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MCM TAPE TAPE-29.TXT

TAPE LABEL/ANNOTATIONS: "4
                         GR
                         LIB/70
                         100"
DATE CREATED: 1975



GROUPS:
    0    2   13   16   19   40   60   80  100  101  200
  206


NAMES IN GROUP 0:
ΔCR  VOL  DTO  OTD  AO   AH   DTH  HTD  RAD  SOR  HIS  DXΔ
RLΔ  ANΔ  DAT  ΔCP  DEG  CEL  FAR  ΔLD  DMD  MMD  ERR


    ∇ΔCR GNΔ;FVΔ;IΔ;GΔ;NMΔ;PLΔ;PSΔ
[1]   ⍝PRINT FUNCTIONS WITH LINE NUMBERS OR PRINT GROUP(S)
[2]   PSΔ←48 51∘⎕PW←93∘⎕OU 1 16∘PLΔ←0
[3]   →L3Δ∘GNΔ←1∘NMΔ←ANΔ GNΔ∘→(0=0\0ρGNΔ)/L0Δ
[4]   L0Δ:GNΔ←GNΔ[⍋GNΔ←((GNΔ⍳GNΔ)=⍳ρGNΔ)/GNΔ←,GNΔ]
[5]   L1Δ:→EΔ⌈⍳0=ρGNΔ
[6]   ⎕XS GΔ∘NMΔ←⎕XN GΔ←''ρGNΔ
[7]   ⎕←''∘⎕←'LISTING GROUP: ',(⍕GΔ),(60ρ' '),DAT
[8]   L3Δ:RLΔ 1+FVΔ←2+⌈(×/ρNMΔ)÷80∘IΔ←¯1
[9]    →L2Δ∘⎕←' '∘⎕←(((⌈(×/ρNMΔ)÷80),80)ρNMΔ⍀40 4ρ' '∘→L4Δ⌈⍳3=FVΔ
[10]   L4Δ:⎕←' '∘⎕←,NMΔ
[11]   L2Δ:→E1Δ⌈⍳(IΔ←IΔ+1)=1↑ρNMΔ
[12]   →L2Δ∘DXΔ NMΔ[IΔ+⎕IO;]
[13]   E1Δ:PLΔ←0∘RLΔ 1+PSΔ[⎕IO]-PLΔ
[14]   →L1Δ∘GNΔ←1↓GNΔ
[15]   EΔ:⎕XS 0
    ∇

VOL   [vector of type char of length 25; element size 1 byte(s)]
DISTRIBUTION VOLUME NO. 1


    ∇R←DTO X
[1]   ⍝CONVERT DECIMAL TO OCTAL
[2]   R←⍕'01234567'[1+(8ρ8)⊤''ρX∘⎕PP←8]
    ∇


    ∇R←OTD X
[1]   ⍝CONVERT OCTAL TO DECIMAL
[2]   R←(8ρ8)⊥X←(8ρ10)⊤X
[3]   →3×~∧/X∈0 1 2 3 4 5 6 7
[4]   'NUMBER IS NOT OCTAL '∘R←⍳0
    ∇
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    ∇R←A AO B
[1]   ⍝ADD OCTAL NUMBERS
[2]   R←DTO (OTD A)+OTD B
    ∇


    ∇R←A AH B
[1]   ⍝ADD HEX NUMBERS
[2]   R←DTH (HTD A)+HTD B
    ∇


    ∇R←DTH X
[1]   ⍝CONVERT DECIMAL TO HEX (R IS CHARACTER)
[2]   R←'0123456789ABCDEF'[1+(8⍴16)⊤''⍴X]
    ∇


    ∇R←HTD X
[1]   ⍝CONVERT HEX TO DECIMAL (X IS CHARACTER) X
[2]   →(~∧/(R←¯8↑(8⍴'0'),X)∈'0123456789ABCDEF')/4
[3]   →0∘R←⌊(16⊥¯1+'0123456789ABCDEF'⍳R)∘(2*32)×R[1]∈'89ABCDEF'
[4]   'NUMBER IS NOT HEX'∘R←⍳0
    ∇


    ∇R←RAD X
[1]   ⍝RADIANS TO DEGREES
[2]   R←○X÷180
    ∇


    ∇R←N SORT A;ALP
[1]    ⍝SORT ON FIRST N COLUMNS
[2]    ALP←' ABCDEFGHIJKLMNOPQRSTUVWXYZ0123456789'
[3]    R←A
[4]    R←R[(⍋ALP⍳R[;N]);]
[5]    →(0≠N←N-1)/3
    ∇


    ∇G←W HIST F;MAX;K
[1]   MAX←⌈/F←⌊0.5+F÷W
[2]   G←('.'),([⌈/K←(F⩾MAX)/1⍴F)⍴' '
[3]   G[K+1]←'⊤'
[4]   ⎕←G
[5]   →(0<MAX←MAX-1)/2
[6]   (1+⍴F)⍴'.'
[7]   G←⍳0
[8]   ⍝THIS PROGRAM PLOTS A HISTOGRAM
    ∇


    ∇DXΔ XΔ;DΔ;NΔ;NMΔ
[1]   →(VΔΔ,VΔ,VΔ,FΔΔ,VΔ,A2Δ)[⎕IO+⎕NC XΔ]
[2]   FΔΔ:RLΔ 2+NΔ←1↑⍴DΔ←⎕CR XΔ
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[3]   DΔ←(6 1 0⍕¯1+(NΔ,1)ριNΔ),DΔ
[4]   DΔ[;⎕IO+5 4,3-ρ⍕¯1+NΔ]←(NΔ,3)ρ' ]['
[5]   ⎕←DΔ∘DΔ[⎕IO;ι7]←'     ∇ '
[6]   →EΔ∘⎕←'     ∇'
[7]   VΔ:NMΔ←'(',(⍕ρDΔ),')',((6ρ0)≠0\0ρDΔ←⍋XΔ)/' ALPHA'
[8]   NMΔ[(' '=NMΔ)/ιρNMΔ]←','
[9]   →EΔ∘⎕←XΔ,':  ',NMΔ∘RLΔ 2
[10]   A2Δ:→EΔ∘⎕←XΔ,'  α2'∘RLΔ 2
[11]   VΔΔ:⎕←XΔ,' NO VALUE'∘RLΔ 2
[12]   EΔ:⎕←''
    ∇


    ∇RLΔ N
[1]   →0×ι(1↑PSΔ)≥PLΔ←PLΔ+N
[2]   PLΔ←N∘⎕←((((¯1↑PSΔ)-(¯1↑PSΔ)|PLΔ-N)-4×¯1+⌊PLΔ÷1↑PSΔ),1)ρ' '
    ∇


    ∇ZΔ←ANΔ XΔ;JΔ
[1]   ⍝CREAT N BY 4 CHARACTER ARRAY FROM NAME VECTOR
[2]   ZΔ←0 4ρ''∘→(2=ρρZΔ←XΔ)/0
[3]   →0×ι0=ρXΔ←(((XΔ=' ')ι0)-⎕IO)↓XΔ
[4]   ZΔ←ZΔ⍪1 4ρ((JΔ←(XΔι' ')-⎕IO)↑XΔ),'   '
[5]   →2∘XΔ←JΔ↓XΔ
    ∇

DAT   [vector of type char of length 8; element size 1 byte(s)]
OCT.2/75


    ∇ΔCP;ΔG;ΔGC;ΔGN;ΔT
[1]   ⍝COPY TAPE TO RIGHT DRIVE (AVS ACTIVE)
[2]   ΔG←⎕XNι0∘⎕PT←10
[3]   'GROUP ';ΔGC∘⎕XS ΔGC∘ΔGN←⎕XN ΔGC←1↑ΔG
[4]   ⍋'ΔGC ⎕X','WC'[⎕IO+0=⎕NC ΔT],'[2] ΔT'∘ΔT←1 4↑ΔGN
[5]   →(0≠ρΔGN←1 0↓ΔGN)/4 6
[6]   →(0<ρΔG←1↓ΔG)/3
[7]   ⎕XS 0∘⎕XF[2]ι0
[8]   'COPY DONE'∘⎕PT←0∘⎕OFF
    ∇


