect only magnetic crustal thickness variations, which are completely resolved.
- Curie temperature is constant.
- Heat production in the crust decays exponentially with depth from a constant surface value.
- Thermal conductivity is constant throughout the crust.
- Gridded heat flow values accurately represent area averages.
- Heat flow is by conduction only.
- One-dimensional heat flow models give a valid first-order approximation.

While one can have no great confidence in the quantitative estimates of regional heat flow given by Figure 17, it is suggested that the methodology is promising provided that 1) more limited areas are treated, 2) better estimates of model parameters are obtained, and 3) a critical evaluation of available heat flow measurements and of the importance of the convective component is made. Geothermal resource potential maps can be produced from a good thermal model derived from a Δm model. For example, the theoretical conductive heat content per unit area in the outer 3 km of the Earth implied by models such as those of Figures 16 and 17 is given by the following equation (Diment et al, 1975)

$$\overline{Q} = C \int_0^3 T dz,$$

where $\overline{Q}$ is heat content in a 3 km column of unit area, C is volumetric specific heat (assumed constant and equal to 0.6 cal/cm^3 °C), T is temperature, z is depth.

REFERENCES

Ander, M. E., Geophysical study of the crust and upper mantle beneath the central Rio Grande Rift and adjacent Great Plains and Colorado Plateau. Los Alamos Scientific Laboratory Report LA-8676-T, 218 pp., 1981.

Bhattacharyya, B. K., and L. K. Leu, Analysis of magnetic anomalies over Yellowstone National Park: Mapping of Curie point isothermal surface for geothermal reconnaissance, J. Geophys. Res., 80, 4461-4465, 1975.

Blackwell, D. D., The thermal structure of the continental crust, in The Structure and Physcial Properties of the Earth's Crust, Geophys. Monogr. Ser., vol. 14, edited by J. D. Heacock, pp. 169-184, AGU, Washington, DC, 1971.

Blackwell, D. D., Heat flow and energy loss in the western United States, Mem. Geol. Soc. Am. 152, 175-208, 1979.

Cordell, L., Regional gephysical setting of the Rio Grande Rift, Geol. Soc. Am. Bull., 89, 1073-1090, 1978.

Diment, W. H., T. C. Urban, J. H. Sass, B. V. Marshall, R. J. Munroe, and A. H. Lachenbruch, Temperatures and heat contents based on conductive transport of heat, U. S. Geological Survey Circ. 726, 84-103, 1975.

Eaton, G. P., R. R. Wahl, H. J. Prostka, D. R. Mabey, and M. D. Kleinkopf, Regional gravity and tectonic patterns: Their relation to late Cenozoic epeirogeny and lateral spreading in the western cordillera, Mem. Geol. Soc. Am. 152, 51-91, 1979.

Galliher, S. C. and M. A. Mayhew, On the Possibility of detecting large-scale crustal remanent magnetization with Magsat vector magnetic anomaly data. Geophysical Research Letters 9, 325-328, 1982.

Keller, G. R., L. W. Braile, and P. Morgan, Crustal structure, geophysical models and contemporary tectonism of the Colorado Plateau, Tectonophysics 16, 131-147, 1979.

Lachenbruch, A. H., and J. H. Sass, Heat flow in the United States and the thermal regime of the crust, in The Nature and Physial Properties of the Earth's Crust, Geophys. Monogr. Ser., Vol. 20, edited by J. G. Heacock, 625-675, AGU, Washington, D.C., 1977.

Mayhew, M. A., Initial equivalent layer magnetization model for the United States based on Magsat data. EOS 62, 270, 1981.

Mayhew, M. A., An equivalent layer magnetization model for the United States derived from satellite-altitude magnetic anomalies, Journal of Geophysical Research 87, 4837-4845, 1982a.

Mayhew, M. A., Application of satellite magnetic anomaly data to Curie isotherm mapping, Journal of Geophysical Research 87, 4846-4854, 1982b.

Mayhew, M. A., B. D. Johnson and R. A. Langel, An equivalent source model of the satellite-altitude magnetic anomaly field over Australia. Earth and Planetary Science Letters 51, 189-198, 1980.

Mayhew, M. A. and R. H. Estes, Simulations and software development related to Magsat data. Final Report, National Aeronautics and Space Administration/Goddard Space Flight Center Contract NAS 5-25720, Volume 1, 87 pp., 1980.

Mayhew, M. A. and R. H. Estes, Constrained inversion of satellite magnetic anomaly data. Final Report, National Aeronautics and Space Administration/Goddard Space Flight Center Contract NAS 5-25698, Volume 3, 68 pp., 1981.

McGetchin, R. R., and L. T. Silver, A crust-upper mantle model for the Colorado Plateau based on observations of crystalline rock fragments in the Moses rock dike, J. Geophys. Res., 77, 7022-7037, 1972.

Pakiser, L. C. and J. N. Brune, Seismic models of the root of the Sierra Nevada, Science 210, 1088-1094.

Roy, R. F., D. D. Blackwell, and E. R. Decker, Continental heat flow, in The Nature of the Solid Earth, edited by E. C. Robertson, pp. 506-543, McGraw-Hill, New York, 1972.

Shuey, R. T., D. K. Schellinger, E. H. Johnson and L. B. Alley, Aeromagnetics and the transition between the Colorado Plateau and the Basin Range province, Geology, 1, 107-110, 1973.

Shuey, R. T., D. K. Schellinger, A. C. Tripp, and L. G. Alley, Curie depth determination from aeromagnetic spectra, Geophys. J. R. Astron. Soc. 50, 75-101, 1977.

Swanberg, C. A., and P. Morgan, Heat flow map the United States based on silica geothermometry, in Physical Properties of Rocks, vol. II-2 edited by Touloukian, H. S., W. R. Judd, and R. F. Roy, in press, McGraw-Hill, 1982.

Wasilewski, P. J. and E. Padovani, Magnetization in the lower crust (abstract), EOS Trans. AGU 61, 222, 1980.

Wasilewski, P. J., H. H. Thomas, and M. A. Mayhew, The Moho as a magnetic boundary, Geophys. Res. Lett., 6, 541-544, 1979.

FIGURE CAPTIONS

Fig. 1 Magsat satellite tracks indicate data coverage for this study.

Fig. 2 Trade-off between (1) fit of equivalent source magnetic anomaly field arising from equal area source array at Earth's surface and observed field at satellite elevation and (2) 'stability' of inversion as measured simply by standard deviation of solution parameters. Optimal solution inferred to be at source spacing of about 300 km. Graphs for eastern and western halves of map area shown separately; sd means standard deviation. From Mayhew (1982a).

Fig. 3 Apparent magnetization contrast in 40 km thick layer obtained from inversion of satellite magnetic anomaly data. Model is series of 300 km dipole grids computed separately but machine contoured together without smoothing on 150 km grid. Contour interval is 0.1 A/m. For simple model of uniformly magnetized magnetic crustal layer, magnetization values are proportional to magnetic layer thickness. From Mayhew (1982a).

Fig. 4 Equivalent source representation of magnetic anomaly field at 450 km elevation. Equal area source distribution at 200 km spacing. Contour interval 0.5 nT. From Mayhew (1982a).

Fig. 5 Trade-off as a function of dipole spacing (kilometers) between 1) the fit of the equivalent source magnetic anomaly field to the field observed at satellite elevations (tenths of nT) and 2) 'stability' of inversion as indicated by standard deviation of solution parameters (tenths of A/m). Optimal solution inferred to be source spacing of about 220 km. SD means standard deviation. From Mayhew and Galliher (1982).

Fig. 6 Equivalent source representation of magnetic anomaly field at a height of 320 km. Source spacing is 136 km. Contour interval 1nT. Albers equal area projection. From Mayhew and Galliher (1982).

Fig. 7 Apparent magnetization contrast in a 40 km thick layer. Distribution is obtained by inversion of Magsat total field anomaly data. Model is series of staggered 222 km - spacing dipole grids computed separately, but machine contoured together without smoothing on 111 km grid. Contour interval is 0.1 A/m. Dashed lines indicate generalized tectonic province boundaries which are geographically related to the magnetization distribution. Letters represent the following; S: Sierra Nevada block, BR: Basin and Range province, CP: Colorado Plateau, R: Rio Grande Rift, SR: Snake River Plain, P: western boundary of Great Plains, A: Appalachian Ouachita front, W: Wichita uplift, K: Kentucky anomaly, LS: lake Superior Syncline. Boundary between Mesozoic/Cenozoic cover and older rocks is indicated by short dashed line. Albers equal area projection. From Mayhew and Galliher (1982).

Fig. 8 300 km grid average free-air gravity. Contour interval 10 mgal.

Fig. 9 Apparent magnetization contrast (Δm) in 40 km layer derived from pseudodata set as described in text. Contour interval for 9a is 0.05 A/m. Contour interval for 9b is 0.2 A/m. Some geologic provinces labeled as in Figure 7. Other features are MCR: Mid-Continent-Rift, Ad: Adirondacks, Ab: Anadarko Basin, Db: Denver Basin, Wb: Williston Basin.

Fig. 10 Comparison of data with equivalent source magnetic anomaly field computed from 136 km grid for nearly north-south Magsat profiles over eastern U.S. at about 276°E. Horizontal scale is degrees latitude; vertical scale is nT. From Galliher and Mayhew (1982).

Fig. 11 As in Fig. 10 for two nearly north-south profiles over western U.S. midcontinent at about 260°E. From Galliher and Mayhew (1982).

Fig. 12 Contours of heat flow averaged over two staggered 200 km grids (one grid shown) and guided by Δm distribution of Figure 9. Contour interval 0.5 HFU.

Fig. 13 Two published heat flow maps to be compared with that of Figure 12. Figure 13a from Blackwell (1979), 13b from Swanberg et al (in press).

Fig. 14 Major western mineral localities from Ander (1981) compared with Δm distribution of Figure 9.

Fig. 15 Estimates of magnetic crustal thickness based on aeromagnetic spectra, depth to 550°C (assumed Curie temperature), or, for Sierran region, seismic crustal thickness. Dashed line implies true (constant) magnetic crustal magnetization of 1 A/m. Sources of estimates given in Table 2.

Fig. 16 Estimates of depth to 550°C. based on one-dimensional thermal model and Δm distribution shown as contours. Contour interval 10 km. Depth to 550° based on same thermal model and observed heat flow averages printed.

Fig. 17 Theoretical heat flow implied by Δm distribution and thermal model shown as contours. Contour interval 0.5 HFU. Average observed heat flow values printed.

