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COMPUTER PROGRAM DESIGNED TO AID IN THE ANALYSIS OF LINEAR FEATURES DERIVED FROM LANDSAT DATA

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This report is preliminary and has not been edited or reviewed for conformity with Geological Survey standards and nomenclature

Menlo Park, California
1976

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C **    COMPUTER PROGRAM DESIGNED TO AID IN THE ANALYSIS OF LINEAR FEATURES     **
C **                        DERIVED FROM LANDSAT DATA                           **
C **                                                                            **
C **                                  BY                                        **
C **                             WM. CLINTON STEELE                             **
C **                                                                            **
C **                           U.S. GEOLOGICAL SURVEY                           **
C **                           MENLO PARK, CALIFORNIA                           **
C **                                1976                                        **
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C                          MCCARTHY QUADRANGLE, ALASKA
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C                                INTRODUCTION
C
C  ONE OF THE PROBLEMS OF RELATING MINERALIZED AREAS TO LINEAR FEATURES OBSERVED
C  ON LANDSAT IMAGERY HAS BEEN THE ELIMINATION OF CHANCE AS CAUSAL AGENT. UNTIL
C  RECENTLY, THE PROBABILITY OF A RANDOM POINT OCCURRING WITHIN A GIVEN DISTANCE
C  OF A LINEAR FEATURE HAS BEEN VERY TEDIOUS TO DETERMINE. THIS COMPUTER PRO-
C  GRAM IS SPECIFICALLY DESIGNED TO SIMPLIFY THIS DETERMINATION AND TO AID IN
C  OTHER ASPECTS OF LINEAR FEATURE ANALYSIS. ALTHOUGH CONCEIVED PRIMARILY FOR
C  ANALYSIS OF LANDSAT IMAGERY FOR THE ALASKAN MINERAL RESOURCE ASSESSMENT PRO-
C  GRAM (AMRAP), ANY MAP WITH RECTILINEAR FEATURES MAY BE ANALYZED BY THIS PRO-
C  GRAM.
C
C  THE COMPUTER PROGRAM PRODUCES EIGHT TYPES OF DATA OUTPUT: 1) AREA COM-
C  PUTATIONS, 2) LINEAR DIRECTIONAL TRENDS, 3) LENGTH OF LINEARS, 4) A HISTOGRAM
C  DISPLAY OF DIRECTIONAL TRENDS VERSUS CUMULATIVE LINEAR LENGTHS, 5) A HISTO-
C  GRAM DISPLAY OF DIRECTIONAL TRENDS VERSUS CUMULATIVE PROXIMITY OF MINERAL
C  OCCURRENCES TO LINEARS, 6) THE MEAN LINEAR FEATURE LENGTH, 7) THE "SIGNIFI-
C  CANCE VALUE" (LENGTH DIVIDED BY MEAN VALUE) FOR EACH ANGLE, 8) A HISTOGRAM
C  DISPLAY OF THE "SIGNIFICANCE VALUES" VERSUS THEIR NUMBER OF OCCURRENCES.
C
C  THE COMPUTER PROGRAM DETERMINES THE AREA WHICH IS WITHIN A GIVEN DISTANCE (OR
C  "RANGE") OF A SET OF LINEAR FEATURES. THIS AREA IS CALCULATED BY COUNTING THE
C  INTERSECTIONS OF GRID LINES WHICH ARE WITHIN THE "RANGE." USING THE GRID
C  INTERSECTIONS, INSTEAD OF THE GEOMETRIC AREA SURROUNDING A LINEAR, AVOIDS THE
C  PROBLEM OF COUNTING OVERLAPPING AREAS MORE THAN ONE TIME. THE PERCENTAGE OF
C  THE TOTAL MAP AREA THAT IS WITHIN THE TOTAL "RANGE" AREA REFLECTS THE PROBA-
C  BILITY OF RANDOM POINTS BEING WITHIN THE GIVEN DISTANCE OF A LINEAR. THUS, IF
C  THE OCCURRENCE OF MINERALIZED ZONES WITHIN THE "RANGE" IS SIGNIFICANTLY
C  GREATER THAN THAT EXPECTED BY CHANCE, A GENETIC RELATIONSHIP BETWEEN LINEAR
C  FEATURES AND MINERALIZED ZONES MAY BE INFERRED MORE EASILY.
C
C  THIS PROGRAM WAS RUN ON DATA FROM THE MCCARTHY QUADRANGLE, ALASKA TO PROVIDE
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C  AN EXAMPLE.
C
C  THE AREAS DETERMINED BY THE COMPUTER PROGRAM FOR THE MCCARTHY QUADRANGLE HAVE
C  BEEN CHECKED AGAINST THOSE CALCULATED BY THE USE OF A DIGITAL PLANIMETER. THE
C  AREA WITHIN THE "RANGE" DIFFERED BY ONLY 0.44% AND THE TOTAL MAP AREA DIF-
C  FERED BY ONLY 0.53%. THE PLANIMETER METHOD IS PROBABLY MORE ACCURATE,
C  ALTHOUGH THE WORK IS TEDIOUS AND REQUIRES VERY CAREFUL ATTENTION TO THE DATA,
C  OTHERWISE SIGNIFICANT ERRORS CAN OCCUR. SINCE THE RESULTS OF THE TWO METHODS
C  WERE SO SIMILAR, AND SINCE THE INVESTMENT IN MAN-HOURS IS REDUCED BY A FACTOR
C  OF 5 TO 10 BY USING THE COMPUTER METHOD, THERE SEEMS LITTLE REASON TO USE THE
C  PLANIMETER METHOD. COMPUTER COSTS ARE LESS THAN $10.
C
C  IN ADDITION TO AREA COMPUTATIONS, THE PROGRAM LISTS THE TREND AND LENGTH OF
C  EACH LINEAR OR LINEAR SEGMENT. THESE ARE LISTED IN TABULAR FORM AND CAN BE
C  CROSS REFERENCED TO A SPECIFIC LINEAR ON THE MAP. A GRAPH (HISTOGRAM) IS PRO-
C  DUCED FROM THIS DATA SHOWING DIRECTIONAL TRENDS VERSUS CUMULATIVE LINEAR
C  LENGTHS. "SIGNIFICANCE VALUES," THE CUMULATIVE LENGTH PER ANGLE DIVIDED BY
C  THE MEAN LENGTH PER ANGLE, ARE ALSO DETERMINED AND GRAPHED. THESE SIGNIFI-
C  CANCE VALUES INDICATE WHICH TRENDS ARE MOST IMPORTANT AND WHICH TRENDS ARE
C  STRONGER THAN A RANDOM DISTRIBUTION WOULD PREDICT.
C
C  RELATIONS BETWEEN MINERALIZED AREAS (OR OTHER POINT-TYPE LOCATIONS) AND
C  NEARBY LINEARS ARE LISTED IN TABULAR FORM AND GRAPHED . THESE HISTOGRAMS SHOW
C  DIRECTIONAL TRENDS VERSUS CUMULATIVE PROXIMITIES OF MINERAL OCCURRENCES TO
C  LINEARS. THESE HISTOGRAMS ARE USEFUL IN DETERMINING POSSIBLE TECTONIC CONTROL
C  OF MINERAL DEPOSITS.
C
C  ALTHOUGH THIS COMPUTER PROGRAM IS DESIGNED FOR LANDSAT DATA INTERPRETATION
C  UNDER AMRAP, ALL OR PART OF THE PROGRAM MAY BE USEFUL IN OTHER STUDIES.  IT
C  IS FOR THIS REASON THAT I HAVE OPEN-FILED THIS REPORT.  SHOULD ANYONE DESIRE
C  MORE INFORMATION ON THIS COMPUTER PROGRAM, BOTH NAIRN R.D. ALBERT AND I WILL
C  BE AVAILABLE TO ASSIST IN ANY WAY WE CAN.
C
C  THE LINEAR FEATURE MAP ANALYZED HERE TO DEMONSTRATE THIS PROGRAM IS FROM
C     ALBERT,N.R.D., AND STEELE,W.C., 1976, INTERPRETATION OF LANDSAT IMAGERY
C          OF THE MCCARTHY QUADRANGLE, ALASKA: U.S. GEOL. SURVEY MISC. FIELD
C          STUDIES MAP MF-773 N, 3 SHEETS, SCALE 1:250,000
C  AND THE MINERAL DATA IS FROM
C     MACKEVETT, E.M., JR., 1976, MINERAL DEPOSITS AND OCCURRENCES IN THE
C          MCCARTHY QUADRANGLE, ALASKA: U.S. GEOL. SURVEY MISC. FIELD STUDIES
C          MAP MF-773 B, 1 SHEET, SCALE 1:250,000.
C
C  *****LINEARS PROGRAM*****
C  THIS COMPUTER PROGRAM IS DESIGNED TO:
C  1)DETERMINE THE AREA WITHIN A SPECIFIED DISTANCE OF A SET OF LINEAR FEATURES,
C  2)DETERMINE THE PERCENTAGE OF THE MAP REPRESENTED BY THE ABOVE AREA,
C  3)DETERMINE THE LENGTH AND DIRECTION OF THE INDIVIDUAL LINEAR FEATURES,
C  4)SHOW GRAPHICALLY THE DIRECTIONS OF THE LINEAR FEATURES VERSUS THEIR
C     CUMULATIVE LENGTHS,
C  5)DETERMINE THE MEAN LINEAR FEATURE LENGTH,
C  6)DETERMINE THE "SIGNIFICANCE VALUE" (LENGTH DIVIDED BY MEAN VALUE) FOR EACH
C     ANGLE,
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C  7)SHOW GRAPHICALLY THE SIGNIFICANCE VALUES VERSUS THEIR NUMBER OF OCCURRENCES
C  8)LIST AND SHOW GRAPHICALLY THE PROXIMITY OF MINERAL DEPOSITS TO LINEARS
C    VERSUS THE DIRECTION OF THE LINEARS.
C
C  TO USE THE PROGRAM:
C  1)SET UP AN ORTHOGONAL X-Y GRID SYSTEM.
C     A)THE GRID MUST BE SLIGHTLY LARGER THAN THE MAP BEING ANALYZED.
C     B)THE NUMBER OF UNITS ALONG EACH AXIS OF THE GRID WILL DEPEND UPON THE
C          ACCURACY DESIRED AND THE COMPUTER STORAGE AVAILABLE, BUT IS OTHER-
C          WISE ARBITRARY.
C          DUE TO INPUT FORMAT THE MAP DIMENSIONS MUST BE LESS THAN 1000 GRID
C          UNITS.
C  2)ALIGN THE GRID ON THE MAP SO THAT THE Y-AXIS IS NORTH.
C     A)FOR THIS EXAMPLE, AN ALBERS EQUAL AREA PROJECTION IS USED.
C       THEREFORE, NORTH IS NOT PARALLEL TO THE Y-AXIS THROUGHOUT THE MAP,
C       IN WHICH CASE, AN AVERAGE NORTH DIRECTION SHOULD BE USED.
C     B)THE MAP SHOULD BE AT LEAST ONE GRID UNIT FROM EACH SIDE OF THE GRID
C        BOUNDARIES.
C  3)READ THE LINEAR END-POINT COORDINATES TO THE NEAREST GRID INTERSECTION.
C     A)EITHER END-POINT MAY BE READ FIRST.
C     B)END-POINTS MAY BE OUTSIDE THE MAP AREA.
C       IF THIS IS THE CASE THE COMPUTED LENGTH WILL INCLUDE THE PORTION OUTSIDE
C         THE MAP.
C     C)SLIGHTLY CURVED LINEARS MAY BE BROKEN INTO STRAIGHT LINE SEGMENTS.
C       THE COMPUTER WILL CONSIDER EACH SEGMENT AS A SEPERATE LINEAR.
C     D)NEVER USE 000 AS A COORDINATE.
C       THIS APPLIES TO ALL COORDINATES, MAP CORNERS, AND MINERAL LOCALITIES.
C  4)READ THE MAP BOUNDARIES IN A CLOCKWISE DIRECTION, STARTING AT UPPER LEFT
C     CORNER.
C     A)UPPER AND LOWER MAP BOUNDARIES MAY BE STRAIGHT OR CURVED.
C     B)CURVED BOUNDARIES SHOULD BE GENERALIZED AS SEVERAL SHORTER STRAIGHT LINE
C       SEGMENTS.
C     C)SIDE MAP BOUNDARIES SHOULD BE STRAIGHT BUT NEED NOT BE VERTICAL.
C  5)READ THE MINERAL LOCATION COORDINATES TO THE NEAREST GRID INTERSECTION.
C
C  DATA CARDS, IN ORDER OF INPUT, ARE:
C  1)GRID SIZE IN THE FORM ___BR___
C    WHERE SPACES 1-3 ARE THE X DIMENSION AS A 3 DIGIT INTEGER (GRID UNITS)
C                 4-5 ARE BLANKS
C                 6-8 ARE THE Y DIMENSION AS A 3 DIGIT INTEGER
C  2)MAP TITLE (UP TO 49 CHARACTERS) IN THE FORM 1_____.
C    WHERE 1 IS THE FIRST CHARACTER AND SPACES 2-49 ARE THE TITLE.
C  3)SCALE IN THE FORM _________RB_________BB___
C    WHERE SPACES 1-10 ARE THE RANGE (GROUND DISTANCE FROM THE LINEAR FEATURES
C                      TO BE CONSIDERED
C                 11-12 ARE BLANK
C                 13-22 ARE THE CONVERSION FACTOR FROM MAP UNITS TO GRID UNITS
C                 23-24 ARE BLANK
C                 25-27 ARE THE NUMBER OF MAP UNITS PER STAR IN THE HISTOGRAM
C    START THE RANGE IN POSITION 1 AND ALWAYS INCLUDE A DECIMAL.
C    START THE CONVERSION FACTOR IN POSITION 13 AND ALWAYS INCLUDE A DECIMAL.
C    ALWAYS HAVE A THREEE DIGIT INTEGER FOR THE UNITS PER STAR (002 INSTEAD OF
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C     2).
C     RANGE DOES NOT NEED TO BE AN INTEGRAL NUMBER OF GRID UNITS.
C   4)LINEAR CARDS (ONE CARD PER LINEAR OR LINEAR SEGMENT)
C     IN THE FORM  ___BB___BB___BB___
C     WHERE SPACES 1-3 ARE THE X COORDINATE FOR END NUMBER 1
C                  4-5 ARE BLANK
C                  6-8 ARE THE Y COORDINATE FOR END NUMBER 1
C                  9-10 ARE BLANK
C                  11-13 ARE THE X COORDINATE FOR END NUMBER 2
C                  14-15 ARE BLANK
C                  16-18 ARE THE Y COORDINATE FOR END NUMBER 2
C       INCLUDE ZEROS IF A COORDINATE IS LESS THAN 3 DIGITS (EX: 009 INSTEAD OF 9)
C   5)BLANK CARD (SIGNIFIES END OF LINEAR DATA CARDS).
C   6)UPPER BOUNDARY CARDS (STARTING WITH UPPER LEFT CORNER OF MAP AND READING
C       CLOCKWISE AROUND BOUNDARY)
C     IN THE FORM ___BB___
C     WHERE SPACES 1-3 ARE THE X COORDINATE
C                  4-5 ARE BLANK
C                  6-8 ARE THE Y COORDINATE
C     ONLY ONE BOUNDARY POINT PER CARD.
C   7)BLANK CARD (SIGNIFIES END OF UPPER BOUNDARY CARDS).
C   8)LOWER BOUNDARY CARDS (STARTING WITH LOWER RIGHT CORNER OF MAP)
C     IN SAME FORM AS UPPER BOUNDARY CARDS.
C   9)BLANK CARD (SIGNIFIES END OF LOWER BOUNDARY CARDS).
C   10)UPPER LEFT BOUNDARY CORNER (A REPEAT OF FIRST UPPER BOUNDARY CARD).
C     SAME FORM AS UPPER BOUNDARY CARDS.
C   11)RANGE (GROUND DISTANCE FROM LINEARS TO MINERALS TO BE CONSIDERED).
C       START IN POSITION 1 AND ALWAYS INCLUDE A DECIMAL.
C       NOT TO BE CONFUSED WITH 'RANGE' FOR LINEARS WHICH IS USED IN AREA
C       CALCULATIONS.
C   12)MINERAL CARDS (ONE CARD PER LOCATION)
C       IN THE FORM ___BB___BB__BB____BB__BB__BB__BB__BB__BB__BB__
C       WHERE SPACES 1-3 ARE THE X COORDINATES
C                    4-5 ARE BLANK
C                    6-8 ARE THE Y COORDINATE
C                    9-10 ARE BLANK
C                    11-12 ARE THE TYPE OF OCCURRENCE
C                    13-14 ARE BLANK
C                    15-18 ARE THE MAP NUMBER FOR THE LOCATION
C                    19-20 ARE BLANK
C                    21-22 ARE THE FIRST MINERAL PRESENT
C                    23-24 ARE BLANK
C                    25-26 ARE THE SECOND MINERAL PRESENT
C                    27-28 ARE BLANK
C                    29-30 ARE THE THIRD MINERAL PRESENT
C                    31-32 ARE BLANK
