APPENDIX XI

Calculating Mean Ceramic Date Formula and Computer Program

Calculating the Mean Ceramic Dates

1. Regular MCD. (from South 1977:217)

$$\text{Formula} = \bar{Y}_1 = \frac{\sum_{i=1}^{n} Xi \cdot fi}{\sum_{i=1}^{n} fi}$$

where: Xi = median date for a specific type
fi = number of fragments of that type
n = total number of types in the sample

2. Inverse Variance MCD. (from Kalb et al. 1982:10)

$$\text{Formula} = Y_2 = \frac{\sum_{i=1}^{n} Xi \cdot fi/Vi}{\sum_{i=1}^{N} fi/Vi}$$

where: Xi = median date for a specific type
fi = number of fragments of that type
Vi = Variance of that type.
(Assumes range of ceramic types equals 2 standard deviations on each side of the mid-point, i.e. V = Range/4)
n = total number of types in the sample.

Note: Range = beginning to end date of manufacture. The inverse variance formula takes into account the longer periods of production which would make this MCD more true to life and more accurate.

Computer Program

BASIC

```
  5  REM KAREN PROGRAM
  6  PRINT
  7  PRINT "INPUT N"
 10  INPUT N
 20  LET P=1
 25  PRINT N
 27  PRINT "INPUT X"
 30  INPUT X
 33  PRINT "INPUT F"
 35  INPUT F
 40  LET A + X*F
 50  IF P=1 THEN LET B=0
 60  LET C=B+A
 70  LET B=C
 80  IF P=1 THEN LET D=0
 90  LET E=D+F
100  LET D=E.
105  PRINT "INPUT V"
110  INPUT V
111  PRINT
112  PRINT "P="; P
115  PRINT TAB 1; X; TAB 10; F; TAB 18; V
118  PRINT
120  IF V=0 THEN GOTO 210
130  LET G=F/V
140  IF P=1 THEN LET J=0
150  LET K=J+G
160  LET J=K
170  LET L=X*(F/V)
180  IF P=1 THEN LET M=0
190  LET R=M+L
200  LET M=R
210  LET P=P+1
220  IF P =N THEN GOTO 27
230  LET Y=B/D
235  PRINT
237  PRINT "D="; D
240  PRINT "Y="; Y
250  IF V=0 THEN GOTO 275
260  LET Z=M/J
270  PRINT "Z="; Z
275  GOTO 6
```

Lines 5-35: Setting up the program and starting to input information into the program. N, X, F are the same as in the formulas.

Lines 40-100: Calculates separately the top and bottom part of the Regular MCD formula.

Lines 105-110: Inputs the variance.

Line 111 A Spacer

Line 112-115: Prints over all information input to recheck that it is correct.

Line 120: The variance will be zero for nails, this makes the program skip calculating its inverse variance MCD.

Lines 130-200: Calculates inverse variance MCD. top and bottom halves separately.

Line 210: Counter

Line 220: Now that it has done calculations for the first type, it goes back to beginning until all the types have been calculated.

Line 230: Calculates the Regular MCD ($Y=Y_1$).

Line 237: Prints out total number of pieces of ceramics.

Line 240: Prints out the Regular MCD.

Line 250: If there had been no variance (nails) then just makes program skip printing a variance and start program all over again.

Lines 260-270: Calculates and prints the inverse variance MCD ($Z=Y_2$).

Line 275: Makes program go back and start over.

NOTE: This program also calculated the median date for the nails using the regular MCD formula.

Terms:

Type = a specific kind of ceramic or nail.
(i.e. Blue shell-edge pearlware or hand-wrought nail)
Piece = a fragment of ceramic or nail.

HAWTHORN HISTORIC - MEAN CERAMIC FOR COMBINED PROVENIENCES

Ceramic Type	Type Median (x_i)	Sherd Count (f_i)	Product
CW	1795	481	863,395
CWAN	1798	12	12,576
CWSP	1772	8	14,176
PW	1805	871	1,572,155
PWSE	1805	108	194,940
PWSG	1805	6	10,830
PWOE	1815	49	88,935
PWST	1830	162	296,460
PWHB	1805	151	272,555
PWTB	1818	304	552,672
PWTC	1818	29	52,722
PWHP	1818	98	178,164
PWFP	1805	9	16,245
PWAN	1805	30	54,150
WW	1855	1063	1,971,865
WWTB	1845	113	208,485
WWTC	1840	77	141,680
WWHP	1865	31	57,815
WWHB	1865	3	5,595
WWSE	1845	15	27,675
WWSG	1845	6	11,070
WWST	1865	44	82,060
WWOT	1845	12	22,140
WWAN	1845	23	42,435
IS	1862	359	668,458
ISOH	1862	20	37,240
ISHP	1862	9	16,758
ISOT	1862	15	27,930
PC	1810	55	99,550
PCEAS	1855	8	14,840
PCEAH	1865	8	14,920
PCCE	1742	14	24,388
SW	1815	157	284,955
SWW	1750	9	15,750
SWBR	1745	3	5,235
SWSB	1760	6	10,560
SWBG	1815	6	10,890
BP	1874	102	191,148
BPRK	1856	4	7,424
BPSF	1725	1	1,725
TG	1720	10	17,200
RW	1812	5,103	9,246,636
RWSL	1812	335	607,020
RWJK	1768	19	33,592
RFEW	1930	12	23,160
	Total	9,960	18,501,174

$$\text{Hawthorn Mean Ceramic Date (Y)} = \frac{\sum_{i=1}^{n} x_i \cdot f_i}{\sum_{i=1}^{n} f_i}$$

where: x_i = the median date for the manufacture of each ceramic type

f_i = the frequency of each ceramic type

n = the number of ceramic types in the sample=

$$\frac{18,501,174}{9960} =$$

1857.54

Key

CW = creamware - undecorated
CWAN = creamware - annular
CWSP = creamware - shell-edged, plain

PW = pearlware - undecorated
PWSE = pearlware - shell-edged, blue
PWSG = pearlware - shell-edged, green
PWOE = pearlware - other edge decoration
PWST = pearlware - stencil
PWHB = pearlware - hand painted blue
PWTB = pearlware - transfer print blue
PWTC = pearlware - transfer print (color other than blue)
PWHP = pearlware - hand painted polychrome
PWFP = pearlware - fingerpainted
PWAN = pearlware - annular

WW = whiteware - undecorated
WWOT = whiteware - overglaze transfer print
Note: other whiteware designations use same second two letter abbreviations as pearlware

IS = ironstone

PC = porcelain
PCEAS = porcelain - English/American soft paste
PCEAH = porcelain - English/American hard paste
PCCE = porcelain - Chinese export

SW = stoneware - undecorated
SWW = stoneware - white salt glaze
SWBR = stoneware - Barley Pattern rim
SWSB = stoneware - scratch blue
SWBG = stoneware - blue/gray

BP = buff paste - undecorated
BPRK = Rockingham
BPSF = Staffordshire

TG = tin glaze earthenware

RW = redware - undecorated
RWSL = redware - slipware
RWJK = redware - Jackfield
RFEW = redware - refined earthenware

Key

GMM - glass maker's mark
MND - mean nail date
BTT - button date range of manufacture
CMM - ceramic maker's mark

y_1 - mean ceramic date

y_2 - adjusted mean ceramic date