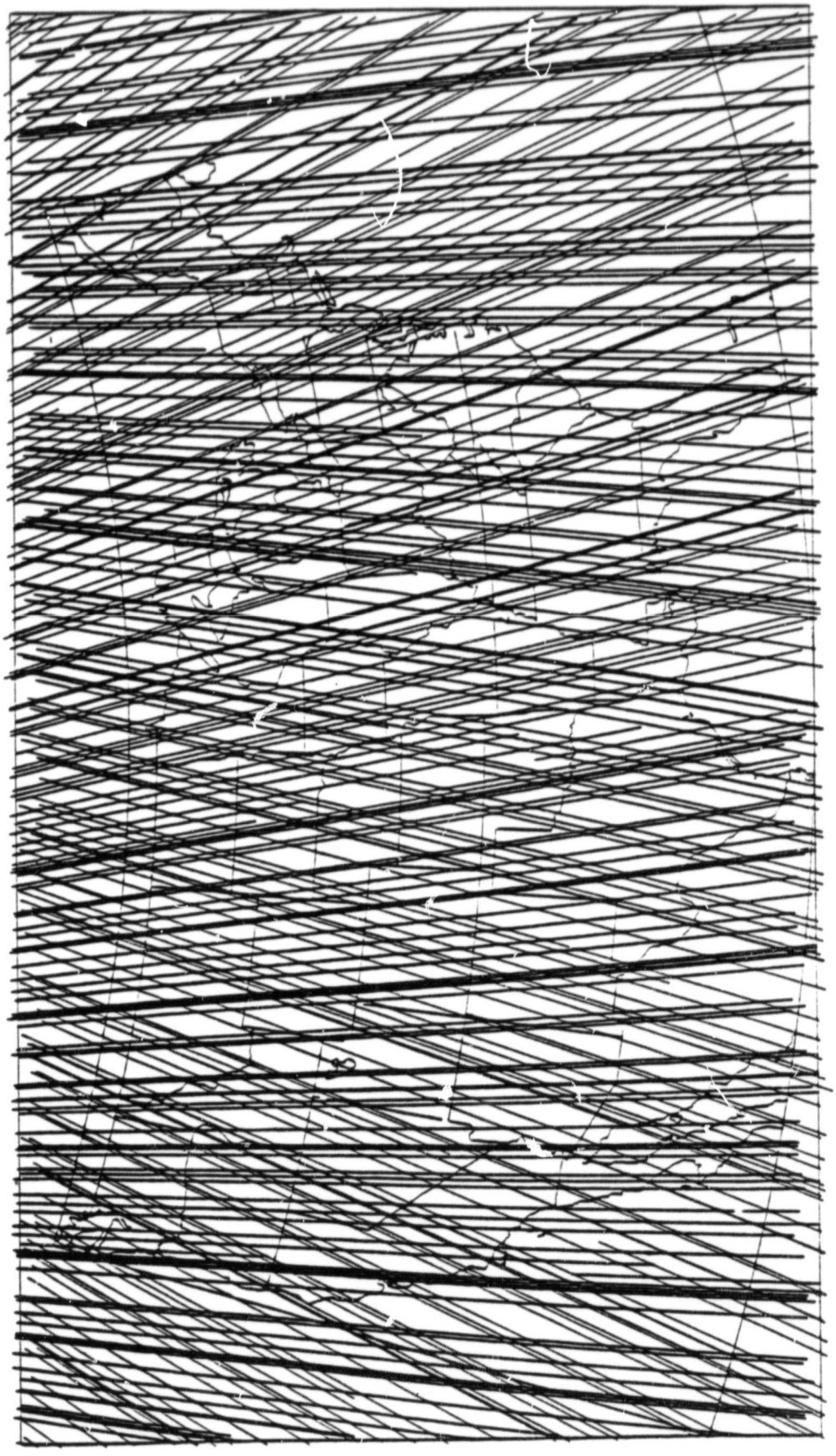


Figure 1

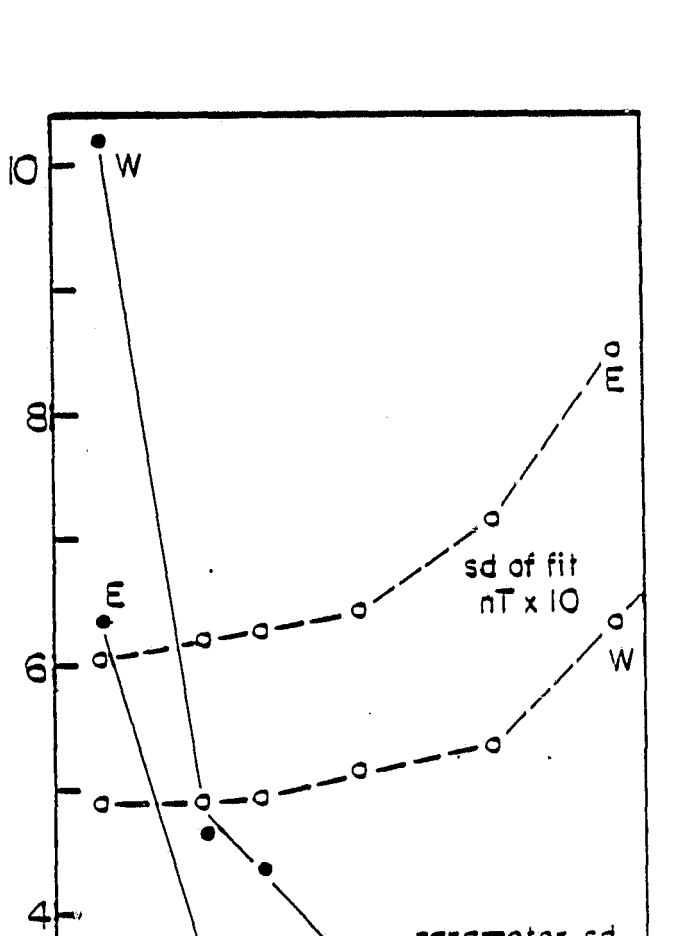


Figure 2

Equivalent layer magnetization model derived from inversion of Pogo data

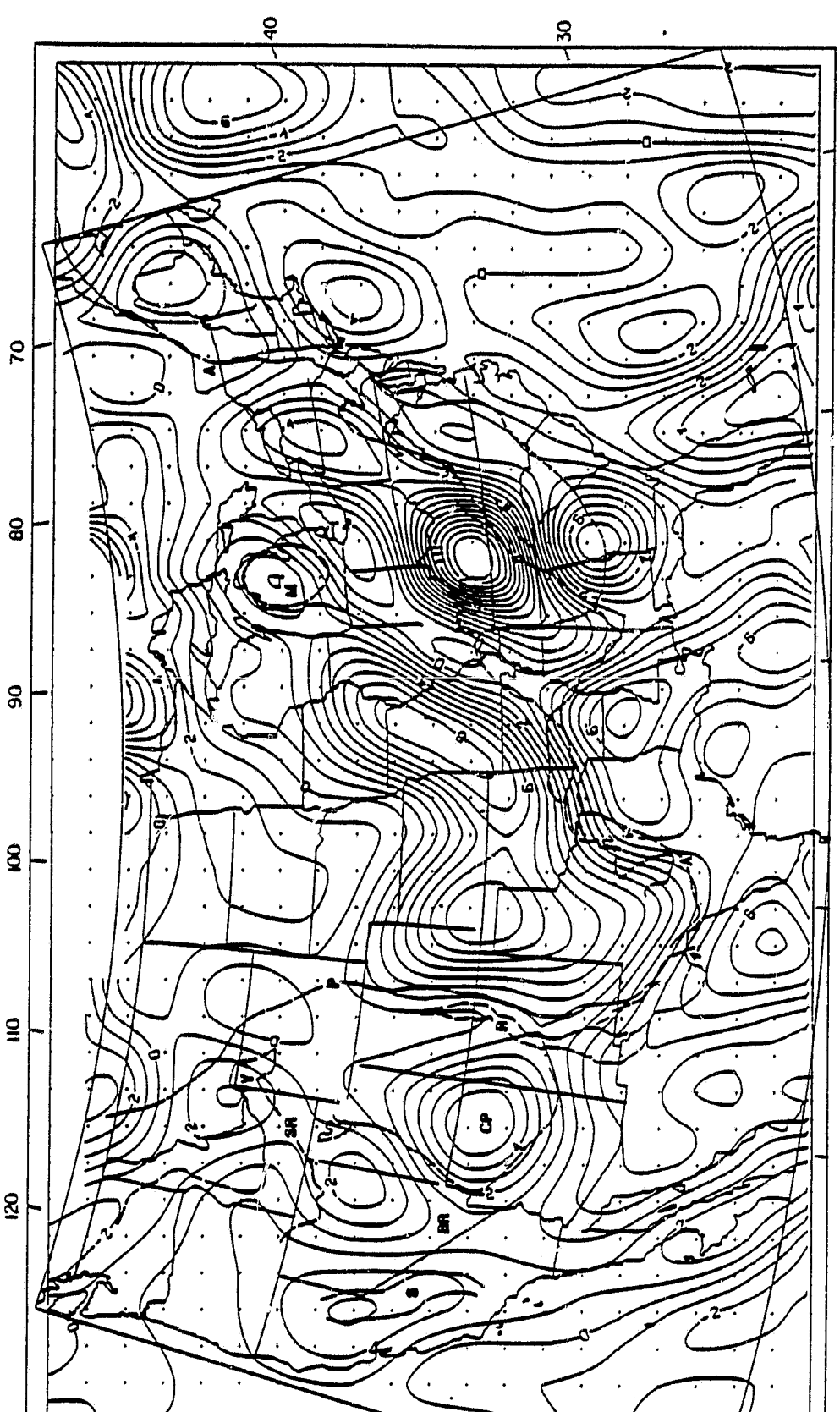


Figure 3

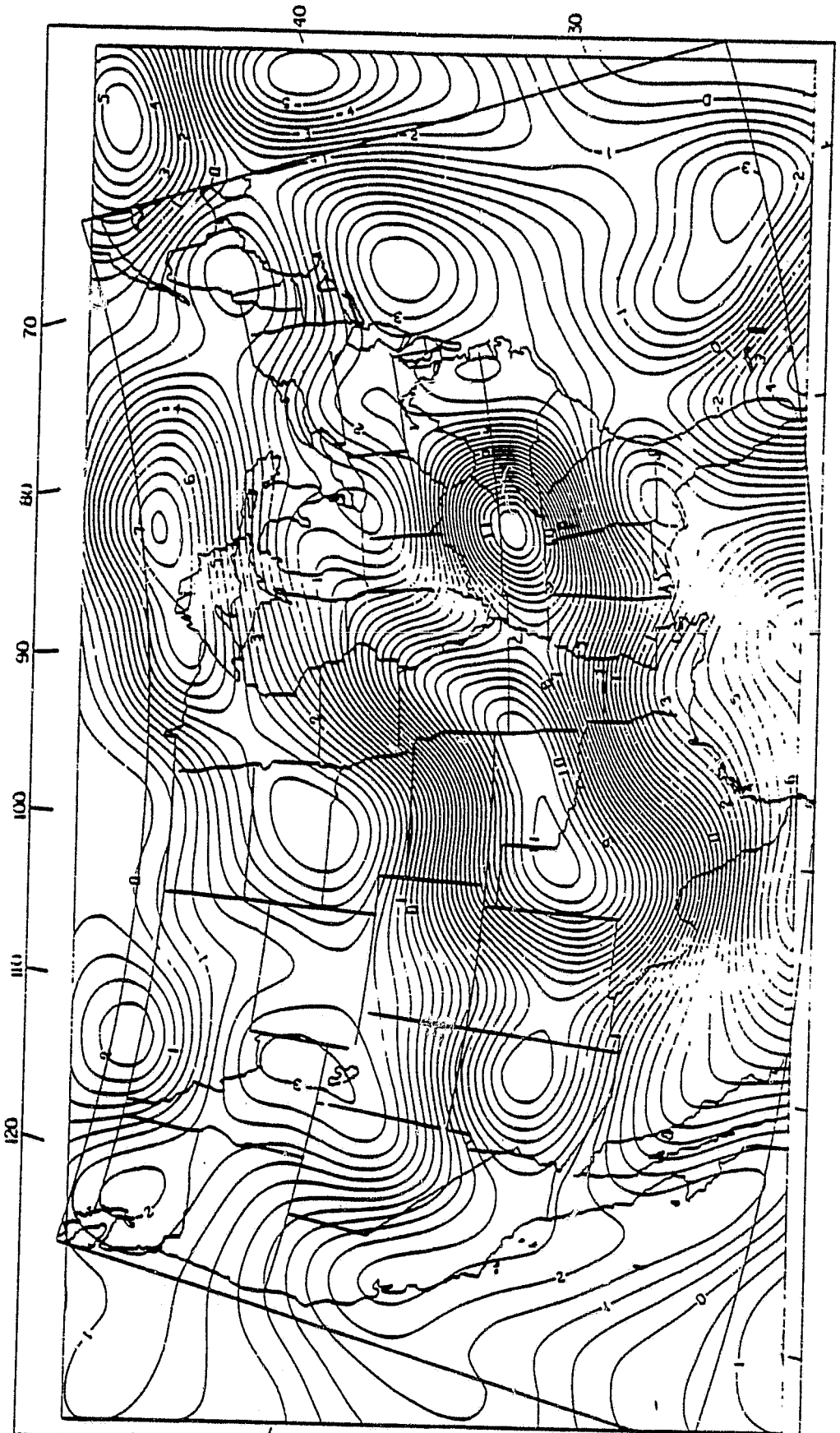


Figure 4

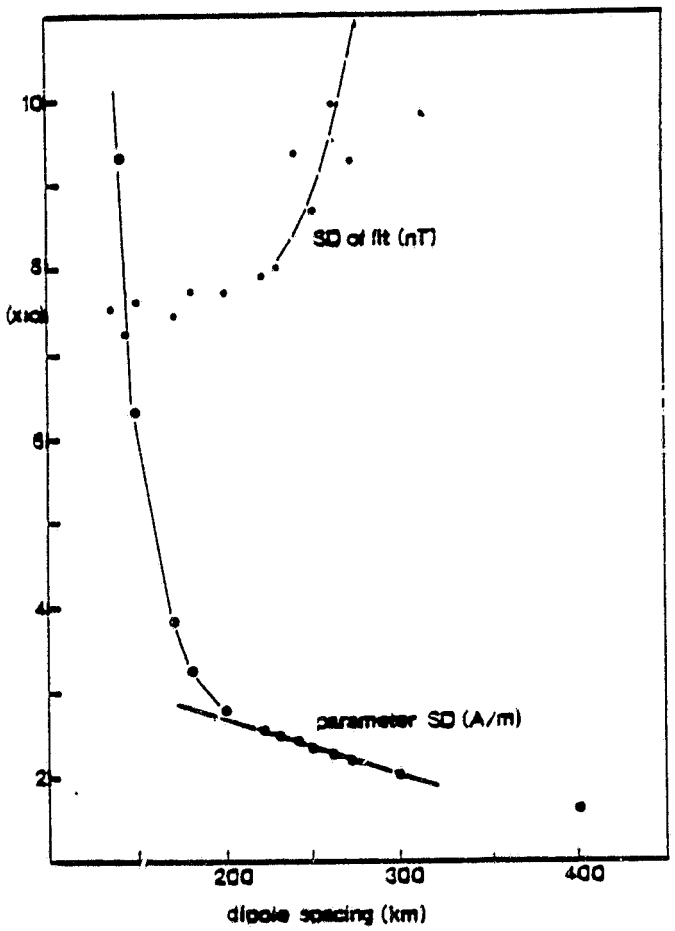


Figure 5

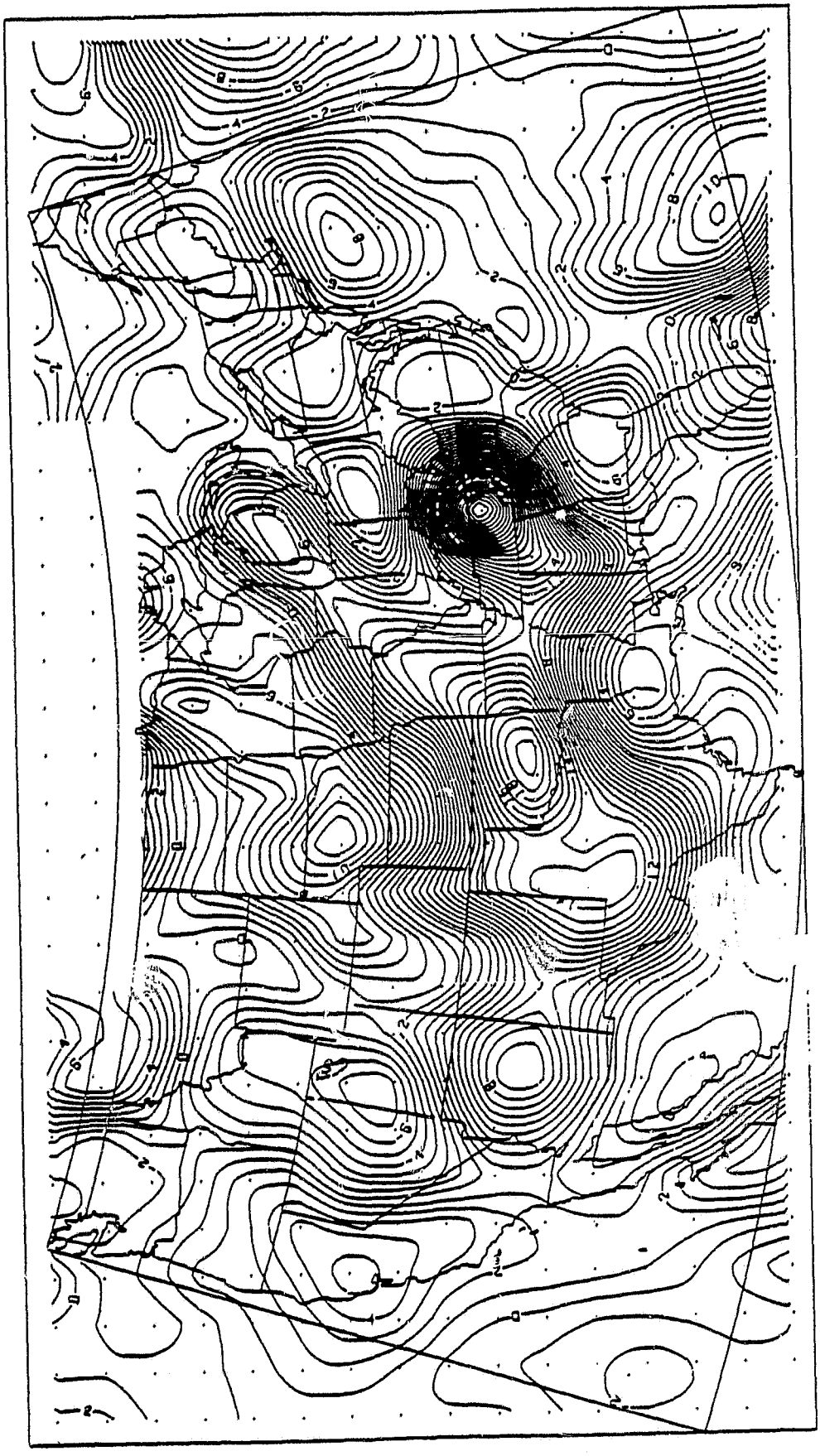


Figure 6

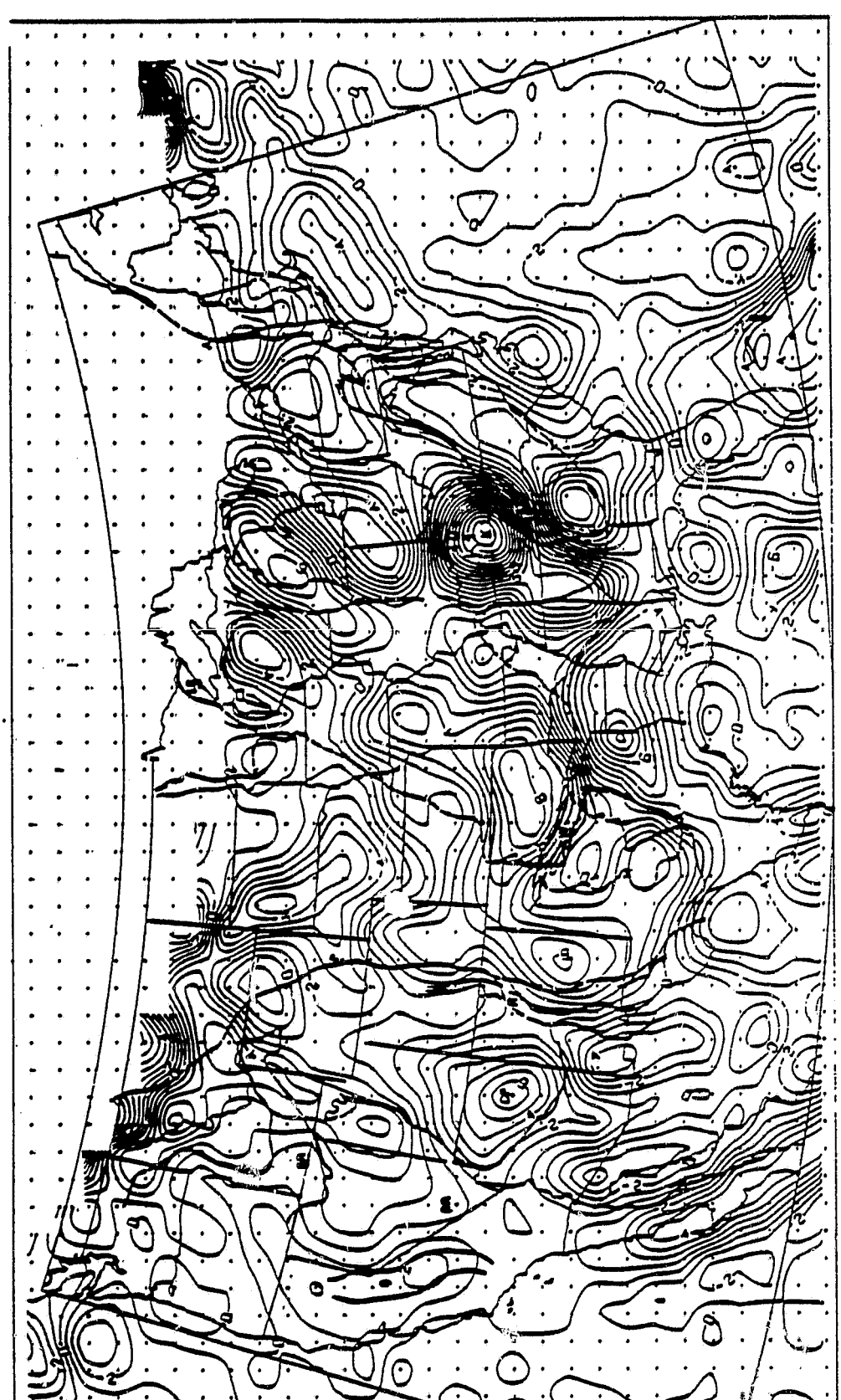


Figure 7

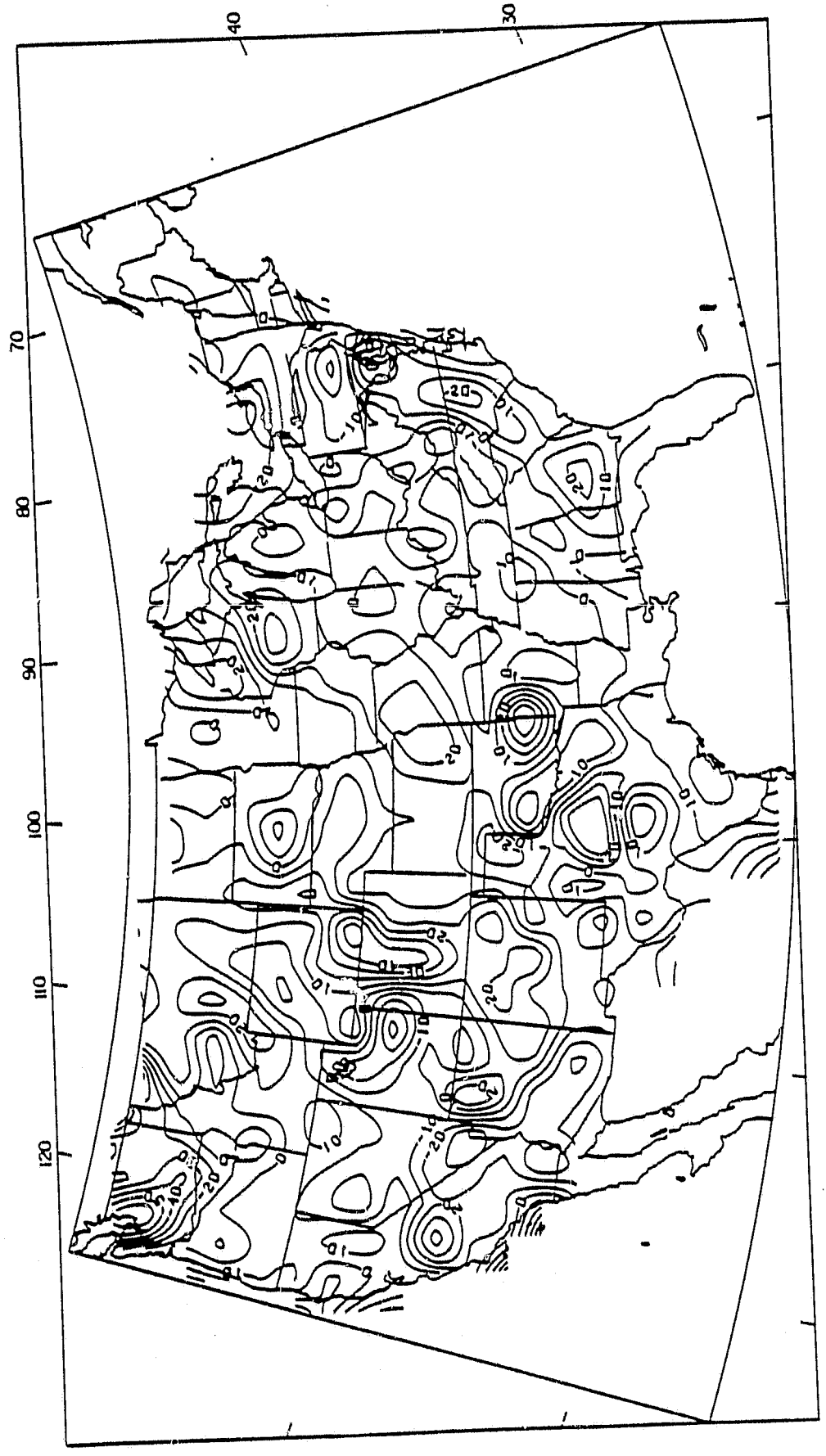


Figure 8

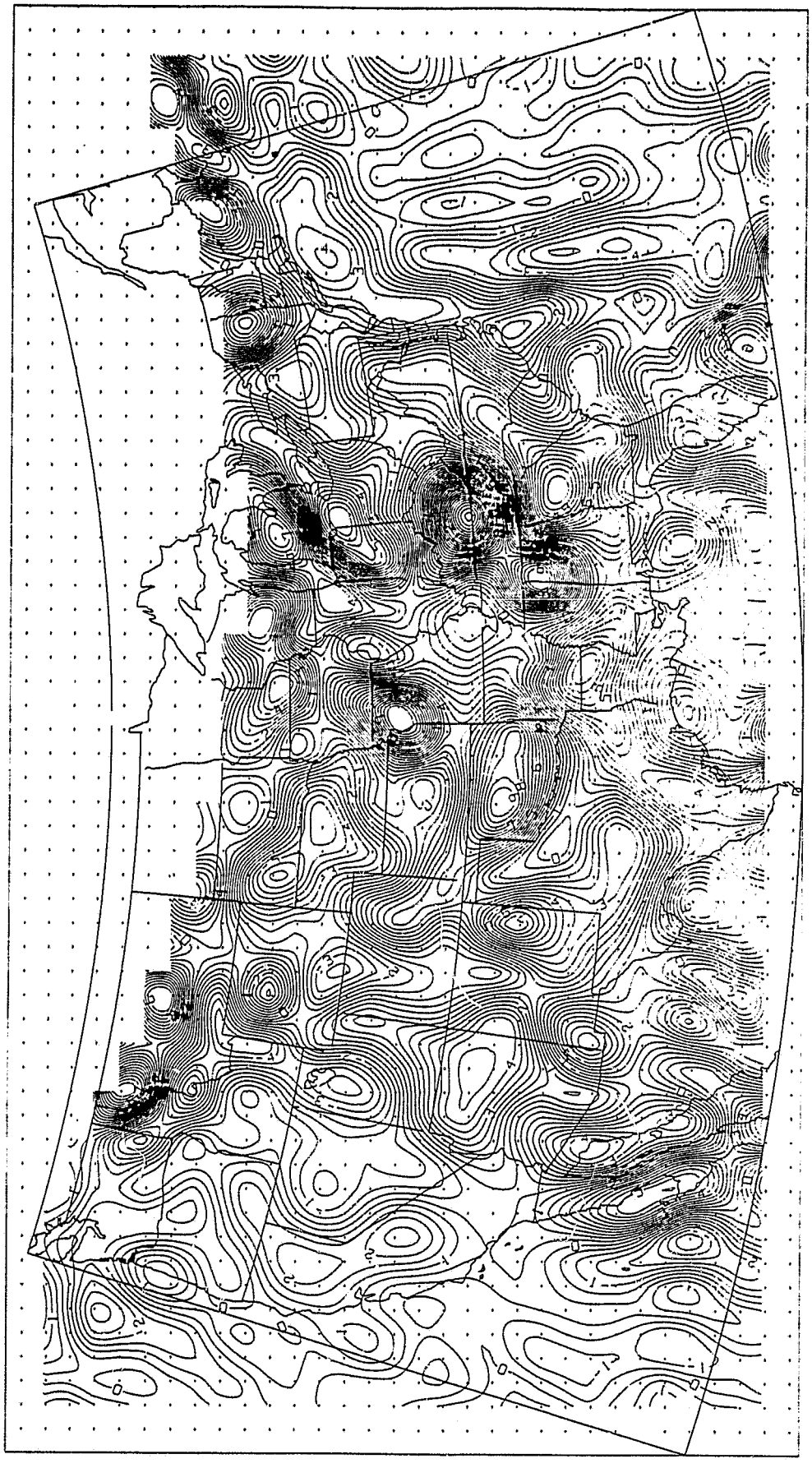


Figure 9a

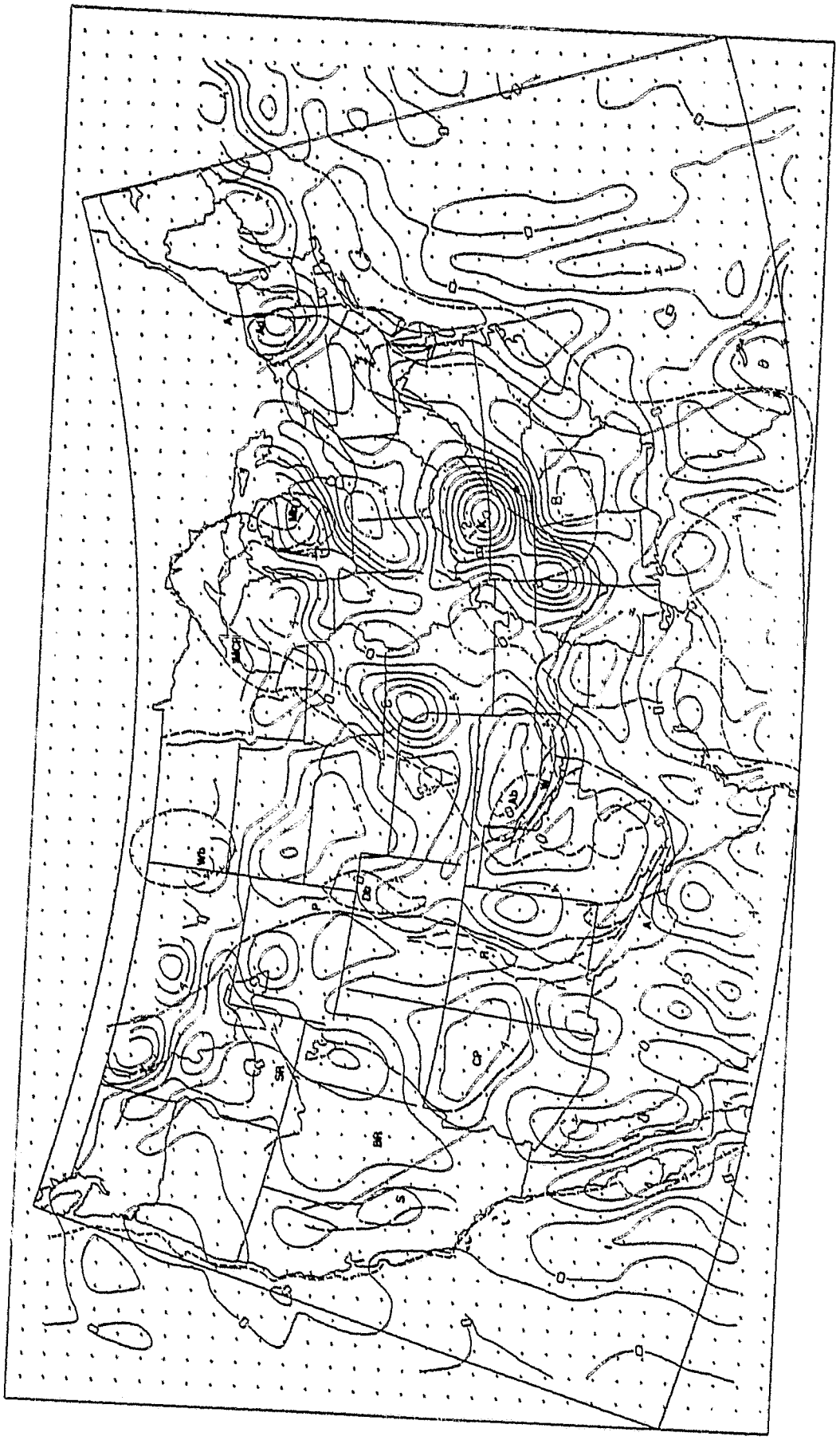


Figure 9b

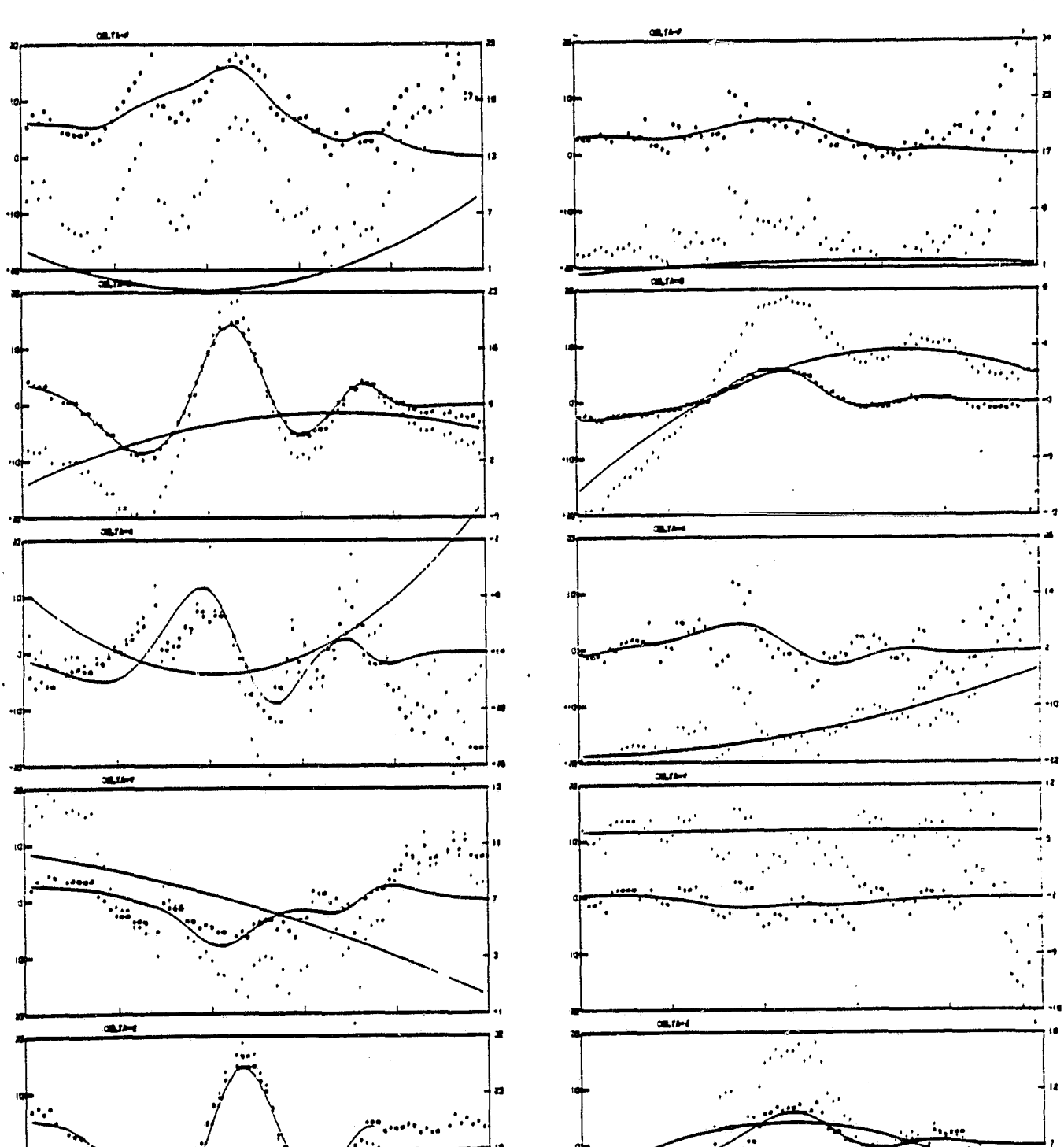


Figure 10

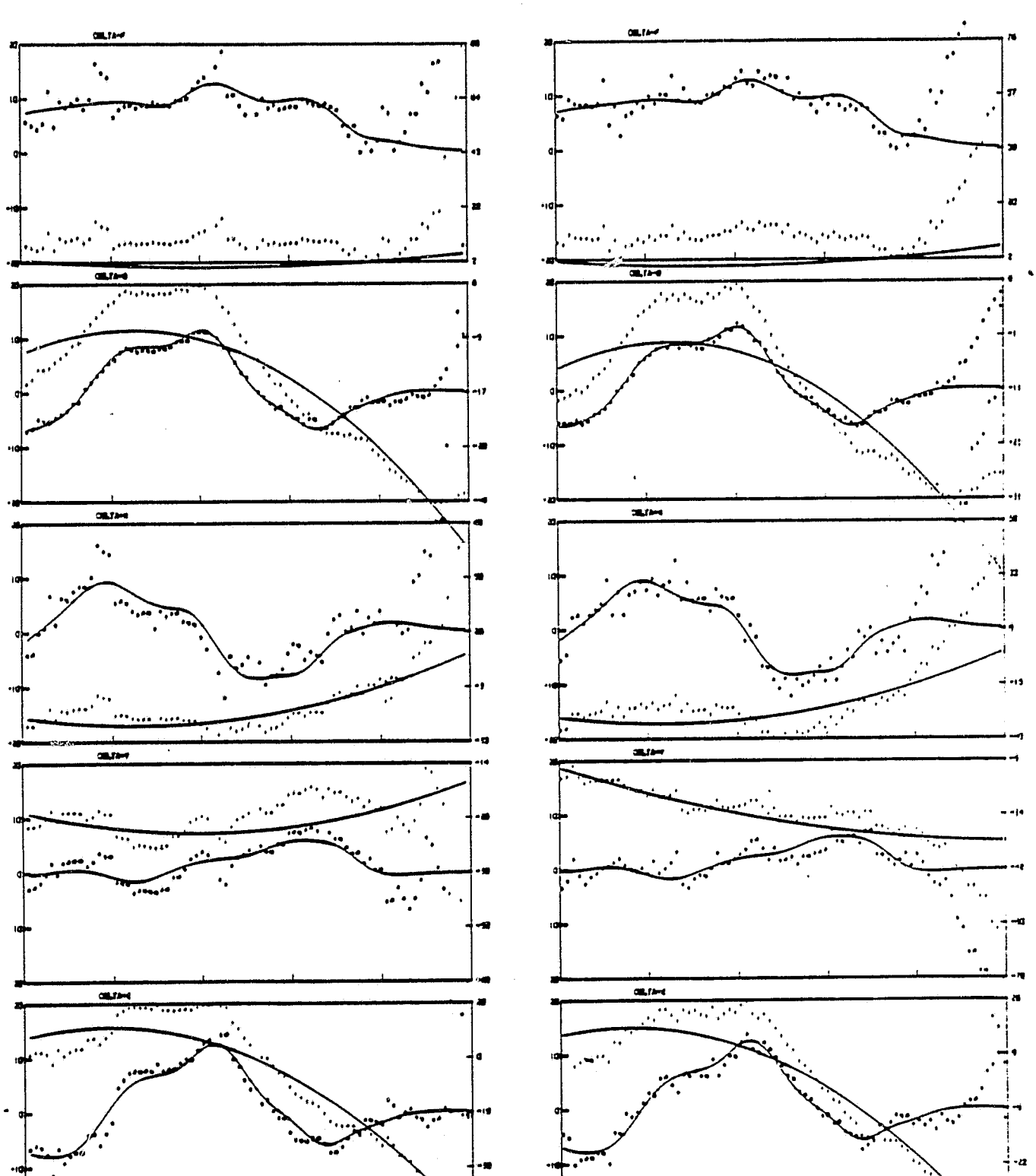


Figure 11

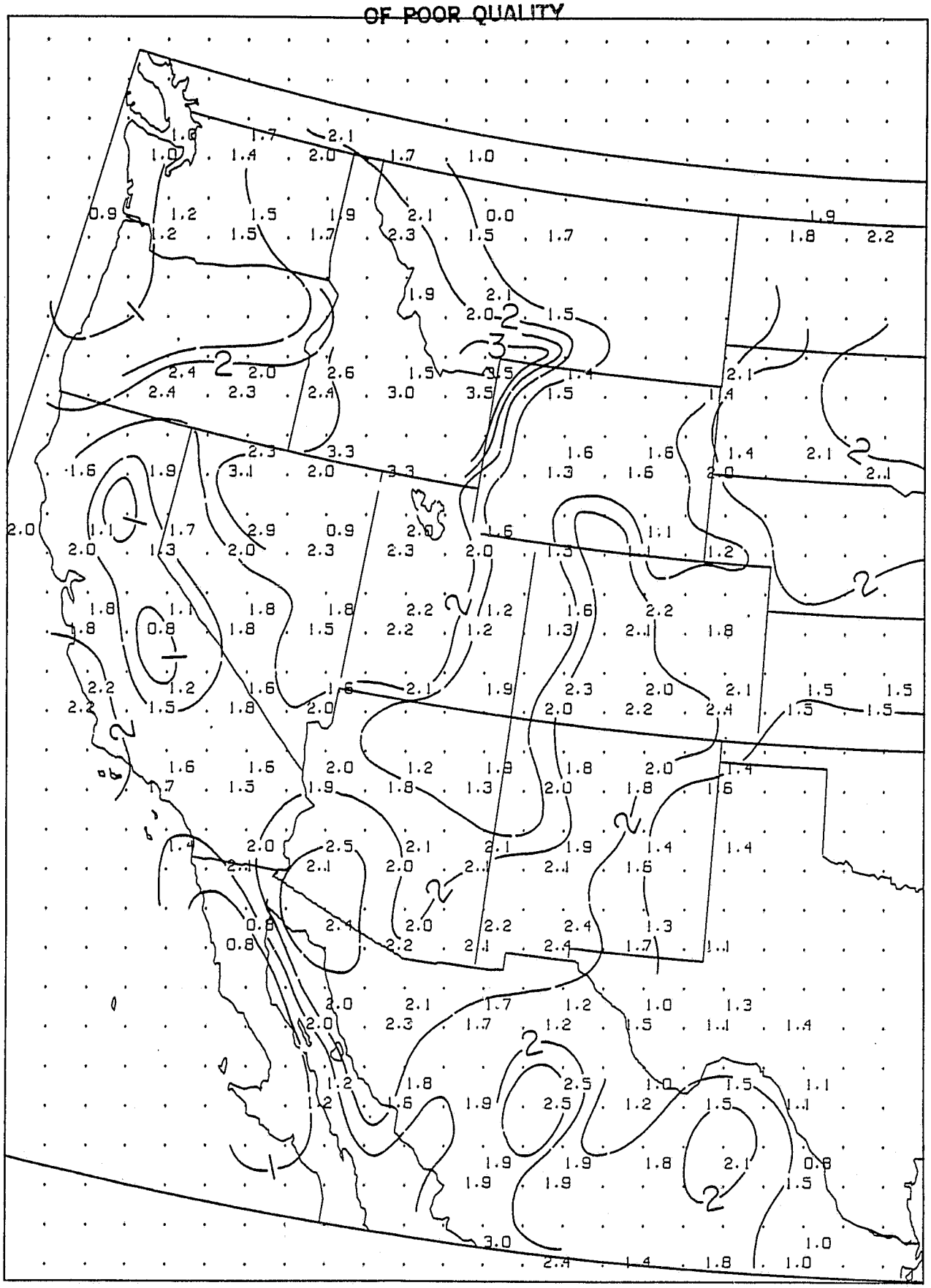


Figure 12