C                    33-34 ARE THE FOURTH MINERAL PRESENT
C                    35-36 ARE BLANK
C                    37-38 ARE THE FIFTH MINERAL PRESENT
C                    39-40 ARE BLANK
C                    41-42 ARE THE SIXTH MINERAL PRESENT
C                    43-44 ARE BLANK
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C                  45-46 ARE THE SEVENTH MINERAL PRESENT
C                  47-48 ARE BLANK
C                  49-50 ARE THE EIGHTH MINERAL PRESENT
C     INCLUDE ZEROS IF A COORDINATE IS LESS THAN 3 DIGITS.
C    TYPE OF OCCURRENCE AND MAP NUMBER SHOULD BE 'LEFT JUSTIFIED' AND ARE
C    ALPHANUMERICS.
C    THE TYPE OF OCCURRENCE IS HERE USED TO INDICATE MINES, PROSPECTS, OR
C    DEPOSITS.  ANY VARIABLE, WHICH CAN BE CODED INTO A 2 DIGIT ALPHANUMERIC MAY
C    BE USED HERE.
C    SPACES FOR ALL 8 MINERAL ENTRIES NEED NOT BE FILLED IN.
C     SPACES MUST BE FILLED IN ORDER AND REMAINING PORTION OF CARD LEFT BLANK.
C    THE MINERALS PRESENT ARE HERE TWO-LETTERED ELEMENT SYMBOLS, BUT MAY BE ANY
C    2 DIGIT ALPHANUMERIC.
C     MAP NUMBER IS NEEDED SINCE PROGRAM ASSIGNS ITS OWN CONSECUTIVE NUMBERS TO
C     THE LOCATIONS.
C     ASSUMES A MAXIMUM NUMBER OF 8 MINERALS PRESENT AT ANY GIVEN LOCATION.
C  13)BLANK CARD (SIGNIFIES END OF MINERAL CARDS).
C  14)HISTOGRAM CARDS (ONE CARD PER HISTOGRAM)
C     IN THE FORM__BB__BB__BB__BB__BB__BB__BB__
C     WHERE SPACES 1-2 ARE THE FIRST MINERAL
C                  3-4 ARE BLANK
C                  5-6 ARE THE SECOND MINERAL
C                  7-8 ARE BLANK
C                  9-10 ARE THE THIRD MINERAL
C                  11-12 ARE BLANK
C                  13-14 ARE THE FOURTH MINERAL
C                  15-16 ARE BLANK
C                  17-18 ARE THE FIFTH MINERAL
C                  19-20 ARE BLANK
C                  21-22 ARE THE SIXTH MINERAL
C                  23-24 ARE BLANK
C                  25-26 ARE THE SEVENTH MINERAL
C                  27-28 ARE BLANK
C                  29-30 ARE THE EIGHTH MINERAL
C     SPACES FOR ALL 8 MINERAL LOCATIONS NEED NOT BE FILLED.
C     SPACES MUST BE FILLED IN ORDER AND REMAINING PORTION OF CARD LEFT BLANK.
C     ASSUMES MAXIMUM NUMBER OF 8 MINERALS PRESENT AT ANY GIVEN LOCATION.
C     ALL MINERALS SHOWN ON CARD MUST BE PRESENT AT A LOCATION BEFORE THE
C     LOCATION IS USED IN HISTOGRAM.
C  15)BLANK CARD (SIGNIFIES END OF HISTOGRAM CARDS).
C
C  ERRORS OF UP TO 1% FOR THE COMPUTED AREAS, MAY BE EXPECTED AS A RESULT OF
C    DIGITAL ANALYSIS.  THE ERRORS ARISE WHEN:
C     1)END-POINTS OF THE LINEARS ARE ADJUSTED TO FIT GRID INTERSECTIONS,
C     2)LINEARS ARE GENERALIZED AS STRAIGHT LINES OR STRAIGHT LINE SEGMENTS,
C     3)MAP BOUNDARIES ARE GENERALIZED AS STRAIGHT LINE SEGMENTS,
C     4)AREAS WITHIN THE RANGE OF A LINEAR FEATURE ARE DETERMINED BY COUNTING
C       GRID INTERSECTIONS INSTEAD OF MEASURING GEOMETRIC REGIONS,
C     5)AREAS OUTSIDE THE MAP ARE ELIMINATED BY COUNTING GRID INTERSECTIONS
C       INSTEAD OF MEASURING GEOMETRIC REGIONS, AND
C     6)RANGE IS ADJUSTED TO FIT THE X-Y GRID.
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C
C   IN THE FOLLOWING PROGRAM, TEXT EXPLANATION (COMMENT CARDS) PRECEED THE CODE
C   REFERED TO.
C   ********************************************************************************
C   * ESTABLISH ARRAYS AND SET ALL VALUES TO ZERO                                   *
C   ********************************************************************************
C   ESTABLISH X,Y,G, AND U AS INTEGERS AND I AS A REAL NUMBER.
C
0001            IMPLICIT  INTEGER(X,Y,G,U),REAL(I)
C
C   ESTABLISH REFERENCE GRID SIZE.
C   FOR THIS EXAMPLE: GRID IS 260 UNITS BY 185 UNITS.
C   THE VALUE IN PARENTHESIS MAY NEED CHANGING FOR VARIOUS MAP SIZES.
C   THE VALUE IN PARENTHESIS SHOULD ALWAYS MATCH THE FIRST DATA CARD.
C   ESTABLISH MAXIMUM NUMBER OF MINERAL LOCATIONS REPRESENTED BY A SINGLE ANGLE
C   ON MINERAL HISTOGRAM.
C   FOR THIS EXAMPLE:'ARRAY' FOR THE 180 ANGLES CAN SHOW 52 POINTS.
C   THE FIRST VALUE IN PARENTHESIS SHOULD ALWAYS BE 180.
C   THE SECOND VALUE MAY BE CHANGED DEPENDING UPON:
C       1) THE SIZE OF THE HISTOGRAM,
C       2) THE EXPECTED DISTANCE BETWEEN MINERAL LOCATIONS AND LINEARS, AND
C       3) THE VALUES USED TO REPRESENT THE PROXIMITY (IF ALL VALUES ARE SMALL,
C            MORE LOCATIONS MAY BE SHOWN).
C   THE SECOND VALUE IN 'ARRAY' SHOULD ALWAYS BE:
C       1) THE SAME AS THE 'ALPHA' ARRAY DIMENSION, AND
C       2) THE SAME AS THE NUMBER OF DATA SYMBOLS IN THE 'ALPHA' DATA STATEMENT.
C   ESTABLISH MAXIMUM NUMBER OF DIFFERENT MINERALS POSSIBLE ON THE MAP.
C   FOR THIS EXAMPLE: MAXIMUM IS 8.
C
0002            INTEGER*2 GRID(260,185),ARRAY(180,52),GMIN(8),LLANK2
C
C   ESTABLISH MAXIMUM NUMBER OF LINEARS EXPECTED ON A GIVEN MAP.
C   FOR THIS EXAMPLE: MAXIMUM IS 375.
C   THE ARRAY, 'BANGLE,' SHOULD ALWAYS HAVE A 'DIMENSION' OF 180.
C   ESTABLISH MAXIMUM NUMBER OF MINERAL LOCATIONS EXPECTED ON A GIVEN MAP.
C   FOR THIS EXAMPLE: MAXIMUM IS 250.
C   'COUNTM' 'DIMENSION' SHOULD ALWAYS BE:
C      1)NO LARGER THAN THE X 'DIMENSION' IN 'GRID.' AND
C      2)THE SAME VALUE AS THE MAXIMUM NUMBER OF MINERAL LOCATIONS EXPECTED.
C
0003            INTEGER AXINIT(375),AYINIT(375),AXFINL(375),AYFINL(375),ADIST(375)
               4,AANGLE(375),ANUMB(375),BANGLE(180),CXMIN(250),CYMIN(250),COUNTM(2
               450)
C
C   FOR THIS EXAMPLE: GRAPH PLOTS MAXIMUM NUMBER OF 110 STARS (CORRESPONDS TO
C     110 KILOMETRES).
C   ESTABLISH THE MAXIMUM NUMBER OF 'ALPHA' SYMBOLS PRINTED FOR A SINGLE ANGLE ON
C   THE MINERAL HISTOGRAMS.
C
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0004              DIMENSION PLOT(110),ALPHA(52),AMEANS(180)
                  C
                  C  SET 'ALPHA' VALUES.
                  C  SET 'BLANK,' 'LLANK2,' 'DOT,' AND 'STAR' VALUES.
                  C  SET 'AXINIT', 'BANGLE', 'CXMIN', AND 'GRID' ARRAY VALUES TO 0.
                  C  SET 'COUNTM' VALUES TO 9.
                  C  SET 'ARRAY' VALUES TO 99.
                  C
0005              DATA AXINIT/375*0/,BANGLE/180*0/,GRID/48100*0/,LLANK2/'  '/,DOT/'.
                 4'/,BLANK/' '/,STAR/'*'/,ARRAY/9360*99/,CXMIN/250*0/,COUNTM/250*9/
0006              DATA ALPHA/'A','B','C','D','E','F','G','H','I','J','K','L','M','N'
                 4,'O','P','Q','R','S','T','U','V','W','X','Y','Z','A','B','C','D','
                 4E','F','G','H','I','J','K','L','M','N','O','P','Q','R','S','T','U'
                 4,'V','W','X','Y','Z'/
                  C
                  C  SET 'LNUMB' AND 'NUMB' COUNTER VALUES.
                  C
0007              LNUMB=1
0008              NUMB=0
                  C
                  C  READ THE GRID DIMENSIONS
                  C
0009              READ (5,29) J,K
                  C
                  C  READ AND WRITE TITLE.
                  C
0010              READ (5,4)
0011             4 FORMAT (50H
0012              WRITE (6,4)
                  C
                  C  READ RANGE (AS DECIMAL).
                  C
0013              READ (5,5) RANGE1,RSCALE,NUMSTR
0014             5 FORMAT(2(F10.0,2X),I3)
                  C
                  C  ADJUST RANGE FROM KILOMETRES (IN EXAMPLE) TO GRID UNITS.
                  C  CONVERSION FACTOR WILL VARY DEPENDING UPON MAP AND GRID SCALES.
                  C
0015              RANGE=RSCALE*RANGE1
                  C
                  C  READ LINEAR END-POINTS.
                  C  PROGRAM WORKS ON ONE LINEAR AT A TIME.
                  C
0016             6 READ (5,7) XINIT,YINIT,XFINAL,YFINAL
0017             7 FORMAT (4(I3,2X))
                  C
                  C  CHECKS FOR BLANK CARD WHICH INDICATES END OF DATA CARDS FOR THE LINEARS.
                  C
0018              IF(XINIT .EQ. 0) GO TO 24
                  C
                  C  CALCULATE LENGTH OF LINEAR IN GRID UNITS USING PYTHAGOREAN THEOREM.
                  C
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0019          8 DIST=SQRT(FLOAT((XINIT-XFINAL)**2+(YINIT-YFINAL)**2))
              C
              C  CHECK FOR HORIZONTAL LINE (ELIMINATING DIVISION BY ZERO IN NEXT STEP).
              C
0020             IF(YFINAL.EQ.YINIT) GO TO 14
              C
              C  CALCULATE TANGENT RELATIVE TO NORTH.
              C
0021             TANG=FLOAT(XFINAL-XINIT)/FLOAT(YFINAL-YINIT)
              C
              C  GO TO 13 IF ANGLE GREATER THAN +45 DEGREES OR LESS THAN -45 DEGREES.
              C  THE ERROR INDUCED BY TAKING INCREMENTS ALONG ONE AXIS ONLY, IS ELIMINATED
              C    TAKING THEM ALONG THE AXIS MOST NEARLY PERPENDICULAR TO THE LINEAR.
              C
0022             IF(TANG.GT. 1.0) GO TO 13
0023             IF(TANG.LT. -1.0) GO TO 13
              C
              C  ********************************************************************
              C  * COMPUTE AREAS WITHIN RANGE OF LINEARS WITH TRENDS BETWEEN -45 AND +45
              C  *    DEGREES.
              C  ********************************************************************
              C  CHECK FOR VERTICAL LINE (ELIMINATING DIVISION BY ZERO).
              C
0024             IF(XFINAL.EQ.XINIT) GO TO 9
              C
              C  CALCULATE INCREMENT (A DISTANCE ALONG A Y GRID LINE).
              C  THE INCREMENT EQUALS THE RANGE DIVIDED BY THE COSINE OF THE ANGLE BETWEEN
              C    NORTH AND THE LINEAR.
              C
0025             INC=RANGE*DIST/(YFINAL-YINIT)
              C
              C  MAKE INCREMENT POSITIVE.
              C
0026             IF (INC.LT. 0) INC=-INC
0027             GO TO 10
              C
              C  INCREMENT EQUALS RANGE FOR VERTICAL LINES.
              C
0028          9 INC=RANGE
              C
              C  EXCHANGE INITIAL AND FINAL POINTS IF 'YINIT' IS NOT SMALLER THAN 'YFINAL.
              C  NEEDED FOR 'DO LOOP' THAT FOLLOWS.
              C  ELIMINATES THE NEED FOR A SPECIFIC ORDERING OF INPUT POINTS.
              C
0029          10 IF(YINIT.LT.YFINAL) GO TO 11
0030             X=XINIT
0031             Y=YINIT
0032             XINIT=XFINAL
0033             YINIT=YFINAL
0034             XFINAL=X
0035             YFINAL=Y
              C
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C  DETERMINE COORESPONDING REAL X VALUE FOR EACH Y GRID LINE ALONG THE LINEAR.
C
0036      11 DO 12 Y=YINIT,YFINAL
0037         IX=((Y-YINIT)*TANG)+XINIT
C
C  CALCULATE MAXIMUM AND MINIMUM INTEGER X VALUE THAT ARE WITHIN RANGE.
C
0038         X1=IX-INC+.99
0039         X2=IX+INC
C
C  CHECK TO SEE THAT X VALUES ARE STILL IN GRID.
C
0040         IF (X1 .LT. 1) X1=1
0041         IF (X2 .GT. J) X2=J
C
C  SET GRID VALUE EQUAL TO +1 FOR GRID POINTS WITHIN RANGE.
C
0042         DO 12 USEDX=X1,X2
0043         GRID (USEDX,Y)=1
0044      12 CONTINUE
0045         GO TO 18
C
C  ************************************************************************
C  * COMPUTE AREAS WITHIN RANGE OF LINEARS WITH TRENDS NOT BETWEEN -45 AND  *
C  *     +45 DEGREES.                                                       *
C  ************************************************************************
C  CALCULATE INCREMENT (A DISTANCE ALONG AN X GRID LINE).
C  THE INCREMENT EQUALS THE RANGE DIVIDED BY THE SINE OF THE ANGLE BETWEEN
C    NORTH AND THE LINEAR.
C
0046      13 INC=RANGE*DIST/(XFINAL-XINIT)
C
C  MAKE INCREMENT POSITIVE.
C
0047         IF (INC.LT. 0) INC=-INC
C
C  USE COTANGENT INSTEAD OF TANGENT FOR X GRID LINE.
C
0048         ITANG=1.0/TANG
0049         GO TO 15
C
C  INCREMENT EQUALS RANGE AND COTANGENT EQUALS ZERO FOR HORIZONTAL LINES.
C
0050      14 INC=RANGE
0051         ITANG=0.0
C  EXCHANGE INITIAL AND FINAL POINTS IF 'XINIT' IS NOT SMALLER THAN 'XFINAL.
C  NEED FOR 'DO LOOP' THAT FOLLOWS.
C  ELIMINATES THE NEED FOR A SPECIFIC ORDERING OF INPUT POINTS.
C
0052      15 IF(XINIT.LT.XFINAL) GO TO 16
0053         X=XINIT
0054         Y=YINIT
```