    ∇R←DEG X
[1]   ⍝DEGREES TO RADIANS
[2]   R←(X×180)÷○1
    ∇


    ∇R←CEL X
[1]   ⍝CONVERT DEGREES F TO C
[2]   R←(5×X-32)÷9 O
    ∇
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```
    ∇R←FAR X
[1]   ⍝CONVERT DEGREES C TO F
[2]   R←32+9×X÷5
    ∇


    ∇ΔLD;GNΔ;FVΔ;IΔ;GΔ;NMΔ;PLΔ;PSΔ
[1]   ⍝PRINT TAPE DIRECTORIES
[2]   PSΔ←48 51∘⎕PW←93∘⎕OU 1 16∘PLΔ←0
[3]   RLΔ 2∘⎕←''∘⎕←'DIRECTORIES IN VOLUME: ',VOL,(20ρ' '),DATE
[4]   GNΔ←⎕XNι0
[5]   L1Δ:→EΔ⌈ι0=ρGNΔ
[6]   NMΔ←⎕XN GΔ←''ρGNΔ
[7]   ⎕←''∘⎕←'GROUP: ',(⍕GΔ)
[8]   L3Δ:RLΔ 1+FVΔ←2+⌈(×/ρNMΔ)÷80∘IΔ←¯1
[9]   →L2Δ∘⎕←' '∘⎕←(((⌈(×/ρNMΔ)÷80),80)ρNMΔ⍳40 4ρ' '∘→L4Δ⌈ι3=FVΔ
[10]   L4Δ:⎕←' '∘⎕←,NMΔ
[11]   L2Δ:→L1Δ∘GNΔ←1↓GNΔ
[12]   EΔ:⎕XS 0
    ∇


    ∇Z←A DMD B;IO;FUZZ;P;LA2;LB2;F;I;J;M2;I2;M1;I1;SIGMA;ALFA;U
[1]   ⎕IO←1∘IO←⎕IO
[2]   'DOMAIN' ERROR 0≠0\0ρA
[3]   'DOMAIN' ERROR 0≠0\0ρB
[4]   'RANK' ERROR 2≠ρρB
[5]   'RANK' ERROR~(ρρA)∈ 1 2
[6]   'LENGTH' ERROR(1↑ρA)≠1↑ρB
[7]   'LENGTH' ERROR(1↑ρB)<1↓ρB
[8]   FUZZ←2*-56-⎕CT
[9]   LA2←((ρA),1)[2]
[10]   ON:LB2←1↓ρB
[11]   →AHEAD IF (0≠LA2)∧0≠LB2
[12]   Z←(LB2,LA2)ρ0
[13]   →FIN
[14]   AHEAD:P←ι1↑ρB
[15]   F←÷⌈/[1]B÷⍉(⌽ρB)ρ⌈/|B
[16]   B←B×(ρB)ρF
[17]   B←B,(2↑(ρA),1)ρA F
[18]   I←0
[19]   LOOP:J←I
[20]   I←I+1
[21]   →END IF LB2<I
[22]   M2←⌈/[⎕IO]|(0,-LA2)↓(J,J)↓B
[23]   'DOMAIN' ERROR FUZZ≥⌈/M2
[24]   I2←J+M2ι⌈/M2
[25]   P[I,I2]←P[I2,I]
[26]   B[;I,I2]←B[;I2,I]
[27]   M1←|J↓B[;I]
[28]   I1←J+M1ι⌈/M1
[29]   B[I,I1;]←B[I1,I;]
[30]   SIGMA←+/(J↓B[;I])*2
[31]   ALFA←(¯1*0≤B[I;I])×SIGMA*0.5
[32]   U←B[I;I]-ALFA
[33]   T←(U,I↓B[;I])+.×(J,I)↓B
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```
[34]   T←T×÷SIGMA-B[I;I]×ALFA
[35]   B[J↓⍳1↑⍴B;I↓⍳1↓⍴B]←((J,I)↓B)-(U,I↓B[;I])∘.×T
[36]   B[I;I]←ALFA
[37]   →LOOP
[38]   END:Z←(LB2,LA2)⍴0
[39]   I←(⍳0)⍴1+LB2 ⎕RG
[40]   QBACK:I←I-1
[41]   →RE IF 0=I
[42]   Z[I;]←((LB2↓B[I;])-(LB2↑B[I;])+.×Z)÷B[I;I]
[43]   →QBACK
[44]   RE:Z←Z[⍋P;]×⍉(⌽⍴Z)⍴F
[45]   FIN:→EXIT IF 1≠⍴⍴A
[46]   Z←,Z
[47]   EXIT:⎕IO←IO
    ∇


    ∇Z←MMD B
[1]   Z←((⍳1↑⍴B)∘.=⍳1↑⍴B)DMD B
    ∇


    ∇A ERROR B
[1]   A,' ERROR'∘→0×⍳~V/B
[2]   ⎕IO←IO
[3]   →
    ∇



NAMES IN GROUP 2:
FO2  EPR  INC  REP  HOM  DOW  POS  RIG  FO1  UP   TΔΔ  V
U    QTY  CAT  T    TMP  RO   ROP  Q    R1   R1P  S    R
R2   R2P  X    W    L0   L1   L2   L3   L4   L5   L6   L7



    ∇FO2 X
[1]   ⎕←'|',6 2 0 ⍕X∘POS
    ∇


    ∇EPR;N
[1]   QTY←⌶22↓⍞'ENTER NUMBER OF ITEMS:'∘⎕OU 1∘⎕PW←132∘⎕PP←6
[2]   CAT←(QTY,7)⍴' '∘N←1
[3]   →(QTY≥N←N+1)/3∘CAT[N;]←7↑8↓9⍞'CAT NO.:        '  :
[4]   'ENTER ESTIMATED COST'
[5]   RO←INCHECK
[6]   'ENTER CURRENT COST'
[7]   Q←-RO-ROP←INCHECK
[8]   'ENTER NET SALES ESTIMATES'
[9]   R1←INCHECK
[10]   'ENTER NET SALES CURRENT'
[11]   R←RO÷R1∘S←ROP÷R1P←INCHECK
[12]   'ENTER EST''D THOUSANDS OF PCS'
[13]   R2←INCHECK
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[14]   'ENTER CURRENT THOUSANDS OF PCS'
[15]   R2P←INCHECK
[16]   T←R2×RO×.001◦U←R2P×ROP×.001◦V←R2×R1×.001◦W←R2P×R1P×.001◦X←-(RO-
ROP)×R2P×.001
[17]   REPORT
    ∇


    ∇RSL←INCHECK
[1]   TMP←⍬
[2]   →0◦RSL←(QTY,1)⍴TMP◦→ERR×⍳QTY≠⍴,TMP
[3]   ERR:'NUMBER OF ITEMS DON''T AGREE    WITH CAT NO''S PLEASE CORRECT' OF
[4]   →2◦TMP←⍎⍞,TMP
    ∇


    ∇REPORT
[1]   ⎕←L1◦⎕←3 1⍴' '◦⎕←L0◦⎕OU 1◦⎕PW←132
[2]   ⎕←L2
[3]   ⎕←L3◦DOWN 16
[4]   ⎕←L4
[5]   ⎕←L5
[6]   ⎕←L6◦DOWN 16
[7]   ⎕←L7
[8]   ⎕←L3◦DOWN 16
[9]   ⎕←'|',CAT
[10]   FO1 R1P◦FO1 R1◦FO1 Q◦FO1 ROP◦FO1 RO
[11]   FO1 R2P◦FO1 R2◦FO2 S◦FO2 R
[12]   FO2 X◦FO2 W◦FO2 V◦FO2 U◦FO2 T
[13]   HOME◦⎕←(QTY,1)⍴'|'◦POS
[14]   ⎕←L3◦DOWN 16
[15]   ⎕←9 1⍴' '
    ∇