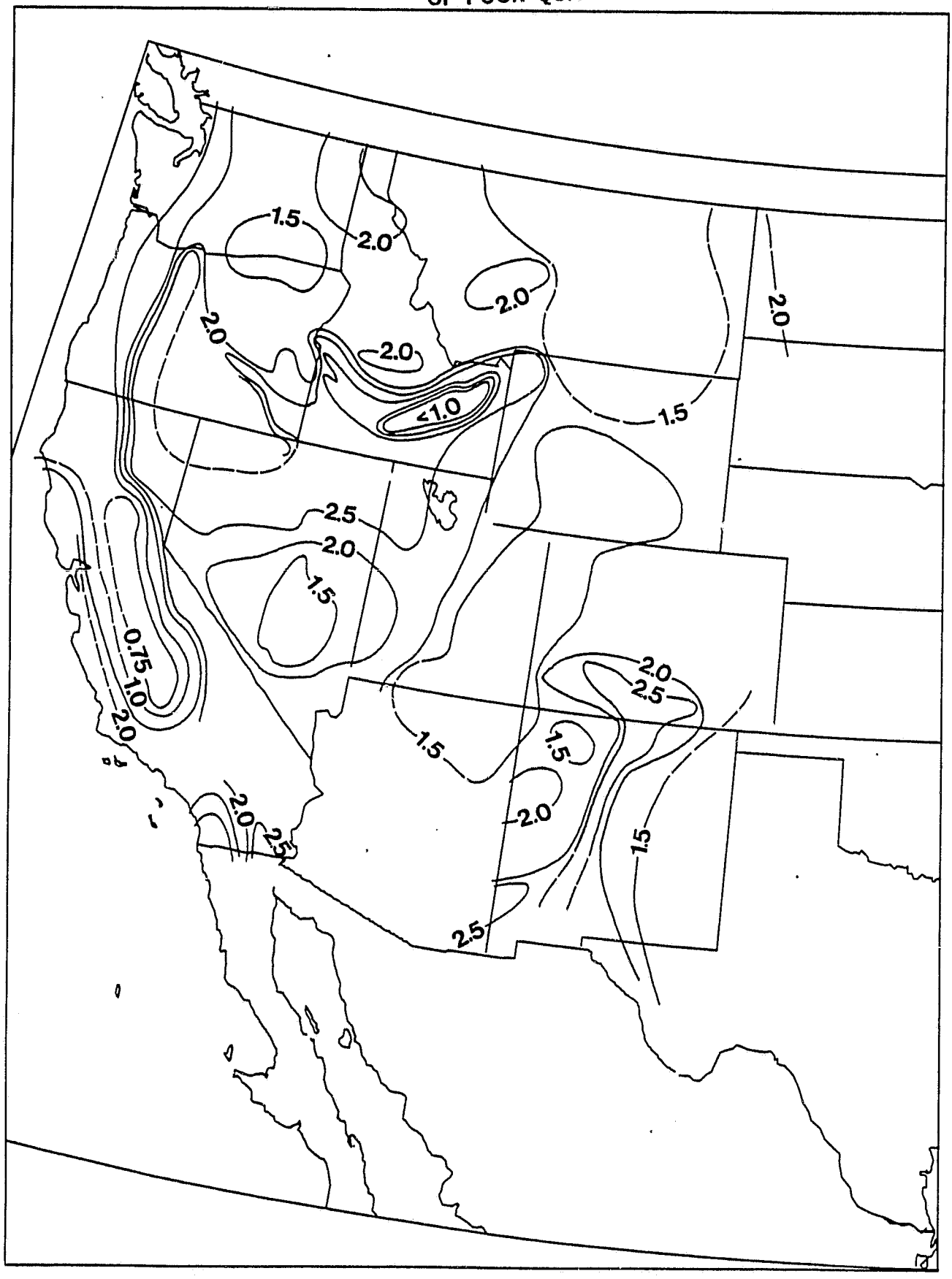


Figure 13a

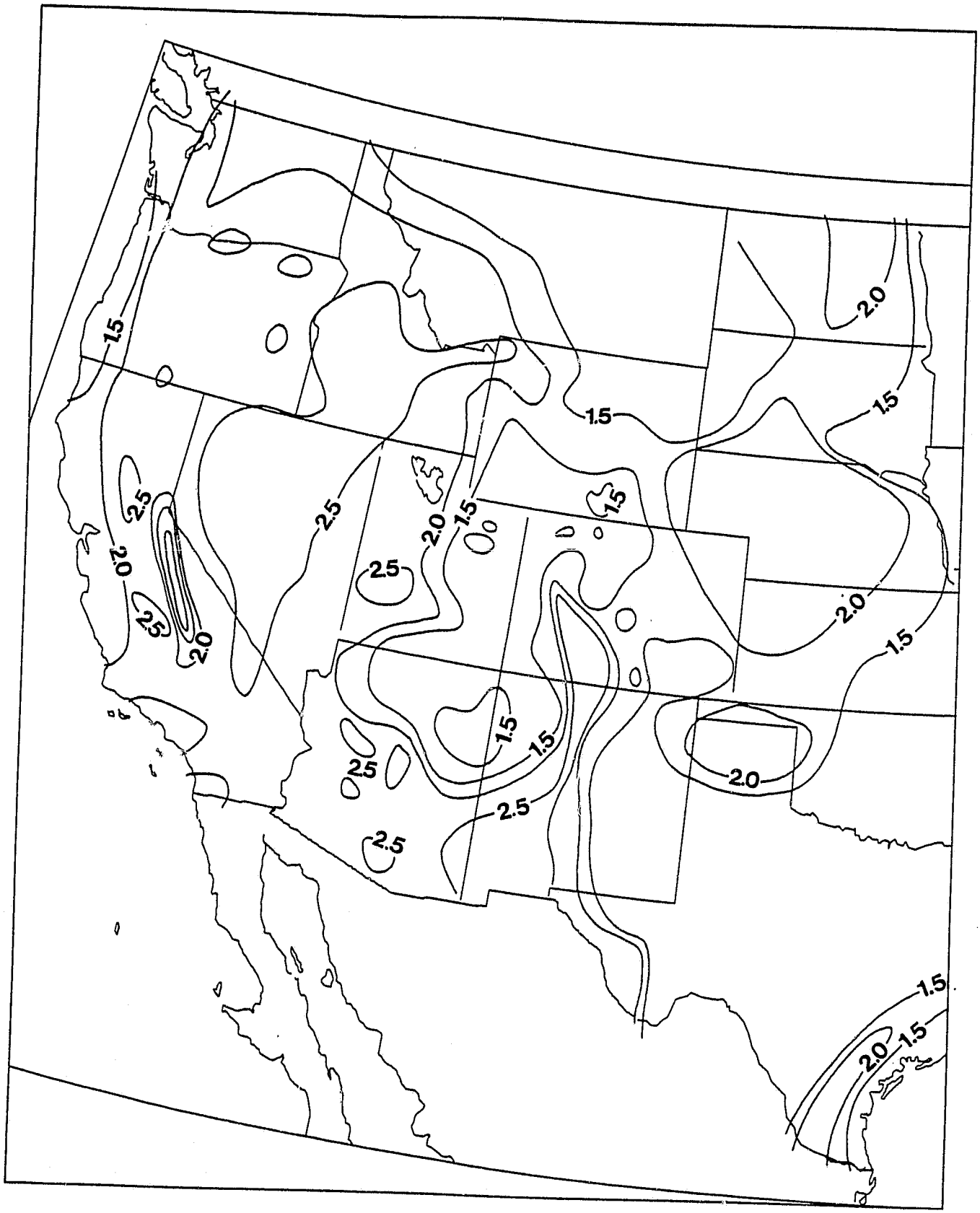


Figure 13b

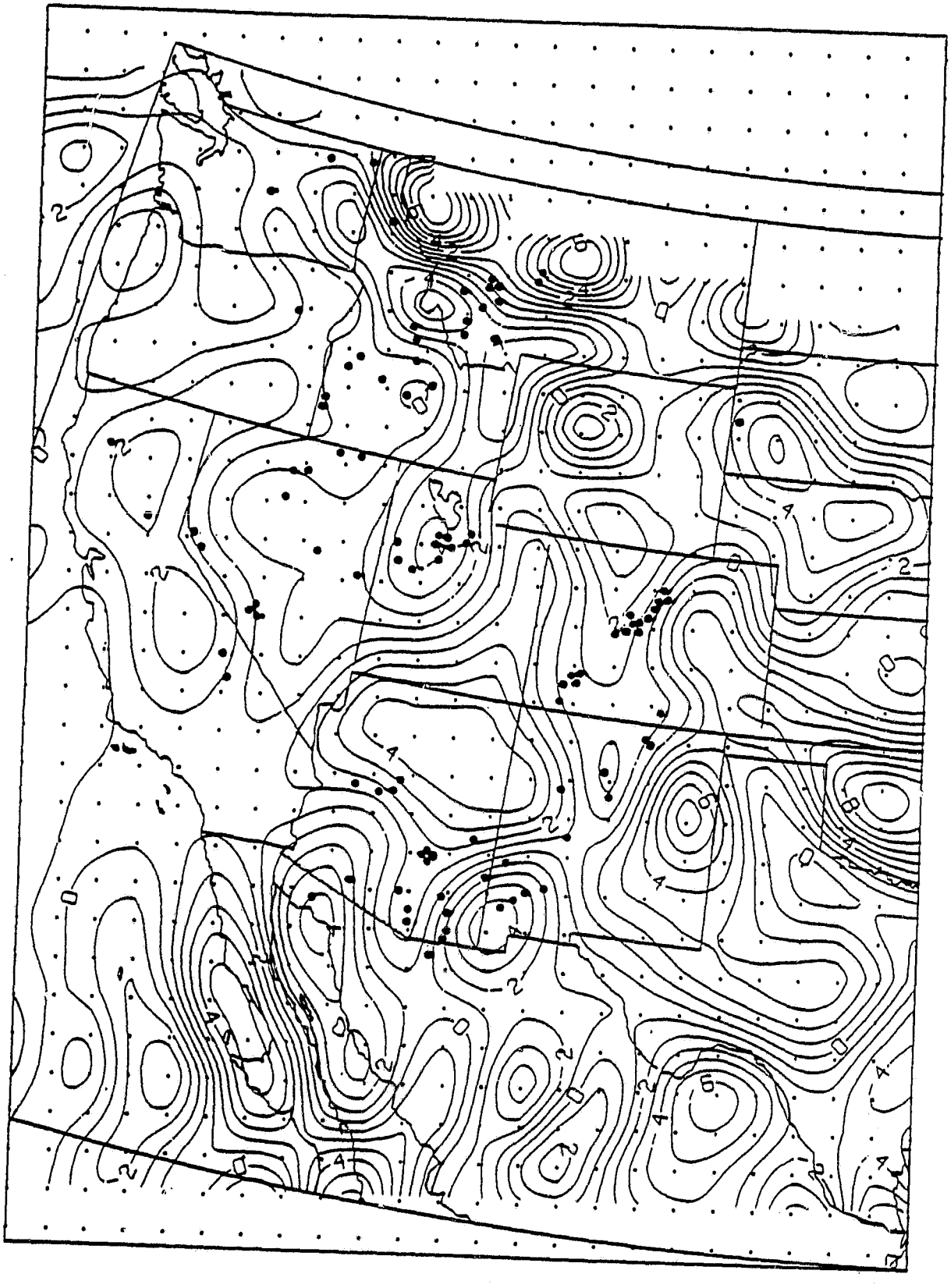


Figure 14

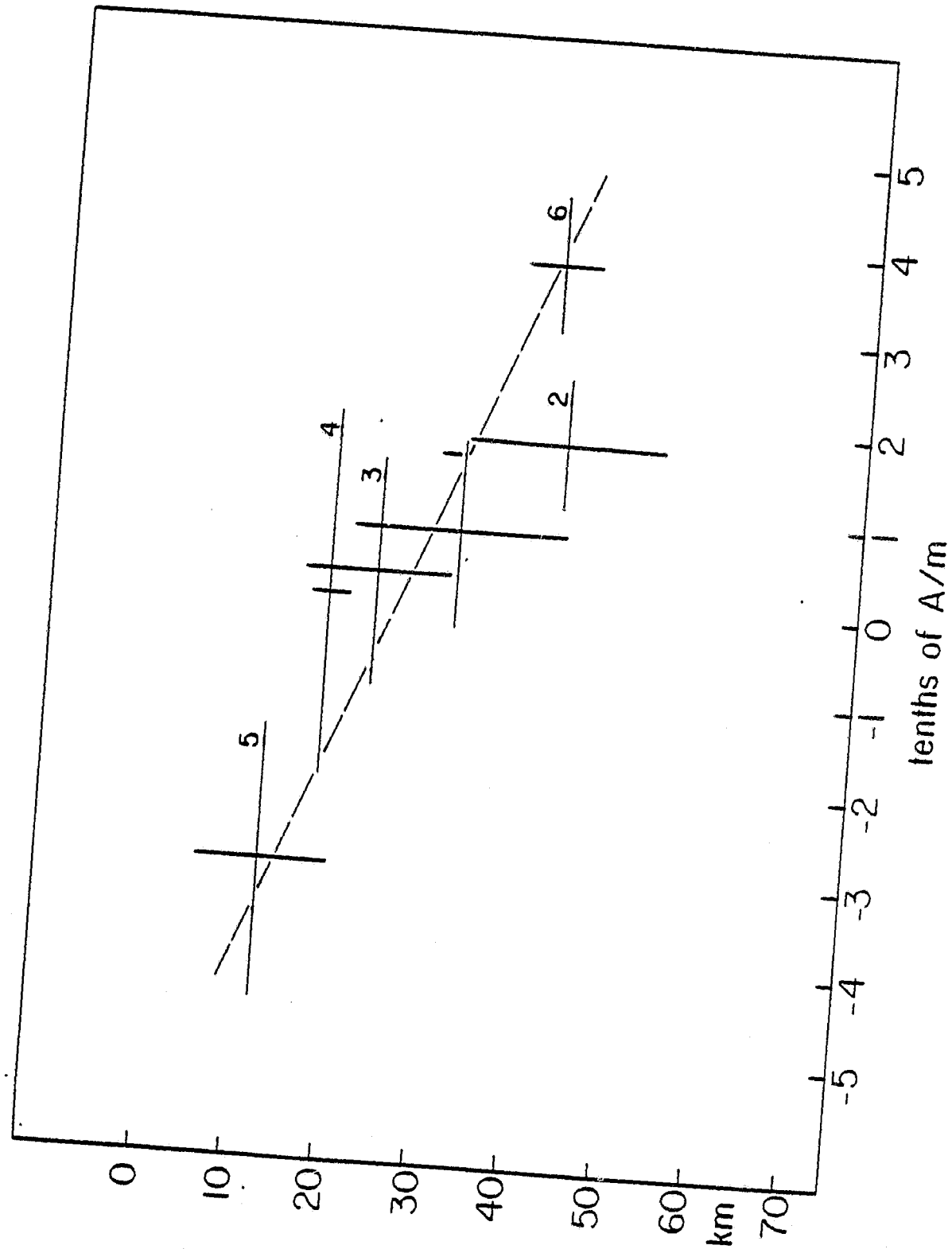


Figure 15

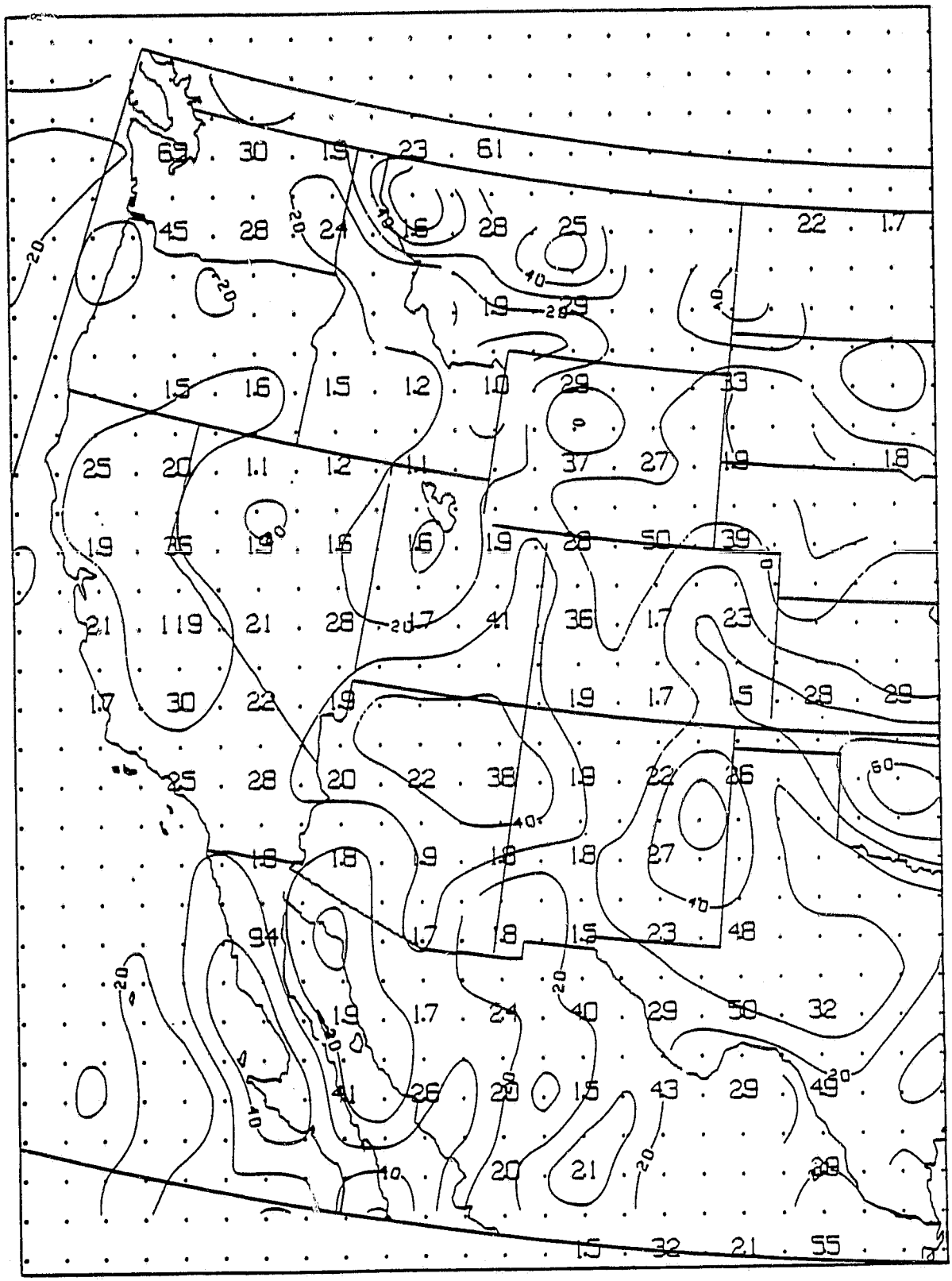


Figure 16

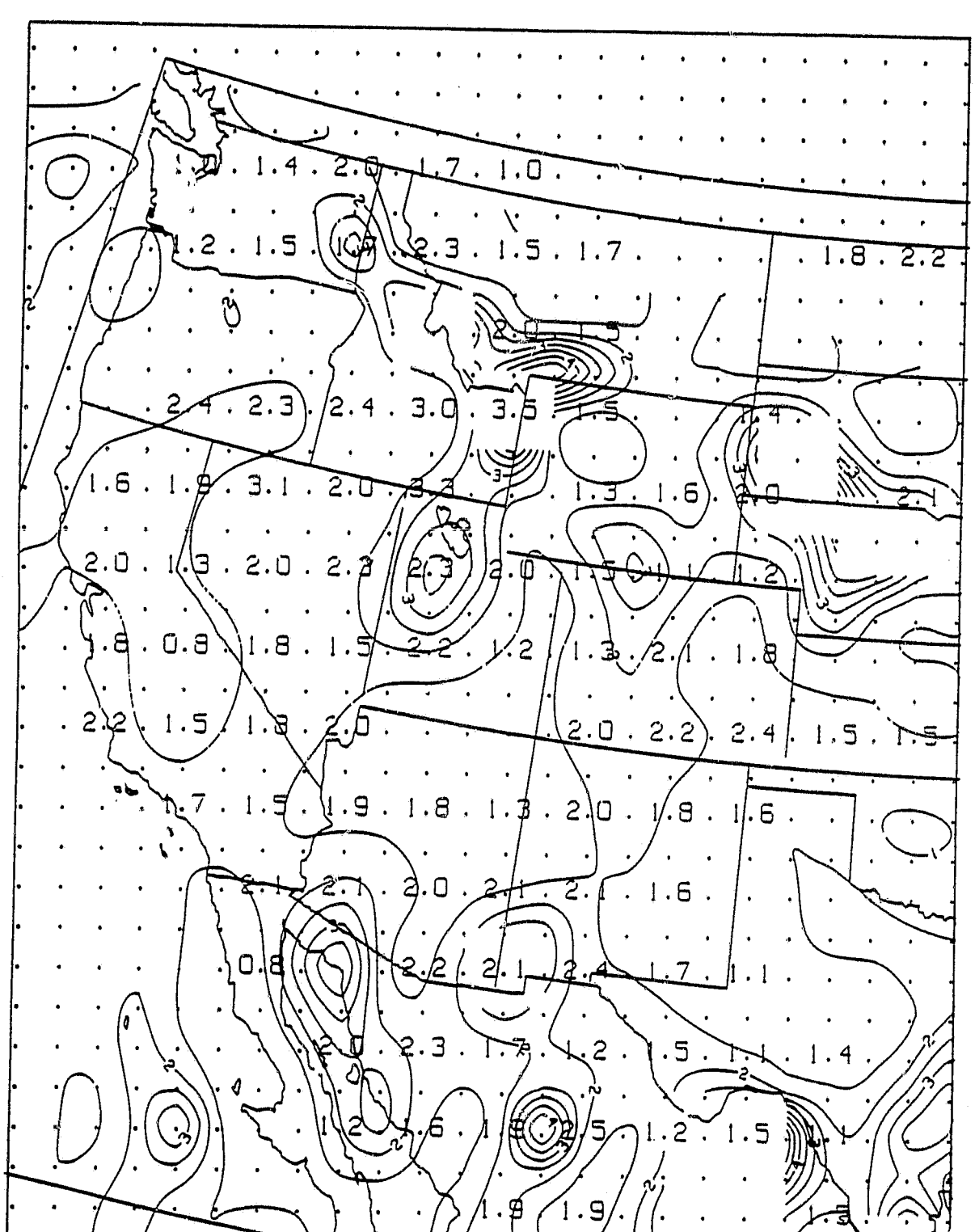


Figure 17

Table 1

Parameters for x-y grid (60 x 32 array of dipoles) which overlays 1:7·5 million scale Albers projection. I and J are the x and y positions, respectively, of individual dipoles. LAT and LON are latitude and longitude (east). X and Y are the x and y map coordinates in inches. DELTA-M is the apparent magnetization contrast value associated with the dipoles (tenths of A/m). Flag value 999.00000 indicates undefined value at that location.