```
0055              XINIT=XFINAL
0056              YINIT=YFINAL
0057              XFINAL=X
0058              YFINAL=Y
                C
                C  DETERMINE CORRESPONDING REAL Y VALUE FOR EACH X GRID LINE ALONG LINEAR.
                C
0059              16 DO 17 X=XINIT,XFINAL
0060                 IY=((X-XINIT)*ITANG)+YINIT
                C
                C  CALCULATE MAXIMUM AND MINIMUM INTEGER Y VALUES THAT ARE WITHIN RANGE.
                C
0061                 Y1=IY-INC+.99
0062                 Y2=IY+INC
                C
                C  CHECK TO SEE THAT Y VALUES ARE STILL IN GRID.
                C
0063                 IF (Y2 .GT. K) Y2=K
0064                 IF (Y1 .LT. 1) Y1=1
                C
                C  SET GRID VALUE EQUAL TO +1 FOR GRID POINTS WITHIN RANGE.
                C
0065                 DO 17 USEDY=Y1,Y2
0066                 GRID (X,USEDY)=1
0067              17 CONTINUE
                C
                C  ********************************************************************************
                C  *  STORE DATA ON LINEARS AND PRINT                                             *
                C  ********************************************************************************
                C  THE ANGLE EQUALS ZERO DEGREES IF VERTICAL LINE.
                C
0068              18 IF(XFINAL.EQ.XINIT) GO TO 19
                C
                C  THE ANGLE EQUALS +90 DEGREES IF HORIZONTAL LINE.
                C
0069                 IF(YFINAL.EQ.YINIT) GO TO 20
0070                 GO TO 21
0071              19 ANGLE=0.
0072                 GO TO 22
0073              20 ANGLE=90.
0074                 GO TO 22
                C
                C  DETERMINE ANGLE (IN RADIANS) FOR ALL LINES OTHER THAN VERTICAL OR HORIZONTAL
                C
0075              21 ANGLE=ATAN(TANG)
                C
                C  CONVERT ANGLE FROM RADIANS TO DEGREES.
                C
0076                 ANGLE=ANGLE*57.29578
                C
                C  CONVERT FROM GRID UNITS TO KILOMETRES.
                C  CONVERSION FACTOR WILL VARY DEPENDING UPON MAP AND GRID SCALES.
```

```
C
0077      22 DIST=DIST*(1./RSCALE)
C
C  COUNT NUMBER OF LINEARS.
C
0078         NUMB=NUMB+1
C
C  CHANGE DISTANCE FROM REAL NUMBER TO NEAREST INTEGER.
C
0079         NDIST=DIST+.5
C
C  CHANGE ANGLE FROM REAL NUMBER TO NEAREST INTEGER.
C
0080         IF(ANGLE .GE. 0.) NANGLE=ANGLE+ .5
0081         IF(ANGLE .LT. 0.) NANGLE=ANGLE- .5
C
C  SET ALL HORIZONTAL LINES EQUAL TO +90 DEGREES.
C  APPLIES TO LINES THAT ARE NOT QUITE HORIZONTAL BUT WHEN 'ANGLE' IS CONVERTED
C    TO AN INTEGER, IT EQUALS -90 DEGREES.
C
0082         IF(NANGLE .EQ. -90) NANGLE=90
C
C  PLACE END-POINT, DISTANCE, ANGLE, AND LINEAR NUMBER VALUES INTO ARRAYS.
C
0083         AXINIT(NUMB)=XINIT
0084         AYINIT(NUMB)=YINIT
0085         AXFINL(NUMB)=XFINAL
0086         AYFINL(NUMB)=YFINAL
0087         ADIST(NUMB)=NDIST
0088         AANGLE(NUMB)=NANGLE
0089         ANUMB(NUMB)=NUMB
C
C  CONVERT ANGLE VALUES FROM -89 THROUGH +90 TO +1 THROUGH +180. FOR USE IN
C    GRAPH 'DO LOOP'.
C
0090         NANGLE=NANGLE+90
C
C  CHECK TO SEE THAT 'BANGLE(NANGLE)' DOES NOT OVERFLOW 'PLOT' ARRAY.
C
0091         IF(BANGLE(NANGLE)+NDIST .GT. 799) GO TO 23
C
C  ADD TOGETHER LENGTHS OF ALL LINEARS WHICH HAVE THE SAME ANGULAR VALUE.
C
0092         BANGLE(NANGLE)=BANGLE(NANGLE)+NDIST
0093         GO TO 6
C
C  FOR THIS EXAMPLE: MAXIMUM SUM OF LINEAR LENGTHS THAT CAN BE SHOWN FOR A
C    SINGLE ANGLE IS 799 KILOMETRES.
C
0094      23 BANGLE(NANGLE)=799
0095         GO TO 6
C
```

```
C  AFTER ALL LINEAR VALUES HAVE BEEN CALCULATED, THE END-POINTS, LENGTH, ANGLE,
C    AND LINEAR NUMBER ARE PRINTED IN THE ORDER READ.
C  A SECOND LIST ACCORDING TO TREND IS PRINTED.
C
0096        24 WRITE (6,25)
0097        25 FORMAT (//1H0,'INITIAL PT.',9X,'FINAL PT.',11X,'DISTANCE',6X,'ANGL
              4E',6X,'LINEAR NO.')
0098           DO 26 X=1,NUMB
0099        26 WRITE(6,27) AXINIT(X),AYINIT(X),AXFINL(X),AYFINL(X),ADIST(X),AANG
              4LE(X),ANUMB(X)
0100        27 FORMAT(1X,2('(',I3,',',I3,')',10X),4X,I3,10X,I3,9X,I3)
0101           WRITE (6,25)
0102           DO 901 XXX=1,180
0103           XXY=XXX-90
0104           DO 901 X=1,NUMB
0105           IF (AANGLE(X) .NE. XXY) GO TO 901
0106           WRITE (6,27) AXINIT(X),AYINIT(X),AXFINL(X),AYFINL(X),ADIST(X),AANG
              4LE(X),ANUMB(X)
0107         901 CONTINUE
C
C  ********************************************************************************
C  *  ELIMINATE AREAS OF GRID WHICH ARE OUTSIDE MAP BOUNDARY                      *
C  ********************************************************************************
C  READ INITIAL POINT (UPPER LEFT) OF MAP BOUNDARY (NON-ZERO).
C
0108        28 READ (5,29) X1,Y1
0109        29 FORMAT (2(I3,2X))
C
C  READ NEXT POINT ALONG BOUNDARY.
C
0110        30 READ (5,29) X2,Y2
C
C  CHECK FOR BLANK CARD INDICATING TOP OF MAP FINISHED AND SET UPPER RIGHT
C    CORNER EQUAL TO -1.
C
0111           IF(Y2 .EQ. 0) X2=J
C
C  SET GRID VALUE TO -1 FOR ALL GRID POINTS ABOVE THE UPPER BOUNDARY.
C
0112           DO 31 X=X1,X2
0113           DO 31 Y=Y1,K
0114        31 GRID(X,Y)= -1
C
C  PROCEED IF Y2 CORRESPONDS TO CORNER OF MAP.
C  IF NOT, EXCHANGE 'Y2' AND 'Y1,' AND MOVE 'X2' A SPACE TO RIGHT.
C
0115           IF(Y2 .EQ. 0) GO TO 32
0116           Y1=Y2
0117           X1=X2+1
0118           GO TO 30
C
C  READ LOWER RIGHT CORNER POINT.
```