    ∇HOME
[1]   ◦⎕OU 1,224
    ∇


    ∇DOWN X
[1]   ◦⎕OU 1,136◦⎕BO X
    ∇


    ∇POS
[1]   DOWN 16×(⍴CAT)[1]◦RIGHT 96
    ∇


    ∇RIGHT X
[1]   ◦⎕OU 1,64◦⎕BO X
    ∇
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```
    ∇FO1 X
[1]   □←'|',6 0 0⍕X∘POS
    ∇


    ∇UP X
[1]   ∘□OU 1 128∘□BO X
    ∇

TΔΔ   [1 by 6 numeric array; element size 2 byte(s)]
345
345
345
345
345
345


V     [1 by 8 numeric array; element size 8 byte(s)]
40E66666666666A0
40999999999999C0
411A3D70A3D70A44
41511EB851EB8533
40999999999999C0
413828F5C28F5C37
411C147AE147AE1C
4140000000000010


U     [1 by 8 numeric array; element size 8 byte(s)]
41399999999999A8
4126666666666670
41A978D4FDF3B670
4214B22D0E56041E
4166666666666680
41D5E353F7CED94C
416AF1A9FBE76CA6
41D0000000000034


QTY   [numeric scalar: element size=1 byte(s)]
16

CAT   [7 by 8 array of type char; element size 1 byte(s)]
AFP050
AFP055
AFP060
AFP065
AFP070
AFP075
AFP080
AFP085



T     [1 by 8 numeric array; element size 8 byte(s)]
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```
413999999999999A8
4126666666666670
41B99999999999C8
4214CCCCCCCCCD2
4176666666666684
41D3333333333368
41699999999999B4
41C4000000000031


TMP   [numeric vector of length 8; element size 1 byte(s)]
12 8 32 52 16 24 12 20

RO    [1 by 8 numeric array; element size 2 byte(s)]
240
240
290
320
370
440
440
490


ROP   [1 by 8 numeric array; element size 2 byte(s)]
300
300
331
398
400
557
557
650


Q     [1 by 8 numeric array; element size 2 byte(s)]
60
60
41
78
30
117
117
160


R1    [1 by 8 numeric array; element size 2 byte(s)]
60
60
41
78
30
117
117
160
```

```
R1P   [1 by 8 numeric array; element size 2 byte(s)]
751
751
835
1092
1466
1708
1708
1771


S     [1 by 8 numeric array; element size 8 byte(s)]
4066437E774EBE40
4066437E774EBE40
40657AF0FA2CC300
405D4DD4DD4DD4E0
4045D995212DC068
40537C1A611FC678
40537C1A611FC678
405DF54D9FBA9D90


R     [1 by 8 numeric array; element size 8 byte(s)]
4E00000000000004
4E00000000000004
41712BB512BB5130
4141A41A41A41A40
41C5555555555560
413C2BC2BC2BC2C0
413C2BC2BC2BC2C0
4131000000000000


R2    [1 by 8 numeric array; element size 1 byte(s)]
15
10
40
65
20
30
15
25


R2P   [1 by 8 numeric array; element size 1 byte(s)]
12
8
32
52
16
24
12
20
```

```
X     [1 by 8 numeric array; element size 8 byte(s)]
40B851EB851EB880
407AE147AE147B00
4114FDF3B645A1D0
4140E5604189375C
407AE147AE147B00
412CED916872B02C
411676C8B4395816
4133333333333340


W     [1 by 8 numeric array; element size 8 byte(s)]
41903126E978D522
416020C49BA5E36C
421AB851EB851EBF
4238C8B439581071
421774BC6A7EF9E1
4228FDF3B645A1D5
42147EF9DB22D0EB
42236B851EB851F5


L0    [vector of type char of length 84; element size 1 byte(s)]
                            E N G I N E E R I N G    P R O D U C T   R E P O R
T

L1    [vector of type char of length 112; element size 1 byte(s)]
                                                                  _____________
_____________________________

L2    [vector of type char of length 113; element size 1 byte(s)]
                                                                 |
VOLUME                     |

L3    [vector of type char of length 120; element size 1 byte(s)]
 ____________________________________________________________________________
_____________________________________

L4    [vector of type char of length 121; element size 1 byte(s)]
|CAT NO.|     FACTORY COST      |NET SALES PRICE|     C.O.G.    | THOUSANDS OF  |
THOUSANDS OF $| THOUSANDS OF $|THOUSND|

L5    [vector of type char of length 121; element size 1 byte(s)]
|       |       $/THOUSAND      |  $/THOUSAND   |     RATIO     |      PCS      |
COST      |     SALES     |  OF $ |

L6    [vector of type char of length 120; element size 1 byte(s)]
        ____________________________________________________________________________
_____________________________________

L7    [vector of type char of length 121; element size 1 byte(s)]
|       |  EST  |  CURR |SAVINGS|  EST  |  CURR |  EST  |  CURR |  EST  |  CURR |
EST  |  CURR |  EST  |  CURR |SAVINGS|
```

```
NAMES IN GROUP 13:
STA  NOB  MAX  MIN  ASO  DSO  AVG  PSV  NGV  RNG  VAR  STD
MDV  MED  MDE  ABS  HMN  GMN  QMN  MMN  POI  ABI  BBI  NDF
NOR  CBI  FRE  FR   FR2  ACH  BCH  CHI  FIS  REG  RES  STR
SMO  INV


    ∇STAT;H;M;N;W;X;V
[1]   X←,⍤11↓⍞'ENTER DATA: '
[2]   'SAMPLE SIZE: ';N←⍴X←X[⍋X]
[3]   'MAXIMUM: ';X[N]
[4]   'MINIMUM: ';X[1]
[5]   'NO. OF POSITIVE VALUES: ';+/0<X
[6]   'NO. OF NEGATIVE VALUES: ';+/0>X
[7]   'RANGE: ';-/X[N,1]
[8]   'MEAN: ';M←(+/X)÷N
[9]   'VARIANCE: ';V←(+/(X-M)*2)÷N-1
[10]  'STANDARD DEVIATION: ';V*0.5
[11]  'MID-MEAN: ';(+/(-H)↓H↓X)÷N-2×H←⌈N÷4
[12]  'MEAN DEVIATION: ';(+/|X-M)÷N
[13]  'MEDIAN: ';0.5×X[⌈N÷2]+X[1+⌊N÷2]
[14]  →((N>⍴M)∧0<⍴M←X[(W=⌈/W←N|V-¯1⌽V)/V←(X≠1⌽X)/⍳N])/16
[15]  M←X[⍳0=⍴M]
[16]  'MODE: ';M
[17]  'HARMONIC MEAN: ';÷(+/÷X)÷N
[18]  →20×⍳X∧.≤⍴M←⍳0
[19]  M←*(+/⍟X)÷N
[20]  'GEOMETRIC MEAN: ';M
[21]  'QUADRATIC MEAN: ';((+/X*2)÷N)*0.5
    ∇