I	J	LAT	LON	X	Y	DELTA-M
1	1	21.73477	237.05081	14.79400	2.51220	999.00000
1	2	22.61072	236.78503	14.79400	3.03654	999.00000
1	3	23.48349	236.51430	14.79400	3.56088	999.00000
1	4	24.35317	236.23846	14.79400	4.08522	999.00000
1	5	25.21989	235.95740	14.79400	4.60956	999.00000
1	6	26.08383	235.67101	14.79400	5.13390	999.00000
1	7	26.94510	235.37901	14.79400	5.65824	999.00000
1	8	27.80385	235.08131	14.79400	6.18258	999.00000
1	9	28.66022	234.77782	14.79400	6.70692	999.00000
1	10	29.51433	234.46823	14.79400	7.23126	999.00000
1	11	30.36632	234.15239	14.79400	7.75560	999.00000
1	12	31.21636	233.83036	14.79400	8.27994	999.00000
1	13	32.06453	233.50150	14.79400	8.80428	999.00000
1	14	32.91098	233.16608	14.79400	9.32862	999.00000
1	15	33.75585	232.82361	14.79400	9.85296	999.00000
1	16	34.59933	232.47394	14.79400	10.37730	999.00000
1	17	35.44152	232.11667	14.79400	10.90164	999.00000
1	18	36.28258	231.75217	14.79400	11.42598	999.00000
1	19	37.12260	231.37970	14.79400	11.95032	999.00000
1	20	37.96184	230.99954	14.79400	12.47466	999.00000
1	21	38.80031	230.60992	14.79400	12.99900	999.00000
1	22	39.63828	230.21226	14.79400	13.52334	999.00000
1	23	40.47589	229.80459	14.79400	14.04768	999.00000
1	24	41.31326	229.38997	14.79400	14.57202	999.00000
1	25	42.15067	228.96465	14.79400	15.09636	999.00000
1	26	42.98820	228.52996	14.79400	15.62070	999.00000
1	27	43.82605	228.08427	14.79400	16.14503	999.00000
1	28	44.66447	227.62653	14.79400	16.66937	999.00000
1	29	45.50362	227.16193	14.79400	17.19371	999.00000
1	30	46.34375	226.68417	14.79400	17.71805	999.00000
1	31	47.18512	226.19479	14.79400	18.24240	999.00000
1	32	48.02789	225.69339	14.79400	18.76674	999.00000
2	1	21.58349	237.56716	15.31834	2.51220	999.00000
2	2	22.46098	237.30525	15.31834	3.03654	0.24000
2	3	23.33537	237.04647	15.31834	3.56088	0.60000
2	4	24.20675	236.77971	15.31834	4.08522	0.85000
2	5	25.07531	236.50579	15.31834	4.60956	1.02000
2	6	25.94111	236.22769	15.31834	5.13390	1.31000
2	7	26.80433	235.94412	15.31834	5.65824	0.27000
2	8	27.66512	235.65495	15.31834	6.18258	0.08000
2	9	28.52360	235.36013	15.31834	6.70692	-0.25000
2	10	29.37992	235.05938	15.31834	7.23126	0.30000
2	11	30.23420	234.75257	15.31834	7.75560	0.61000
2	12	31.08665	234.43966	15.31834	8.27994	0.66000
2	13	32.93731	234.12011	15.31834	8.80428	0.35000
2	14	33.18637	234.19400	15.31834	9.32862	0.25000
2	15	34.03397	233.46112	15.31834	9.85296	0.04000
2	16	34.88025	233.12116	15.31834	10.37730	-0.27000
2	17	35.72533	232.77388	15.31834	10.90164	-0.65000
2	18	36.56944	232.41925	15.31834	11.42598	-0.93000
2	19	37.41264	232.05694	15.31834	11.95032	-0.79000
2	20	38.25516	231.68664	15.31834	12.47466	-0.46000
2	21	39.09711	231.30810	15.31834	12.99900	-0.30000
2	22	39.93867	230.92117	15.31834	13.52334	-0.51000
2	23	40.78000	230.52540	15.31834	14.04768	-0.82000
2	24	41.62131	230.12061	15.31834	14.57202	-0.65000
2	25	42.46278	229.70651	15.31834	15.09636	-0.14000
2	26	43.30457	229.28280	15.31834	15.62070	-0.18000
2	27	44.14687	228.84904	15.31834	16.14503	-0.36000
2	28	44.98983	228.40511	15.31834	16.66937	-0.66000
2	29	45.83394	227.95045	15.31834	17.19371	-1.06000
2	30	46.67917	227.48474	15.31834	17.71805	-1.87000
2	31	47.52585	227.00756	15.31834	18.24240	-1.46000
2	32	48.37421	226.51858	15.31834	18.76674	999.00000
3	1	22.22388	238.88831	15.84266	2.51220	999.00000
3	2	23.10292	238.63851	15.84266	3.03654	-0.89000
3	3	23.97891	238.38256	15.84266	3.56088	-0.40000
3	4	24.85196	238.12055	15.84266	4.08522	-0.33000
3	5	25.72229	237.85242	15.84266	4.60956	0.11000
3	6	26.58990	237.58775	15.84266	5.13390	0.66000
3	7	27.45503	237.31477	15.84266	5.65824	0.47000
3	8	28.31783	237.03436	15.84266	6.18258	-0.41000
3	9	29.17838	236.74834	15.84266	6.70692	-1.06000
3	10	30.03687	236.45665	15.84266	7.23126	-0.77000

4	11	30.89340	236.15903	15.84266	7.75560	-0.26000
4	12	31.74620	235.85426	15.84266	8.27994	0.30000
4	13	32.60132	235.54830	15.84266	8.80428	0.01000
4	14	33.45291	235.22878	15.84266	9.32862	-0.62000
4	15	34.30315	234.60676	15.84266	9.85296	-1.06000
4	16	35.15219	234.67570	15.84266	10.37730	-0.91000
4	17	36.00018	234.33659	15.84266	10.90164	-0.64000
4	18	36.84727	233.99421	15.84266	11.42598	-0.71000
4	19	37.69360	233.64228	15.84266	11.95032	-0.77000
4	20	38.53934	233.28253	15.84266	12.47466	-0.42000
4	21	39.38467	232.91477	15.84266	12.99900	0.06000
4	22	40.22977	232.53678	15.84266	13.52334	-0.12000
4	23	41.07480	232.15414	15.84266	14.04768	-0.61000
4	24	41.91995	231.66666	15.84266	14.57202	-1.18000
4	25	42.76543	231.25807	15.84266	15.09636	-0.72000
4	26	43.61140	230.84607	15.84266	15.62070	-0.21000
4	27	44.45807	230.42416	15.84266	16.14503	0.20000
4	28	45.30573	229.99231	15.84266	16.66937	0.12000
4	29	46.15454	229.54990	15.84266	17.19371	-0.02000
4	30	47.00479	229.09663	15.84266	17.71805	-0.33000
4	31	47.85672	228.63117	15.84266	18.24240	-0.61000
4	32	48.71060	228.15613	15.84266	18.76674	999.00000
5	1	22.45590	239.81400	16.36702	2.51220	999.00000
5	2	23.33647	239.57208	16.36702	3.03654	-0.71000
5	3	24.21402	239.32650	16.36702	3.56088	-0.69000
5	4	25.08875	239.07426	16.36702	4.08522	-1.13000
5	5	25.96074	238.81818	16.36702	4.60956	-1.42000
5	6	26.83017	238.55708	16.36702	5.13390	-1.28000
5	7	27.69717	238.29082	16.36702	5.65824	-0.53000
5	8	28.56189	238.01935	16.36702	6.18258	-1.05000
5	9	29.42448	237.74236	16.36702	6.70692	-1.10000
5	10	30.28510	237.45987	16.36702	7.23126	-1.24000
5	11	31.14384	237.17157	16.36702	7.75560	-1.27000
5	12	32.00095	236.87730	16.36702	8.27994	-0.56000
5	13	32.85645	236.57652	16.36702	8.80428	0.03000
5	14	33.71054	236.27029	16.36702	9.32862	-0.35000
5	15	34.56337	235.95716	16.36702	9.85296	-0.66000
5	16	35.41512	235.63728	16.36702	10.37730	-0.60000
5	17	36.26591	235.31050	16.36702	10.90164	0.47000
5	18	37.11595	234.97659	16.36702	11.42598	0.81000
5	19	37.96533	234.63527	16.36702	11.95032	0.28000
5	20	38.81425	234.28647	16.36702	12.47466	-0.08000
5	21	39.66293	233.92976	16.36702	12.99900	0.19000
5	22	40.51151	233.56490	16.36702	13.52334	0.37000
5	23	41.36011	233.19173	16.36702	14.04768	0.05000
5	24	42.20906	232.80984	16.36702	14.57202	-0.83000
5	25	43.05847	232.41911	16.36702	15.09636	-1.54000
5	26	43.90857	232.01900	16.36702	15.62070	-1.21000
5	27	44.75955	231.60944	16.36702	16.14503	-0.67000
5	28	45.61172	231.18993	16.36702	16.66937	-0.54000
5	29	46.46524	230.76016	16.36702	17.19371	-0.58000
5	30	47.32047	230.31982	16.36702	17.71805	0.36000
5	31	48.17768	229.86826	16.36702	18.24240	0.80000
5	32	49.03694	229.40565	16.36702	18.76674	999.00000
6	1	22.67955	240.74391	16.89136	2.51220	999.00000
6	2	23.56158	240.51041	16.89136	3.03654	0.22000
6	3	24.44067	240.27217	16.89136	3.56088	0.28000
6	4	25.31699	240.02940	16.89136	4.08522	-0.03000
6	5	26.19067	239.78186	16.89136	4.60956	-1.23000
6	6	27.06184	239.52950	16.89136	5.13390	-1.50000
6	7	27.93066	239.27215	16.89136	5.65824	-0.65000
6	8	28.79732	239.00974	16.89136	6.18258	-0.43000
6	9	29.66188	238.74197	16.89136	6.70692	-0.27000
6	10	30.52457	238.46860	16.89136	7.23126	-0.24000
6	11	31.38547	238.19000	16.89136	7.75560	-0.90000
6	12	32.24480	237.90541	16.89136	8.27994	-0.78000
6	13	33.10263	237.61493	16.89136	8.80428	-0.13000
6	14	33.95915	237.31819	16.89136	9.32862	0.03000
6	15	34.81453	237.01524	16.89136	9.85296	-0.41000
6	16	35.66893	236.70578	16.89136	10.37730	-0.36000
6	17	36.52249	236.38945	16.89136	10.90164	0.52000
6	18	37.37538	236.06628	16.89136	11.42598	1.19000
6	19	38.22777	235.73590	16.89136	11.95032	1.01000
6	20	39.07980	235.39819	16.89136	12.47466	0.38000
6	21	39.93172	235.05272	16.89136	12.99900	-0.06000
6	22	40.78368	234.69943	16.89136	13.52334	0.17000
6	23	41.63586	234.33756	16.89136	14.04768	0.66000
6	24	42.48851	233.96796	16.89136	14.57202	0.06000
6	25	43.34178	233.58929	16.89136	15.09636	-1.25000
6	26	44.19592	233.20100	16.89136	15.62070	-1.66000
6	27	45.05115	232.80461	16.89136	16.14503	-1.57000
6	28	45.90773	232.39784	16.89136	16.66937	-2.39000
6	29	46.76593	231.98108	16.89136	17.19371	-2.38000

5	30	47.62599	231.55356	16.69136	17.71805	-0.09000
5	31	48.48824	231.11600	16.69136	18.24240	1.44000
5	32	49.35295	230.66655	16.69136	18.76674	999.00000
6	1	22.69479	241.67836	17.41570	2.51220	999.00000
6	2	23.77624	241.45261	17.41570	3.03654	0.04000
6	3	24.65881	241.22324	17.41570	3.56088	0.39000
6	4	25.53670	240.98688	17.41570	4.08522	0.78000
6	5	26.41202	240.75127	17.41570	4.60956	0.82000
6	6	27.28490	240.50699	17.41570	5.13390	0.45000
6	7	28.15552	240.25670	17.41570	5.65824	0.13000
6	8	29.02399	240.00537	17.41570	6.18258	0.23000
6	9	29.89049	239.74699	17.41570	6.70692	0.17000
6	10	30.75517	239.48338	17.41570	7.23126	0.14000
6	11	31.61819	239.21423	17.41570	7.75560	0.0
6	12	32.47971	238.93942	17.41570	8.27994	-0.18000
6	13	33.33983	238.65902	17.41570	8.80428	-0.22000
6	14	34.19873	238.37253	17.41570	9.32862	-0.33000
6	15	35.05659	238.07986	17.41570	9.85296	-0.55000
6	16	35.91356	237.78053	17.41570	10.37730	-0.64000
6	17	36.76979	237.47445	17.41570	10.90164	-0.24000
6	18	37.62550	237.16161	17.41570	11.42598	0.41000
6	19	38.48079	236.84199	17.41570	11.95032	0.85000
6	20	39.33589	236.51563	17.41570	12.47466	0.88000
6	21	40.19099	236.18228	17.41570	12.99900	0.54000
6	22	41.04626	235.84215	17.41570	13.52334	0.15000
6	23	41.90190	235.49266	17.41570	14.04768	0.01000
6	24	42.75818	235.13489	17.41570	14.57202	0.04000
6	25	43.61525	234.76862	17.41570	15.09636	0.05000
6	26	44.47336	234.39254	17.41570	15.62070	-0.24000
6	27	45.33270	234.00537	17.41570	16.14503	-1.19000
6	28	46.19365	233.61571	17.41570	16.66937	-2.70000
6	29	47.05638	233.21236	17.41570	17.19371	-3.04000
6	30	47.92123	232.79883	17.41570	17.71805	-0.48000
6	31	48.78854	232.37476	17.41570	18.24240	1.78000
6	32	49.65854	231.93965	17.41570	18.76674	999.00000
7	1	23.10155	242.61709	17.94003	2.51220	999.00000
7	2	23.98637	242.40010	17.94003	3.03654	-1.65000
7	3	24.86844	242.17691	17.94003	3.56088	-1.38000
7	4	25.74780	241.95348	17.94003	4.08522	0.12000
7	5	26.62473	241.72336	17.94003	4.60956	1.09000
7	6	27.49925	241.48900	17.94003	5.13390	0.62000
7	7	28.37161	241.24998	17.94003	5.65824	-0.60000
7	8	29.24188	241.00686	17.94003	6.18258	-0.95000
7	9	30.11028	240.75706	17.94003	6.70692	-0.76000
7	10	30.97693	240.50127	17.94003	7.23126	-0.23000
7	11	31.84196	240.24405	17.94003	7.75560	0.24000
7	12	32.70561	239.97934	17.94003	8.27994	0.42000
7	13	33.56795	239.70900	17.94003	8.80428	0.02000
7	14	34.42915	239.43297	17.94003	9.32862	-0.23000
7	15	35.28943	239.15066	17.94003	9.85296	-0.19000
7	16	36.14890	238.86276	17.94003	10.37730	-0.16000
7	17	37.00775	238.56816	17.94003	10.90164	0.0
7	18	37.86620	238.26706	17.94003	11.42598	0.61000
7	19	38.72433	237.95920	17.94003	11.95032	1.37000
7	20	39.58241	237.64439	17.94003	12.47466	1.89000
7	21	40.44061	237.32226	17.94003	12.99900	1.82000
7	22	41.29912	236.99275	17.94003	13.52334	0.83000
7	23	42.15814	236.65552	17.94003	14.04768	-0.46000
7	24	43.01793	236.31020	17.94003	14.57202	-0.52000
7	25	43.87871	235.95673	17.94003	15.09636	0.75000
7	26	44.74069	235.59466	17.94003	15.62070	1.76000
7	27	45.60410	235.22365	17.94003	16.14503	1.08000
7	28	46.46928	234.84346	17.94003	16.66937	-1.10000
7	29	47.33649	234.45380	17.94003	17.19371	-2.12000
7	30	48.20602	234.05424	17.94003	17.71805	-0.37000
7	31	49.07825	233.64441	17.94003	18.24240	1.42000
7	32	49.95345	233.22404	17.94003	18.76674	999.00000
8	1	23.29980	243.55598	18.46437	2.51220	999.00000
8	2	24.18600	243.36110	18.46437	3.03654	-1.76000
8	3	25.06944	243.13682	18.46437	3.56088	-2.33000
8	4	25.95029	242.92230	18.46437	4.08522	-2.15000
8	5	26.82877	242.70154	18.46437	4.60956	-2.02000
8	6	27.70490	242.47609	18.46437	5.13390	-2.15000
8	7	28.57890	242.24641	18.46437	5.65824	-2.11000
8	8	29.45094	242.01163	18.46437	6.18258	-1.71000
8	9	30.32115	241.77261	18.46437	6.70692	-1.27000
8	10	31.18971	241.52845	18.46437	7.23126	-0.56000
8	11	32.05672	241.27928	18.46437	7.75560	0.18000
8	12	32.92244	241.02454	18.46437	8.27994	0.61000
8	13	33.78693	240.76471	18.46437	8.80428	0.46000
8	14	34.65041	240.49928	18.46437	9.32862	0.52000
8	15	35.51300	240.22800	18.46437	9.85296	1.05000
8	16	36.37489	239.95082	18.46437	10.37730	1.56000

8	17	37.23631	239.66737	18.46437	10.90164	1.70000
8	18	38.09740	239.37767	18.46437	11.42598	1.82000
8	19	38.95831	239.08148	18.46437	11.95032	2.01000
8	20	39.81926	238.77846	18.46437	12.47466	2.34000
8	21	40.68047	238.46440	18.46437	13.00900	2.44000
8	22	41.54214	238.15115	18.46437	13.52334	1.50000
8	23	42.40443	237.82637	18.46437	14.04768	-0.14000
8	24	43.26767	237.49388	18.46437	14.57202	-0.72000
8	25	44.13206	237.15334	18.46437	15.09636	0.14000
8	26	44.99782	236.80452	18.46437	15.62070	1.30000
8	27	45.86517	236.44704	18.46437	16.14503	1.26000
8	28	46.73451	236.08072	18.46437	16.66937	-0.24000
8	29	47.60608	235.70512	18.46437	17.19371	-1.42000
8	30	48.48019	235.31990	18.46437	17.71805	-0.78000
8	31	49.35724	234.92471	18.46437	18.24240	0.38000
8	32	50.23750	234.51917	18.46437	18.76674	999.00000
9	1	23.48953	244.50632	18.98871	2.51220	999.00000
9	2	24.37703	244.30676	18.98871	3.03654	0.13000
9	3	25.26184	244.10200	18.98871	3.56088	-0.81000
9	4	26.14413	243.89339	18.98871	4.08522	-2.86000
9	5	27.02405	243.68163	18.98871	4.60956	-3.66000
9	6	27.90176	243.46744	18.98871	5.13390	-2.24000
9	7	28.77737	243.24705	18.98871	5.65824	0.02000
9	8	29.65111	243.02211	18.98871	6.18258	1.02000
9	9	30.52309	242.79282	18.98871	6.70692	0.80000
9	10	31.39346	242.55888	18.98871	7.23126	0.64000
9	11	32.26242	242.31944	18.98871	7.75560	0.70000
9	12	33.13013	242.07532	18.98871	8.27994	0.64000
9	13	33.99670	241.82616	18.98871	8.80428	0.44000
9	14	34.86232	241.57137	18.98871	9.32862	0.78000
9	15	35.72720	241.31111	18.98871	9.85296	1.66000
9	16	36.59148	241.04452	18.98871	10.37730	2.55000
9	17	37.45532	240.77278	18.98871	10.90164	2.67000
9	18	38.31900	240.49490	18.98871	11.42598	1.95000
9	19	39.18260	240.21043	18.98871	11.95032	1.10000
9	20	40.04634	239.91948	18.98871	12.47466	1.12000
9	21	40.91049	239.62167	18.98871	12.99900	1.70000
9	22	41.77521	239.31656	18.98871	13.52334	1.73000
9	23	42.64079	239.00459	18.98871	14.04768	0.69000
9	24	43.50729	238.68553	18.98871	14.57202	-0.49000
9	25	44.37517	238.35626	18.98871	15.09636	-0.91000
9	26	45.24458	238.02296	18.98871	15.62070	-0.85000
9	27	46.11580	237.67947	18.98871	16.14503	-0.90000
9	28	46.98918	237.32712	18.98871	16.66937	-1.14000
9	29	47.86499	236.96654	18.98871	17.19371	-1.38000
9	30	48.74356	236.59947	18.98871	17.71805	-0.74000
9	31	49.62531	236.21525	18.98871	18.24240	0.07000
9	32	50.51054	235.82212	18.98871	18.76674	999.00000
10	1	23.67070	245.45685	19.51306	2.51220	999.00000
10	2	24.55545	245.26585	19.51306	3.03654	0.25000
10	3	25.44556	245.07058	19.51306	3.56088	0.85000
10	4	26.32922	244.87228	19.51306	4.08522	0.16000
10	5	27.21060	244.67020	19.51306	4.60956	0.22000
10	6	28.08980	244.46344	19.51306	5.13390	2.85000
10	7	28.96700	244.25287	19.51306	5.65824	4.86000
10	8	29.84235	244.03761	19.51306	6.18258	4.72000
10	9	30.71602	243.81812	19.51306	6.70692	3.35000
10	10	31.58820	243.59356	19.51306	7.23126	2.20000
10	11	32.45898	243.36511	19.51306	7.75560	1.11000
10	12	33.32863	243.13161	19.51306	8.27994	0.48000
10	13	34.19720	242.89301	19.51306	8.80428	0.83000
10	14	35.06494	242.64890	19.51306	9.32862	0.38000
10	15	35.93199	242.39967	19.51306	9.85296	0.82000
10	16	36.79854	242.14494	19.51306	10.37730	1.22000
10	17	37.66479	241.88469	19.51306	10.90164	1.60000
10	18	38.53091	241.61807	19.51306	11.42598	0.57000
10	19	39.39713	241.34593	19.51306	11.95032	-0.64000
10	20	40.26360	241.06700	19.51306	12.47466	-0.79000
10	21	41.13054	240.78165	19.51306	12.99900	0.29000
10	22	41.99821	240.49008	19.51306	13.52334	1.63000
10	23	42.86684	240.19113	19.51306	14.04768	1.81000
10	24	43.73686	239.88496	19.51306	14.57202	-0.29000
10	25	44.60793	239.57132	19.51306	15.09636	-1.64000
10	26	45.48090	239.24585	19.51306	15.62070	-1.50000
10	27	46.35583	238.92041	19.51306	16.14503	-1.09000
10	28	47.23314	238.58263	19.51306	16.66937	-1.29000
10	29	48.11305	238.23416	19.51306	17.19371	-1.10000
10	30	48.99599	237.88071	19.51306	17.71805	0.40000
10	31	49.88229	237.51593	19.51306	18.24240	1.08000
10	32	50.77234	237.14126	19.51306	18.76674	999.00000
11	1	23.84326	246.41087	20.03740	2.51220	999.00000
11	2	24.73320	246.22874	20.03740	3.03654	-1.76000
11	3	25.62059	246.04321	20.03740	3.56088	1.00000

11	4	26.50557	245.85387	20.03740	4.08522	3.85000
11	5	27.38832	245.66665	20.03740	4.60556	5.17000
11	6	28.26895	245.46327	20.03740	5.13390	5.51000
11	7	29.14766	245.26245	20.03740	5.65824	4.80000
11	8	30.02458	245.05736	20.03740	6.18258	3.29000
11	9	30.89990	244.84766	20.03740	6.70692	1.65000
11	10	31.77377	244.63411	20.03740	7.23126	0.73000
11	11	32.64635	244.41647	20.03740	7.75560	0.30000
11	12	33.51785	244.19458	20.03740	8.27994	0.48000
11	13	34.38837	243.96856	20.03740	8.80428	0.46000
11	14	35.25813	243.73792	20.03740	9.32862	0.06000
11	15	36.12729	243.49419	20.03740	9.85296	-0.42000
11	16	36.99606	243.25063	20.03740	10.37730	-0.41000
11	17	37.86456	243.00212	20.03740	10.90164	-0.36000
11	18	38.73309	242.74782	20.03740	11.42598	-0.70000
11	19	39.60179	242.48756	20.03740	11.95032	-1.41000
11	20	40.47087	242.22136	20.03740	12.47466	-1.57000
11	21	41.34058	241.94879	20.03740	12.99900	-0.84000
11	22	42.21109	241.66986	20.03740	13.52334	1.19000
11	23	43.08270	241.38414	20.03740	14.04768	1.63000
11	24	43.95563	241.09161	20.03740	14.57202	0.21000
11	25	44.83020	240.79185	20.03740	15.09636	-1.06000
11	26	45.70662	240.48474	20.03740	15.62070	-0.22000
11	27	46.58516	240.16978	20.03740	16.14503	0.23000
11	28	47.46625	239.84669	20.03740	16.66937	-0.52000
11	29	48.35017	239.51535	20.03740	17.19371	-0.31000
11	30	49.23729	239.17526	20.03740	17.71805	1.49000
11	31	50.12804	238.82625	20.03740	18.24240	1.38000
11	32	51.02277	238.46764	20.03740	18.76674	999.00000
12	1	24.00717	247.36667	20.56174	2.51220	999.00000
12	2	24.89828	247.19545	20.56174	3.03654	-0.58000
12	3	25.78890	247.01664	20.56174	3.56088	1.42000
12	4	26.67313	246.83641	20.56174	4.08522	3.63000
12	5	27.55721	246.65500	20.56174	4.60556	4.13000
12	6	28.43921	246.46735	20.56174	5.13390	2.51000
12	7	29.31938	246.27625	20.56174	5.65824	-0.19000
12	8	30.19778	246.08065	20.56174	6.18258	-2.31000
12	9	31.07468	245.88188	20.56174	6.70692	-2.37000
12	10	31.95020	245.67661	20.56174	7.23126	-2.66000
12	11	32.82448	245.47045	20.56174	7.75560	-1.04000
12	12	33.69775	245.25864	20.56174	8.27994	0.55000
12	13	34.57013	245.04165	20.56174	8.80428	1.22000
12	14	35.44183	244.82007	20.56174	9.32862	0.86000
12	15	36.31300	244.59378	20.56174	9.85296	-0.32000
12	16	37.18287	244.36240	20.56174	10.37730	-1.21000
12	17	38.05460	244.12649	20.56174	10.90164	-1.24000
12	18	38.92545	243.88550	20.56174	11.42598	-0.55000
12	19	39.79552	243.63956	20.56174	11.95032	-1.29000
12	20	40.66814	243.38210	20.56174	12.47466	-1.36000
12	21	41.54045	243.12270	20.56174	12.99900	-0.58000
12	22	42.41371	242.85692	20.56174	13.52334	0.46000
12	23	43.28818	242.58478	20.56174	14.04768	0.63000
12	24	44.16416	242.30666	20.56174	14.57202	0.03000
12	25	45.04185	242.02013	20.56174	15.09636	0.28000
12	26	45.92159	241.72717	20.56174	15.62070	0.27000
12	27	46.80360	241.42702	20.56174	16.14503	-0.50000
12	28	47.68835	241.11879	20.56174	16.66937	-1.55000
12	29	48.57613	240.80292	20.56174	17.19371	-0.95000
12	30	49.46732	240.47885	20.56174	17.71805	1.00000
12	31	50.36230	240.14590	20.56174	18.24240	999.00000
12	32	51.26157	239.80402	20.56174	18.76674	999.00000
13	1	24.16241	248.32544	21.08607	2.51220	999.00000
13	2	25.05463	248.16515	21.08607	3.03654	4.78000
13	3	25.94438	247.99766	21.08607	3.56088	2.09000
13	4	26.83185	247.82719	21.08607	4.08522	0.23000
13	5	27.71719	247.65318	21.08607	4.60556	-1.48000
13	6	28.60052	247.47523	21.08607	5.13390	-2.07000
13	7	29.48206	247.29295	21.08607	5.65824	-2.00000
13	8	30.36192	247.10604	21.08607	6.18258	-3.82000
13	9	31.24030	246.91992	21.08607	6.70692	-4.31000
13	10	32.11737	246.72717	21.08607	7.23126	-3.57000
13	11	32.99330	246.52918	21.08607	7.75560	-2.02000
13	12	33.86829	246.32693	21.08607	8.27994	0.03000
13	13	34.74245	246.12346	21.08607	8.80428	2.02000
13	14	35.61598	245.91330	21.08607	9.32862	2.52000
13	15	36.48909	245.69847	21.08607	9.85296	1.71000
13	16	37.36197	245.47857	21.08607	10.37730	-0.10000
13	17	38.23482	245.25439	21.08607	10.90164	-1.07000
13	18	39.10786	245.02428	21.08607	11.42598	-1.28000
13	19	39.98126	244.78906	21.08607	11.95032	-1.40000
13	20	40.85526	244.54678	21.08607	12.47466	-0.95000
13	21	41.73009	244.30211	21.08607	12.99900	-0.24000
13	22	42.60597	244.04553	21.08607	13.52334	-0.23000