```
C
0119      32 READ (5,29) X2,Y2
C
C  DETERMINE INCREMENT ALONG BOUNDARY WHICH CORRESPONDS TO Y INTEGER VALUES.
C
0120         XN=X2
0121         INC=FLOAT(X2-X1)/FLOAT(Y2-Y1)
C
C  SET THE VALUES OF THE AREA TO RIGHT OF BOUNDARY BETWEEN 'Y1' AND 'Y2' TO -1.
C
0122         DO 34 Y=Y2,Y1
0123         DO 33 X=XN,J
0124      33 GRID(X,Y)= -1
C
C  TAKE NEXT Y INTEGER INCREMENT UP RIGHT BOUNDARY AND DO SAME.
C
0125      34 XN=X2+(Y-Y2)*INC
C
C  SET THE VALUES OF THE LOWER RIGHT CORNER TO -1.
C
0126         DO 35 X=X2,J
0127         DO 35 Y=1,Y2
0128      35 GRID(X,Y)= -1
C
C  CHANGE 'X2' TO 'X1' AND 'Y2' TO 'Y1'.
C
0129         X1=X2
0130         Y1=Y2
C
C  READ POINTS FOR LOWER MAP BOUNDARY.
C
0131      36 READ (5,29) X2,Y2
C
C  CHECK FOR BLANK CARD INDICATING LOWER LEFT CORNER OF MAP.
C
0132         IF(Y2 .EQ. 0) X2=1
C
C  SET COORDINATES BELOW LOWER BOUNDARY TO -1.
C
0133         DO 37 X=X2,X1
0134         DO 37 Y=1,Y2
0135      37 GRID(X,Y)= -1
C
C  PROCEED IF Y2 CORRESPONDS TO CORNER OF MAP.
C  IF NOT, EXCHANGE 'Y2' AND 'Y1,' AND MOVE 'X2' A SPACE TO LEFT.
C
0136         IF(Y2 .EQ. 0) GO TO 38
0137         X1=X2-1
0138         Y1=Y2
0139         GO TO 36
C
C  READ UPPER LEFT CORNER CARD.
```

```
C
0140      38 READ (5,29) X2,Y2
0141         XN=X2
C
C  DETERMINE INCREMENT ALONG BOUNDARY WHICH CORRESPONDS TO Y INTEGER VALUES.
C
0142         INC=FLOAT(X2-X1)/FLOAT(Y2-Y1)
C
C  SET ALL GRID POINTS TO LEFT OF BOUNDARY EQUAL TO -1.
C
0143         DO 40 Y=Y1,Y2
0144         DO 39 X=1,XN
0145      39 GRID(X,Y)= -1
0146      40 XN=X1+(Y-Y1)*INC
C
C  SET UPPER LEFT CORNER AREA EQUAL TO -1.
C
0147         DO 41 X=1,X2
0148         DO 41 Y=Y2,K
0149      41 GRID(X,Y)= -1
C
C  ********************************************************************************
C  *  PRINT AREAS AND PERCENTAGES                                                 *
C  ********************************************************************************
C  SET 'COUNTER' VALUES TO ZERO.
C
0150         NOTUSE=0
0151         USED=0
C
C  FOR ALL GRID POINTS
C   A) DO NOT COUNT POINTS OUTSIDE MAP (-1 VALUES),
C   B) COUNT POINTS NOT WITHIN THE RANGE OF LINEARS (0 VALUES),
C   C) COUNT POINTS WITHIN THE RANGE OF LINEARS (+1 VALUES).
C
0152         DO 44 X=1,J
0153         DO 44 Y=1,K
0154         IF(GRID(X,Y)) 44,43,42
0155      42 USED=USED+1
0156         GO TO 44
0157      43 NOTUSE=NOTUSE+1
0158      44 CONTINUE
C
C  CONVERT 'USED' (TOTAL +1 VALUES) AND 'NOTUSE' (TOTAL 0 VALUES) FROM SQUARE
C    GRID UNITS TO SQUARE KILOMETRES.
C  CONVERSION FACTOR DEPENDENT UPON MAP AND GRID SCALES.
C
0159         USED=USED*((1./RSCALE)**2)
0160         NOTUSE=NOTUSE*((1./RSCALE)**2)
C
C  ADD 'USED' AND 'NOTUSE' AREAS TO FIND TOTAL AREA OF MAP.
C
0161         GTOTAL=USED+NOTUSE
```

```
C
C  CALCULATE PERCENTAGES OF MAP WITHIN RANGE AND NOT WITHIN RANGE OF LINEARS.
C
0162          RATIOU=FLOAT(USED)/FLOAT(GTOTAL)
0163          RATION=FLOAT(NOTUSE)/FLOAT(GTOTAL)
C
C  WRITE TITLE.
C
0164          WRITE(6,110) RANGE1
0165        110 FORMAT(/////1H0,'FOR A RANGE OF ',F10.0)
C
C  PRINT AREAS AND PERCENTAGES.
C
0166          WRITE (6,45)
0167         45 FORMAT (/////1H0,10X,'USED AREA',5X,'UNUSED AREA',2X,'TOTAL AREA',
             47X,'RATIO USED',4X,'RATIO NOT USED',5X,'(AREAS IN SQUARE KMS.)')
0168          WRITE (6,46) USED,NOTUSE,GTOTAL,RATIOU,RATION
0169         46 FORMAT (1H0,3I15,2F15.2,/1H1)
C
C  ********************************************************************************
C  * GRAPH DATA
C  ********************************************************************************
C  DETERMINE THE MEAN LINEAR LENGTH PER ANGLE.
C
0170          WRITE(6,476)
0171        476 FORMAT(///1H0,'HISTOGRAM OF DIRECTIONAL TRENDS VERSUS CUMULATIVE L
             4INEAR FEATURE LENGTHS',//1H0,'KM. SIGNIF. ANGLE')
0172          XMEAN=0
0173          DO 950 X=1,180
0174        950 XMEAN=XMEAN+BANGLE(X)
0175          AMEAN=XMEAN/180.
C
C  DO THE FOLLOWING FOR EACH ANGLE VALUE (1 TO 180):
C
0176          DO 50 X=1,180
C
C  RESET ALL PLOT VALUES TO BLANKS FOR EACH ANGLE.
C
0177          DO 47 L=1,110
0178         47 PLOT(L)=BLANK
C
C  CALCULATE THE NUMBER OF STARS TO BE PRINTED FOR EACH ANGULAR VALUE (1 STAR
C    EQUALS 2  KILOMETRES IN EXAMPLE).
C
0179          NSTAR=BANGLE(X)/NUMSTR
C
C  AVOID THE 'DO LOOP' IF 'NSTAR' EQUALS 0 (LINEAR LENGTHS EQUAL 9 UNITS OR
C    LESS).
C
0180          IF(NSTAR .EQ. 0) GO TO 49
0181          IF(NSTAR .GT. 110) NSTAR=110
0182          DO 48 Y=1,NSTAR
```

```
0183            48 PLOT(Y)=STAR
                C
                C  SET ANGLES BACK TO VALUES FROM -89 TO +90 DEGREES.
                C
0184            49 NANGLE=X-90
                C
                C  DETERMINE "SIGNIFICANCE VALUE" (LENGTH DIVIDED BY MEAN) FOR EACH ANGLE.
                C
0185               AMEANS(X)=BANGLE(X)/AMEAN
                C
                C  PRINT LINEAR LENGTH, ANGLE, SIGNIFICANCE VALUE, AND GRAPH.
                C
0186            50 WRITE(6,51) BANGLE(X),AMEANS(X),NANGLE,DOT,PLOT
0187            51 FORMAT(1X,I3,2X,F5.2,2X,I3,1X,A1,110A1)
0188               WRITE(6,910)AMEAN,NUMSTR
0189           910 FORMAT (//1X,'THE MEAN VALUE IS',F6.2,2X,'ONE STAR EQUALS',1X,I3,1
                  4X,'UNITS')
                C
                C  WRITE TITLE.
                C
0190               WRITE(6,4)
                C
                C  GRAPH SIGNIFICANCE VALUE VERSUS NUMBER OF OCCURRENCES OF A GIVEN VALUE.
                C
0191               WRITE(6,477)
0192           477 FORMAT(///1H0,'HISTOGRAM OF SIGNIFICANCE VALUES (1.0=MEAN, 2.0=2 T
                  4IMES THE MEAN, ETC.) VERSUS THEIR NUMBER OF OCCUPRENCES')
0193               AMEANM=0.
0194               DO 920 X=1,180
0195               AMEANS(X)=AMEANS(X)+.05
0196               IF(AMEANS(X) .GT. AMEANM) AMEANM=AMEANS(X)
0197           920 CONTINUE
0198               MEANM=(AMEANM+.05)*10
0199               DO 930 X=1,MEANM
0200               DO 931 L=1,110
0201           931 PLOT(L)=BLANK
0202               MEANCT=1
0203               DO 932 Y=1,180
0204               MEANMS=AMEANS(Y)*10
0205               IF(MEANMS .NE. X) GO TO 932
0206               MEANCT=MEANCT+1
0207           932 CONTINUE
0208               DO 933 Y=1,MEANCT
0209               YY=Y-1
0210               IF(YY .EQ. 0) GO TO 933
0211               PLOT(YY)=STAR
0212           933 CONTINUE
0213               XX=X/10
0214               XY=X-(XX*10)
0215           930 WRITE (6,934) XX,XY,DOT,PLOT
0216           934 FORMAT (1X,I2,'.',I1,2X,A1,110A1)
                C
```

```
C  ********************************************************************************
C  *  CALCULATE DISTANCE FROM MINERAL LOCALITIES TO ALL LINEARS AND STORE     *
C  *  VALUES WITHIN 'RANGE'                                                   *
C  ********************************************************************************
C  READ MINERAL RANGE (AS DECIMAL).
C
0217          READ(5,5) RANGE2
C
C  ADJUST RANGE FROM KILOMETRES (IN EXAMPLE) TO GRID UNITS.
C  CONVERSION FACTOR WILL VARY DEPENDING UPON MAP AND GRID SCALES.
C
0218          RANGE=(RANGE2+.5)*RSCALE
C
C  SET 'GRID' VALUES TO 0.
C
0219          DO 67 X=1,260
0220          DO 67 Y=1,185
0221       67 GRID(X,Y)=0
C
C  WRITE HEADINGS FOR LIST OF MINERAL LOCATIONS.
C
0222          WRITE(6,68)
0223       68 FORMAT (//1H0,'X=PROSPECT',/1H0,'O=DEPOSITS FOUND DURING INVESTIGA
             4TION',/1H0,'M=MINES',/1H0,'XX=MULTIPLE PROSPECTS',//1H0,'MINERAL L
             4OCATION',3X,'OCCURRENCE',3X,'PROGRAM NUMBER',3X,'MAP NUMBER',3X,'M
             4INERALS PRESENT')
C
C  READ MINERAL LOCALITY, TYPE OF OCCURRENCE, MINERALS PRESENT, AND LOCATION
C  NUMBER.
C
0224       69 READ(5,70)CXMIN(LNUMB),CYMIN(LNUMB),OCC,NNM,(GRID(LNUMB,L),L=1,8)
0225       70 FORMAT (2(I3,2X),A2,2X,A4,2X,8(A2,2X))
C
C  CHECK FOR BLANK CARD WHICH INDICATES THE END OF DATA CARDS FOR THE MINERALS.
C
0226          IF(CXMIN(LNUMB) .EQ. 0) GO TO 72
C
C  WRITE THE MINERAL LOCATION, MINERALS PRESENT, TYPE OF OCCURRENCE, LOCATION
C  NUMBER ON MAP, AND LOCATION NUMBER IN COMPUTER.
C
0227          WRITE(6,71)CXMIN(LNUMB),CYMIN(LNUMB),OCC,LNUMB,NNM,(GRID(LNUMB,L),
             4L=1,8)
0228       71 FORMAT (1X,3X,'(',I3,',',I3,')',11X,A2,11X,I3,13X,A4,6X,8(A2,2X))
C
C  INCREASE 'COUNTER'.
C
0229          LNUMB=LNUMB+1
C
C  RETURN TO READ NEXT MINERAL POINT.
C
0230          GO TO 69
0231       72 LNUMB=LNUMB-1
```