    ∇R←NOB X
[1]   R←⍴,X
    ∇


    ∇R←MAX X
[1]   R←⌈/X
    ∇


    ∇R←MIN X
[1]   R←⌊/X
    ∇


    ∇R←ASO X
[1]    R←X[⍋X]
    ∇


    ∇R←DSO X
[1]   R←X[⍒X]
    ∇
```

```
    ∇R←AVG X
[1]   R←(+/X)÷⍴X
    ∇


    ∇R←PSV X
[1]   R←(0<X)/X
    ∇


    ∇R←NGV X
[1]   R←(0>X)/X
    ∇


    ∇R←RNG X
[1]   R←(⌈/X)-⌊/X
    ∇


    ∇R←VAR X
[1]   R←(+/(X-MN)*2)÷((⍴X)-1)∘MN←(+/X)÷⍴X
    ∇


    ∇R←STD X V
[1]   R←((+/(X-MN)*2)÷((⍴X)-1))*0.5∘MN←(+/X)÷⍴X
    ∇


    ∇R←MDV X
[1]   R←(+/|X-(+/X)÷⍴X)÷⍴X O
    ∇


    ∇R←MED X G
[1]   R←0.5×+/X[(⌈R),1+⌊R←(⍴X←X[⍋X])÷2]
    ∇


    ∇R←MDE X;N;V
[1]   →0×⍳(N>⍴R)∧0<⍴R←X[(R=⌈/R←N|V-¯1⌽V)/V←(X≠1⌽X)/⍳N]∘N←⍴X←X[⍋X]
[2]   R←X[⍳0=⍴R]
    ∇


    ∇R←ABS X
[1]   R←|X
    ∇


    ∇R←HMN X
[1]   R←÷(+/÷X)÷⍴X
    ∇
```

```
    ∇R←GMN X
[1]   →0×ιX∧.≤ρR←ι0
[2]   R←*(+/⊛X)÷ρX
    ∇


    ∇R←QMN X
[1]   R←((+/X*2)÷ρX)*0.5
    ∇


    ∇R←MMN X;H;N
[1]   R←(+/(-H)↓H↓X)÷N-2×H←⌈0.25×N←ρX←(,X)[⍋⍋X]
    ∇


    ∇P←N POI K
[1]   P←(*-K)×(K*X)÷!X←0,ιN
    ∇


    ∇P ABIN D;I;S;Q;X;T F
[1]   →3×ι(I←0)=X←1↑D∘S←T←(Q←1-P)*N←D[2]
[2]   →2×ιX>I←I+1∘S←S+T×((N-I)÷I+1)×P÷Q
[3]   'PROBABILITY OF ';X;' SUCCESSES'
[4]   'OUT OF ';N;' IS ';T
[5]   'PROBABILITY OF ';X;' OR LESS'
[6]   'SUCCESSES OUT OF ';N;' IS ';S
    ∇


    ∇P BBIN X
[1]   P←*+/(+/⊛ιX[2]),(X[1]×⊛P),((-/⌽X)×⊛1-P)-(+/⊛ι-/⌽X)++/⊛ιX[1]
[2]   'PROBABILITY OF ';X[1];' SUCESSES'
[3]   'IN ';X[2];' TRIALS IS: ';P
    ∇


    ∇Y←NDF X
[1]   Y←.3985423×*¯0.5×X×X
    ∇


    ∇R←NORM X;A
[1]   →0∘R←0.5+0.5××X,→(7≥|X)/2
[2]   A←0.430638E¯4 0.2765672E¯3 0.1520143E¯3 0.92705272E¯2 0.422820123E¯1
0.705230784E¯1 1
[3]   R←0.5×(A+.×((|X)÷2*0.5)*⌽0,ι6)*¯16   6
[4]   R←-R-1∘→(X≤0)/0
    ∇


    ∇R←N CBIN P;B
[1]   R←(B!N)×(P*B)×(1-P)*N-B←0,ιN
    ∇
```

```
    ∇T←P FREQ X;K;M;SD;F;W;N;A;V;C
[1]   T←((N←P[3]),4+2×K←4=ρP)ρ0
[2]   T[⍳N;4]←+/(⍳N)∘.=⌈(X-F←P[1])÷W←P[2] =
[3]   T[⍳N;1]←V←F+W×(⍳N)-1
[4]   T[⍳N;2]←V+W
[5]   T[⍳N;3]←V+W÷2
[6]   →(K=0)/0
[7]   T←(0,(Nρ1),0)⍉T
[8]   C←0.196854  0.115194  0.000344  0.019527
[9]   SD←((+/(X-M←(+/X)÷ρX)*2)÷(ρX)-1)*0.5
[10]   A←((V,V[ρV]+W)-M)÷SD
[11]   V←⍳0
[12]   V←V,((F<0),F⩾0)/(1-W),W←1-0.5×(1++/C×(|F←A[1+ρV])*⍳4)*¯4
[13]   →((ρV)<N+1)/12
[14]   V←V,1
[15]   T[;5]←(ρX)×V+.×((⍳N)∘.=⍳N)-(⍳N)∘.=¯1+⍳N←N+2
[16]   T[;6]←,-/T[;4 5]
[17]   T[;5 6]←0.1×⌊0.5+10×T[;5 6]
    ∇


    ∇F←P FR X
[1]   F←+/(⍳P[3])∘.=⌈(X-P[1])÷P[2]
    ∇


    ∇T←P FR2 M
[1]   T←⌈(M[1;]-P[1;1])÷P[1;2]
[2]   M←⌈(M[2;]-P[2;1])÷P[2;2]
[3]   T←P[;3]ρ+/(⍳×/P[;3])∘.=M+P[2;3]×T-1
    ∇


    ∇Z←ACHI A;E
[1]   Z←(+/+/((A-E)*2)÷E←((+/A)∘.×+⌿A)÷+/+/A),×/¯1+ρA
    ∇


    ∇Z←BCHI A
[1]   Z←(+/+/((⌊|A-E)-0.5)*2)÷E←((+/A)∘.×+⌿A)÷+/+/A),×/¯1×ρA
    ∇


    ∇CHISQ A;E;S;T;N
[1]   □←E←T∘.×(S←+⌿A)÷N←+/T←+/A∘□←'EXPECTED FREQUENCIES:'
[2]   →((2<⌈/ρA),(5⩽⌊/,E)∨∧/(2=ρA),N>40)/12 5
[3]   'FISHER EXACT PROBABILITY: ';1↑Z←FISHER A
[4]   →0∘□←'TOCHER MODIFICATION: ';Z[2]
[5]   →8×⍳(×/ρE)⩾5×+/,5>E R
[6]   'MORE THAN 20∘/∘ OF CELLS HAVE'
[7]   →0∘□←'AN EXPECTED FREQ. <5'
[8]   →11×⍳1⩽⌊/⌊/E
[9]   'AT LEAST 1 CELL HAS EXPECTED'
[10]   →0∘□←'FREQ. < 1. CHI SQ. NOT FOUND'
```

```
[11]   →13∘⍞←'CHI SQUARE: ';1↑Z←ACHI A
[12]   'CHI SQUARE: ';1↑Z←BCHI A
[13]   'DEGREES OF FREEDOM: ';Z[2]
[14]   'PHI COEFFICIENT: ';(S←Z[1]÷N)*0.5
[15]   'CRAMER''S STATISTIC: ';(S÷¯1+⌊/ρA)*0.5
[16]   'CONTINGENCY COEFFICIENT: ';(S÷N+S←1↑Z)*0.5
    ∇


    ∇Z←FISHER A;B;C;F;G;H;I
[1]   F←×/!(+⌿A),+/A
[2]   G←+/A←,A
[3]   Z←(H←F÷×/!A,G),0
[4]   →(0=I←⌊/A)/0
[5]   →6 7 9 11[+/B←A=I]
[6]   →10∘→(0<+/B[1 4])/11
[7]   →(2=B[1 2]+B[4 3])/11 10
[8]   →11 10 10 11[Aι⌊/A[(~B)/ι4]]
[9]   →(2=+/B[1 4])/11
[10]   →12∘C←1 ¯1 ¯1 1
[11]   C←¯1 1 1 ¯1
[12]   →12∘Z←Z+F÷×/!A,G∘→(0>⌊/A←A+C)/0
    ∇