13	23	43.48322	243.79137	21.0E607	14.04768	-0.52000
13	24	44.36206	243.52667	21.0E607	14.57202	-0.43000
13	25	45.24280	243.25558	21.0E607	15.09636	0.67000
13	26	46.12569	242.97707	21.0E607	15.62070	-1.23000
13	27	47.01109	242.69177	21.0E607	16.14503	-3.76000
13	28	47.89934	242.39925	21.0E607	16.66937	-2.23000
13	29	48.79080	242.09909	21.0E607	17.19371	0.33000
13	30	49.68588	241.79088	21.0E607	17.71805	0.67000
13	31	50.58502	241.47415	21.0E607	18.24240	999.00000
13	32	51.48863	241.14835	21.0E607	18.76674	999.00000
14	1	24.30898	249.29318	21.61041	2.51220	999.00000
14	2	25.20224	249.13821	21.61041	3.03654	6.01000
14	3	26.09311	248.98086	21.61041	3.56088	3.66000
14	4	26.98172	248.81895	21.61041	4.08522	-0.55000
14	5	27.86826	248.65468	21.61041	4.60956	-3.05000
14	6	28.75284	248.48694	21.61041	5.13390	-2.99000
14	7	29.63570	248.31542	21.61041	5.65824	-2.22000
14	8	30.51692	248.14059	21.61041	6.18258	-1.05000
14	9	31.39674	247.96220	21.61041	6.70692	-0.38000
14	10	32.27528	247.78008	21.61041	7.23126	-0.60000
14	11	33.15279	247.59412	21.61041	7.75560	-0.61000
14	12	34.02937	247.40392	21.61041	8.27994	0.37000
14	13	34.90523	247.20947	21.61041	8.80428	2.74000
14	14	35.78055	247.01120	21.61041	9.32862	4.26000
14	15	36.65550	246.80783	21.61041	9.85296	3.66000
14	16	37.53030	246.60023	21.61041	10.37730	1.13000
14	17	38.40515	246.38795	21.61041	10.90164	-1.55000
14	18	39.28029	246.17058	21.61041	11.42598	-2.66000
14	19	40.15587	245.94662	21.61041	11.95032	-3.44000
14	20	41.03218	245.72098	21.61041	12.47466	-1.76000
14	21	41.90941	245.48790	21.61041	12.99900	-0.99000
14	22	42.78781	245.24530	21.61041	13.52334	-0.34000
14	23	43.66768	245.00475	21.61041	14.04768	-0.36000
14	24	44.54926	244.75426	21.61041	14.57202	-1.22000
14	25	45.43292	244.49741	21.61041	15.09636	-2.83000
14	26	46.31885	244.23418	21.61041	15.62070	-3.06000
14	27	47.20743	243.96416	21.61041	16.14503	0.33000
14	28	48.09903	243.68735	21.61041	16.66937	3.69000
14	29	48.99406	243.40291	21.61041	17.19371	2.02000
14	30	49.89288	243.11124	21.61041	17.71805	999.00000
14	31	50.79597	242.81149	21.61041	18.24240	999.00000
14	32	51.70375	242.50365	21.61041	18.76674	999.00000
15	1	24.44681	250.25990	22.13475	2.51220	999.00000
15	2	25.34108	250.11427	22.13475	3.03654	2.10000
15	3	26.23257	249.96666	22.13475	3.56088	2.37000
15	4	27.12268	249.81412	22.13475	4.08522	1.67000
15	5	28.01035	249.65958	22.13475	4.60956	0.06000
15	6	28.89615	249.50162	22.13475	5.13390	-0.81000
15	7	29.78020	249.34073	22.13475	5.65824	-0.84000
15	8	30.66273	249.17644	22.13475	6.18258	0.26000
15	9	31.54391	249.00830	22.13475	6.70692	1.37000
15	10	32.42390	248.83675	22.13475	7.23126	1.51000
15	11	33.30284	248.66167	22.13475	7.75560	1.16000
15	12	34.18098	248.48271	22.13475	8.27994	2.36000
15	13	35.05846	248.30016	22.13475	8.80428	4.05000
15	14	35.93544	248.11334	22.13475	9.32862	4.56000
15	15	36.81213	247.92229	22.13475	9.85296	3.50000
15	16	37.68877	247.72656	22.13475	10.37730	1.21000
15	17	38.56654	247.52661	22.13475	10.90164	-1.67000
15	18	39.44266	247.32240	22.13475	11.42598	-3.82000
15	19	40.32034	247.11310	22.13475	11.95032	-4.10000
15	20	41.19879	246.89870	22.13475	12.47466	-3.50000
15	21	42.07831	246.67920	22.13475	12.99900	-2.35000
15	22	42.95911	246.45461	22.13475	13.52334	-0.84000
15	23	43.84146	246.22408	22.13475	14.04768	0.03000
15	24	44.72568	245.98802	22.13475	14.57202	-2.06000
15	25	45.61209	245.74644	22.13475	15.09636	-5.73000
15	26	46.50092	245.49808	22.13475	15.62070	-2.58000
15	27	47.39253	245.24377	22.13475	16.14503	6.13000
15	28	48.28735	244.98267	22.13475	16.66937	7.94000
15	29	49.18576	244.71478	22.13475	17.19371	2.22000
15	30	50.08819	244.43967	22.13475	17.71805	999.00000
15	31	50.99501	244.15691	22.13475	18.24240	999.00000
15	32	51.90678	243.86652	22.13475	18.76674	999.00000
16	1	24.57687	251.23001	22.65510	2.51220	999.00000
16	2	25.47107	251.09329	22.65510	3.03654	-1.55000
16	3	26.36357	250.95447	22.65510	3.56088	-0.60000
16	4	27.25471	250.81224	22.65510	4.08522	1.37000
16	5	28.14345	250.66785	22.65510	4.60956	1.65000
16	6	29.03036	250.52116	22.65510	5.13390	0.61000
16	7	29.91562	250.36900	22.65510	5.65824	-0.56000
16	8	30.79938	250.21532	22.65510	6.18258	-1.82000
16	9	31.68182	250.05823	22.65510	6.70692	-2.06000

16	10	32.56314	249.85732	22.65510	7.23126	-0.18000
16	11	33.44347	249.73344	22.65510	7.75560	2.03000
16	12	34.32306	249.56575	22.65510	8.27994	3.66000
16	13	35.20203	249.39468	22.65510	8.80428	4.55000
16	14	36.08061	249.21674	22.65510	9.32862	4.74000
16	15	36.95897	249.04057	22.65510	9.85296	3.51000
16	16	37.83733	248.85759	22.65510	10.37730	1.57000
16	17	38.71590	248.67036	22.65510	10.90164	-0.62000
16	18	39.59489	248.47648	22.65510	11.42598	-2.62000
16	19	40.47453	248.28232	22.65510	11.95032	-3.56000
16	20	41.35507	248.08150	22.65510	12.47466	-3.38000
16	21	42.23674	247.87602	22.65510	12.99900	-3.32000
16	22	43.11978	247.66601	22.65510	13.52334	-3.04000
16	23	44.00452	247.44934	22.65510	14.04768	-2.66000
16	24	44.89124	247.22615	22.65510	14.57202	-2.16000
16	25	45.78024	247.00101	22.65510	15.09636	-1.22000
16	26	46.67180	246.76836	22.65510	15.62070	-0.91000
16	27	47.56630	246.52975	22.65510	16.14503	4.47000
16	28	48.46417	246.28479	22.65510	16.66937	3.74000
16	29	49.36675	246.03345	22.65510	17.19371	999.00000
16	30	50.27453	245.77531	22.65510	17.71805	999.00000
16	31	51.18198	245.50956	22.65510	18.24240	999.00000
16	32	52.09755	245.23741	22.65510	18.76674	999.00000
17	1	24.69615	252.20224	23.18344	2.81220	999.00000
17	2	25.59225	252.07530	23.18344	3.03654	-2.18000
17	3	26.48608	251.94580	23.18344	3.56088	-2.13000
17	4	27.37776	251.81334	23.18344	4.08522	-2.00000
17	5	28.26753	251.67876	23.18344	4.60956	-1.34000
17	6	29.15550	251.54120	23.18344	5.13390	-0.66000
17	7	30.04185	251.40068	23.18344	5.65824	-1.33000
17	8	30.92677	251.25760	23.18344	6.18258	-2.35000
17	9	31.81041	251.11113	23.18344	6.70692	-4.51000
17	10	32.69296	250.96126	23.18344	7.23126	-3.02000
17	11	33.57463	250.80843	23.18344	7.75560	1.06000
17	12	34.45557	250.65262	23.18344	8.27994	2.96000
17	13	35.33595	250.49298	23.18344	8.80428	4.43000
17	14	36.21602	250.32556	23.18344	9.32862	4.23000
17	15	37.09595	250.16310	23.18344	9.85296	3.46000
17	16	37.97591	249.99243	23.18344	10.37730	2.46000
17	17	38.85616	249.81793	23.18344	10.90164	1.61000
17	18	39.73695	249.63919	23.18344	11.42598	-0.05000
17	19	40.61842	249.45621	23.18344	11.95032	-0.37000
17	20	41.50090	249.26898	23.18344	12.47466	-0.45000
17	21	42.38458	249.07751	23.18344	12.99900	-2.46000
17	22	43.26976	248.88054	23.18344	13.52334	-4.68000
17	23	44.15674	248.67970	23.18344	14.04768	-4.99000
17	24	45.04576	248.47337	23.18344	14.57202	-4.80000
17	25	45.93721	248.26153	23.18344	15.09636	-1.99000
17	26	46.83138	248.04457	23.18344	15.62070	1.25000
17	27	47.72861	247.82210	23.18344	16.14503	1.28000
17	28	48.62933	247.59365	23.18344	16.66937	-0.27000
17	29	49.53394	247.35890	23.18344	17.19371	999.00000
17	30	50.44292	247.11816	23.18344	17.71806	999.00000
17	31	51.35672	246.87024	23.18344	18.24240	999.00000
17	32	52.27589	246.61594	23.18344	18.76674	999.00000
18	1	24.60765	253.17702	23.70778	2.81220	999.00000
18	2	25.70456	253.05542	23.70778	3.03654	-0.15000
18	3	26.59924	252.93570	23.70778	3.56088	0.56000
18	4	27.49184	252.81741	23.70778	4.08522	-2.77000
18	5	28.38254	252.69260	23.70778	4.60956	-4.65000
18	6	29.27148	252.56667	23.70778	5.13390	-2.88000
18	7	30.15886	252.43832	23.70778	5.65824	-1.74000
18	8	31.04486	252.30243	23.70778	6.18258	-2.18000
18	9	31.92961	252.16701	23.70778	6.70692	-3.35000
18	10	32.81334	252.02859	23.70778	7.23126	-3.02000
18	11	33.69620	251.88722	23.70778	7.75560	-0.01000
18	12	34.57845	251.74287	23.70778	8.27994	3.63000
18	13	35.46016	251.59512	23.70778	8.80428	4.19000
18	14	36.34161	251.44366	23.70778	9.32862	2.61000
18	15	37.22295	251.28944	23.70778	9.85296	1.28000
18	16	38.10445	251.13152	23.70778	10.37730	1.13000
18	17	38.98628	250.96776	23.70778	10.90164	1.22000
18	18	39.86873	250.80418	23.70778	11.42598	1.73000
18	19	40.75192	250.63478	23.70778	11.95032	1.13000
18	20	41.63620	250.46156	23.70778	12.47466	-0.62000
18	21	42.52179	250.28366	23.70778	12.99900	-1.26000
18	22	43.40857	250.10156	23.70778	13.52334	-0.46000
18	23	44.29802	249.91816	23.70778	14.04768	-1.75000
18	24	45.18924	249.72411	23.70778	14.57202	-4.77000
18	25	46.08299	249.52797	23.70778	15.09636	-0.53000
18	26	46.97957	249.32672	23.70778	15.62070	4.73000
18	27	47.87933	249.12039	23.70778	16.14503	3.12000
18	28	48.78275	248.90854	23.70778	16.66937	999.00000

18	29	49.69020	248.69073	23.70778	17.19371	999.00000
18	30	50.60214	248.46742	23.70778	17.71805	999.00000
18	31	51.51915	248.23773	23.70778	18.24240	999.00000
18	32	52.44168	248.00169	23.70778	18.76674	999.00000
19	1	24.61031	254.16362	24.23212	2.51220	999.00000
19	2	25.60797	254.04608	24.23212	3.03654	0.64000
19	3	26.70346	253.93613	24.23212	3.56088	2.50000
19	4	27.79688	253.82361	24.23212	4.08522	0.78000
19	5	28.48846	253.70858	24.23212	4.60956	-1.98000
19	6	29.37833	253.59224	24.23212	5.13390	-2.06000
19	7	30.26665	253.47250	24.23212	5.65824	-1.36000
19	8	31.15364	253.35066	24.23212	6.18258	-0.72000
19	9	32.03941	253.22656	24.23212	6.70692	-0.62000
19	10	32.92424	253.09889	24.23212	7.23126	-0.19000
19	11	33.80824	252.96958	24.23212	7.75560	0.47000
19	12	34.69165	252.83866	24.23212	8.27994	1.42000
19	13	35.57458	252.70024	24.23212	8.80428	1.21000
19	14	36.45732	252.56142	24.23212	9.32862	0.24000
19	15	37.34001	252.41919	24.23212	9.85296	-0.46000
19	16	38.22293	252.27395	24.23212	10.37730	-0.76000
19	17	39.10620	252.12540	24.23212	10.90164	-0.61000
19	18	39.99017	251.97298	24.23212	11.42598	-0.33000
19	19	40.87502	251.81717	24.23212	11.95032	-1.54000
19	20	41.76097	251.65796	24.23212	12.47466	-2.61000
19	21	42.64828	251.49451	24.23212	12.99900	-0.10000
19	22	43.53731	251.32680	24.23212	13.52334	3.57000
19	23	44.42828	251.15529	24.23212	14.04768	0.66000
19	24	45.32155	250.97952	24.23212	14.57202	-3.77000
19	25	46.21744	250.79905	24.23212	15.09636	-0.43000
19	26	47.11626	250.61398	24.23212	15.62070	0.50000
19	27	48.01840	250.42378	24.23212	16.14503	5.42000
19	28	48.92430	250.22690	24.23212	16.66937	999.00000
19	29	49.83438	250.02282	24.23212	17.19371	999.00000
19	30	50.74911	249.81303	24.23212	17.71805	999.00000
19	31	51.66908	249.61160	24.23212	18.24240	999.00000
19	32	52.59473	249.39422	24.23212	18.76674	999.00000
20	1	25.00410	256.13236	24.75645	2.51220	999.00000
20	2	25.90248	255.03467	24.75645	3.03654	-0.94000
20	3	26.79868	254.93468	24.75645	3.56088	-0.08000
20	4	27.69287	254.83237	24.75645	4.08522	1.40000
20	5	28.58527	254.72792	24.75645	4.60956	0.96000
20	6	29.47595	254.62135	24.75645	5.13390	-0.44000
20	7	30.36516	254.51224	24.75645	5.65824	-1.06000
20	8	31.25305	254.40144	24.75645	6.18258	-0.33000
20	9	32.13982	254.28766	24.75645	6.70692	0.50000
20	10	33.02560	254.17178	24.75645	7.23126	2.38000
20	11	33.91064	254.05330	24.75645	7.75560	1.83000
20	12	34.79514	253.93230	24.75645	8.27994	-0.17000
20	13	35.67923	253.80833	24.75645	8.80428	-1.33000
20	14	36.56314	253.68181	24.75645	9.32862	-0.97000
20	15	37.44707	253.55232	24.75645	9.85296	-0.64000
20	16	38.33125	253.41986	24.75645	10.37730	-1.24000
20	17	39.21590	253.28442	24.75645	10.90164	-2.03000
20	18	40.10127	253.14560	24.75645	11.42598	-2.76000
20	19	40.98756	253.00380	24.75645	11.95032	-2.65000
20	20	41.87505	252.85817	24.75645	12.47466	-2.09000
20	21	42.76402	252.70915	24.75645	12.99900	-0.36000
20	22	43.65474	252.55632	24.75645	13.52334	1.85000
20	23	44.54750	252.39966	24.75645	14.04768	-0.03000
20	24	45.44263	252.23918	24.75645	14.57202	-1.23000
20	25	46.34048	252.07467	24.75645	15.09636	0.43000
20	26	47.24139	251.90590	24.75645	15.62070	2.65000
20	27	48.14568	251.73268	24.75645	16.14503	2.27000
20	28	49.05388	251.55479	24.75645	16.66937	999.00000
20	29	49.96642	251.37181	24.75645	17.19371	999.00000
20	30	50.88371	251.18416	24.75645	17.71805	999.00000
20	31	51.80640	250.99098	24.75645	18.24240	999.00000
20	32	52.73495	250.79271	24.75645	18.76674	999.00000
21	1	25.08604	256.11460	25.28079	2.51220	999.00000
21	2	25.98805	256.02563	25.28079	3.03654	-2.86000
21	3	26.88492	255.93535	25.28079	3.56088	-3.36000
21	4	27.77582	255.84260	25.28079	4.08522	-2.02000
21	5	28.67293	255.74668	25.28079	4.60956	-1.24000
21	6	29.56436	255.65260	25.28079	5.13390	-1.14000
21	7	30.45438	255.55453	25.28079	5.65824	-0.81000
21	8	31.34309	255.45433	25.28079	6.18258	0.57000
21	9	32.23073	255.35209	25.28079	6.70692	1.84000
21	10	33.11743	255.24715	25.28079	7.23126	3.33000
21	11	34.00342	255.14017	25.28079	7.75560	4.12000
21	12	34.88889	255.03109	25.28079	8.27994	3.22000
21	13	35.77400	254.91939	25.28079	8.80428	1.84000
21	14	36.65898	254.80819	25.28079	9.32862	0.08000
21	15	37.54402	254.68843	25.28079	9.85296	-0.64000

21	16	38.42938	254.56914	25.28079	10.37730	0.33000
21	17	39.31528	254.44687	25.28079	10.90164	0.13000
21	18	40.20193	254.32162	25.28079	11.42598	-1.51000
21	19	41.08958	254.19341	25.28079	11.95032	-2.61000
21	20	41.97847	254.06180	25.28079	12.47466	-1.83000
21	21	42.86893	253.92763	25.28079	12.99900	-1.20000
21	22	43.76117	253.78966	25.28079	13.52334	-1.25000
21	23	44.65556	253.64827	25.28079	14.04768	-0.57000
21	24	45.55241	253.50349	25.28079	14.57202	0.51000
21	25	46.45204	253.35490	25.28079	15.09636	0.13000
21	26	47.35483	253.20248	25.28079	15.62070	-1.31000
21	27	48.26112	253.04584	25.28079	16.14503	999.00000
21	28	49.17145	252.88496	25.28079	16.66937	999.00000
21	29	50.08618	252.72020	25.28079	17.19371	999.00000
21	30	51.00583	252.55037	25.28079	17.71805	999.00000
21	31	51.93102	252.37631	25.28079	18.24240	999.00000
21	32	52.86223	252.19672	25.28079	18.76674	999.00000
22	1	25.16505	257.09717	25.80513	2.51220	999.00000
22	2	26.06465	257.01831	25.80513	3.03654	-3.80000
22	3	26.96214	256.93760	25.80513	3.56088	-4.83000
22	4	27.85765	256.85522	25.80513	4.08522	-5.24000
22	5	28.75140	256.77173	25.80513	4.60956	-4.97000
22	6	29.64355	256.68579	25.80513	5.13390	-2.83000
22	7	30.53427	256.59839	25.80513	5.65824	-0.28000
22	8	31.42374	256.50928	25.80513	6.18258	1.89000
22	9	32.31215	256.41797	25.80513	6.70692	2.97000
22	10	33.19966	256.32495	25.80513	7.23126	3.83000
22	11	34.08649	256.22998	25.80513	7.75560	5.76000
22	12	34.97286	256.13333	25.80513	8.27994	7.60000
22	13	35.85889	256.03296	25.80513	8.80428	5.69000
22	14	36.74486	255.93111	25.80513	9.32862	2.12000
22	15	37.63092	255.82709	25.80513	9.85296	1.00000
22	16	38.51733	255.72095	25.80513	10.37730	3.00000
22	17	39.40431	255.61185	25.80513	10.90164	3.51000
22	18	40.29213	255.50018	25.80513	11.42598	1.46000
22	19	41.18098	255.38599	25.80513	11.95032	-1.14000
22	20	42.07115	255.26883	25.80513	12.47466	-1.98000
22	21	42.96292	255.14908	25.80513	12.99900	-1.82000
22	22	43.85657	255.02638	25.80513	13.52334	-2.32000
22	23	44.75243	254.90028	25.80513	14.04768	-1.42000
22	24	45.65080	254.77122	25.80513	14.57202	0.58000
22	25	46.55205	254.63876	25.80513	15.09636	1.66000
22	26	47.45654	254.50290	25.80513	15.62070	0.69000
22	27	48.36464	254.36322	25.80513	16.14503	999.00000
22	28	49.27684	254.22015	25.80513	16.66937	999.00000
22	29	50.19357	254.07283	25.80513	17.19371	999.00000
22	30	51.11537	253.92169	25.80513	17.71805	999.00000
22	31	52.04279	253.76636	25.80513	18.24240	999.00000
22	32	52.97639	253.60625	25.80513	18.76674	999.00000
23	1	25.23221	258.08130	26.32948	2.51220	999.00000
23	2	26.13229	258.01221	26.32948	3.03654	-3.69000
23	3	27.03030	257.94165	26.32948	3.56088	-4.46000
23	4	27.92639	257.86963	26.32948	4.08522	-6.06000
23	5	28.82074	257.79614	26.32948	4.60956	-6.46000
23	6	29.71347	257.72144	26.32948	5.13390	-3.05000
23	7	30.60481	257.64453	26.32948	5.65824	0.80000
23	8	31.49495	257.56641	26.32948	6.18258	2.89000
23	9	32.38403	257.48608	26.32948	6.70692	2.56000
23	10	33.27229	257.40454	26.32948	7.23126	3.56000
23	11	34.15988	257.32153	26.32948	7.75560	4.57000
23	12	35.04703	257.23706	26.32948	8.27994	4.76000
23	13	35.93388	257.14966	26.32948	8.80428	3.36000
23	14	36.82068	257.05957	26.32948	9.32862	2.54000
23	15	37.70766	256.96626	26.32948	9.85296	2.79000
23	16	38.59500	256.87476	26.32948	10.37730	3.47000
23	17	39.48299	256.77975	26.32948	10.90164	2.39000
23	18	40.37181	256.68164	26.32948	11.42598	1.28000
23	19	41.26173	256.58130	26.32948	11.95032	-0.73000
23	20	42.15303	256.47800	26.32948	12.47466	-2.65000
23	21	43.04599	256.37378	26.32948	12.99900	-3.78000
23	22	43.94089	256.26867	26.32948	13.52334	-4.39000
23	23	44.83803	256.15982	26.32948	14.04768	-3.25000
23	24	45.73776	256.04224	26.32948	14.57202	1.26000
23	25	46.64046	255.92644	26.32948	15.09636	4.34000
23	26	47.54645	255.80714	26.32948	15.62070	2.95000
23	27	48.45616	255.68445	26.32948	16.14503	999.00000
23	28	49.37004	255.55675	26.32948	16.66937	999.00000
23	29	50.28857	255.42970	26.32948	17.19371	999.00000
23	30	51.21223	255.29663	26.32948	17.71805	999.00000
23	31	52.14166	255.16054	26.32948	18.24240	999.00000
23	32	53.07738	255.02002	26.32948	18.76674	999.00000
24	1	25.29041	259.06714	26.85382	2.51220	999.00000
24	2	26.19093	259.00781	26.85382	3.03654	-2.27000

24	3	27.08543	256.94751	26.65382	3.56088	-2.55000
24	4	27.58598	258.68550	26.65382	4.08522	-4.61000
24	5	28.08083	258.82227	26.65382	4.60556	-4.90000
24	6	29.77411	258.75806	26.65382	5.13390	-1.65000
24	7	30.66602	258.69336	26.65382	5.65824	1.67000
24	8	31.55672	258.62476	26.65382	6.18258	3.21000
24	9	32.44641	258.55640	26.65382	6.70692	2.05000
24	10	33.33527	258.48823	26.65382	7.23126	1.80000
24	11	34.22351	258.41955	26.65382	7.75560	1.37000
24	12	35.11134	258.34155	26.65382	8.27994	0.64000
24	13	35.99893	258.26636	26.65382	8.80428	1.24000
24	14	36.88647	258.18994	26.65382	9.32862	3.31000
24	15	37.77422	258.11167	26.65382	9.85296	4.66000
24	16	38.66238	258.03174	26.65382	10.37730	1.76000
24	17	39.55121	257.94922	26.65382	10.90164	-1.01000
24	18	40.44095	257.86572	26.65382	11.42598	-2.02000
24	19	41.33182	257.77954	26.65382	11.95032	-2.25000
24	20	42.22411	257.69116	26.65382	12.47466	-3.44000
24	21	43.11806	257.60107	26.65382	12.99900	-5.66000
24	22	44.01402	257.50854	26.65382	13.52334	-6.02000
24	23	44.91231	257.41357	26.65382	14.04768	-3.25000
24	24	45.81323	257.31641	26.65382	14.57202	1.67000
24	25	46.71719	257.21655	26.65382	15.09636	3.35000
24	26	47.62453	257.11426	26.65382	15.62070	999.00000
24	27	48.53561	257.00903	26.65382	16.14503	999.00000
24	28	49.45096	256.90112	26.65382	16.66937	999.00000
24	29	50.37103	256.78979	26.65382	17.19371	999.00000
24	30	51.29637	256.67603	26.65382	17.71805	999.00000
24	31	52.22752	256.55865	26.65382	18.24240	999.00000
24	32	53.16512	256.43799	26.65382	18.76674	999.00000
25	1	25.33969	260.05420	27.37816	2.51220	999.00000
25	2	26.24060	260.00464	27.37816	3.03654	0.19000
25	3	27.13948	259.95410	27.37816	3.56088	-1.56000
25	4	28.03644	259.90234	27.37816	4.08522	-2.75000
25	5	28.93173	259.84961	27.37816	4.60556	-2.40000
25	6	29.82544	259.79614	27.37816	5.13390	0.19000
25	7	30.71780	259.74146	27.37816	5.65824	2.75000
25	8	31.60901	259.68530	27.37816	6.18258	3.45000
25	9	32.49921	259.62793	27.37816	6.70692	1.82000
25	10	33.38861	259.56934	27.37816	7.23126	0.01000
25	11	34.27740	259.50952	27.37816	7.75560	-0.21000
25	12	35.16582	259.44849	27.37816	8.27994	1.65000
25	13	36.05400	259.38599	27.37816	8.80428	3.85000
25	14	36.94218	259.32227	27.37816	9.32862	4.75000
25	15	37.83061	259.25708	27.37816	9.85296	3.64000
25	16	38.71947	259.18994	27.37816	10.37730	0.73000
25	17	39.60901	259.12158	27.37816	10.90164	-1.64000
25	18	40.49953	259.05151	27.37816	11.42598	-3.47000
25	19	41.39117	258.97925	27.37816	11.95032	-4.38000
25	20	42.28427	258.90576	27.37816	12.47466	-4.74000
25	21	43.17912	258.83081	27.37816	12.99900	-4.87000
25	22	44.07602	258.75342	27.37816	13.52334	-3.43000
25	23	44.97525	258.67407	27.37816	14.04768	-0.66000
25	24	45.87720	258.59302	27.37816	14.57202	0.65000
25	25	46.78221	258.50977	27.37816	15.09636	0.31000
25	26	47.69064	258.42407	27.37816	15.62070	999.00000
25	27	48.60291	258.33618	27.37816	16.14503	999.00000
25	28	49.51955	258.24609	27.37816	16.66937	999.00000
25	29	50.44095	258.15356	27.37816	17.19371	999.00000
25	30	51.36765	258.05811	27.37816	17.71805	999.00000
25	31	52.30032	257.96045	27.37816	18.24240	999.00000
25	32	53.23949	257.85986	27.37816	18.76674	999.00000
26	1	25.38004	261.04224	27.90250	2.51220	999.00000
26	2	26.28123	261.00220	27.90250	3.03654	-1.21000
26	3	27.18042	260.96191	27.90250	3.56088	-2.56000
26	4	28.07774	260.92090	27.90250	4.08522	-2.72000
26	5	28.97337	260.87842	27.90250	4.60556	-2.22000
26	6	29.86746	260.83545	27.90250	5.13390	-0.29000
26	7	30.76022	260.79126	27.90250	5.65824	2.33000
26	8	31.65181	260.74634	27.90250	6.18258	3.38000
26	9	32.54242	260.70093	27.90250	6.70692	1.76000
26	10	33.43228	260.65381	27.90250	7.23126	-0.20000
26	11	34.32153	260.60571	27.90250	7.75560	1.21000
26	12	35.21042	260.55688	27.90250	8.27994	5.54000
26	13	36.09912	260.50684	27.90250	8.80428	7.91000
26	14	36.98781	260.45581	27.90250	9.32862	5.85000
26	15	37.87677	260.40381	27.90250	9.85296	1.85000
26	16	38.76620	260.34985	27.90250	10.37730	0.62000
26	17	39.65633	260.29492	27.90250	10.90164	-0.02000
26	18	40.54743	260.23901	27.90250	11.42598	-1.65000
26	19	41.43977	260.18115	27.90250	11.95032	-4.35000
26	20	42.33356	260.12256	27.90250	12.47466	-5.43000
26	21	43.22914	260.06201	27.90250	12.99900	-3.48000