```
C
C  DO THE FOLLOWING FOR EACH LINEAR:
C
0232        DO 83 X=1,NUMB
C
C  SET LINEAR END-POINTS TO NON-ARRAY VALUES TO AVOID MULTIPLE REFERENCES TO
C  ARRAYS.
C
0233        XINIT=AXINIT(X)
0234        YINIT=AYINIT(X)
0235        XFINAL=AXFINL(X)
0236        YFINAL=AYFINL(X)
C
C  EXCHANGE INITIAL AND FINAL POINTS IF 'XINIT' IS NOT SMALLER THAN 'XFINAL.'
C  NEEDED FOR 'TESTS' THAT FOLLOW.
C
0237        IF(XINIT .LE. XFINAL) GO TO 73
0238        XI=XINIT
0239        YI=YINIT
0240        XINIT=XFINAL
0241        YINIT=YFINAL
0242        XFINAL=XI
0243        YFINAL=YI
C
C  CHECK FOR VERTICAL LINEAR.
C
0244     73 IF(XFINAL .EQ. XINIT) GO TO 74
C
C  CALCULATE 'A' AND 'C' IN EQUATION FOR STRAIGHT LINE(AX+BY+C=0) WHERE 'B'=1.
C
0245        A=FLOAT(YINIT-YFINAL)/FLOAT(XFINAL-XINIT)
0246        C=-YFINAL-(A*XFINAL)
C
C  FIND E AND F (TO SIMPLIFY LATER COMPUTATIONS.)
C
0247        E=(A**2)+1.
0248        F=SQRT(E)
C
C  SET JC, A 'COUNTER', TO 9.
C
0249     74 JC=9
C
C  DO THE FOLLOWING FOR EACH MINERAL LOCALITY:
C
0250        DO 83 Y=1,LNUMB
C
C  GIVE MINERAL LOCATIONS NON-ARRAY VALUES TO AVOID MULTIPLE REFERENCES TO
C  ARRAYS.
C
0251        X3=CXMIN(Y)
0252        Y3=CYMIN(Y)
C
```

```
C  CHECK FOR VERTICAL LINEAR.
C
0253        IF(XFINAL .EQ. XINIT) GO TO 75
C
C  FIND TANGENT TO LINEAR FOR A CIRCLE WITH CENTER AT THE MINERAL LOCATION,
C  AVOIDING THE USE OF TRIGONOMETRIC FUNCTIONS (TO SAVE COMPUTER TIME).
C
0254        JX4=((X3-(A*Y3)-(A*C))/E)+.5
0255        GO TO 79
C
C  DO THE FOLLOWING FOR VERTICAL LINEARS.
C
0256     75 JX4=XINIT
C
C  EXCHANGE INITIAL AND FINAL POINTS FOR VERTICAL LINEARS. IF 'YINIT' IS NOT
C  SMALLER THAN 'YFINAL.'
C
0257        IF(YINIT .LT. YFINAL) GO TO 76
0258        XI=XINIT
0259        YI=YINIT
0260        XINIT=XFINAL
0261        YINIT=YFINAL
0262        XFINAL=XI
0263        YFINAL=YI
C
C  GO TO 81 IF THE LINEARS ARE VERTICAL AND IF THE PERPENDICULAR FROM THE
C  MINERAL LOCATION INTERSECTS THE LINEAR (NON-EXTENDED ORIGINAL LINEAR).
C  IN THIS CASE, THE Y VALUE OF THE MINERAL LOCATION EQUALS THE Y VALUE OF THE
C  PERPENDICULAR INTERSECTION.
C
0264     76 IF((Y3 .LE. YFINAL) .AND. (Y3 .GE. YINIT)) GO TO 81
C
C  GO TO 78 IF THE MINERAL LOCATION IS ABOVE THE UPPER END-POINT FOR THE LINEAR
C
0265        IF(Y3 .GT. YFINAL) GO TO 78
C
C  FOR MINERAL POINTS BELOW VERTICAL LINEARS OR WITH INTERCEPTS TO THE LEFT OF
C  FIND DISTANCE 'H,' FROM MINERAL LOCATION TO NEARSAT LINEAR END-POINT
C  (INITIAL) USING PYTHAGOREAN THEOREM.
C
0266     77 H=SQRT(FLOAT(((XINIT-X3)**2)+((YINIT-Y3)**2)))
0267        GO TO 82
C
C  FOR MINERAL LOCATIONS BELOW VERTICAL LINEARS OR WITH INTERCEPTS TO THE LEFT
C  OF NON-VERTICAL LINEARS.
C  FIND DISTANCE 'H' FROM MINERAL POINT TO CLOSEST LINEAR ENDPOINT (FINAL) USIN
C  PYTHAGOREAN THEOREM.
C  FOR MINERAL LOCATIONS ABOVE VERTICAL LINEARS OR WITH INTERCEPTS TO THE RIGHT
C  OF NON-VERTICAL LINEARS.
C
0268     78 H=SQRT(FLOAT(((X3-XFINAL)**2)+((Y3-YFINAL)**2)))
0269        GO TO 82
```

```
C
C  GO TO 80 FOR NON-VERTICAL LINEARS, IF THE X-INTERCEPT OF THE LINEAR AND A
C  PERPENDICULAR FROM THE MINERAL LOCATION TO THE LINEAR INTERSECTS THE LINEAR
C  (NON-EXTENDED, ORIGINAL LINEAR).
C
0270      79 IF((JX4 .LE. XFINAL) .AND. (JX4 .GE. XINIT)) GO TO 80
C
C  GO TO 78 IF PERPENDICULAR INTERCEPT IS TO RIGHT OF NON-VERTICAL LINEAR.
C
0271         IF(JX4 .GT. XFINAL) GO TO 78
C
C  GO TO 77 IF PERPENDICULAR INTERCEPT IS TO LEFT OF NON-VERTICAL LINEAR.
C
0272         GO TO 77
C
C  CALCULATE 'H' FOR THE MINERAL LOCATIONS WITH PERPENDICULAR INTERCEPT ON
C  NON-VERTICAL LINEARS.
C
0273      80 H=((A*X3)+Y3+C)/F
C
C  MAKE DISTANCE, 'H', POSITIVE.
C
0274         IF(H .LT. 0) H=-H
0275         GO TO 82
C
C  CALCULATE 'H' FOR VERTICAL LINEAR WITH PERPENDICULAR INTERCEPT ON LINEAR.
C
0276      81 H=FLOAT(X3-XINIT)
C
C  MAKE DISTANCE, 'H', POSITIVE.
C
0277         IF(H .LT. 0) H=-H
C
C  GO TO 83 IF DISTANCE, 'H,' IS NOT WITHIN THE 'RANGE' FOR MINERALS.
C
0278      82 IF(H .GT. RANGE) GO TO 83
C
C  CHANGE DISTANCE, 'H', FROM REAL NUMBER TO NEAREST INTEGER, 'NH'.
C
0279         HNH=(RANGE-H)*(1./RSCALE)
0280         NH=HNH+.5
C
C  USE 'GRID' TO STORE MINERALS DATA TO SAVE COMPUTER STORAGE SPACE.
C  IN 'GRID,' VALUES 1-8 HAVE THE MINERALS PRESENT FOR A GIVEN LOCATION.
C  THEREFORE, START WITH VALUE 9 TO STORE DATA ON LINEAR NUMBER AND DISTANCE FO
C  ALL LINEARS WITHIN 'RANGE' OF MINERAL LOCATION.
C  'COUNTM' IS A 'COUNTER' TO STORE THE NUMBER OF VALUES IN 'GRID' FOR LATER
C  REFERENCE.
C
0281         JC=COUNTM(Y)
C
C  STORE IN 'GRID' THE LINEAR NUMBER AND DISTANCE 'H' FOR THE LINEARS WHICH
```

```
C  ARE WITHIN THE 'RANGE' OF THE MINERAL LOCATIONS.
C
0282        GRID(Y,JC)=X
0283        JC=JC+1
0284        GRID(Y,JC)=NH
0285        JC=JC+1
0286        COUNTM(Y)=JC
0287     83 CONTINUE
C
C  ********************************************************************************
C  *  LIST AND PLOT HISTOGRAM DATA                                                *
C  ********************************************************************************
C  READ MINERALS TO BE USED IN PLOTTING HISTOGRAM.
C  UP TO 8  MINERALS MAY BE USED FOR SINGLE GRAPH.
C  USE ONE DATA CARD FOR EACH GROUP OF MINERALS TO BE PLOTTED.
C
0288     84 READ (5,85) (GMIN(L),L=1,8)
0289     85 FORMAT(8(A2,2X))
C
C  CHECK FOR BLANK CARD INDICATING END OF HISTOGRAM DATA CARDS.
C
0290        IF(GMIN(1) .EQ. LLANK2) GO TO 106
C
C  PRINT HEADINGS FOR A LISTING OF THE HISTOGRAM DATA.
C
0291        WRITE(6,86) (GMIN(J),J=1,8),RANGE2
0292     86 FORMAT(//1H1,'HISTOGRAM DATA FOR ',8(A2,2X),'RANGE=',F10.0)
0293        WRITE(6,87)
0294     87 FORMAT(1H0,'MINERAL NUMBER',3X,'PROXIMITY TO LINEAR',3X,'LINEAR NU
          4MBER',3X,'LINEAR ANGLE')
C
C  SET 'BANGLE' TO ZERO.
C
0295        DO 88 X=1,180
0296     88 BANGLE(X)=0
C
C  DETERMINE NUMBER OF MINERALS, 'KC', TO BE SHOWN ON ONE GRAPH.
C
0297        DO 89 L=1,8
0298        IF(GMIN(L) .EQ. LLANK2) GO TO 90
0299     89 CONTINUE
0300     90 KC=L-1
C
C  FOR EACH MINERAL AT THE MINERAL LOCATION:
C
0301        DO 97 Y=1,LNUMB
C
C  SET 'COUNTER' TO ZERO.
C
0302        JCNTR=0
C
C  CHECK FOR LAST MINERAL PRESENT AT LOCATION.
```

```
C
0303        DO 96 J=1,8
C
C  CHECK FOR END OF MINERALS PRESENT AT LOCALITY.
C
0304        IF(GRID(Y,J) .EQ. LLANK2) GO TO 97
C
C  FOR EACH MINERAL TO BE GRAPHED:
C
0305        DO 95 L=1,KC
C
C  GO TO 95 IF THE MINERAL TO BE GRAPHED IS NOT SAME AS THAT AT THE MINERAL
C  LOCATION.
C
0306        IF(GMIN(L) .NE. GRID(Y,J)) GO TO 95
C
C  INCREASE 'COUNTER'.
C
0307        91 JCNTR=JCNTR+1
C
C  GO TO 92 IF ALL MINERALS TO BE GRAPHED OCCUR AT LOCATION.
C  OTHERWISE, CONTINUE COMPARISON.
C
0308        IF(JCNTR .EQ. KC) GO TO 92
0309        GO TO 96
C
C  DETERMINE NUMBER OF LINEARS ASSOCIATED WITH EACH MINERAL LOCATION FROM
C  'COUNTM.'
C
0310        92 MC=(COUNTM(Y)-9)/2
C
C  GO TO 97 IF NO LINEARS ARE ASSOCIATED WITH LOCATION.
C
0311        IF(MC .EQ. 0) GO TO 97
0312        XQ=7
C
C  READ LINEAR NUMBER AND DISTANCE FROM 'GRID' FOR ASSOCIATED LINEARS.
C
0313        DO 94 XX=1,MC
0314        XQ=XQ+2
0315        LINNO=GRID(Y,XQ)
0316        XS=XQ+1
0317        NH=GRID(Y,XS)
C
C  CONVERT ANGLE VALUES OF LINEARS FROM -89 THROUGH +90 TO +1 THROUGH +180,
C  FOR USE IN HISTOGRAM 'DO LOOP.'
C
0318        XT=AANGLE(LINNO)+90
C
C  USE 'BANGLE' AS A 'COUNTER.'
C
0319        BANGLE(XT)=BANGLE(XT)+1
```