    ∇T←V REG X;B;N;M;Q;S;R;U
[1]   T←((3+ρV),5)ρ0
[2]   T[ιρV;1]←V[ρV],¯1↓V R
[3]   Q←(⌹R)+.×R←U-(ρU)ρM←(+⌿U←X[;V])÷N←(ρX)[1]
[4]   T[(3+ρV);3]←,TΔ←Q[(ρV);ρV]
[5]   Q←¯1 0↓Q
[6]   B←(-M+.×B,¯1),B←,(S←INV 0 ¯1↓Q)+.×Q[;ρV]
[7]   T[ιρV;2]←B
[8]   T[1+ρV;3]←(1↓B)+.×Q[;ρV]
[9]   T[(ρV)+ι3;2]←(¯1+ρV),(N-ρV),N-1
[10]   T[2+ρV;3]←-/T[(3+ρV),(1+ρV);3]
[11]   T[1 2+ρV;4]←T[1 2+ρV;3]÷T[1 2+ρV;2]
[12]   T[1+ι(ρV)-1;3]←(T[2+ρV;4]×+/S×(ι¯1+ρV)∘.=ι¯1+ρV)*0.5
[13]   T[1+ι¯1+ρV;4]←,÷/T[1+ι¯1+ρV;2 3]
[14]   T[3+ρV;4]←T[2+ρV;4]*0.5 ▯
[15]   T[1+ρV;5]←,÷⌿T[1 2+ρV;4]
[16]   T[3+ρV;5]←,÷/T[1 3+ρV;3]
    ∇


    ∇R←T RES X;V;O;E
[1]   V←T[1+ι¯4+ρT[;1];1]
[2]   R←(O←X[;T[1;1]])-E←T[1;2]+T[1+ιρV;2]+.×⌹X[;V]
[3]   R←⌹(4,(ρX)[1])ρ(ι(ρX)[1]),O,E,R
    ∇


    ∇STRES T;V;N;DW;RN;M;P;MN;SD;R
[1]   DW←(+/((1↓R)-(~(⌽ι(N←ρR))≤1)/R)*2)÷1↑1↓V←(+/R),+/(R←T[;4])*2
[2]   RN←(R[1]=R[N])++/R≠1⌽R←R≥0
[3]   MN←1+(P←2××/M)÷S←+/M←⌽(N-M),M←+/R
```

```
[4]   'SUM OF RESIDUALS: ';1↑V
[5]   'SUM OF SQS. OF RESIDUALS: ';V[2]
[6]   'DURDAN-WATSON STATISTIC: ';DW
[7]   'NUMBER OF RUNS: ';RN
[8]   'POSITIVE SIGNS: ';1↑M
[9]   'NEGATIVE SIGNS: ';M[2]
[10]   'MEAN: ';MN
[11]   'STANDARD DEVIATION: ';((P×P-S)÷(S*2)×S-1)*0.5
    ∇


    ∇R←W SMO V
[1]   R←(+⌿((⍴W),1+⍴V)⍴W∘.×V)[⍳1+(⍴V)-⍴W]÷+/W
    ∇


    ∇Z←INV M;I;J;N
[1]   M←⌹(1 0+⍴M)⍴(,⌹M),~J←1<⍳I←1↑⍴M
[2]   M←1⌽(J,1)⊖M-(J×M[;1])∘.×M[1;]←M[1;]÷1⍴M
[3]   →2×⍳0≠I←I-1
[4]   Z←M[;⍳1↑⍴M] B
    ∇



NAMES IN GROUP 16:
ADD  EO   CLK  LOG  RS   PJ   CS   RE   IM   ABS  ARG  CON
JS   CAD  CMU  CDI  CPW  CEX  CLO  POL  XY   MΔT  RΔK


    ∇R←A ADD B;C;N;STA
[1]   C←(STA+1)⍴C←0∘R←STA⍴R←0∘STA←⍴A
[2]   N←STA
[3]   AGA:→0×⍳(N=0)
[4]   R[N]←C[N+1] EO A[N]
[5]   R[N]←R[N] EO B[N]
[6]   C[N]←(A[N]∧B[N])∨(A[N]∧C[N+1])∨B[N]∧C[N+1]
[7]   N←N-1
[8]   →AGA
    ∇


    ∇R←A EO B
[1]   R←A≠B
    ∇


    ∇R←CLK N
[1]   R←N⍴0 1
    ∇


    ∇R←LOGIC IN
[1]   R←'_¯'[1+IN]
    ∇
```

```
    ∇R←RS X
[1]   →MΔT
[2]   R←(1↓ρX)ρX
    ∇


    ∇R←X PJ Y;RX;RY;L
[1]   →3⌈⍳L←(ρRX←ρX)≠ρRY←ρY
[2]   →9⌈⍳∧/RX=RY
[3]   →(1=(×/RX),×/RY)/7 8
[4]   →Lρ6
[5]   →0∘⍞←'COMPLEX LENGTH ERROR'
[6]   →0∘⍞←'COMPLEX RANK ERROR'
[7]   →9∘X←RY ρX
[8]   Y←RXρY
[9]   R←(RρX)⍤¯1⍤(R←1ρY)ρY
    ∇


    ∇R←CS X
[1]   R←1 0⍉ (1,ρX)ρX
    ∇


    ∇ R←RE X
[1]   →MΔT
[2]   R←1 0⍉1 0⌿X
    ∇


    ∇R←IM X
[1]   →MΔT
[2]   R←1 0⍉0 1⌿X
    ∇


    ∇ R←ABS X
[1]   →MΔT
[2]   R←1 0⍉(1,1↓ρX)ρ(+⌿X×X)*0.5
    ∇


    ∇ R←ARG X;A
[1]   →MΔT
[2]   R←¯2○¯1⌈1⌊(A↑X)÷(A←1,1↓ρX)ρ(+⌿X×X)*0.5
[3]   R←1 0\(○2)|R×1-2×0>(-A)↑X
    ∇


    ∇ R←CONJ X
[1]   →MΔT
[2]   R←(R↑X)⍤¯1⍤-(-R←1,1↓ρX)↑X
    ∇
```

```
    ∇ R←JS X
[1]   →MΔT
[2]   R←(-(-R)↑X)⍠(R←1,1↓⍴X)↑X
    ∇


    ∇ R←X CADD Y
[1]   →RΔK
[2]   R←X+Y
    ∇


    ∇ R←X CMUL Y
[1]   →RΔK
[2]   R←(R⍴-⌿X×Y)⍠(R←1,1↓⍴X)⍴+⌿X×⊖Y
    ∇


    ∇ R←X CDIV Y;A
[1]   →RΔK
[2]   →4⌈⍳∧/,∨⌿0≠Y
[3]   →0⋄⎕←'COMPLEX DOMAIN ERROR'
[4]   R←(A⍴(+⌿X+Y)÷R)⍠(A←1,⍴R)⍴(-⌿Y×⊖X)÷R←+⌿Y×Y
    ∇


    ∇ R←X CPWR Y;A
[1]   →RΔK
[2]   R←(A←1,1↓⍴X)⍴(+⌿X×X)*0.5
[3]   X←(⍟R+R=0)⍠(○2)|(1-2×0>(-A)↑X)×¯2○¯1⌈1⌊(A↑X)÷R
[4]   X←(A⍴-⌿X×Y),A⍴+⌿X+⊖Y
[5]   Y←(×/⍴X)⍴(R≠0)∨A⍴∧⌿Y=0
[6]   R←(2,1↓⍴X)⍴Y\Y/(,X×2○R),,(X←*A↑X)×1○R←(-A)↑X
    ∇


    ∇ R←CEXP X
[1]   →MΔT
[2]   R←(X×2○R)⍠(X←*1 0⌿X)×1○R←0 1⌿X
    ∇


    ∇ R←CLOG X;A;S
[1]   →M∇T
[2]   →4⌈⍳∧/,0≠S←(A←1,1⍴X)⍴(+⌿X×X)*0.5
[3]   →0⋄⎕←'COMPLEX DOMAIN ERROR'
[4]   R←(⍟S)⍠(○2)|(1-2×0>(-A)↑X)×¯2○¯1⌈1⌈1⌊(A↑X)÷S
    ∇