26	22	44.12677	260.00024	27.90250	13.52334	-0.42000
26	23	45.02681	259.93677	27.90250	14.04768	1.41000
26	24	45.92958	259.87183	27.90250	14.57202	0.72000
26	25	46.83546	259.80516	27.90250	15.09636	-0.37000
26	26	47.74484	259.73633	27.90250	15.62070	999.00000
26	27	48.65607	259.66626	27.90250	16.14503	999.00000
26	28	49.57570	259.59375	27.90250	16.66937	999.00000
26	29	50.49620	259.51929	27.90250	17.19371	999.00000
26	30	51.42607	259.44336	27.90250	17.71805	999.00000
26	31	52.35995	259.36475	27.90250	18.24240	999.00000
26	32	53.30042	259.28418	27.90250	18.76674	999.00000
27	1	25.41141	262.03052	28.42683	2.51220	999.00000
27	2	26.31388	262.00054	28.42683	3.03654	-6.03000
27	3	27.21231	261.97021	28.42683	3.56088	-4.50000
27	4	28.10988	261.93921	28.42683	4.08522	-3.63000
27	5	29.00577	261.90796	28.42683	4.60956	-4.12000
27	6	29.90018	261.87573	28.42683	5.13390	-3.04000
27	7	30.79321	261.84253	28.42683	5.65824	-0.63000
27	8	31.68512	261.80908	28.42683	6.18258	1.31000
27	9	32.57607	261.77466	28.42683	6.70692	0.17000
27	10	33.46626	261.73994	28.42683	7.23126	0.32000
27	11	34.35588	261.70337	28.42683	7.75560	3.84000
27	12	35.24513	261.66675	28.42683	8.27994	8.70000
27	13	36.13420	261.62891	28.42683	8.80428	9.22000
27	14	37.02330	261.59082	28.42683	9.32862	4.84000
27	15	37.91270	261.55127	28.42683	9.85296	0.97000
27	16	38.80257	261.51099	28.42683	10.37730	-0.13000
27	17	39.69318	261.46973	28.42683	10.90164	0.91000
27	18	40.58478	261.42773	28.42683	11.42598	0.15000
27	19	41.47762	261.38452	28.42683	11.95032	-2.09000
27	20	42.37193	261.34033	28.42683	12.47466	-5.05000
27	21	43.26804	261.29517	28.42683	12.99900	-3.20000
27	22	44.16628	261.24854	28.42683	13.52334	0.51000
27	23	45.06694	261.20093	28.42683	14.04768	1.51000
27	24	45.97034	261.15210	28.42683	14.57202	1.09000
27	25	46.87691	261.10205	28.42683	15.09636	-0.02000
27	26	47.78702	261.05026	28.42683	15.62070	999.00000
27	27	48.70099	260.99756	28.42683	16.14503	999.00000
27	28	49.61943	260.94336	28.42683	16.66937	999.00000
27	29	50.54280	260.88770	28.42683	17.19371	999.00000
27	30	51.47157	260.83032	28.42683	17.71805	999.00000
27	31	52.40640	260.77124	28.42683	18.24240	999.00000
27	32	53.34789	260.71069	28.42683	18.76674	999.00000
28	1	25.43382	262.01978	28.95117	2.51220	999.00000
28	2	26.33546	261.99976	28.95117	3.03654	-6.66000
28	3	27.23506	261.97998	28.95117	3.56088	-3.04000
28	4	28.13283	261.95898	28.95117	4.08522	-2.72000
28	5	29.02895	261.93774	28.95117	4.60956	-3.97000
28	6	29.92354	261.91626	28.95117	5.13390	-4.14000
28	7	30.81679	261.89453	28.95117	5.65824	-3.40000
28	8	31.70891	261.87207	28.95117	6.18258	-1.62000
28	9	32.60008	261.84912	28.95117	6.70692	-1.09000
28	10	33.49052	261.82544	28.95117	7.23126	1.06000
28	11	34.38040	261.80151	28.95117	7.75560	4.56000
28	12	35.26994	261.77686	28.95117	8.27994	8.08000
28	13	36.15927	261.75195	28.95117	8.80428	8.24000
28	14	37.04869	261.72632	28.95117	9.32862	4.56000
28	15	37.93837	261.70020	28.95117	9.85296	0.66000
28	16	38.82857	261.67334	28.95117	10.37730	0.02000
28	17	39.71950	261.64575	28.95117	10.90164	1.15000
28	18	40.61143	261.61766	28.95117	11.42598	-0.03000
28	19	41.50464	261.58887	28.95117	11.95032	-2.38000
28	20	42.39932	261.55957	28.95117	12.47466	-3.81000
28	21	43.29587	261.52905	28.95117	12.99900	-1.66000
28	22	44.19450	261.49805	28.95117	13.52334	0.22000
28	23	45.09560	261.46606	28.95117	14.04768	0.71000
28	24	45.99950	261.43384	28.95117	14.57202	0.42000
28	25	46.90657	261.40039	28.95117	15.09636	999.00000
28	26	47.81715	261.36657	28.95117	15.62070	999.00000
28	27	48.73172	261.33081	28.95117	16.14503	999.00000
28	28	49.65071	261.29468	28.95117	16.66937	999.00000
28	29	50.57465	261.25732	28.95117	17.19371	999.00000
28	30	51.50409	261.21899	28.95117	17.71805	999.00000
28	31	52.43962	261.17969	28.95117	18.24240	999.00000
28	32	53.38184	261.13916	28.95117	18.76674	999.00000
29	1	25.44727	264.00952	29.47551	2.51220	999.00000
29	2	26.34603	263.99976	29.47551	3.03654	-6.54000
29	3	27.24675	263.98950	29.47551	3.56088	0.03000
29	4	28.14661	263.97925	29.47551	4.08522	-0.44000
29	5	29.04283	263.96826	29.47551	4.60956	-0.82000
29	6	29.93753	263.95752	29.47551	5.13390	-1.80000
29	7	30.83095	263.94653	29.47551	5.65824	-3.01000
29	8	31.72322	263.93555	29.47551	6.18258	-3.36000

25	9	32.61453	263.92407	29.47851	6.70692	-1.36000
25	10	33.50511	263.91211	29.47851	7.23126	1.55000
25	11	34.39511	263.90039	29.47851	7.75560	5.08000
25	12	35.28481	263.88794	29.47851	8.27994	7.85000
25	13	36.17432	263.87524	29.47851	8.80426	7.64000
25	14	37.06390	263.86255	29.47851	9.32862	4.83000
25	15	37.95378	263.84937	29.47851	9.85296	2.61000
25	16	38.84418	263.83618	29.47851	10.37730	4.62000
25	17	39.73529	263.82227	29.47851	10.90164	4.63000
25	18	40.62746	263.80811	29.47851	11.42598	1.09000
25	19	41.52086	263.79370	29.47851	11.95032	-1.40000
25	20	42.41580	263.77881	29.47851	12.47466	0.30000
25	21	43.31256	263.76416	29.47851	12.99900	1.55000
25	22	44.21146	263.74829	29.47851	13.52334	-0.24000
25	23	45.11282	263.73267	29.47851	14.04768	-1.31000
25	24	46.01698	263.71606	29.47851	14.57202	-0.47000
25	25	46.92435	263.69946	29.47851	15.09636	999.00000
25	26	47.83525	263.68262	29.47851	15.62070	999.00000
25	27	48.75012	263.66479	29.47851	16.14503	999.00000
25	28	49.66948	263.64746	29.47851	16.66937	999.00000
25	29	50.59381	263.62817	29.47851	17.19371	999.00000
25	30	51.52361	263.60864	29.47851	17.71805	999.00000
25	31	52.45955	263.58911	29.47851	18.24240	999.00000
25	32	53.40221	263.56885	29.47851	18.76674	999.00000
0	1	25.45177	264.99951	29.99986	2.51220	999.00000
0	2	26.35355	264.99951	29.99986	3.03654	2.82000
0	3	27.25330	264.99951	29.99986	3.56088	0.81000
0	4	28.15120	264.99951	29.99986	4.08522	0.55000
0	5	29.04747	264.99951	29.99986	4.60956	1.04000
0	6	29.94221	264.99951	29.99986	5.13390	0.57000
0	7	30.83565	264.99951	29.99986	5.65824	-2.26000
0	8	31.72797	264.99951	29.99986	6.18258	-4.51000
0	9	32.61934	264.99951	29.99986	6.70692	-3.04000
0	10	33.50996	264.99951	29.99986	7.23126	0.14000
0	11	34.40002	264.99951	29.99986	7.75560	3.56000
0	12	35.28976	264.99902	29.99986	8.27994	8.05000
0	13	36.17934	264.99902	29.99986	8.80428	6.61000
0	14	37.06898	264.99902	29.99986	9.32862	4.12000
0	15	37.95891	264.99902	29.99986	9.85296	4.47000
0	16	38.84935	264.99902	29.99986	10.37730	9.46000
0	17	39.74055	264.99902	29.99986	10.90164	10.21000
0	18	40.63280	264.99902	29.99986	11.42598	5.37000
0	19	41.52628	264.99902	29.99986	11.95032	0.55000
0	20	42.42128	264.99902	29.99986	12.47466	0.52000
0	21	43.31813	264.99902	29.99986	12.99900	1.26000
0	22	44.21712	264.99902	29.99986	13.52334	-1.93000
0	23	45.11856	264.99902	29.99986	14.04768	-2.66000
0	24	46.02281	264.99902	29.99986	14.57202	-0.25000
0	25	46.93027	264.99902	29.99986	15.09636	999.00000
0	26	47.84128	264.99902	29.99986	15.62070	999.00000
0	27	48.75627	264.99902	29.99986	16.14503	999.00000
0	28	49.67574	264.99902	29.99986	16.66937	999.00000
0	29	50.60017	264.99902	29.99986	17.19371	999.00000
0	30	51.53011	264.99902	29.99986	17.71805	999.00000
0	31	52.46619	264.99902	29.99986	18.24240	999.00000
0	32	53.40900	264.99902	29.99986	18.76674	999.00000
1	1	25.44730	265.98926	30.02419	2.51220	999.00000
1	2	26.34503	265.99927	30.02419	3.03654	2.15000
1	3	27.24875	266.00952	30.02419	3.56088	-0.35000
1	4	28.14661	266.01978	30.02419	4.08522	0.47000
1	5	29.04283	266.03027	30.02419	4.60956	2.56000
1	6	29.93756	266.04102	30.02419	5.13390	1.44000
1	7	30.83095	266.05200	30.02419	5.65824	-1.55000
1	8	31.72322	266.06348	30.02419	6.18258	-4.01000
1	9	32.61453	266.07446	30.02419	6.70692	-5.29000
1	10	33.50511	266.08643	30.02419	7.23126	-4.10000
1	11	34.39513	266.09814	30.02419	7.75560	-0.62000
1	12	35.28482	266.11060	30.02419	8.27994	4.37000
1	13	36.17432	266.12305	30.02419	8.80426	4.47000
1	14	37.06390	266.13599	30.02419	9.32862	2.66000
1	15	37.95378	266.14917	30.02419	9.85296	2.89000
1	16	38.84418	266.16284	30.02419	10.37730	6.33000
1	17	39.73529	266.17627	30.02419	10.90164	10.86000
1	18	40.62746	266.19043	30.02419	11.42598	7.65000
1	19	41.52086	266.20483	30.02419	11.95032	3.87000
1	20	42.41580	266.21973	30.02419	12.47466	0.55000
1	21	43.31256	266.23462	30.02419	12.99900	-2.66000
1	22	44.21149	266.25024	30.02419	13.52334	-4.82000
1	23	45.11282	266.26587	30.02419	14.04768	-2.66000
1	24	46.01698	266.28247	30.02419	14.57202	0.55000
1	25	46.92435	266.29907	30.02419	15.09636	999.00000
1	26	47.83525	266.31616	30.02419	15.62070	999.00000
1	27	48.75012	266.33398	30.02419	16.14503	999.00000

1	24	49.66948	266.35205	0.52419	16.66937	999.00000
1	25	50.59381	266.37026	0.52419	17.19371	999.00000
1	30	51.52361	266.38940	0.52419	17.71805	999.00000
1	31	52.45555	266.40942	0.52419	18.24240	999.00000
1	32	53.40321	266.42944	0.52419	18.76674	999.00000
2	1	25.43385	266.57176	1.04652	2.51220	999.00000
2	2	26.33548	266.59878	1.04652	3.03654	-2.47000
2	3	27.23809	267.01904	1.04652	3.56088	-1.73000
2	4	28.13286	267.03979	1.04652	4.08522	-0.34000
2	5	29.02895	267.06079	1.04652	4.60956	1.14000
2	6	29.92354	267.08228	1.04652	5.13390	0.58000
2	7	30.81679	267.10449	1.04652	5.65824	-0.57000
2	8	31.70864	267.12665	1.04652	6.18258	-2.80000
2	9	32.60011	267.14990	1.04652	6.70692	-6.56000
2	10	33.49055	267.17334	1.04652	7.23126	-6.60000
2	11	34.38040	267.19702	1.04652	7.75560	-2.74000
2	12	35.26994	267.22168	1.04652	8.27994	1.03000
2	13	36.15927	267.24656	1.04652	8.80428	2.52000
2	14	37.04869	267.27222	1.04652	9.32862	1.51000
2	15	37.93837	267.29858	1.04652	9.85296	1.78000
2	16	38.82857	267.32636	1.04652	10.37730	3.31000
2	17	39.71951	267.35278	1.04652	10.90164	4.08000
2	18	40.61147	267.38086	1.04652	11.42598	3.67000
2	19	41.50464	267.40967	1.04652	11.95032	2.10000
2	20	42.39937	267.43945	1.04652	12.47466	0.64000
2	21	43.29587	267.46948	1.04652	12.99900	-4.73000
2	22	44.19453	267.50049	1.04652	13.52334	-5.03000
2	23	45.09563	267.53247	1.04652	14.04768	-1.28000
2	24	45.99951	267.56616	1.04652	14.57202	6.73000
2	25	46.90657	267.59814	1.04652	15.09636	999.00000
2	26	47.81715	267.63257	1.04652	15.62070	999.00000
2	27	48.73172	267.66772	1.04652	16.14503	999.00000
2	28	49.65074	267.70386	1.04652	16.66937	999.00000
2	29	50.57468	267.74121	1.04652	17.19371	999.00000
2	30	51.50409	267.77994	1.04652	17.71805	999.00000
2	31	52.43962	267.81909	1.04652	18.24240	999.00000
2	32	53.38184	267.86036	1.04652	18.76674	999.00000
3	1	25.41142	267.96802	1.57286	2.51220	999.00000
3	2	26.31288	267.99780	1.57286	3.03654	-3.55000
3	3	27.21231	268.02822	1.57286	3.56088	-2.29000
3	4	28.10988	268.05933	1.57286	4.08522	-1.64000
3	5	29.00580	268.09106	1.57286	4.60956	-1.00000
3	6	29.90018	268.12329	1.57286	5.13390	-0.37000
3	7	30.79321	268.15601	1.57286	5.65824	-1.62000
3	8	31.68513	268.18954	1.57286	6.18258	-4.66000
3	9	32.57608	268.22437	1.57286	6.70692	-7.43000
3	10	33.46628	268.25928	1.57286	7.23126	-5.80000
3	11	34.35588	268.29541	1.57286	7.75560	-0.97000
3	12	35.24513	268.33228	1.57286	8.27994	1.06000
3	13	36.13422	268.36963	1.57286	8.80428	0.51000
3	14	37.02333	268.40771	1.57286	9.32862	-0.06000
3	15	37.91270	268.44727	1.57286	9.85296	0.50000
3	16	38.80260	268.48755	1.57286	10.37730	6.55000
3	17	39.69318	268.52881	1.57286	10.90164	-0.61000
3	18	40.58481	268.57080	1.57286	11.42598	-1.62000
3	19	41.47762	268.61426	1.57286	11.95032	-0.48000
3	20	42.37193	268.65820	1.57286	12.47466	0.85000
3	21	43.26807	268.70386	1.57286	12.99900	-1.84000
3	22	44.16629	268.75000	1.57286	13.52334	-3.83000
3	23	45.06694	268.79761	1.57286	14.04768	-2.18000
3	24	45.97037	268.84644	1.57286	14.57202	0.03000
3	25	46.87694	268.89648	1.57286	15.09636	999.00000
3	26	47.78702	268.94824	1.57286	15.62070	999.00000
3	27	48.70102	269.00159	1.57286	16.14503	999.00000
3	28	49.61946	269.05518	1.57286	16.66937	999.00000
3	29	50.54280	269.11084	1.57286	17.19371	999.00000
3	30	51.47157	269.16821	1.57286	17.71805	999.00000
3	31	52.40642	269.22729	1.57286	18.24240	999.00000
3	32	53.34792	269.28784	1.57286	18.76674	999.00000
4	1	25.38005	268.95679	2.09721	2.51220	999.00000
4	2	26.28127	268.99634	2.09721	3.03654	-1.55000
4	3	27.18045	269.03711	2.09721	3.56088	-1.45000
4	4	28.07776	269.07813	2.09721	4.08522	-2.33000
4	5	28.97340	269.12012	2.09721	4.60956	-1.55000
4	6	29.86749	269.16357	2.09721	5.13390	-1.40000
4	7	30.76024	269.20728	2.09721	5.65824	-2.91000
4	8	31.65184	269.25220	2.09721	6.18258	-5.11000
4	9	32.54245	269.29810	2.09721	6.70692	-5.38000
4	10	33.43230	269.34472	2.09721	7.23126	-3.41000
4	11	34.32156	269.39282	2.09721	7.75560	-1.11000
4	12	35.21045	269.44165	2.09721	8.27994	0.11000
4	13	36.09912	269.49170	2.09721	8.80428	-0.45000
4	14	36.98784	269.54321	2.09721	9.32862	-1.21000

4	15	37.87680	269.59521	2.09721	9.85296	-0.42000
4	16	38.76622	269.64552	2.09721	10.37730	0.56000
4	17	39.65636	269.70361	2.09721	10.90164	0.50000
4	18	40.54749	269.75952	2.09721	11.42598	-0.62000
4	19	41.43980	269.81336	2.09721	11.95032	-0.26000
4	20	42.33359	269.87646	2.09721	12.47466	2.21000
4	21	43.22914	269.93677	2.09721	12.99900	1.74000
4	22	44.12680	269.99524	2.09721	13.52334	-4.47000
4	23	45.02652	270.06201	2.09721	14.04768	-4.62000
4	24	45.92960	270.12655	2.09721	14.57202	-0.82000
4	25	46.83549	270.19385	2.09721	15.09636	555.00000
4	26	47.74486	270.26221	2.09721	15.62070	555.00000
4	27	48.65810	270.33276	2.09721	16.14503	555.00000
4	28	49.57573	270.40503	2.09721	16.66937	555.00000
4	29	50.49823	270.47925	2.09721	17.19371	555.00000
4	30	51.42610	270.55516	2.09721	17.71805	555.00000
4	31	52.35999	270.63279	2.09721	18.24240	555.00000
4	32	53.30048	270.71436	2.09721	18.76674	555.00000
5	1	25.33971	269.54482	2.62155	2.51220	555.00000
5	2	26.24063	269.59438	2.62155	3.03654	-2.26000
5	3	27.13660	270.04492	2.62155	3.56088	-2.74000
5	4	28.03645	270.09619	2.62155	4.08522	-2.55000
5	5	28.92175	270.14653	2.62155	4.60956	-1.58000
5	6	29.82545	270.20286	2.62155	5.13390	-1.57000
5	7	30.71783	270.25757	2.62155	5.65824	-2.24000
5	8	31.60904	270.31372	2.62155	6.18258	-2.21000
5	9	32.49922	270.37109	2.62155	6.70692	-2.47000
5	10	33.38864	270.42920	2.62155	7.23126	0.80000
5	11	34.27744	270.48501	2.62155	7.75560	1.22000
5	12	35.16586	270.55008	2.62155	8.27994	1.40000
5	13	36.05405	270.61288	2.62155	8.80428	-0.45000
5	14	36.94225	270.67676	2.62155	9.32862	-1.22000
5	15	37.83064	270.74194	2.62155	9.85296	-0.36000
5	16	38.71950	270.80855	2.62155	10.37730	1.12000
5	17	39.60904	270.87655	2.62155	10.90164	2.61000
5	18	40.49954	270.94751	2.62155	11.42598	2.07000
5	19	41.39120	271.01955	2.62155	11.95032	2.12000
5	20	42.28430	271.09277	2.62155	12.47466	2.71000
5	21	43.17918	271.16797	2.62155	12.99900	-0.13000
5	22	44.07605	271.24512	2.62155	13.52334	-1.15000
5	23	44.97528	271.32446	2.62155	14.04768	-1.79000
5	24	45.87721	271.40552	2.62155	14.57202	555.00000
5	25	46.78224	271.48877	2.62155	15.09636	555.00000
5	26	47.69070	271.57471	2.62155	15.62070	555.00000
5	27	48.60267	271.66336	2.62155	16.14503	555.00000
5	28	49.51956	271.75244	2.62155	16.66937	555.00000
5	29	50.44096	271.84497	2.62155	17.19371	555.00000
5	30	51.36769	271.94067	2.62155	17.71805	555.00000
5	31	52.30034	272.03605	2.62155	18.24240	555.00000
5	32	53.23953	272.13652	2.62155	18.76674	555.00000
6	1	25.29044	270.93140	.14585	2.51220	-2.75000
6	2	26.19099	270.99072	.14585	3.03654	-2.17000
6	3	27.08945	271.05161	.14585	3.56088	-2.72000
6	4	27.98601	271.11353	.14585	4.08522	-2.26000
6	5	28.88087	271.17627	.14585	4.60956	-1.43000
6	6	29.77414	271.24057	.14585	5.13390	-1.43000
6	7	30.66605	271.30664	.14585	5.65824	-2.44000
6	8	31.55673	271.37378	.14585	6.18258	-0.52000
6	9	32.44643	271.44266	.14585	6.70692	4.65000
6	10	33.33531	271.51270	.14585	7.23126	5.40000
6	11	34.22354	271.58396	.14585	7.75560	6.82000
6	12	35.11140	271.65747	.14585	8.27994	1.56000
6	13	35.99896	271.73218	.14585	8.80428	0.21000
6	14	36.88652	271.80859	.14585	9.32862	2.21000
6	15	37.77428	271.88696	.14585	9.85296	2.56000
6	16	38.66245	271.96725	.14585	10.37730	0.87000
6	17	39.55125	272.04982	.14585	10.90164	0.38000
6	18	40.44099	272.13380	.14585	11.42598	2.36000
6	19	41.33186	272.21996	.14585	11.95032	4.38000
6	20	42.22412	272.30737	.14585	12.47466	0.47000
6	21	43.11810	272.39746	.14585	12.99900	-1.06000
6	22	44.01408	272.48999	.14585	13.52334	-0.31000
6	23	44.91237	272.58496	.14585	14.04768	555.00000
6	24	45.81329	272.68237	.14585	14.57202	555.00000
6	25	46.71722	272.78198	.14585	15.09636	555.00000
6	26	47.62456	272.88428	.14585	15.62070	555.00000
6	27	48.53564	272.98975	.14585	16.14503	555.00000
6	28	49.45099	273.09741	.14585	16.66937	555.00000
6	29	50.37106	273.20674	.14585	17.19371	555.00000
6	30	51.29640	273.32221	.14585	17.71805	555.00000
6	31	52.22758	273.44019	.14585	18.24240	555.00000
6	32	53.16516	273.56030	.14585	18.76674	555.00000
7	1	25.23224	271.51724	.67023	2.51220	555.00000