```
C
C  STOP STORING DATA IF 'BANGLE' IS LARGER THAN THE NUMBER OF SYMBOLS WHICH MAY
C  BE PLOTTED.
C  ONLY THE FIRST 52 LINEAR ASSOCIATIONS WILL BE SHOWN ON GRAPH.
C  THIS MAY BE INCREASED IF NUMBER OF SYMBOLS IS INCREASED.
C  NUMBER OF SYMBOLS DEPENDS UPON EXPECTED RELATIONS BETWEEN MINERAL LOCATIONS
C  AND LINEARS, AND THE GRAPH SIZE AND SCALE.
C
0320        IF(BANGLE(XT).EQ. 53) GO TO 94
C
C  CONVERT DISTANCE TO PROXIMITY.
C  PROXIMITY, AS USED HERE, IS THE COMPLEMENT OF THE "RANGE."
C  CONVERSION FACTOR DEPENDS UPON MAP AND GRID SCALES AND RELATIONSHIP DESIRED
C  TO BE SHOWN AS PROXIMITY.
C  PLACE PROXIMITY, "NH," INTO "ARRAY."
C
0321        ARRAY(XT,BANGLE(XT))=NH
C
C  LIST DATA TO BE USED IN HISTOGRAM.
C
0322        WRITE(6,93) Y,NH,LINNO,AANGLE(LINNO)
0323     93 FORMAT(6X,I3,17X,I2,16X,I3,13A,I3)
0324     94 CONTINUE
C
C  GO TO 97 UNTIL ALL MINERAL LOCATIONS HAVE BEEN EVALUATED.
C
0325        GO TO 97
0326     95 CONTINUE
0327     96 CONTINUE
0328     97 CONTINUE
C
C  WRITE MAP AND HISTOGRAM TITLES AFTER ALL LOCATIONS HAVE BEEN EVALUATED FOR
C  ALL MINERALS.
C
0329     98 WRITE(6,4)
0330        WRITE(6,99)(GMIN(L),L=1,8)
0331     99 FORMAT(//1H1,'HISTOGRAM FOR',1X,8(A2,2X),/1X,'      ANGLE')
C
C  DO THE FOLLOWING FOR EACH ANGLE VALUE (1 TO 180):
C
0332        DO 104 X=1,180
C
C  SET 'COUNTER' TO ZERO.
C
0333        NNN=0
C
C  RESET ALL "PLOT" VALUES TO BLANKS FOR EACH ANGLE.
C
0334        DO 100 L=1,110
0335   100 PLOT(L)=BLANK
C
C  GO TO 103 IF "BANGLE" EQUALS ZERO (NO VALUES ASSOCIATED WITH THE ANGLE).
```

```
C
0336            IF(BANGLE(X) .EQ. 0) GO TO 103
C
C  FIND THE "ARRAY" (PROXIMITY) VALUE FOR EACH OF THE 52 ASSOCIATED LINEARS.
C
0337            DO 102 Y=1,52
0338            YY=ARRAY(X,Y)
C
C  DO NOT SHOW IN HISTOGRAM IF THE PROXIMITY EQUALS ZERO (DISTANCE EQUALS
C  "RANGE").
C  GO TO 103 IF ALL PROXIMITY VALUES FOR ANGLE, "X," HAVE BEEN USED.
C
0339            IF(YY .EQ. 0) GO TO 102
0340            IF(YY .EQ. 99) GO TO 103
C
C  PLACE A SYMBOL FROM "ALPHA" INTO "PLOT" FOR EACH PROXIMITY VALUE ASSOCIATE
C  WITH A GIVEN LINEAR.
C
0341            DO 101 XX=1,YY
0342            NNM=XX+NNN
C
C  SHOW ONLY UP TO 80 SYMBOLS PER ANGLE ON HISTOGRAM.
C
0343            IF(NNM .GT. 110) GO TO 103
0344          101 PLOT(NNM)=ALPHA(Y)
C
C  INCREASE 'COUNTER' BY THE NUMBER OF SYMBOLS TO BE PRINTED.
C
0345            NNN=NNN+XX
0346          102 CONTINUE
C
C  SET ANGLES BACK TO VALUES FROM -89 TO +90 DEGREES.
C
0347          103 NANGLE=X-90
C
C  PRINT PROXIMITY TOTAL, ANGLE, AND HISTOGRAM.
C
0348          104 WRITE(6,775) NNN,NANGLE,DOT,PLOT
0349          775 FORMAT(1X,I3,2X,I3,1X,A1,110A1)
0350            DO 105 X=1,180
0351            DO 105 Y=1,52
0352          105 ARRAY(X,Y)=99
0353            GO TO 84
C
C  WRITE TITLE.
C
0354          106 WRITE(6,4)
0355            STOP
0356            END
```

FOR A RANGE OF 1.

(AREAS IN SQUARE KMS.)

USED AREA	UNUSED AREA	TOTAL AREA	RATIO USED	RATIO NOT USED
6256	11521	17777	0.35	0.65

MCCARTHY QUADRANGLE, ALASKA (1 KM. RANGE)

INITIAL PT.	FINAL PT.	DISTANCE	ANGLE	LINEAR NO.
(6,178)	(56,180)	32	88	1
(7,180)	(85,104)	69	-46	2
(85,104)	(179, 17)	81	-47	3
(179, 17)	(196, 4)	14	-53	4
(85,104)	(214, 4)	104	-52	5
(85,104)	(187, 39)	77	-57	6
(6,156)	(26,172)	16	51	7
(20,165)	(163,119)	95	-72	8
(163,119)	(215,104)	34	-74	9
(215,104)	(256, 88)	28	-69	10
(181,113)	(256,100)	48	-80	11
(5,130)	(74,132)	44	88	12
(74,132)	(210,131)	86	90	13
(210,131)	(255,134)	29	86	14
(15,113)	(5,124)	9	-42	15
(3,114)	(65, 84)	44	-64	16
(5,103)	(75, 38)	61	-47	17
(4, 92)	(57,132)	42	53	18
(4, 74)	(64,120)	48	53	19
(4, 74)	(256, 85)	160	88	20
(4, 64)	(69, 43)	43	-72	21
(3, 52)	(120, 13)	78	-72	22
(3, 40)	(28, 57)	19	56	23
(3, 29)	(77, 33)	47	87	24
(15, 4)	(166,105)	115	56	25
(42, 4)	(110, 53)	53	54	26
(35, 4)	(43, 31)	18	17	27
(50, 4)	(57, 32)	18	14	28
(60, 4)	(65, 30)	17	11	29
(70, 4)	(74, 28)	15	9	30
(106, 3)	(109, 15)	8	14	31
(117, 3)	(127, 49)	30	12	32
(189, 4)	(257, 67)	59	47	33
(137, 56)	(220, 4)	62	-58	34
(191, 38)	(241, 5)	38	-57	35
(142, 11)	(258, 10)	74	90	36
(164, 37)	(257, 41)	59	88	37
(110, 37)	(164, 37)	34	90	38
(230,167)	(255,146)	21	-50	39
(157, 44)	(257, 57)	64	83	40
(181,179)	(255,112)	63	-48	41
(92, 80)	(256,103)	105	82	42
(141,179)	(257, 69)	102	-47	43
(201, 62)	(257, 50)	36	-78	44
(129,141)	(255,148)	80	87	45
(188,126)	(254,176)	53	53	46
(169,108)	(238,180)	63	44	47
(125, 68)	(169,108)	38	48	48
(184, 85)	(184,179)	60	0	49
(72,151)	(105,179)	27	50	50
(68,146)	(96,179)	27	40	51
(87,179)	(202, 69)	101	-46	52
(64, 77)	(80,157)	52	11	53
(43,123)	(64,143)	18	46	54
(31, 97)	(20,109)	10	-43	55
(41, 89)	(31,101)	10	-40	56
(34,102)	(23,116)	11	-38	57
(30,117)	(58, 95)	23	-52	58
(57, 90)	(58,109)	12	3	59
(62,102)	(64,118)	10	7	60
(68,120)	(97,145)	24	49	61
(90,151)	(108,164)	14	54	62
(100,146)	(110,154)	8	51	63
(112,154)	(133,172)	18	49	64
(157,122)	(135,177)	38	-22	65
(67,167)	(178, 84)	88	-53	66
(128,134)	(164,168)	31	47	67
(69, 80)	(128,134)	51	48	68
(40, 63)	(69, 80)	21	60	69
(7, 29)	(10, 49)	13	9	70
(43, 12)	(7, 48)	32	-45	71
(31, 10)	(34, 28)	12	9	72
(105, 12)	(136,131)	78	15	73
(138,132)	(147,166)	22	15	74
(106, 32)	(99,106)	47	-5	75
(110, 37)	(105,117)	51	-4	76
(106,121)	(159, 78)	43	-51	77
(143, 25)	(170, 98)	49	20	78
(117, 31)	(184, 47)	44	77	79
(105, 38)	(168, 58)	42	72	80
(129, 44)	(137, 77)	22	14	81
(171, 44)	(215, 22)	31	-63	82
(224, 33)	(211, 47)	12	-43	83
(227, 38)	(212, 55)	14	-41	84
(150, 36)	(230,113)	71	46	85

INITIAL PT.	FINAL PT.	DISTANCE	ANGLE	LINEAR NO.
(181,113)	(256,100)	48	-80	11
(201, 62)	(257, 50)	36	-78	44
(163,119)	(215,104)	34	-74	9
(20,165)	(163,119)	95	-72	8
(4, 64)	(69, 43)	43	-72	21
(3, 52)	(120, 13)	78	-72	22
(215,104)	(256, 88)	28	-69	10
(3,114)	(65, 84)	44	-64	16
(171, 44)	(215, 22)	31	-63	82
(137, 56)	(220, 4)	62	-58	34
(85,104)	(187, 39)	77	-57	6
(191, 38)	(241, 5)	38	-57	35
(179, 17)	(196, 4)	14	-53	4
(67,167)	(178, 84)	88	-53	66
(85,104)	(214, 4)	104	-52	5
(30,117)	(58, 95)	23	-52	58
(106,121)	(159, 78)	43	-51	77
(230,167)	(255,146)	21	-50	39
(181,179)	(255,112)	63	-48	41
(85,104)	(179, 17)	81	-47	3
(5,103)	(75, 38)	61	-47	17
(141,179)	(257, 69)	102	-47	43
(7,180)	(85,104)	69	-46	2
(87,179)	(202, 69)	101	-46	52
(43, 12)	(7, 48)	32	-45	71
(31, 97)	(20,109)	10	-43	55
(224, 33)	(211, 47)	12	-43	83
(15,113)	(5,124)	9	-42	15
(227, 38)	(212, 55)	14	-41	84
(41, 89)	(31,101)	10	-40	56
(34,102)	(23,116)	11	-38	57
(157,122)	(135,177)	38	-22	65
(106, 32)	(99,106)	47	-5	75
(110, 37)	(105,117)	51	-4	76
(184, 85)	(184,179)	60	0	49
(57, 90)	(58,109)	12	3	59
(62,102)	(64,118)	10	7	60
(70, 4)	(74, 28)	15	9	30
(7, 29)	(10, 49)	13	9	70
(31, 10)	(34, 28)	12	9	72
(60, 4)	(65, 30)	17	11	29
(64, 77)	(80,157)	52	11	53
(117, 3)	(127, 49)	30	12	32
(50, 4)	(57, 32)	18	14	28
(106, 3)	(109, 15)	8	14	31
(129, 44)	(137, 77)	22	14	81
(105, 12)	(136,131)	78	15	73
(138,132)	(147,166)	22	15	74
(35, 4)	(43, 31)	18	17	27
(143, 25)	(170, 98)	49	20	78
(68,146)	(96,179)	27	40	51
(169,108)	(238,180)	63	44	47
(43,123)	(64,143)	18	46	54
(150, 36)	(230,113)	71	46	85
(189, 4)	(257, 67)	59	47	33
(128,134)	(164,168)	31	47	67
(125, 68)	(169,108)	38	48	48
(69, 80)	(128,134)	51	48	68
(68,120)	(97,145)	24	49	61
(112,154)	(133,172)	18	49	64
(72,151)	(105,179)	27	50	50
(6,156)	(26,172)	16	51	7
(100,146)	(110,154)	8	51	63
(4, 92)	(57,132)	42	53	18
(4, 74)	(64,120)	48	53	19
(188,126)	(254,176)	53	53	46
(42, 4)	(110, 53)	53	54	26
(90,151)	(108,164)	14	54	62
(3, 40)	(28, 57)	19	56	23
(15, 4)	(166,105)	115	56	25
(40, 63)	(69, 80)	21	60	69
(105, 38)	(168, 58)	42	72	80
(117, 31)	(184, 47)	44	77	79
(92, 80)	(256,103)	105	82	42
(157, 44)	(257, 57)	64	83	40
(210,131)	(255,134)	29	86	14
(3, 29)	(77, 33)	47	87	24
(129,141)	(255,148)	80	87	45
(6,178)	(56,180)	32	88	1
(5,130)	(74,132)	44	88	12
(4, 74)	(256, 85)	160	88	20
(164, 37)	(257, 41)	59	88	37
(74,132)	(210,131)	86	90	13
(142, 11)	(258, 10)	74	90	36
(110, 37)	(164, 37)	34	90	38

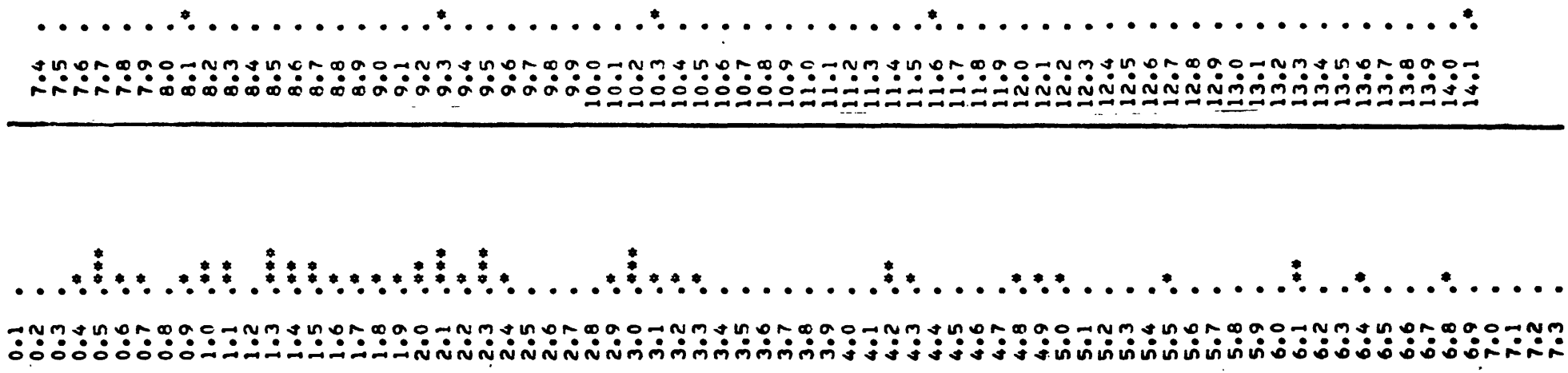
HISTOGRAM OF DIRECTIONAL TRENDS VERSUS CUMULATIVE LINEAR FEATURE LENGTHS

KM.	SIGNIF.	ANGLE	
0	0.0	-89	.
0	0.0	-88	.
0	0.0	-87	.
0	0.0	-86	.
0	0.0	-85	.
0	0.0	-84	.
0	0.0	-83	.
0	0.0	-82	.
0	0.0	-81	.
48	2.29	-80	.**********
0	0.0	-79	.
36	1.72	-78	.********
0	0.0	-77	.
0	0.0	-76	.
0	0.0	-75	.
34	1.62	-74	.********
0	0.0	-73	.
216	10.31	-72	.**********
0	0.0	-71	.
0	0.0	-70	.
28	1.34	-69	.*******
0	0.0	-68	.
0	0.0	-67	.
0	0.0	-66	.
0	0.0	-65	.
44	2.10	-64	.**********
31	1.48	-63	.*******
0	0.0	-62	.
0	0.0	-61	.
0	0.0	-60	.
0	0.0	-59	.
62	2.96	-58	.**********
115	5.49	-57	.**********
0	0.0	-56	.
0	0.0	-55	.
0	0.0	-54	.
102	4.87	-53	.**********
127	6.06	-52	.**********
43	2.05	-51	.**********
21	1.00	-50	.**********
0	0.0	-49	.
63	3.01	-48	.**********
244	11.65	-47	.**********
170	8.12	-46	.**********
32	1.53	-45	.*******
0	0.0	-44	.
22	1.05	-43	.**********
9	0.43	-42	.****
14	0.67	-41	.*******
10	0.48	-40	.*****
0	0.0	-39	.
11	0.53	-38	.*****
0	0.0	-37	.
0	0.0	-36	.
0	0.0	-35	.
0	0.0	-34	.
0	0.0	-33	.
0	0.0	-32	.
0	0.0	-31	.
0	0.0	-30	.
0	0.0	-29	.
0	0.0	-28	.
0	0.0	-27	.
0	0.0	-26	.
0	0.0	-25	.
0	0.0	-24	.
0	0.0	-23	.
38	1.81	-22	.**********
0	0.0	-21	.
0	0.0	-20	.
0	0.0	-19	.
0	0.0	-18	.
0	0.0	-17	.
0	0.0	-16	.
0	0.0	-15	.
0	0.0	-14	.
0	0.0	-13	.
0	0.0	-12	.
0	0.0	-11	.
0	0.0	-10	.
0	0.0	-9	.
0	0.0	-8	.
0	0.0	-7	.
0	0.0	-6	.
47	2.24	-5	.**********
51	2.44	-4	.**********
0	0.0	-3	.
0	0.0	-2	.
0	0.0	-1	.
60	2.86	0	.**********