    ∇ R←POLAR X;A
[1]   →MΔT
[2]   R←(A←1,1↓⍴X)⍴(+⌿X×X)*0.5
[3]   R←R⍠(○2)|(1-2×0>(-A)↑X)×¯2○¯1⌈1⌊(A↑X)÷R+0=R
    ∇
```

```
    ∇ R←XY X
[1]   →MΔT
[2]   R←(X×2○R)⌿(X←1 0≠X)×1○R←0 1≠X
    ∇


    ∇R←MΔT
[1]   R←⍳0
    ∇


    ∇R←RΔK
[1]   R←⍳0
    ∇



NAMES IN GROUP 19:
INΔ  IΔ0  IΔ1  IΔ2  IΔ3  IΔ4  AL   ALL  BAL  ER   FV   FVA
ROI  TLA  TOT  TVA  LOA  MOR  NR   PAY  PLA  PV   PVA  LPA



    ∇R←INΔ X
[1]   R←⌸(X∈' .0123456789')/X←(⍴X)↓⍞X
    ∇


    ∇X←IΔ0
[1]   X←INΔ 'PRINCIPAL AMOUNT: '
[2]   →3+1>1↓X←X,INΔ 'NOMINAL INTEREST RATE: '
[3]   X[2]←X[2]÷100
[4]   X←X,INΔ 'NO. OF COMPOUND PERIODS/YR: '
[5]   X←X,INΔ 'TOTAL NO. OF PYMT. PERIODS: '
    ∇


    ∇X←IΔ1
[1]   X←INΔ 'PRINCIPAL AMOUNT: '
[2]   →3+1>1↓X←X,INΔ 'NOMINAL INTEREST RATE: '
[3]   X[2]←X[2]÷100
[4]   X[2]←X[2]÷INΔ'NO. OF PAYMENTS/YR: '
[5]   X←X,INΔ 'TOTAL NO. OF PYMT. PERIODS: '
    ∇


    ∇X←IΔ2
[1]   X←INΔ 'PRINCIPAL AMOUNT: '
[2]   →3+1>1↓X←X,INΔ 'NOMINAL INTEREST RATE: '
[3]   X[2]←X[2]÷100
[4]   X[2]←X[2]÷INΔ 'NO. OF INTEREST PERIODS/YR: '
[5]   X←X,INΔ 'TOTAL NO. OF INT. PERIODS: '
    ∇
```

```
    ∇X←IΔ3
[1]   X←INΔ 'ANNUITY AMOUNT: '
[2]   →3+1>1↓X←X,INΔ 'NOMINAL INTEREST RATE: '
[3]   X[2]←X[2]÷100
[4]   X[2]←X[2]÷INΔ 'NO. OF INTEREST PERIODS/YR: '
[5]   X←X,INΔ 'TOTAL NO. OF PYMT. PERIODS: '
[6]   X←X,'Y'∈30↓⍞'ARE PAYMENTS MADE IN ADVANCE? '
    ∇


    ∇X←IΔ4
[1]   X←INΔ 'INVESTMENT AMOUNT: '
[2]   X←X,INΔ 'ORIGINAL AMT. OF INVESTMENT: '
[3]   X←X,INΔ 'NUMBER OF PERIODS HELD: '
    ∇


    ∇V←AL X
[1]   V←X[1]×X[2]÷(1+×/X[2 4])-÷(1+X[2])*-/X[3 4] Δ0
    ∇


    ∇R←ALL
[1]   R←IΔ1
[2]   R←R,'Y'∈30↓⍞'ARE PAYMENTS MADE IN ADVANCE? '
[3]   R←.01×⌈100×R[3]×AL R
    ∇


    ∇Z←BAL;B;I
[1]   Z←IΔ0
[2]   Z←Z,⍎(A∈'.0123456789')/A←29↓⍞'NO. OF PYMT. PERIODS ELAPSED: '
[3]   Z←Z,ER Z[2 3],12
[4]   B←(×/Z[1 6])÷1-(1+Z[6])*-Z[4]
[5]   I←(1+Z[6])*⌊/Z[4 5]
[6]   Z←.01×⌈100×(I×1↑Z)-(I-1)×B÷Z[6]
    ∇


    ∇R←ER X
[1]   R←¯1+(1+÷/2↑X)*÷/1↓X
    ∇


    ∇V←FV
[1]   V←IΔ2
[2]   V←.01×⌊.5+100×V[1]×(1+V[2])*V[3]
    ∇


    ∇V←FVA;J;P;R;S
[1]   V←INΔ 'NO. OF PAYMENT PERIODS: '
[2]   V←V,'Y'∈30↓⍞'ARE PAYMENTS MADE IN ADVANCE? '
[3]   →12×⍳∧/(1,1↑V)≠ρ,P←INΔ 'ENTER PAYMENT(S): '
[4]   →13×⍳∧/(1,1↑V)≠ρ,R←INΔ 'ENTER COMPOUNDING RATE(S): '
[5]   R←V[1]ρR∘P←V[1]ρP
```

```
[6]   →(V[2]=1∘S←J←⎕PT←0)/9
[7]   →7×ιJ<V[1]-1∘S←(1+R[J+1])×S+P[J←J+1] Y
[8]   →14∘S←S+P[V[1]]
[9]   S←(1+R[J])×S+P[J←J+1]
[10]   →14×ιJ=V[1]
[11]   →9
[12]   →3∘⎕←'NO. OF PYMTS. ≠ NO. OF PERIODS'∘⎕PT←15
[13]   →4∘⎕←'NO. OF RATES ≠ NO. OF PERIODS'∘⎕PT←15
[14]   V←.01×⌊.5+100×S S
    ∇


    ∇V←ROI
[1]   V←¯1+(÷/2↑V)*÷2↓V←IΔ4
    ∇


    ∇V←TLA;A
[1]   V←INΔ'PRINCIPAL AMOUNT: '
[2]   V←V,INΔ'ANNUITY AMOUNT: '
[3]   V←V,INΔ'NUMBER OF PAYMENTS: '
[4]   V←V,INΔ'REINVESTMENT RATE: '
[5]   V←V,'Y'∈30↓⍞'ARE PAYMENTS MADE IN ADVANCE? '
[6]   A←.01×⌊.5+100×V[2]×(1+(×/V[4 5])-÷(1+V[4])*-/V[3 5])÷V[4]
[7]   V←(A-V[1])÷V[1]
    ∇


    ∇Z←TOT
[1]   Z←IΔ0
[2]   Z←Z[4]×.01×⌈100×PAY Z
    ∇


    ∇V←TVA;A
[1]   V←PVA
[2]   V←(V-A)÷A←⍎(A∈'.0123456789')/A←18↓⍞'PRINCIPAL AMOUNT: '
    ∇


    ∇LOAN;P;PI;PP;X;Y
[1]   X←IΔ1
[2]   X←X,'Y'∈29↓⍞'ARE PAYMENTS MADE IN ADVANCE? '
[3]   →4+'Y'∈29↓⍞'SHALL I COMPUTE PAYMENT AMT.? '∘Y←0 E:
[4]   →6∘P←⍎18↓⍞'ENTER PAYMENT AMT. '
[5]   P←.01×⌈100×AL X
[6]   →((0⩾1↑X)∨X[3]<Y←Y+1)/0 .
[7]   →(1=3↓X)/12
[8]   PP←P-PI←.01×⌊.5+100××/2↑X
[9]   →(PP>1↑X)/13
[10]   Y,P,PI,PP,X[1]←X[1]-PP
[11]   →6
[12]   →9∘PP←P+PI←X[4]←0
[13]   →9∘PP←X[1]
    ∇
```