27	2	26.13232	271.98633	.67023	3.03654	-4.26000
27	3	27.03033	272.05688	.67023	3.56088	-4.09000
27	4	27.92642	272.12915	.67023	4.08522	-2.15000
27	5	28.82076	272.20239	.67023	4.60956	-0.17000
27	6	29.71350	272.27766	.67023	5.13390	2.50000
27	7	30.60486	272.35400	.67023	5.65824	-0.44000
27	8	31.49498	272.43262	.67023	6.18258	-2.15000
27	9	32.38405	272.51248	.67023	6.70692	-1.37000
27	10	33.27232	272.59399	.67023	7.23126	3.53000
27	11	34.15990	272.67749	.67023	7.75560	8.11000
27	12	35.04706	272.76294	.67023	8.27994	7.34000
27	13	35.93393	272.84988	.67023	8.80428	4.91000
27	14	36.82074	272.93841	.67023	9.32862	5.33000
27	15	37.70769	273.03027	.67023	9.85296	6.61000
27	16	38.59506	273.12378	.67023	10.37730	3.24000
27	17	39.48302	273.21924	.67023	10.90164	-2.52000
27	18	40.37186	273.31689	.67023	11.42598	-5.32000
27	19	41.26180	273.41724	.67023	11.95032	-2.13000
27	20	42.15309	273.52002	.67023	12.47466	2.40000
27	21	43.04605	273.62476	.67023	12.99900	4.74000
27	22	43.94092	273.73267	.67023	13.52334	4.47000
27	23	44.83809	273.84302	.67023	14.04768	1.52000
27	24	45.73781	273.95630	.67023	14.57202	999.00000
27	25	46.64050	274.07275	.67023	15.09636	999.00000
27	26	47.54651	274.19165	.67023	15.62070	999.00000
27	27	48.45621	274.31421	.67023	16.14503	999.00000
27	28	49.37009	274.43994	.67023	16.66937	999.00000
27	29	50.28862	274.56909	.67023	17.19371	999.00000
27	30	51.21230	274.70196	.67023	17.71805	999.00000
27	31	52.14172	274.83813	.67023	18.24240	999.00000
27	32	53.07742	274.97827	.67023	18.76674	999.00000
28	1	25.16512	272.90186	4.19456	2.51220	999.00000
28	2	26.06471	272.98171	4.19456	3.03654	-4.59000
28	3	26.96216	273.06104	4.19456	3.56088	-4.94000
28	4	27.85770	273.14231	4.19456	4.08522	-1.55000
28	5	28.75146	273.22725	4.19456	4.60956	1.36000
28	6	29.64362	273.31374	4.19456	5.13390	1.05000
28	7	30.53432	273.40015	4.19456	5.65824	-1.76000
28	8	31.42377	273.48926	4.19456	6.18258	-3.85000
28	9	32.31216	273.58057	4.19456	6.70692	-4.19000
28	10	33.19971	273.67407	4.19456	7.23126	-1.58000
28	11	34.08653	273.76904	4.19456	7.75560	-1.23000
28	12	34.97292	273.86646	4.19456	8.27994	2.13000
28	13	35.85893	273.96558	4.19456	8.80428	8.77000
28	14	36.74490	274.06763	4.19456	9.32862	10.88000
28	15	37.63097	274.17163	4.19456	9.85296	5.78000
28	16	38.51738	274.27808	4.19456	10.37730	2.66000
28	17	39.40436	274.38656	4.19456	10.90164	-2.12000
28	18	40.29219	274.49654	4.19456	11.42598	-4.55000
28	19	41.18105	274.61279	4.19456	11.95032	-6.74000
28	20	42.07121	274.72958	4.19456	12.47466	-3.06000
28	21	42.96297	274.84961	4.19456	12.99900	5.84000
28	22	43.85664	274.97241	4.19456	13.52334	7.16000
28	23	44.75247	275.09839	4.19456	14.04768	2.05000
28	24	45.65086	275.22754	4.19456	14.57202	999.00000
28	25	46.55209	275.35986	4.19456	15.09636	999.00000
28	26	47.45659	275.49585	4.19456	15.62070	999.00000
28	27	48.36469	275.63550	4.19456	16.14503	999.00000
28	28	49.27690	275.77856	4.19456	16.66937	999.00000
28	29	50.19366	275.92578	4.19456	17.19371	999.00000
28	30	51.11643	276.07656	4.19456	17.71805	999.00000
28	31	52.04285	276.23242	4.19456	18.24240	999.00000
28	32	52.97646	276.39233	4.19456	18.76674	999.00000
29	1	25.08908	272.85452	4.71890	2.51220	999.00000
29	2	25.98810	272.97339	4.71890	3.03654	-5.29000
29	3	26.88496	274.06372	4.71890	3.56088	-6.00000
29	4	27.77985	274.15601	4.71890	4.08522	-3.02000
29	5	28.67297	274.25024	4.71890	4.60956	-1.36000
29	6	29.56443	274.34616	4.71890	5.13390	-1.17000
29	7	30.45442	274.44458	4.71890	5.65824	-2.36000
29	8	31.34315	274.54468	4.71890	6.18258	-3.85000
29	9	32.23077	274.64722	4.71890	6.70692	-4.67000
29	10	33.11748	274.75146	4.71890	7.23126	-6.90000
29	11	34.00348	274.85864	4.71890	7.75560	-7.46000
29	12	34.88895	274.96753	4.71890	8.27994	-1.40000
29	13	35.77405	275.07935	4.71890	8.80428	5.56000
29	14	36.65903	275.19360	4.71890	9.32862	16.23000
29	15	37.54408	275.31030	4.71890	9.85296	11.85000
29	16	38.42946	275.42993	4.71890	10.37730	3.35000
29	17	39.31532	275.55224	4.71890	10.90164	0.16000
29	18	40.20198	275.67749	4.71890	11.42598	-2.35000
29	19	41.08965	275.80566	4.71890	11.95032	-7.31000
29	20	41.97855	275.93701	4.71890	12.47466	-5.96000

39	21	42.86897	276.07153	24.71690	12.99900	2.35000
39	22	43.76125	276.26658	24.71690	13.52334	6.76000
39	23	44.65564	276.35034	24.71690	14.04768	3.56000
39	24	45.55246	276.49512	24.71690	14.57202	999.00000
39	25	46.45213	276.64360	24.71690	15.09636	999.00000
39	26	47.35487	276.79614	24.71690	15.62070	999.00000
39	27	48.26122	276.95288	24.71690	16.14503	999.00000
39	28	49.17149	277.11377	24.71690	16.66937	999.00000
39	29	50.08624	277.27856	24.71690	17.19371	999.00000
39	30	51.00591	277.44624	24.71690	17.71805	999.00000
39	31	51.93108	277.62231	24.71690	18.24240	999.00000
39	32	52.86229	277.80151	24.71690	18.76674	999.00000
40	1	25.00415	274.66572	25.24324	2.51220	999.00000
40	2	25.90254	274.96367	25.24324	3.03654	-2.36000
40	3	26.79872	275.06445	25.24324	3.56088	-3.40000
40	4	27.69292	275.16675	25.24324	4.08522	-2.69000
40	5	28.58533	275.27184	25.24324	4.60956	-2.80000
40	6	29.47600	275.37765	25.24324	5.13390	-1.56000
40	7	30.36520	275.48632	25.24324	5.65824	-1.19000
40	8	31.25310	275.59766	25.24324	6.18258	-1.90000
40	9	32.13986	275.71064	25.24324	6.70692	-5.13000
40	10	33.02565	275.82690	25.24324	7.23126	-5.00000
40	11	33.91069	275.94580	25.24324	7.75560	-8.60000
40	12	34.79520	276.06685	25.24324	8.27994	-2.81000
40	13	35.67928	276.19043	25.24324	8.80428	6.58000
40	14	36.56319	276.31685	25.24324	9.32862	11.67000
40	15	37.44711	276.44629	25.24324	9.85296	9.64000
40	16	38.33130	276.57886	25.24324	10.37730	4.02000
40	17	39.21604	276.71436	25.24324	10.90164	-0.15000
40	18	40.10132	276.85303	25.24324	11.42598	-2.81000
40	19	40.98763	276.99536	25.24324	11.95032	-4.61000
40	20	41.87514	277.14162	25.24324	12.47466	-4.81000
40	21	42.76410	277.28955	25.24324	12.99900	-2.09000
40	22	43.65482	277.44236	25.24324	13.52334	3.45000
40	23	44.54756	277.59912	25.24324	14.04768	4.55000
40	24	45.44270	277.75952	25.24324	14.57202	999.00000
40	25	46.34056	277.92383	25.24324	15.09636	999.00000
40	26	47.24144	278.09277	25.24324	15.62070	999.00000
40	27	48.14575	278.26611	25.24324	16.14503	999.00000
40	28	49.05397	278.44385	25.24324	16.66937	999.00000
40	29	49.96648	278.62695	25.24324	17.19371	999.00000
40	30	50.88379	278.81445	25.24324	17.71805	999.00000
40	31	51.80649	279.00781	25.24324	18.24240	999.00000
40	32	52.73503	279.20605	25.24324	18.76674	999.00000
41	1	24.61035	276.64473	25.76755	2.51220	999.00000
41	2	25.50603	276.95264	25.76755	3.03654	1.25000
41	3	26.70351	276.06299	25.76755	3.56088	-0.05000
41	4	27.59694	276.17505	25.76755	4.08522	-0.05000
41	5	28.48853	276.28979	25.76755	4.60956	0.91000
41	6	29.37837	276.40658	25.76755	5.13390	0.44000
41	7	30.26671	276.52612	25.76755	5.65824	-0.68000
41	8	31.15369	276.64844	25.76755	6.18258	-2.56000
41	9	32.03945	276.77295	25.76755	6.70692	-5.40000
41	10	32.92430	276.90015	25.76755	7.23126	-8.07000
41	11	33.80829	277.03003	25.76755	7.75560	-7.93000
41	12	34.69170	277.16205	25.76755	8.27994	-4.66000
41	13	35.57466	277.29883	25.76755	8.80428	0.47000
41	14	36.45738	277.43774	25.76755	9.32862	3.73000
41	15	37.34009	277.57959	25.76755	9.85296	4.04000
41	16	38.22298	277.72461	25.76755	10.37730	1.93000
41	17	39.10629	277.87276	25.76755	10.90164	-0.56000
41	18	39.99025	278.02563	25.76755	11.42598	-2.15000
41	19	40.87506	278.18164	25.76755	11.95032	-1.06000
41	20	41.76102	278.34106	25.76755	12.47466	-2.05000
41	21	42.64838	278.50464	25.76755	12.99900	-3.75000
41	22	43.53738	278.67188	25.76755	13.52334	-0.35000
41	23	44.42838	278.84351	25.76755	14.04768	1.81000
41	24	45.32162	279.01929	25.76755	14.57202	-0.29000
41	25	46.21753	279.19971	25.76755	15.09636	999.00000
41	26	47.11633	279.38477	25.76755	15.62070	999.00000
41	27	48.01845	279.57495	25.76755	16.14503	999.00000
41	28	48.92438	279.76978	25.76755	16.66937	999.00000
41	29	49.83447	279.97021	25.76755	17.19371	999.00000
41	30	50.74921	280.17578	25.76755	17.71805	999.00000
41	31	51.66916	280.38721	25.76755	18.24240	999.00000
41	32	52.59480	280.60449	25.76755	18.76674	999.00000
42	1	24.60769	276.62178	26.29193	2.51220	999.00000
42	2	25.70462	276.93921	26.29193	3.03654	1.86000
42	3	26.59929	277.05933	26.29193	3.56088	2.21000
42	4	27.49188	277.18164	26.29193	4.08522	2.06000
42	5	28.38260	277.30615	26.29193	4.60956	3.76000
42	6	29.27156	277.43335	26.29193	5.13390	2.36000
42	7	30.15894	277.56372	26.29193	5.65824	-1.22000

42	8	31.04491	277.69625	36.29193	6.18258	-4.84000
42	9	31.52967	277.83179	36.29193	6.70692	-5.63000
42	10	32.81342	277.97021	36.29193	7.23126	-5.40000
42	11	33.69627	278.11182	36.29193	7.75560	-5.75000
42	12	34.57849	278.25636	36.29193	8.27994	-5.66000
42	13	35.46022	278.40405	36.29193	8.80428	-3.76000
42	14	36.34166	278.55518	36.29193	9.32862	-1.71000
42	15	37.22302	278.70972	36.29193	9.85296	-0.06000
42	16	38.10452	278.86768	36.29193	10.37730	0.01000
42	17	38.98634	279.02905	36.29193	10.90164	-0.88000
42	18	39.86879	279.19458	36.29193	11.42598	-0.36000
42	19	40.75200	279.36401	36.29193	11.95032	1.63000
42	20	41.63628	279.53760	36.29193	12.47466	0.61000
42	21	42.52188	279.71509	36.29193	12.99900	-1.40000
42	22	43.40904	279.89722	36.29193	13.52334	-2.45000
42	23	44.29810	280.08350	36.29193	14.04768	-1.78000
42	24	45.18932	280.27490	36.29193	14.57202	-0.39000
42	25	46.08307	280.47119	36.29193	15.09636	999.00000
42	26	46.97964	280.67188	36.29193	15.62070	999.00000
42	27	47.87941	280.87842	36.29193	16.14503	999.00000
42	28	48.78282	281.09009	36.29193	16.66937	999.00000
42	29	49.69028	281.30786	36.29193	17.19371	999.00000
42	30	50.60222	281.53125	36.29193	17.71805	999.00000
42	31	51.51924	281.76099	36.29193	18.24240	999.00000
42	32	52.44176	281.99707	36.29193	18.76674	999.00000
43	1	24.69624	277.79688	36.81627	2.51220	999.00000
43	2	25.59233	277.92383	36.81627	3.03654	0.91000
43	3	26.48613	278.05322	36.81627	3.56088	1.55000
43	4	27.37784	278.18530	36.81627	4.08522	1.55000
43	5	28.26759	278.32031	36.81627	4.60956	2.87000
43	6	29.15555	278.45752	36.81627	5.13390	2.48000
43	7	30.04192	278.59790	36.81627	5.65824	-0.83000
43	8	30.92682	278.74146	36.81627	6.18258	-4.22000
43	9	31.81046	278.88794	36.81627	6.70692	-4.61000
43	10	32.69304	279.03735	36.81627	7.23126	-3.23000
43	11	33.57468	279.19019	36.81627	7.75560	-2.66000
43	12	34.45564	279.34644	36.81627	8.27994	-3.67000
43	13	35.33603	279.50562	36.81627	8.80428	-4.90000
43	14	36.21608	279.66919	36.81627	9.32862	-4.66000
43	15	37.09599	279.83569	36.81627	9.85296	-1.88000
43	16	37.97598	280.00635	36.81627	10.37730	-0.97000
43	17	38.85622	280.18066	36.81627	10.90164	-0.85000
43	18	39.73700	280.35938	36.81627	11.42598	0.66000
43	19	40.61850	280.54248	36.81627	11.95032	1.32000
43	20	41.50098	280.72974	36.81627	12.47466	1.66000
43	21	42.38466	280.92114	36.81627	12.99900	1.97000
43	22	43.26985	281.11768	36.81627	13.52334	-0.70000
43	23	44.15681	281.31909	36.81627	14.04768	-1.16000
43	24	45.04595	281.52637	36.81627	14.57202	0.24000
43	25	45.93732	281.73706	36.81627	15.09636	999.00000
43	26	46.83147	281.95410	36.81627	15.62070	999.00000
43	27	47.72868	282.17651	36.81627	16.14503	999.00000
43	28	48.62943	282.40503	36.81627	16.66937	999.00000
43	29	49.53404	282.63989	36.81627	17.19371	999.00000
43	30	50.44299	282.88062	36.81627	17.71805	999.00000
43	31	51.35683	283.12842	36.81627	18.24240	999.00000
43	32	52.27600	283.38281	36.81627	18.76674	999.00000
44	1	24.57594	278.76904	37.34061	2.51220	999.00000
44	2	25.47115	278.90527	37.34061	3.03654	2.17000
44	3	26.36404	279.04468	37.34061	3.56088	1.55000
44	4	27.25476	279.18652	37.34061	4.08522	0.62000
44	5	28.14352	279.33130	37.34061	4.60956	1.81000
44	6	29.03046	279.47900	37.34061	5.13390	2.22000
44	7	29.91570	279.62964	37.34061	5.65824	0.51000
44	8	30.79945	279.78369	37.34061	6.18258	-2.02000
44	9	31.68190	279.94092	37.34061	6.70692	-3.76000
44	10	32.56323	280.10132	37.34061	7.23126	-2.85000
44	11	33.44354	280.26514	37.34061	7.75560	-0.44000
44	12	34.32314	280.43286	37.34061	8.27994	-1.15000
44	13	35.20210	280.60449	37.34061	8.80428	-3.46000
44	14	36.08069	280.77930	37.34061	9.32862	-3.84000
44	15	36.95905	280.95801	37.34061	9.85296	-2.63000
44	16	37.83740	281.14160	37.34061	10.37730	-2.36000
44	17	38.71597	281.32886	37.34061	10.90164	-2.42000
44	18	39.59497	281.52026	37.34061	11.42598	-1.90000
44	19	40.47464	281.71631	37.34061	11.95032	-0.19000
44	20	41.35515	281.91724	37.34061	12.47466	-2.27000
44	21	42.23682	282.12305	37.34061	12.99900	-2.35000
44	22	43.11989	282.33374	37.34061	13.52334	-2.35000
44	23	44.00461	282.54932	37.34061	14.04768	-1.29000
44	24	44.89131	282.77051	37.34061	14.57202	0.51000
44	25	45.78032	282.99780	37.34061	15.09636	999.00000
44	26	46.67191	283.23022	37.34061	15.62070	999.00000

44	27	47.56641	283.46859	27.34061	16.14503	999.00000
44	28	48.46426	283.71387	27.34061	16.66937	999.00000
44	29	49.36586	283.96533	27.34061	17.19371	999.00000
44	30	50.27164	284.22339	27.34061	17.71805	999.00000
44	31	51.18207	284.48673	27.34061	18.24240	999.00000
44	32	52.09766	284.76123	27.34061	18.76674	999.00000
45	1	24.44688	279.73677	27.66494	2.51220	999.00000
45	2	25.34116	279.88452	27.66494	3.03654	5.00000
45	3	26.23305	280.03296	27.66494	3.56088	4.32000
45	4	27.12276	280.18457	27.66494	4.08522	2.69000
45	5	28.01044	280.33960	27.66494	4.60956	1.73000
45	6	28.89622	280.49707	27.66494	5.13390	1.07000
45	7	29.78032	280.65756	27.66494	5.65824	1.66000
45	8	30.66284	280.82279	27.66494	6.18258	-0.96000
45	9	31.54402	280.99048	27.66494	6.70692	-3.91000
45	10	32.42398	281.16187	27.66494	7.23126	-3.29000
45	11	33.30293	281.33691	27.66494	7.75560	-0.05000
45	12	34.18109	281.51567	27.66494	8.27994	1.04000
45	13	35.05853	281.69697	27.66494	8.80428	-0.45000
45	14	35.93552	281.88574	27.66494	9.32862	-2.46000
45	15	36.81221	282.07666	27.66494	9.85296	-3.73000
45	16	37.68886	282.27222	27.66494	10.37730	-3.43000
45	17	38.56561	282.47217	27.66494	10.90164	-3.13000
45	18	39.44275	282.67676	27.66494	11.42598	-2.71000
45	19	40.32042	282.88599	27.66494	11.95032	-0.70000
45	20	41.19888	283.10010	27.66494	12.47466	2.07000
45	21	42.07840	283.31958	27.66494	12.99900	3.44000
45	22	42.95921	283.54443	27.66494	13.52334	2.69000
45	23	43.84157	283.77466	27.66494	14.04768	0.62000
45	24	44.72578	284.01074	27.66494	14.57202	-0.75000
45	25	45.61220	284.25269	27.66494	15.09636	999.00000
45	26	46.50102	284.50049	27.66494	15.62070	999.00000
45	27	47.39262	284.75488	27.66494	16.14503	999.00000
45	28	48.28746	285.01611	27.66494	16.66937	999.00000
45	29	49.18587	285.28394	27.66494	17.19371	999.00000
45	30	50.08826	285.55908	27.66494	17.71805	999.00000
45	31	50.99512	285.84167	27.66494	18.24240	999.00000
45	32	51.90689	286.13208	27.66494	18.76674	999.00000
46	1	24.30905	280.70581	28.38528	2.51220	999.00000
46	2	25.20235	280.85034	28.38528	3.03654	5.28000
46	3	26.09320	281.01880	28.38528	3.56088	6.02000
46	4	26.98180	281.17969	28.38528	4.08522	4.50000
46	5	27.86835	281.34448	28.38528	4.60956	1.62000
46	6	28.75294	281.51221	28.38528	5.13390	-0.55000
46	7	29.63677	281.68326	28.38528	5.65824	-0.45000
46	8	30.51701	281.85815	28.38528	6.18258	-1.60000
46	9	31.39682	282.03638	28.38528	6.70692	-3.08000
46	10	32.27539	282.21851	28.38528	7.23126	-2.25000
46	11	33.15286	282.40503	28.38528	7.75560	0.62000
46	12	34.02946	282.59473	28.38528	8.27994	2.62000
46	13	34.90533	282.78931	28.38528	8.80428	2.70000
46	14	35.78062	282.98804	28.38528	9.32862	0.10000
46	15	36.65558	283.19092	28.38528	9.85296	-1.70000
46	16	37.53041	283.39844	28.38528	10.37730	-1.45000
46	17	38.40526	283.61084	28.38528	10.90164	-0.49000
46	18	39.28040	283.82812	28.38528	11.42598	-0.44000
46	19	40.15598	284.05054	28.38528	11.95032	0.04000
46	20	41.03226	284.27783	28.38528	12.47466	1.37000
46	21	41.90950	284.51074	28.38528	12.99900	2.01000
46	22	42.78792	284.74951	28.38528	13.52334	-1.06000
46	23	43.66779	284.99390	28.38528	14.04768	-4.76000
46	24	44.54939	285.24438	28.38528	14.57202	-3.83000
46	25	45.43303	285.50122	28.38528	15.09636	999.00000
46	26	46.31895	285.76440	28.38528	15.62070	999.00000
46	27	47.20753	286.03442	28.38528	16.14503	999.00000
46	28	48.09917	286.31128	28.38528	16.66937	999.00000
46	29	48.99417	286.59570	28.38528	17.19371	999.00000
46	30	49.89299	286.88745	28.38528	17.71805	999.00000
46	31	50.79608	287.18726	28.38528	18.24240	999.00000
46	32	51.70390	287.49512	28.38528	18.76674	999.00000
47	1	24.16252	281.66968	28.91362	2.51220	999.00000
47	2	25.05473	281.83350	28.91362	3.03654	3.33000
47	3	25.94449	282.00122	28.91362	3.56088	4.56000
47	4	26.83195	282.17188	28.91362	4.08522	2.57000
47	5	27.71727	282.34595	28.91362	4.60956	-0.26000
47	6	28.60063	282.52344	28.91362	5.13390	-1.05000
47	7	29.48215	282.70483	28.91362	5.65824	-0.35000
47	8	30.36200	282.88989	28.91362	6.18258	-1.05000
47	9	31.24040	283.07886	28.91362	6.70692	-1.01000
47	10	32.11748	283.27148	28.91362	7.23126	0.72000
47	11	32.99341	283.46851	28.91362	7.75560	2.93000
47	12	33.86839	283.66968	28.91362	8.27994	3.63000
47	13	34.74252	283.87524	28.91362	8.80428	3.00000

47	14	35.61605	284.08548	38.91362	9.32862	2.02000
47	15	36.48520	284.30025	38.91362	9.85256	1.83000
47	16	37.36208	284.52002	38.91362	10.37730	2.29000
47	17	38.23492	284.74463	38.91362	10.90164	2.80000
47	18	39.10767	284.97437	38.91362	11.42608	3.66000
47	19	39.98137	285.20972	38.91362	11.95032	1.35000
47	20	40.85536	285.45044	38.91362	12.47466	1.18000
47	21	41.73019	285.69653	38.91362	12.99900	0.20000
47	22	42.60609	285.94873	38.91362	13.52334	-4.02000
47	23	43.48332	286.20728	38.91362	14.04768	-7.27000
47	24	44.36217	286.47192	38.91362	14.57202	-4.94000
47	25	45.24290	286.74365	38.91362	15.09636	999.00000
47	26	46.12582	287.02173	38.91362	15.62070	999.00000
47	27	47.01120	287.30688	38.91362	16.14503	999.00000
47	28	47.89944	287.59937	38.91362	16.66937	999.00000
47	29	48.79051	287.89966	38.91362	17.19371	999.00000
47	30	49.68602	288.20776	38.91362	17.71805	999.00000
47	31	50.58514	288.52466	38.91362	18.24240	999.00000
47	32	51.48877	288.84937	38.91362	18.76674	999.00000
48	1	24.00728	282.63037	39.43797	2.51220	999.00000
48	2	24.66838	282.80371	39.43797	3.03654	1.61000
48	3	25.78697	282.98022	39.43797	3.56088	0.86000
48	4	26.67320	283.16040	39.43797	4.08522	-1.88000
48	5	27.55728	283.34424	39.43797	4.60956	-2.07000
48	6	28.43932	283.53125	39.43797	5.13390	-0.64000
48	7	29.31946	283.72290	39.43797	5.65824	0.25000
48	8	30.19789	283.91772	39.43797	6.18258	-0.46000
48	9	31.07478	284.11670	39.43797	6.70692	-0.36000
48	10	31.95030	284.32056	39.43797	7.23126	0.65000
48	11	32.82458	284.52832	39.43797	7.75560	1.91000
48	12	33.69786	284.74048	39.43797	8.27994	1.13000
48	13	34.57024	284.95703	39.43797	8.80428	0.22000
48	14	35.44191	285.17871	39.43797	9.32862	0.79000
48	15	36.31311	285.40503	39.43797	9.85256	2.13000
48	16	37.18398	285.63672	39.43797	10.37730	2.48000
48	17	38.05470	285.87329	39.43797	10.90164	2.89000
48	18	38.92558	286.11572	39.43797	11.42608	3.66000
48	19	39.79663	286.36304	39.43797	11.95032	2.57000
48	20	40.66823	286.61670	39.43797	12.47466	2.31000
48	21	41.54056	286.87646	39.43797	12.99900	0.82000
48	22	42.41383	287.14209	39.43797	13.52334	-2.22000
48	23	43.28828	287.41431	39.43797	14.04768	-3.77000
48	24	44.16426	287.69287	39.43797	14.57202	-2.29000
48	25	45.04196	287.97852	39.43797	15.09636	-0.13000
48	26	45.92169	288.27146	39.43797	15.62070	999.00000
48	27	46.80373	288.57178	39.43797	16.14503	999.00000
48	28	47.68846	288.87988	39.43797	16.66937	999.00000
48	29	48.57623	289.19580	39.43797	17.19371	999.00000
48	30	49.46741	289.52002	39.43797	17.71805	999.00000
48	31	50.36246	289.85303	39.43797	18.24240	999.00000
48	32	51.26170	290.19482	39.43797	18.76674	999.00000
49	1	23.64335	283.58789	39.96231	2.51220	999.00000
49	2	24.73231	283.77026	39.96231	3.03654	2.53000
49	3	25.62070	283.95581	39.96231	3.56088	-1.18000
49	4	26.50568	284.14526	39.96231	4.08522	-4.14000
49	5	27.38843	284.33838	39.96231	4.60956	-2.21000
49	6	28.26906	284.53540	39.96231	5.13390	-2.11000
49	7	29.14777	284.73657	39.96231	5.65824	-1.82000
49	8	30.02469	284.94165	39.96231	6.18258	-2.29000
49	9	30.90001	285.15112	39.96231	6.70692	-2.55000
49	10	31.77386	285.36499	39.96231	7.23126	-2.84000
49	11	32.64645	285.58325	39.96231	7.75560	-2.61000
49	12	33.51796	285.80615	39.96231	8.27994	-2.66000
49	13	34.38847	286.03418	39.96231	8.80428	-2.32000
49	14	35.25824	286.26685	39.96231	9.32862	-1.76000
49	15	36.12740	286.50488	39.96231	9.85256	-1.14000
49	16	36.99615	286.74780	39.96231	10.37730	-0.89000
49	17	37.86467	286.99658	39.96231	10.90164	0.18000
49	18	38.73320	287.25056	39.96231	11.42608	1.08000
49	19	39.60190	287.51123	39.96231	11.95032	1.55000
49	20	40.47098	287.77734	39.96231	12.47466	1.76000
49	21	41.34068	288.04980	39.96231	12.99900	2.60000
49	22	42.21120	288.32666	39.96231	13.52334	0.69000
49	23	43.08281	288.61450	39.96231	14.04768	-0.29000
49	24	43.95575	288.90698	39.96231	14.57202	0.30000
49	25	44.83031	289.20679	39.96231	15.09636	0.97000
49	26	45.70671	289.51416	39.96231	15.62070	999.00000
49	27	46.58528	289.82910	39.96231	16.14503	999.00000
49	28	47.46637	290.15234	39.96231	16.66937	999.00000
49	29	48.35028	290.48340	39.96231	17.19371	999.00000
49	30	49.23741	290.82349	39.96231	17.71805	999.00000
49	31	50.12817	291.17261	39.96231	18.24240	999.00000
49	32	51.02290	291.53076	39.96231	18.76674	999.00000