```
  0    0.0     1 .
  0    0.0     2 .
 12    0.57    3 .******
  0    0.0     4 .
  0    0.0     5 .
  0    0.0     6 .
 10    0.48    7 .*****
  0    0.0     8 .
 40    1.91    9 .*********************
  0    0.0    10 .
 69    3.29   11 .***********************************
 30    1.43   12 .***************
  0    0.0    13 .
 48    2.29   14 .************************
100    4.77   15 .**************************************************
  0    0.0    16 .
 18    0.86   17 .*********
  0    0.0    18 .
  0    0.0    19 .
 49    2.34   20 .*************************
  0    0.0    21 .
  0    0.0    22 .
  0    0.0    23 .
  0    0.0    24 .
  0    0.0    25 .
  0    0.0    26 .
  0    0.0    27 .
  0    0.0    28 .
  0    0.0    29 .
  0    0.0    30 .
  0    0.0    31 .
  0    0.0    32 .
  0    0.0    33 .
  0    0.0    34 .
  0    0.0    35 .
  0    0.0    36 .
  0    0.0    37 .
  0    0.0    38 .
  0    0.0    39 .
 27    1.29   40 .*************
  0    0.0    41 .
  0    0.0    42 .
  0    0.0    43 .
 63    3.01   44 .********************************
  0    0.0    45 .
 89    4.25   46 .*********************************************
 90    4.30   47 .**********************************************
 89    4.25   48 .*********************************************
 42    2.01   49 .*********************
 27    1.29   50 .*************
 24    1.15   51 .************
  0    0.0    52 .
143    6.83   53 .***************************************************************************
 67    3.20   54 .*********************************
  0    0.0    55 .
134    6.40   56 .*****************************************************************
  0    0.0    57 .
  0    0.0    58 .
  0    0.0    59 .
 21    1.00   60 .**********
  0    0.0    61 .
  0    0.0    62 .
  0    0.0    63 .
  0    0.0    64 .
  0    0.0    65 .
  0    0.0    66 .
  0    0.0    67 .
  0    0.0    68 .
  0    0.0    69 .
  0    0.0    70 .
  0    0.0    71 .
 42    2.01   72 .*********************
  0    0.0    73 .
  0    0.0    74 .
  0    0.0    75 .
  0    0.0    76 .
 44    2.10   77 .**********************
  0    0.0    78 .
  0    0.0    79 .
  0    0.0    80 .
  0    0.0    81 .
105    5.01   82 .****************************************************
 64    3.06   83 .********************************
  0    0.0    84 .
  0    0.0    85 .
 29    1.38   86 .**************
127    6.06   87 .*****************************************************************
295   14.08   88 .*********************************************************************************************************************************************
  0    0.0    89 .
194    9.26   90 .*******************************************************************************************************
```

THE MEAN VALUE IS 20.94 ONE STAR EQUALS   2 UNITS

HISTOGRAM OF SIGNIFICANCE VALUES (1.0=MEAN, 2.0=2 TIMES THE MEAN, ETC.) VERSUS THEIR NUMBER OF OCCURRENCES



X=PROSPECT

O=DEPOSITS FOUND DURING INVESTIGATION

M=MINES

XX=MULTIPLE PROSPECTS

MINERAL LOCATION	OCCURRENCE	PROGRAM NUMBER	MAP NUMBER	MINERALS PRESENT
(205, 9)	X	1	002	CU
(52, 5)	X	2	007	AU
(152, 9)	O	3	006	CU
(55, 9)	M	4	009	AU
(55, 10)	X	5	010	AU
(53, 10)	X	6	011	AU
(52, 13)	M	7	023	AU
(52, 14)	M	8	024	AU
(185, 26)	X	9	029	CU
(157, 52)	O	10	036	CU
(174, 61)	X	11	044	MO
(158, 63)	O	12	046	CU
(158, 64)	O	13	047	CU
(155, 66)	O	14	048	CU
(146, 64)	O	15	050	SB
(137, 66)	X	16	052	CU
(135, 69)	X	17	054	CU
(132, 58)	X	18	055	AU
(129, 64)	X	19	056	AU
(17, 63)	X	20	059	PB ZN
(19, 64)	O	21	060	ZN
(151, 75)	M	22	062	CU
(158, 84)	O	23	063	CU
(141, 74)	X	24	065	CU
(140, 76)	X	25	066	CU
(143, 78)	X	26	067	CU
(139, 80)	X	27	068	CU
(140, 82)	M	28	069	CU AG
(149, 83)	O	29	070	CU
(129, 73)	X	30	071	CU
(130, 73)	M	31	072	CU AG
(131, 82)	M	32	073	CU
(118, 83)	X	33	074	CU
(115, 85)	X	34	075	CU AG
(115, 86)	X	35	075A	CU
(118, 86)	X	36	076	CU
(102, 81)	X	37	077	AU MO
(228, 98)	O	38	080	CU
(143, 89)	X	39	081	CU
(146, 90)	X	40	082	CU
(149, 91)	O	41	083	CU
(149, 94)	O	42	084	CU
(135, 87)	X	43	085	CU
(108, 90)	M	44	087	CU AG
(107, 91)	X	45	088	CU
(102, 94)	M	46	089	CU AG
(103, 94)	X	47	090	CU
(103, 95)	M	48	091	CU AG
(101, 95)	M	49	092	CU AG
(97, 98)	M	50	093	CU AG
(99, 99)	X	51	094	CU
(92,100)	X	52	096	CU
(90,101)	M	53	097	CU
(81, 99)	O	54	095	CU
(75, 95)	X	55	099	CU
(75, 99)	X	56	100	CU
(55,102)	X	57	101	CU AG
(38, 88)	O	58	102	CU
(35, 94)	X	59	104	CU
(28,100)	X	60	106	CU
(21,100)	X	61	107	CU
(22,101)	M	62	108	AU CU
(255,106)	O	63	109	CU
(238,105)	O	64	111	CU AG
(210,113)	O	65	111A	CU
(143,115)	O	66	113	CU
(136,113)	O	67	114	CU
(90,102)	X	68	115	CU
(73,102)	X	69	116	CU
(74,102)	X	70	117	CU
(76,103)	X	71	118	CU
(64,109)	O	72	119	CU AG
(36,114)	X	73	127	CU
(35,115)	O	74	128	CU
(28,102)	X	75	129	CU
(26,102)	X	76	130	CU
(25,102)	X	77	131	CU
(19,111)	X	78	133	CU
(22,113)	X	79	135	CU
(17,114)	X	80	136	CU
(18,114)	X	81	137	CU
(18,116)	X	82	138	CU
(28,117)	M	83	139	CU AG
(13,104)	O	84	140	CU AG
(13,108)	O	85	142	CU
(6,114)	X	86	147	CU
(200,122)	X	87	148	CU
(208,124)	O	88	149	CU
(190,118)	X	89	151	CU
(194,123)	X	90	152	CU
(183,126)	XX	91	153	CU
(185,130)	X	92	155	CU
(179,132)	X	93	156	CU
(37,119)	X	94	157	CU
(19,124)	XX	95	159	CU
(22,126)	X	96	160	CU
(22,128)	X	97	161	CU
(24,128)	XX	98	162	CU
(18,128)	XX	99	163	CU
(29,132)	X	100	164	CU
(15,119)	O	101	165	ZN
(15,125)	O	102	166	CU
(10,126)	X	103	167	CU
(15,128)	X	104	168	CU
(8,129)	X	105	169	CU
(16,130)	X	106	170	CU
(171,137)	X	107	172	CU
(158,168)	O	108	189	CU
(21,134)	X	109	173	CU
(14,133)	X	110	175	AG
(13,134)	X	111	176	AG CU
(7,133)	X	112	177	CU
(15,134)	O	113	178	CU
(14,137)	X	114	179	CU
(10,140)	X	115	180	CU
(10,144)	X	116	181	CU
(15,145)	X	117	182	CU
(8,146)	O	118	183	CU
(176,160)	X	119	184A	CU
(250,171)	O	120	185	CU
(249,175)	X	121	187	CU
(246,178)	O	122	188	CU

HISTOGRAM DATA FOR CU RANGE= 5.

MINERAL NUMBER	PROXIMITY TO LINEAR	LINEAR NUMBER	LINEAR ANGLE
1	3	5	-52
1	1	33	47
1	3	34	-58
1	5	36	90
3	4	36	90
9	5	5	-52
9	5	34	-58
10	4	5	-52
10	2	6	-57
10	1	34	-58
10	0	40	83
10	3	78	20
10	4	80	72
10	1	85	46
12	3	6	-57
12	5	78	20
12	1	80	72
13	2	6	-57
13	5	78	20
14	2	6	-57
14	4	78	20
16	1	3	-47
16	4	5	-52
16	3	6	-57
16	4	81	14
17	0	3	-47
17	4	5	-52
17	4	6	-57
17	2	48	48
17	5	81	14
22	2	20	88
22	1	77	-51
23	3	20	88
23	2	42	82
23	3	77	-51
23	1	78	20
24	2	6	-57
24	2	20	88
24	1	48	48
24	3	81	14
25	2	6	-57
25	3	20	88
25	3	48	48
25	3	81	14
26	4	20	88
26	3	48	48
26	2	81	14
27	5	20	88
27	2	25	56
27	1	42	82
27	5	48	48
27	3	81	14
28	4	20	88
28	3	25	56
28	3	42	82
28	5	48	48
28	2	81	14
29	4	20	88
29	2	42	82
29	4	77	-51
30	1	3	-47
30	4	5	-52
30	4	6	-57
30	1	20	88
30	2	25	56
30	5	48	48
30	1	73	15
30	1	81	14
31	1	3	-47
31	4	5	-52
31	4	6	-57
31	1	20	88
31	1	25	56
31	5	48	48
31	2	81	14
32	2	6	-57
32	4	20	88
32	5	25	56
32	3	42	82
32	1	48	48
32	1	73	15
32	1	81	14
33	1	3	-47
33	3	5	-52
33	5	6	-57
33	3	20	88
33	0	25	56
33	5	42	82
33	2	73	15
34	1	3	-47
34	3	5	-52
34	5	6	-57
34	2	20	88
34	4	42	82
34	0	76	-4
35	1	3	-47
35	3	5	-52
35	5	6	-57
35	1	20	88
35	4	42	82
35	0	76	-4
36	2	5	-52
36	4	6	-57
36	1	20	88
36	4	42	82
36	2	73	15