```
    ∇Z←MORT
[1]   Z←IΔ0
[2]   Z←.01×⌈100×PAY Z
    ∇


    ∇V←NR X
[1]   V←X[2]×((1+X[1])*÷X[2])-1
    ∇


    ∇P←PAY X
[1]   P←X[1]×P÷1-(1+P←ER X[2 3],12)*-X[4]
    ∇


    ∇V←PLA
[1]   V←IΔ3
[2]   V←.01×⌊0.5+100×V[1]×(1+(×/V[2 4])-÷(1+V[2])*-/2↓V)÷V[2]
    ∇


    ∇V←PV
[1]   V←IΔ2
[2]   V←.01×⌊.5+100×V[1]÷(1+V[2])*V[3]
    ∇


    ∇V←PVA;P;R
[1]   V←INΔ 'NO. OF PAYMENT PERIODS: '⋄⎕PT←20 AL
[2]   V←V,'Y'∈30↓⍞'ARE PAYMENTS MADE IN ADVANCE? '
[3]   →7×ι∧/(1,1↑V)≠ρP←,INΔ 'ENTER PAYMENT(S): '
[4]   →8÷ι∧/(1,1↑V)≠ρR←,INΔ 'ENTER COMPOUNDING RATE(S): '
[5]   R←V[1]ρR⋄P←V[1]ρP⋄⎕PT←0
[6]   →0⋄V←.01×⌊0.5+100×+/(V[2]↓P)÷(1+(-V[2])↓R)*ι-/V
[7]   →3⋄⎕←'NO. OF PYMTS. ≠ NO. OF PERIODS'
[8]   →4⋄⎕←'NO. OF RATES ≠ NO. OF PERIODS'
    ∇


    ∇V←LPA
[1]   V←.01×⌈100×AL IΔ3
    ∇



NAMES IN GROUP 40:
INV  IVP  PRI  DTR  DTP  ZER  PRM  PER  PAL  LFC  HIL  GCV
FC   COM  BIN  ASC  TRU  DCO  SEI  SI   CRO  LEN  DIF  INT
EVA  GEN  POZ  ZPR  PAD  PMU  PDI  PFR  BΔ   PPW  PO   IN3
IN4  IN5  SIM  SYS  LS   LS1  LS2  FIT  FUN  NIN  DTB  SBL
SBS  FBL  FBS  BSN  HBS  BSX  PSI  LEG  LAG  HRM  ERF  CHE
BAI  COP  LFI  CBI
```

```
    ∇Z←INV M;I;J;N
[1]   M←⌽(1 0+⍴M)⍴(,⌽M),~J←1<⍳I←1↑⍴M
[2]   M←1⌽(J,1)⊖M-(J×M[;1])∘.×M[1;]←M[1;]÷1⍴M
[3]   →2×⍳0≠I←I-1
[4]   Z←M[;⍳1↑⍴M] B
    ∇


    ∇Z←IVP M;I;J;K;P;S
[1]   M←⌽(1 0+⍴M)⍴(,⌽M),~J←1<P←⍳I←1↑⍴M
[2]   S←÷⌈/|M
[3]   Z←|M[⍳I;1]×I↑S
[4]   K←Z⍳⌈/Z
[5]   M[K,1;⍳⍴P]←M[1,K;⍳⍴P]
[6]   S[K,1]←S[1,K]
[7]   P[K,1]←P[1,K]
[8]   P←1⌽P
[9]   S←1⌽P
[10]   M[1;]←M[1;]÷1⍴M
[11]   M←1⌽(J,1)⊖M-(J×M[;1])∘.×M[1;]
[12]   →3×⍳0≠I←I-1
[13]   Z←M[;⍋P]
    ∇


    ∇Y←PRIME N;I;J;K
[1]   I←J←1∘N←,N∘Y←⍳0
[2]   →5×⍳0v.=(J+⍳K←50⌊N[I]-J+1)|N[I] .
[3]   →2×⍳N[I]>J←J+K+1
[4]   →6∘Y←Y,1
[5]   Y←Y,0
[6]   →2×⍳(⍴N)≥I←I+J←1
    ∇


    ∇Z←DTR M;J;Q 1
[1]   →(1=⍴,M)⍴0,Z←,M
[2]   →L2×⍳(2=⍴⍴M)∧=/⍴M
[3]   →0∘□→'ILLEGAL STRUCTURE'
[4]   L2:→0×⍳(1↑⍴M)<J←(M[1;]=0)⍳C←,0
[5]   M←(J-1)⌽M
[6]   L6:M←M-M[;1]∘.×M[1;]÷Z←M[1;1]
[7]   Z←(¯1*J-1)×Z×DTR 1 1↓M
    ∇


    ∇Z←DTP M;K;L
[1]   Z←1
[2]   L←(|M[;1])⍳⌈/|M[;1]
[3]   M[L,1;]←M[1,L;]
[4]   M←1 1↓M-M[;1]∘.×M[1;]÷K←1⍴M
[5]   →2×⍳2≤1↑⍴M∘Z←Z×K×1-2×L≠1
[6]   Z←Z×1⍴M
    ∇
```

```
    ∇Z←EB ZER FUN;T M
[1]   →0×⍳EB[1]≥|T←⍎FUN,' Z←.5×+/1↓EB'
[2]   →1∘EB[1+2⊥(0<T)≠0<⍎FUN,' 1↓EB']←Z
    ∇


    ∇Z←A PRM B;I;Y
[1]   I←⍴Z←1+(⌽⍳A)⊤B-1
[2]   →0×⍳0=I←I-1 J
[3]   →2∘Z[Y]←Z[Y]+Z[I]≤Z[Y←I+⍳A-I]
    ∇


    ∇P←PER M;Z
[1]   →2×M>,P←1 1⍴1
[2]   P←PER M-1
[3]   P←⍉(1 0+⌽⍴P)⍴(,⍉P),(1↑⍴P)⍴M
[4]   Z←,⍉((1↑⍴P),M)⍴¯1-⍳M
[5]   P←Z⌽((M,1)×⍴P)⍴P
    ∇


    ∇Z←PAL N;I
[1]   Z←((!N),N)⍴0
[2]   I←1
[3]   Z[I;]←N PRM I
[4]   →3×(!N)≥I←I+1
    ∇


    ∇Z←LFC N
[1]   Z←'ABCDEFGHIJKLMNOPQRSTUVWXYZ'[FC N]
    ∇


    ∇Z←HIL N
[1]   Z←÷¯1+(⍳N)∘.+⍳N
    ∇


    ∇Z←GCV W R
[1]   A←(Z←⌊/W)|W 1
[2]   →1≠⍴W←Z,(A≠0)/A
    ∇


    ∇R←FC N;A;B
[1]   B←(⍳N)∘.+N⍴0
[2]   A←(⍳N)∘.+⍳N
[3]   R←(2,N×N)⍴(,B),,A
[4]   R←⍉(R[2;]≤N)/R
    ∇
```

```
    ∇C←COM N;A;B
[1]   →0×⍳N<2
[2]   →0×⍳N=2×1⍴C←1 2⍴1 2
[3]   A←COM N-1
[4]   C←((2!N),2)⍴(,A),,(⍳N-1)∘.⌈0,N      =
    ∇


    ∇Z←BIN N
[1]   Z←⌊⍉(0,⍳N)∘.!0,⍳N
    ∇


    ∇Z←ASC M
[1]   Z←∧/,M[M;]=M[;M]
    ∇


    ∇Z←TRU N
[1]   Z←2|⌊(¯1+⍳2*N)∘.÷2*N-⍳N
    ∇


    ∇Y←DCOS X
[1]   Y←X÷LEN X
    ∇


    ∇X←A SEI B;I;N;V;Y
[1]   V←A×(⍳N)∘.≠⍳N←1↑⍴A∘I←0
[2]   X←(N⍴0),¯3↓N↓B
[3]   Y←⍴⍴X←(N↓X),N↓X
[4]   X[N+Y]←,(B[Y]-V[Y;]+.×N↓X)÷A[Y;Y]
[5]   →(N≥Y←Y+1)/4
[6]   N↓X∘→(0=B[⍴B])/7
[7]   →((B[¯2+⍴B]>I←I+1)∧B[¯1+⍴B]<⌈/|(N↑X)-N↓X)/3
    ∇