50	1	23.67081	284.54224	40.48665	2.51220	999.00000
50	2	24.55554	284.73291	40.48665	3.03654	3.00000
50	3	25.44566	284.92773	40.48665	3.56088	-1.56000
50	4	26.32932	285.12646	40.48665	4.08522	-4.05000
50	5	27.21069	285.32854	40.48665	4.60656	-3.63000
50	6	28.08987	285.53516	40.48665	5.13390	-3.80000
50	7	28.96710	285.74634	40.48665	5.65824	-4.20000
50	8	29.84245	285.96143	40.48665	6.18258	-4.56000
50	9	30.71613	286.18091	40.48665	6.70692	-4.40000
50	10	31.58830	286.40479	40.48665	7.23126	-4.07000
50	11	32.45909	286.63354	40.48665	7.75560	-4.45000
50	12	33.32874	286.86743	40.48665	8.27994	-3.55000
50	13	34.19731	287.10620	40.48665	8.80428	-3.37000
50	14	35.06505	287.34985	40.48665	9.32862	-2.24000
50	15	35.93210	287.59912	40.48665	9.85296	-2.37000
50	16	36.79865	287.85371	40.48665	10.37730	-2.07000
50	17	37.66490	288.11450	40.48665	10.90164	-0.65000
50	18	38.53105	288.38062	40.48665	11.42598	1.52000
50	19	39.39723	288.65308	40.48665	11.95032	2.51000
50	20	40.26370	288.93164	40.48665	12.47466	4.01000
50	21	41.13066	289.21704	40.48665	12.99900	3.57000
50	22	41.99835	289.50903	40.48665	13.52334	1.69000
50	23	42.86697	289.80786	40.48665	14.04768	-0.50000
50	24	43.73677	290.11401	40.48665	14.57202	-1.23000
50	25	44.60805	290.42773	40.48665	15.09636	-0.18000
50	26	45.48103	290.74927	40.48665	15.62070	999.00000
50	27	46.35597	291.07861	40.48665	16.14503	999.00000
50	28	47.23328	291.41626	40.48665	16.66937	999.00000
50	29	48.11319	291.76270	40.48665	17.19371	999.00000
50	30	48.99612	292.11792	40.48665	17.71805	999.00000
50	31	49.88243	292.48315	40.48665	18.24240	999.00000
50	32	50.77251	292.85767	40.48665	18.76674	999.00000
51	1	23.48964	285.49243	41.01099	2.51220	999.00000
51	2	24.37714	285.69238	41.01099	3.03654	-0.49000
51	3	25.26193	285.89575	41.01099	3.56088	-0.05000
51	4	26.14423	286.10376	41.01099	4.08522	-0.74000
51	5	27.02417	286.31567	41.01099	4.60656	-1.26000
51	6	27.90187	286.53125	41.01099	5.13390	-1.58000
51	7	28.77751	286.75171	41.01099	5.65824	-1.67000
51	8	29.65123	286.97656	41.01099	6.18258	-1.55000
51	9	30.52319	287.20581	41.01099	6.70692	-1.56000
51	10	31.39360	287.44019	41.01099	7.23126	-1.84000
51	11	32.26253	287.67920	41.01099	7.75560	-1.71000
51	12	33.13026	287.92334	41.01099	8.27994	-0.88000
51	13	33.99681	288.17310	41.01099	8.80428	-0.36000
51	14	34.86246	288.42773	41.01099	9.32862	-0.31000
51	15	35.72733	288.68799	41.01099	9.85296	-0.09000
51	16	36.59161	288.95410	41.01099	10.37730	-0.12000
51	17	37.45546	289.22583	41.01099	10.90164	-0.04000
51	18	38.31912	289.50391	41.01099	11.42598	0.72000
51	19	39.18272	289.78833	41.01099	11.95032	2.19000
51	20	40.04648	290.07959	41.01099	12.47466	3.14000
51	21	40.91063	290.37720	41.01099	12.99900	3.44000
51	22	41.77539	290.68213	41.01099	13.52334	2.12000
51	23	42.64085	290.99414	41.01099	14.04768	-1.63000
51	24	43.50743	291.31348	41.01099	14.57202	-2.13000
51	25	44.37532	291.64087	41.01099	15.09636	-4.05000
51	26	45.24472	291.97583	41.01099	15.62070	999.00000
51	27	46.11597	292.31958	41.01099	16.14503	999.00000
51	28	46.98933	292.67163	41.01099	16.66937	999.00000
51	29	47.86514	293.03296	41.01099	17.19371	999.00000
51	30	48.74373	293.40356	41.01099	17.71805	999.00000
51	31	49.62546	293.78345	41.01099	18.24240	999.00000
51	32	50.51071	294.17358	41.01099	18.76674	999.00000
52	1	23.29994	286.43921	41.53632	2.51220	999.00000
52	2	24.18610	286.64771	41.53632	3.03654	-3.82000
52	3	25.06956	286.85986	41.53632	3.56088	-3.33000
52	4	25.95042	287.07690	41.53632	4.08522	-3.04000
52	5	26.82896	287.29761	41.53632	4.60656	-2.61000
52	6	27.70502	287.52295	41.53632	5.13390	-2.50000
52	7	28.57904	287.75269	41.53632	5.65824	-2.06000
52	8	29.45105	287.98706	41.53632	6.18258	-1.61000
52	9	30.32129	288.22656	41.53632	6.70692	-0.74000
52	10	31.18982	288.47070	41.53632	7.23126	-0.07000
52	11	32.05685	288.71973	41.53632	7.75560	0.57000
52	12	32.92258	288.97412	41.53632	8.27994	0.49000
52	13	33.78706	289.23376	41.53632	8.80428	0.61000
52	14	34.65053	289.49976	41.53632	9.32862	0.90000
52	15	35.51311	289.77100	41.53632	9.85296	1.09000
52	16	36.37503	290.04834	41.53632	10.37730	0.92000
52	17	37.23643	290.33154	41.53632	10.90164	-0.18000
52	18	38.09753	290.62134	41.53632	11.42598	-0.37000
52	19	38.95844	290.91724	41.53632	11.95032	0.91000

	20	39.81940	291.22046	41.53632	12.47466	2.63000
	21	40.68060	291.53652	41.53632	12.99900	2.22000
	22	41.54227	291.84790	41.53632	13.52334	2.73000
	23	42.40460	292.17265	41.53632	14.04768	0.35000
	24	43.26784	292.50613	41.53632	14.57202	-4.26000
	25	44.13220	292.84570	41.53632	15.09636	-5.79000
	26	44.99797	293.19458	41.53632	15.62070	-2.21000
	27	45.86534	293.55176	41.53632	16.14503	999.00000
	28	46.73468	293.91621	41.53632	16.66937	999.00000
	29	47.60623	294.29395	41.53632	17.19371	999.00000
	30	48.48035	294.67696	41.53632	17.71805	999.00000
	31	49.35741	295.07422	41.53632	18.24240	999.00000
	32	50.23769	295.47545	41.53632	18.76674	999.00000
	1	23.10168	287.38159	42.05566	2.51220	999.00000
	2	23.98651	287.69512	42.05566	3.03654	-2.50000
	3	24.86855	287.82031	42.05566	3.56088	-2.80000
	4	25.74794	288.04565	42.05566	4.08522	-3.03000
	5	26.62485	288.27539	42.05566	4.60956	-3.16000
	6	27.49939	288.50977	42.05566	5.13390	-2.05000
	7	28.37172	288.74902	42.05566	5.65824	-1.71000
	8	29.24202	288.99316	42.05566	6.18256	-0.55000
	9	30.11040	289.24170	42.05566	6.70692	0.58000
	10	30.97704	289.49585	42.05566	7.23126	0.23000
	11	31.84210	289.75488	42.05566	7.75560	-0.41000
	12	32.70575	290.01978	42.05566	8.27994	-0.51000
	13	33.56807	290.28979	42.05566	8.80428	-0.18000
	14	34.42929	290.56616	42.05566	9.32862	-0.34000
	15	35.28957	290.84814	42.05566	9.85296	-0.80000
	16	36.14902	291.13647	42.05566	10.37730	-1.66000
	17	37.00790	291.43066	42.05566	10.90164	-1.05000
	18	37.86633	291.73218	42.05566	11.42598	-1.11000
	19	38.72449	292.03979	42.05566	11.95032	0.22000
	20	39.58255	292.35449	42.05566	12.47466	2.45000
	21	40.44073	292.67676	42.05566	12.99900	2.53000
	22	41.29924	293.00610	42.05566	13.52334	1.45000
	23	42.15829	293.34375	42.05566	14.04768	1.23000
	24	43.01808	293.68872	42.05566	14.57202	1.41000
	25	43.87886	294.04199	42.05566	15.09636	-0.43000
	26	44.74083	294.40430	42.05566	15.62070	-1.60000
	27	45.60425	294.77539	42.05566	16.14503	999.00000
	28	46.46944	295.15576	42.05566	16.66937	999.00000
	29	47.33665	295.54492	42.05566	17.19371	999.00000
	30	48.20619	295.94458	42.05566	17.71805	999.00000
	31	49.07840	296.35474	42.05566	18.24240	999.00000
	32	49.95363	296.77490	42.05566	18.76674	999.00000
4	1	22.89490	288.32031	42.58401	2.51220	999.00000
4	2	23.77835	288.64614	42.58401	3.03654	-0.06000
4	3	24.65895	288.97588	42.58401	3.56088	-2.62000
4	4	25.53680	289.00977	42.58401	4.08522	-3.73000
4	5	26.41216	289.24878	42.58401	4.60956	-2.15000
4	6	27.28502	289.49219	42.58401	5.13390	-2.05000
4	7	28.15561	289.74048	42.58401	5.65824	-2.01000
4	8	29.02412	289.99390	42.58401	6.18256	-1.42000
4	9	29.89063	290.25195	42.58401	6.70692	-0.55000
4	10	30.75531	290.51563	42.58401	7.23126	-1.36000
4	11	31.61832	290.78491	42.58401	7.75560	-1.55000
4	12	32.47983	291.05957	42.58401	8.27994	-1.20000
4	13	33.33995	291.34009	42.58401	8.80428	-1.14000
4	14	34.19885	291.62646	42.58401	9.32862	-1.74000
4	15	35.05672	291.91919	42.58401	9.85296	-1.56000
4	16	35.91368	292.21826	42.58401	10.37730	-1.61000
4	17	36.76991	292.52344	42.58401	10.90164	-0.78000
4	18	37.62564	292.83594	42.58401	11.42598	-0.63000
4	19	38.48093	293.15527	42.58401	11.95032	-0.29000
4	20	39.33604	293.48169	42.58401	12.47466	0.56000
4	21	40.19113	293.81543	42.58401	12.99900	1.41000
4	22	41.04640	294.15723	42.58401	13.52334	0.29000
4	23	41.90207	294.50659	42.58401	14.04768	-0.22000
4	24	42.75830	294.86401	42.58401	14.57202	-1.11000
4	25	43.61539	295.23047	42.58401	15.09636	-1.33000
4	26	44.47348	295.60522	42.58401	15.62070	0.73000
4	27	45.33286	295.98950	42.58401	16.14503	999.00000
4	28	46.19379	296.38306	42.58401	16.66937	999.00000
4	29	47.05653	296.78687	42.58401	17.19371	999.00000
4	30	47.92140	297.20044	42.58401	17.71805	999.00000
4	31	48.78870	297.62402	42.58401	18.24240	999.00000
4	32	49.65871	298.05933	42.58401	18.76674	999.00000
5	1	22.67569	289.25513	43.10835	2.51220	999.00000
5	2	23.56172	289.48877	43.10835	3.03654	-1.84000
5	3	24.44080	289.72681	43.10835	3.56088	-2.20000
5	4	25.31711	289.96973	43.10835	4.08522	-2.77000
5	5	26.19081	290.21729	43.10835	4.60956	-1.90000
5	6	27.06198	290.46948	43.10835	5.13390	-1.82000

55	7	27.93080	290.72681	43.10635	5.65824	-1.70000
55	8	28.79742	290.98550	43.10635	6.18258	-1.51000
55	9	29.66202	291.25708	43.10635	6.70692	-1.55000
55	10	30.52470	291.53052	43.10635	7.23126	-1.66000
55	11	31.36660	291.80664	43.10635	7.75660	-0.60000
55	12	32.24492	292.09375	43.10635	8.27994	-0.85000
55	13	33.10277	292.38428	43.10635	8.80428	-1.02000
55	14	33.95530	292.68091	43.10635	9.32862	-1.35000
55	15	34.81468	292.98364	43.10635	9.85296	-0.58000
55	16	35.66905	293.29321	43.10635	10.37730	-0.48000
55	17	36.52261	293.60938	43.10635	10.90164	0.08000
55	18	37.37552	293.93286	43.10635	11.42598	0.17000
55	19	38.22789	294.26416	43.10635	11.95032	-0.75000
55	20	39.07997	294.60083	43.10635	12.47466	-1.72000
55	21	39.93187	294.94629	43.10635	12.99900	-0.73000
55	22	40.78384	295.29956	43.10635	13.52334	0.43000
55	23	41.63602	295.66138	43.10635	14.04768	-1.46000
55	24	42.48865	296.03101	43.10635	14.57202	-2.30000
55	25	43.34193	296.40991	43.10635	15.09636	1.28000
55	26	44.19608	296.79736	43.10635	15.62070	3.12000
55	27	45.05130	297.19434	43.10635	16.14503	1.30000
55	28	45.90790	297.60107	43.10635	16.66937	999.00000
55	29	46.76608	298.01807	43.10635	17.19371	999.00000
55	30	47.62614	298.44507	43.10635	17.71805	999.00000
55	31	48.48840	298.88281	43.10635	18.24240	999.00000
55	32	49.35315	299.33203	43.10635	18.76674	999.00000
56	1	22.45604	290.18506	43.63269	2.51220	999.00000
56	2	23.33661	290.42700	43.63269	3.03654	-2.82000
56	3	24.21416	290.67358	43.63269	3.56088	-1.25000
56	4	25.08885	290.92505	43.63269	4.08522	-0.63000
56	5	25.96086	291.18091	43.63269	4.60956	-0.36000
56	6	26.83031	291.44214	43.63269	5.13390	-0.57000
56	7	27.69731	291.70825	43.63269	5.65824	-0.93000
56	8	28.56203	291.97949	43.63269	6.18258	-1.44000
56	9	29.42462	292.25684	43.63269	6.70692	-1.25000
56	10	30.28525	292.53906	43.63269	7.23126	-0.74000
56	11	31.14400	292.82739	43.63269	7.75660	-0.15000
56	12	32.00107	293.12158	43.63269	8.27994	-0.62000
56	13	32.85657	293.42212	43.63269	8.80428	-0.68000
56	14	33.71066	293.72876	43.63269	9.32862	-0.42000
56	15	34.56351	294.04199	43.63269	9.85296	-0.12000
56	16	35.41525	294.36182	43.63269	10.37730	-0.35000
56	17	36.26604	294.68872	43.63269	10.90164	-0.08000
56	18	37.11609	295.02246	43.63269	11.42598	0.51000
56	19	37.96548	295.36377	43.63269	11.95032	-0.43000
56	20	38.81441	295.71265	43.63269	12.47466	-2.11000
56	21	39.66307	296.06934	43.63269	12.99900	-1.61000
56	22	40.51163	296.43408	43.63269	13.52334	0.82000
56	23	41.36028	296.80713	43.63269	14.04768	-1.10000
56	24	42.20920	297.18921	43.63269	14.57202	-4.72000
56	25	43.05862	297.57983	43.63269	15.09636	-1.35000
56	26	43.90872	297.97974	43.63269	15.62070	4.97000
56	27	44.75972	298.38940	43.63269	16.14503	4.16000
56	28	45.61188	298.80908	43.63269	16.66937	999.00000
56	29	46.46542	299.23853	43.63269	17.19371	999.00000
56	30	47.32062	299.67920	43.63269	17.71805	999.00000
56	31	48.17776	300.13062	43.63269	18.24240	999.00000
56	32	49.03709	300.59351	43.63269	18.76674	999.00000
57	1	22.22401	291.11084	44.15703	2.51220	999.00000
57	2	23.10306	291.36108	44.15703	3.03654	-0.36000
57	3	23.97505	291.61572	44.15703	3.56088	0.27000
57	4	24.85210	291.87524	44.15703	4.08522	0.54000
57	5	25.72241	292.13965	44.15703	4.60956	1.41000
57	6	26.59004	292.40918	44.15703	5.13390	0.69000
57	7	27.45517	292.68433	44.15703	5.65824	-0.50000
57	8	28.31796	292.96460	44.15703	6.18258	-0.62000
57	9	29.17853	293.25073	44.15703	6.70692	0.14000
57	10	30.03702	293.54248	44.15703	7.23126	0.19000
57	11	30.89357	293.84009	44.15703	7.75660	-0.76000
57	12	31.74834	294.14355	44.15703	8.27994	-1.10000
57	13	32.60144	294.45386	44.15703	8.80428	-0.84000
57	14	33.45306	294.77026	44.15703	9.32862	0.01000
57	15	34.30330	295.09326	44.15703	9.85296	-0.57000
57	16	35.15233	295.42358	44.15703	10.37730	-1.94000
57	17	36.00031	295.76074	44.15703	10.90164	-1.87000
57	18	36.84740	296.10498	44.15703	11.42598	-0.74000
57	19	37.69376	296.45703	44.15703	11.95032	-0.15000
57	20	38.53951	296.81665	44.15703	12.47466	-0.51000
57	21	39.38483	297.18408	44.15703	12.99900	-1.00000
57	22	40.22992	297.55933	44.15703	13.52334	-1.19000
57	23	41.07495	297.94507	44.15703	14.04768	-1.47000
57	24	41.92010	298.33813	44.15703	14.57202	-3.07000
57	25	42.76558	298.74097	44.15703	15.09636	-1.64000

57	26	43.61156	299.15283	44.15703	15.62070	3.13000
57	27	44.45825	299.57456	44.15703	16.14503	3.68000
57	28	45.30589	300.00659	44.15703	16.66937	999.00000
57	29	46.15472	300.44897	44.15703	17.19371	999.00000
57	30	47.00464	300.89234	44.15703	17.71805	999.00000
57	31	47.85690	301.36654	44.15703	18.24240	999.00000
57	32	48.71078	301.84277	44.15703	18.76674	999.00000
58	1	21.98361	292.03174	44.68137	2.51220	999.00000
58	2	22.86115	292.29004	44.68137	3.03654	1.48000
58	3	23.73953	292.55273	44.68137	3.56088	0.58000
58	4	24.60689	292.82056	44.68137	4.08522	0.51000
58	5	25.47543	293.09326	44.68137	4.60956	1.25000
58	6	26.34125	293.37158	44.68137	5.13390	0.61000
58	7	27.20448	293.65479	44.68137	5.65824	0.14000
58	8	28.06526	293.94409	44.68137	6.18258	0.37000
58	9	28.92375	294.23901	44.68137	6.70692	0.54000
58	10	29.78008	294.53955	44.68137	7.23126	0.33000
58	11	30.63435	294.84668	44.68137	7.75560	-0.55000
58	12	31.48680	295.15942	44.68137	8.27994	-0.55000
58	13	32.33745	295.47876	44.68137	8.80428	0.24000
58	14	33.18652	295.80518	44.68137	9.32862	0.43000
58	15	34.03412	296.13818	44.68137	9.85296	-0.72000
58	16	34.88040	296.47778	44.68137	10.37730	-2.35000
58	17	35.72549	296.82495	44.68137	10.90164	-2.95000
58	18	36.56961	297.17944	44.68137	11.42598	-2.31000
58	19	37.41281	297.54199	44.68137	11.95032	-0.67000
58	20	38.25531	297.91235	44.68137	12.47466	0.06000
58	21	39.09726	298.29102	44.68137	12.99900	-1.72000
58	22	39.93883	298.67773	44.68137	13.52334	-3.62000
58	23	40.78018	299.07349	44.68137	14.04768	-2.10000
58	24	41.62149	299.47852	44.68137	14.57202	-1.53000
58	25	42.46295	299.89233	44.68137	15.09636	-2.22000
58	26	43.30475	300.31616	44.68137	15.62070	-1.81000
58	27	44.14705	300.75000	44.68137	16.14503	2.56000
58	28	44.99008	301.19360	44.68137	16.66937	3.51000
58	29	45.83412	301.64844	44.68137	17.19371	999.00000
58	30	46.67935	302.11426	44.68137	17.71805	999.00000
58	31	47.52603	302.59131	44.68137	18.24240	999.00000
58	32	48.37439	303.08032	44.68137	18.76674	999.00000
59	1	21.73489	292.54849	45.20570	2.51220	999.00000
59	2	22.61086	293.21411	45.20570	3.03654	999.00000
59	3	23.48761	293.48462	45.20570	3.56088	-0.15000
59	4	24.35329	293.76050	45.20570	4.08522	999.00000
59	5	25.22003	294.04175	45.20570	4.60956	0.10000
59	6	26.08798	294.32813	45.20570	5.13390	999.00000
59	7	26.94525	294.62036	45.20570	5.65824	0.72000
59	8	27.80402	294.91797	45.20570	6.18258	999.00000
59	9	28.66039	295.22144	45.20570	6.70692	0.28000
59	10	29.51448	295.53101	45.20570	7.23126	999.00000
59	11	30.36649	295.84692	45.20570	7.75560	0.10000
59	12	31.21651	296.16870	45.20570	8.27994	999.00000
59	13	32.06468	296.49780	45.20570	8.80428	2.38000
59	14	32.91113	296.83301	45.20570	9.32862	999.00000
59	15	33.75604	297.17529	45.20570	9.85296	0.18000
59	16	34.59950	297.52515	45.20570	10.37730	999.00000
59	17	35.44168	297.88208	45.20570	10.90164	-1.48000
59	18	36.28273	298.24683	45.20570	11.42598	999.00000
59	19	37.12277	298.61914	45.20570	11.95032	-0.82000
59	20	37.96198	299.00000	45.20570	12.47466	999.00000
59	21	38.80046	299.38892	45.20570	12.99900	-3.14000
59	22	39.63843	299.78662	45.20570	13.52334	999.00000
59	23	40.47604	300.19336	45.20570	14.04768	-1.54000
59	24	41.31345	300.60913	45.20570	14.57202	999.00000
59	25	42.15085	301.03442	45.20570	15.09636	-2.35000
59	26	42.98837	301.46973	45.20570	15.62070	999.00000
59	27	43.82623	301.91455	45.20570	16.14503	3.13000
59	28	44.66466	302.37061	45.20570	16.66937	999.00000
59	29	45.50381	302.83716	45.20570	17.19371	999.00000
59	30	46.34383	303.31470	45.20570	17.71805	999.00000
59	31	47.18530	303.80420	45.20570	18.24240	999.00000
59	32	48.02809	304.30566	45.20570	18.76674	999.00000
60	1	21.47794	293.03564	45.73004	2.51220	999.00000
60	2	22.35229	294.13330	45.73004	3.03654	999.00000
60	3	23.22337	294.41187	45.73004	3.56088	999.00000
60	4	24.09129	294.69556	45.73004	4.08522	999.00000
60	5	24.95624	294.98462	45.73004	4.60956	999.00000
60	6	25.81827	295.27930	45.73004	5.13390	999.00000
60	7	26.67755	295.57935	45.73004	5.65824	999.00000
60	8	27.53423	295.88550	45.73004	6.18258	999.00000
60	9	28.38844	296.19751	45.73004	6.70692	999.00000
60	10	29.24030	296.51587	45.73004	7.23126	999.00000
60	11	30.08995	296.84033	45.73004	7.75560	999.00000
60	12	30.93755	297.17139	45.73004	8.27994	999.00000

60	13	31.78319	297.50952	45.73004	8.60428	999.00000
60	14	32.62701	297.65425	45.73004	9.32862	999.00000
60	15	33.46915	298.20557	45.73004	9.85296	999.00000
60	16	34.30975	298.56494	45.73004	10.37730	999.00000
60	17	35.14856	299.03164	45.73004	10.90164	999.00000
60	18	35.98692	299.30615	45.73004	11.42598	999.00000
60	19	36.82372	299.68672	45.73004	11.95032	999.00000
60	20	37.65956	300.07935	45.73004	12.47466	999.00000
60	21	38.49455	300.47676	45.73004	12.99900	999.00000
60	22	39.32889	300.88672	45.73004	13.52334	999.00000
60	23	40.16270	301.30371	45.73004	14.04768	999.00000
60	24	40.99614	301.73022	45.73004	14.57202	999.00000
60	25	41.82941	302.16626	45.73004	15.09636	999.00000
60	26	42.66261	302.61255	45.73004	15.62070	999.00000
60	27	43.49597	303.06885	45.73004	16.14503	999.00000
60	28	44.32970	303.53589	45.73004	16.66937	999.00000
60	29	45.16396	304.01440	45.73004	17.19371	999.00000
60	30	45.99896	304.50366	45.73004	17.71805	999.00000
60	31	46.83492	305.00488	45.73004	18.24240	999.00000
60	32	47.67206	305.51855	45.73004	18.76674	999.00000

LOCATION	POSITIVE OR NEGATIVE	CLEARLY "SEEN"? Blackwell	Swanberg	this study
Sierra Nevada-Baja California	-	yes	yes	yes
Colorado Plateau-Wyoming Basin	-	yes	yes	yes
Basin and Range-Yellowstone	+	yes	yes	yes
Rio Grande Rift	+	yes	yes	yes
Central Montana	-	yes	yes	yes
Battle Mountain anomaly	+	yes	(no)	(yes)
Eureka anomaly	-	yes	no	no
Cascades anomaly	+	yes	no	no
Northern Great Plains	+	(yes)	yes	yes
Texas Panhandle	+	-	yes	no

Table 2. Comparison of features "seen" or not "seen" in regional heat flow maps of Blackwell (1979), Swanberg et al (in press), and this study.

Table 3. Source of information on magnetic crustal thickness plotted in Figure 15.

1	Sierra (38°N)	Eaton (1963)
2	Sierra (whole)	Pakiser and Brune (1980)
3	Uinta Basin	Shuey et al (1977)
4	Utah High Plateaus	Shuey et al (1977)
5	Yellowstone	Bhattacharyya and Leu (1975)
6	Colorado Plateau	McGetchin and Silver (1972)