38	5	10	-69
38	1	11	-80
38	5	42	82
38	5	43	-47
39	5	25	56
39	4	42	82
39	3	48	48
39	5	77	-51
40	5	25	56
40	4	42	82
40	4	48	48
40	5	77	-51
41	4	25	56
41	4	42	82
41	5	48	48
41	3	77	-51
42	5	25	56
42	2	42	82

42	2	77	-51
43	1	20	88
43	4	25	56
43	5	42	82
43	1	48	48
43	0	77	-51
44	2	3	-47
44	4	5	-52
44	5	6	-57
44	1	42	82
44	1	75	-5
44	5	76	-4
45	2	3	-47
45	3	5	-52
45	5	6	-57
45	1	75	-5
45	5	76	-4
46	3	3	-47
46	4	5	-52
46	5	6	-57
46	4	75	-5
46	3	76	-4
47	2	3	-47
47	4	5	-52
47	5	6	-57
47	4	75	-5
47	3	76	-4
48	2	3	-47
48	3	5	-52
48	4	6	-57
48	4	75	-5
48	3	76	-4
49	3	3	-47
49	4	5	-52
49	5	6	-57
49	5	75	-5
49	2	76	-4
50	3	3	-47
50	4	5	-52
50	5	6	-57
50	2	68	48
50	4	75	-5
51	2	3	-47
51	3	5	-52
51	3	6	-57
51	2	68	48
51	5	75	-5
51	1	76	-4
52	0	2	-46
52	4	3	-47
52	5	5	-52
52	5	6	-57
52	5	68	48
52	1	75	-5
53	2	2	-46
53	5	3	-47
53	5	5	-52
53	5	6	-57
53	5	68	48
54	1	2	-46
54	1	3	-47
54	1	5	-52
54	1	6	-57
54	2	68	48
55	1	53	11
55	1	68	48

56	1	53	11
57	3	58	-52
57	4	59	3
57	1	60	7
58	0	16	-64
58	4	56	-40
59	3	16	-64
59	4	19	53
59	2	55	-43
59	5	56	-40
59	0	57	-38
60	4	16	-64
60	0	18	53
60	2	19	53
60	5	55	-43
60	3	56	-40
60	2	57	-38
61	2	16	-64
61	3	18	53
61	2	55	-43
62	3	16	-64
62	3	18	53
62	3	55	-43
63	2	11	-80
63	2	41	-48
63	4	42	82
64	4	11	-80
64	3	42	82
65	1	9	-74
65	2	11	-80
65	5	43	-47
66	1	52	-46
66	3	66	-53
67	4	66	-53
67	3	73	15
68	2	2	-46
68	4	3	-47
68	5	5	-52
68	5	6	-57
68	4	68	48
69	3	53	11
70	2	53	11
71	1	2	-46
71	1	53	11
72	2	53	11
72	2	59	3
72	5	60	7
73	4	18	53
73	5	58	-52
74	5	18	53
74	5	58	-52
75	5	16	-64
75	1	18	53
75	1	19	53
75	5	55	-43
75	3	56	-40
75	3	57	-38
76	5	16	-64
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76	5	55	-43
76	2	56	-40
76	2	57	-38
77	5	16	-64
77	3	18	53
77	5	55	-43
77	2	56	-40

77	1	57	-38
78	3	15	-42
78	3	16	-64
78	2	18	53
78	4	55	-43
78	2	57	-38
79	1	15	-42
79	1	16	-64
79	2	18	53
79	3	55	-43
79	4	57	-38
80	4	15	-42
80	2	16	-64
80	2	55	-43
80	1	57	-38
81	3	15	-42
81	1	16	-64
81	2	55	-43
81	2	57	-38
82	3	15	-42
82	0	16	-64
82	1	55	-43
82	2	57	-38
83	2	18	53
83	3	57	-38
83	4	58	-52
84	3	16	-64
84	2	17	-47
84	3	18	53
84	0	55	-43
85	2	15	-42
85	5	16	-64
85	1	18	53
85	1	55	-43
86	2	15	-42
86	5	16	-64
87	5	43	-47
88	1	13	90
88	1	14	86
88	2	43	-47
89	1	9	-74
89	1	11	-80
89	0	46	53
89	0	47	44
89	2	49	0
90	0	13	90
90	3	43	-47
90	2	46	53
90	1	47	44
91	2	13	90
91	2	46	53
91	4	47	44
91	5	49	0
92	5	13	90
92	2	43	-47
92	2	46	53
92	3	47	44
92	5	49	0
93	5	13	90
93	0	43	-47
93	2	49	0
94	4	18	53
94	1	54	46
94	2	58	-52
95	1	12	88
96	3	12	88
97	4	12	88
98	4	12	88
99	4	12	88
100	5	12	88
102	2	12	88
102	0	15	-42
103	3	12	88
103	2	15	-42
104	4	12	88
105	5	12	88
105	2	15	-42
106	5	12	88
107	2	13	90
107	1	45	87
108	3	43	-47
108	3	67	47
109	3	12	88
111	3	12	88
112	4	12	88
113	3	12	88
114	1	12	88
119	0	49	0
120	5	46	53
121	4	46	53
122	1	46	53
122	0	47	44

HISTOGRAM DATA FOR AU RANGE= 5.

MINERAL NUMBER	PROXIMITY TO LINEAR	LINEAR NUMBER	LINEAR ANGLE
2	2	26	54
2	4	28	14
2	0	29	11
4	3	26	54
4	3	28	14
4	2	29	11
5	4	26	54
5	3	28	14
5	2	29	11
6	5	26	54
6	5	28	14
6	0	29	11
7	5	26	54
7	5	28	14
8	4	26	54
8	5	28	14
18	4	3	-47
18	1	5	-52
18	2	34	-58
18	5	81	14
19	5	3	-47
19	3	5	-52
19	2	48	48
19	3	81	14
37	2	3	-47
37	1	5	-52
37	4	20	88
37	5	42	82
37	5	75	-5
37	2	76	-4
62	3	16	-64
62	3	18	53
62	3	55	-43

HISTOGRAM DATA FOR CU AG RANGE= 5.

MINERAL NUMBER	PROXIMITY TO LINEAR	LINEAR NUMBER	LINEAR ANGLE
28	4	20	88
28	3	25	56
28	3	42	82
28	5	48	48
28	2	81	14
31	1	3	-47
31	4	5	-52
31	4	6	-57
31	1	20	88
31	1	25	56
31	5	48	48
31	2	81	14
34	1	3	-47
34	3	5	-52
34	5	6	-57
34	2	20	88
34	4	42	82
34	0	76	-4
44	2	3	-47
44	4	5	-52
44	5	6	-57
44	1	42	82
44	1	75	-5
44	5	76	-4
46	3	3	-47
46	4	5	-52
46	5	6	-57
46	4	75	-5
46	3	76	-4
48	2	3	-47
48	3	5	-52
48	4	6	-57
48	4	75	-5
48	3	76	-4
49	3	3	-47
49	4	5	-52
49	5	6	-57
49	5	75	-5
49	2	76	-4
50	3	3	-47
50	4	5	-52
50	5	6	-57
50	2	68	46
50	4	75	-5
57	3	58	-52
57	4	59	3
57	1	60	7
64	4	11	-80
64	3	42	82
72	2	53	11
72	2	59	3
72	5	60	7
83	2	18	53
83	3	57	-38
83	4	58	-52
84	3	16	-64
84	2	17	-47
84	3	18	53
84	0	55	-43
111	3	12	88

S. HISTOGRAM DATA FOR AG RANGE= 5.

MINERAL NUMBER	PROXIMITY TO LINEAR	LINEAR NUMBER	LINEAR ANGLE
28	4	20	88
28	3	25	56
28	3	42	82
28	5	48	48
28	2	81	14
31	1	3	-47
31	4	5	-52
31	4	6	-57
31	1	20	88
31	1	25	56
31	5	48	48
31	2	81	14
34	1	3	-47
34	3	5	-52
34	5	6	-57
34	2	20	88
34	4	42	82
34	0	76	-4
44	2	3	-47
44	4	5	-52
44	5	6	-57
44	1	42	82
44	1	75	-5
44	5	76	-4
46	3	3	-47
46	4	5	-52
46	5	6	-57
46	4	75	-5
46	3	76	-4
48	2	3	-47
48	3	5	-52
48	4	6	-57
48	4	75	-5
48	3	76	-4
49	3	3	-47
49	4	5	-52
49	5	6	-57
49	5	75	-5
49	2	76	-4
50	3	3	-47
50	4	5	-52
50	5	6	-57
50	2	68	48
50	4	75	-5
57	3	58	-52
57	4	59	3
57	1	60	7
64	4	11	-80
64	3	42	82
72	2	53	11
72	2	59	3
72	5	60	7
83	2	18	53
83	3	57	-38
83	4	58	-52
84	3	16	-64
84	2	17	-47
84	3	18	53
84	0	55	-43
110	4	12	88
111	3	12	88

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HISTOGRAM FOR CU
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   5  -69 .AAAAA
   0  -68 .
   0  -67 .
   0  -66 .
   0  -65 .
  47  -64 .BABCCCCDDEEEFFFFFGGGGGHHHHHIIIJKKLNNNOOOOOPPPPP
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   0  -62 .
   0  -61 .
   0  -60 .
   0  -59 .
   9  -58 .AAABBBBBC
 102  -57 .AABBBCCDDEEEFFFFGGHHIIIIJJJJKKLLLLLMMMMMNNNNNOOOOPPPPPQQQQQRRRRRSSSSSTTTTUUUUUVVVVVWWWXXXXXYYYYYZAAAAA
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   7  -53 .AAABBBB
 105  -52 .AAAAABBBBBCCCCDDDDEEEEFFFFFGGGGHHHIIIJJJKKLLLLMMMNNNNOOOOPPPQQQQRRRRSSSTTTTTUUUUVWWWXXXXXYYYYYZZZZZAAAABB
  23  -51 .ABBBCCCCDDDDDEEEEEFFFGG
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   0  -49 .
   2  -48 .AA
  66  -47 .ACDEFGHHHHHIIJJKKKLLMMNNNODOPPQQQQRRRRRSTTTTTUUUUVVWWWWWXXYYYZZBBB
   7  -46 .BBCDEEF
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  22  -42 .AAABCCCCDDDEEEEFFGGIIJJ
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  22   -4 .CCCCCDDDDDEEEEFFFGGGHHI
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   0   -1 .
  14    0 .AABBBBBCCCCCDD
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  0    6 .
  6    7 .ABBBBB
  0    8 .
  0    9 .
  0   10 .
 10   11 .ABCCCDDEFF
  0   12 .
  0   13 .
 26   14 .AAAABBBBBCCCDDDEEFFFFGGHIIJ
  9   15 .ABCCDDEEE
  0   16 .
  0   17 .
  0   18 .
  0   19 .
 18   20 .AAABBBBBCCCCCDDDDE
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  0   43 .
  8   44 .BCCCCDDD
  0   45 .
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  4   47 .ABBB
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 36   56 .AABBBCCDEEEEEGGGGGHHHHHIIIIJJJJJKKKK
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  0   69 .
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 24   90 .AAAAAHBBBCEEFFFFFGGGGGHH
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HISTOGRAM FOR AU

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0	-84	.
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0	10	.
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HISTOGRAM FOR CU  AG
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HISTOGRAM FOR AG

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