    ∇V←A SI B
[1]   V←⍉((1+⍴B),⍴B)⍴(,⍉A),B
[2]   V[1;]←V[1;]÷1⍴V
[3]   B←(0 1↓V[;1]∘.×V[1;])
[4]   →2×⍳1<1↓⍴V←0 1↓⊖V-B
[5]   V←,V
    ∇


    ∇X←A CROUT C;I;IJ;J;R;Y
[1]   A[1;]←A[1;1],1↓A[1;]÷1⍴A∘I←J←IJ←2∘R←1↑⍴A
[2]   →2×⍳R≥I←I+1∘A[I;J]←A[I;J]-A[I;⍳J-1]+.×A[⍳J-1;J]
[3]   →6×⍳R<J←1+I←IJ
[4]   →4×⍳R≥J←J+1∘A[I;J]←(A[I;J]-A[I;⍳I-1]+.×A[⍳I-1;J])÷A[I;I]
[5]   →2∘I←J←IJ←IJ+1
[6]   Y[1]←C[1]÷1⍴A∘X←Y←R⍴0∘I←J←2
[7]   →7×⍳R≥I←I+1∘Y[I]←(C[I]-Y[⍳I-1]+.×,A[I;⍳I-1])÷A[I;I]
```

```
[8]   X[R]←Y[R]∘I←J←R-1
[9]   →9×ι0<I←I-1∘X[I]←Y[I]-(I↓,A[I;])+.×I↓X
    ∇


    ∇Y←LEN X
[1]   Y←(+/,X*2)*0.5
    ∇


    ∇Y←C DIFF X
[1]   Y←((1↓C)×ι¯1+ρC) EVAL X
    ∇


    ∇Y←C INT X
[1]   Y←+/¯1 1×(0,C÷ιρC) EVAL X
    ∇


    ∇Y←C EVAL X
[1]   Y←C+.×⍉X∘.*¯1+ιρC
    ∇


    ∇C←GEN N;I
[1]   C←I←1
[2]   C←(0,C)-I×C,0
[3]   →2×ιN≥I←I+1
    ∇


    ∇X←C POZ A;E;I;M;N;P;R;W;Y;Z
[1]   A←1ρA∘J←A[2]∘K←0=¯1↑A←3ρA
[2]   W←X[¯1+M+ι(ρX)-M]∘Y←1∘N←1∘X←(ρC)ρ1∘M←1
[3]   →K/5∘Y←Y-Z←(W EVAL Y)÷Z+0=Z←W DIFF Y
[4]   'ROOT ';M;' TRY ';N;' EST. ';Y
[5]   →3×J≥N←N+1∘→((|Y×A)≥|Z)/6
[6]   N←P
[7]   →(M≤N←N-1)/7∘X[N]←X[N]+Y×X[N+1]     AL
[8]   →2×(ρC)≠M←1+X[ρX]←M
    ∇


    ∇ZPR X;M
[1]   →((0=M),(ρX)≠2+M←X[ρX])/5 3
[2]   →0∘⍞←'ZEROS OF POLY. ARE: ';X[ιM]
[3]   'ZEROS LOCATED ARE: ';X[ιM]
[4]   →0∘⍞←'COEFF''S OF RESIDUAL POLY.: ';X[M+ι(ρX)-1+M]
[5]   'NO ZEROS COULD BE FOUND.'
    ∇


    ∇Z←C PADD D
[1]   Z←((ρC)⌈ρD)ρ(C,(ρD)ρ0)+D,(ρC)ρ0
    ∇
```

```
    ∇Z←C PMUL D
[1]   Z←+⌿((⍴C),¯1+(⍴C)+⍴D)⍴C∘.×D,(⍴C)⍴0
    ∇


    ∇Z←C PDIV D;I;J;K;L 'S
[1]   L←(⍴Z)-⍴D←1↓D÷K∘Z←,⌽C∘K←(D←⌽D)[I←1]
[2]   →2×⍳L≥I←I+1∘Z[J]←Z[J+I+⍳⍴D]-D×Z[I]
[3]   Z[⍳⍴D]←K×(⍴D)↑Z←⌽Z
    ∇


    ∇C←N PFRAC D;DE;DI;I;J;K;L;NL;NQ;Q
[1]   L←(K←0=D[;3])⌿D[;1 2]
[2]   Q←(~K)⌿D[;1 2 3]
[3]   NQ←(~K)/D[;4]∘NL←K/D[;4]
[4]   DE←,1∘D←(2⍴+NL,2×NL,2×NQ)⍴K←I←0
[5]   →7×⍳(⍴NL)<I←I+1
[6]   →5∘DE←DE PMUL L[I;] PPWR NL[I]
[7]   I←0
[8]   →10×⍳(⍴NQ)<I←I+1
[9]   →8∘DE←DE PMUL Q[I;] PPWR NQ
[10]   I←0
[11]   →16×⍳(⍴NL)<I←+1
[12]   J←0∘DI←DE BΔ A←L[I;] PPWR NL [I]
[13]   →11×⍳NL[I]<J←J+1
[14]    D[K;]←D[K←K+1;] PADD DI
[15]   →13∘DI←DI PMUL L[I;]
[16]   I←0
[17]   →23×⍳(⍴NQ)<I←I+1
[18]   J←0∘DI←DE BΔ A←Q[I;] PPWR NQ[1]
[19]   →17×⍳NQ[I]←J←J+1
[20]   D[K;]←D[K←K+1;] PADD DI
[21]   D[K;]←D[K←K+1;] PADD 0,DI
[22]   →19∘DI←DI PMUL Q[I;]
[23]    POLY←⌽(⌽N) BΔ ⌽DE
[24]   C←(IVP ⍉M)+.×K⍴(K⍴0) PADD N PADD-POLY PMUL DE
    ∇


    ∇Z←X BΔ Y
[1]   Z←0⍴0
[2]   →0×⍳(⍴X)<⍴Y
[3]   Z←Z,X[1]÷Y[1]
[4]   Z←1↓X PADD-Z[⍴Z]×Y
[5]   →0
    ∇


    ∇X←C PPWR N
[1]   →(0×X←,1)×⍳N=0
[2]   X←C PMUL C PPWR N-1 R
    ∇
```

```
    ∇Z←C PO X
[1]   Z←(X∘.*¯1+⍳1⍴⍴C)+.×C
    ∇


    ∇I←X IN3 Y
[1]   I←(3÷8×¯1+⍴Y)×--/X×+/(1,((¯2+⍴Y)⍴3 3 2),1)×Y
    ∇


    ∇I←X IN4 Y
[1]   I←(2÷45×¯1+⍴Y)×--/X×+/(7,((¯2+⍴Y)⍴32 12 32 14),7)×Y
    ∇


    ∇I←X IN5 Y
[1]   I←(5÷288×¯1+⍴Y)×--/X×+/(19,((¯2+⍴Y)⍴75 50 50 75 38),19)×Y
    ∇


    ∇Z←SIMUL;A;B;C;D;K;N;PHI;T;TT;UT;UU;X;Y
[1]   →(=/⍴A←⍎9↓⍞'A MATRIX: ')/3∘⍞PT←20
[2]   →1∘⍞←'A MATRIX NOT SQUARE'
[3]   →((1↓⍴A)=1↑⍴B←⍎9↓⍞'B MATRIX: ')/5
[4]   →3∘⍞←'B INCOMPATIBLE WITH A'
[5]   →((1↑⍴A)=1↓⍴C←⍎9↓⍞'C MATRIX: ')/7
[6]   →5∘⍞←'C INCOMPATIBLE WITH A'
[7]   UT←¯4↑⍞'ZERO, STEP, OR RAMP?'
[8]   →((1↓⍴B)=1↑⍴UU←⍎17↓⍞'MAGNITUDE VECTOR: ')/10
[9]   →8∘⍞←'INCOMPATIBLE WITH B'
[10]   T←⍎10↓⍞'TIME STEP: '
[11]   TT←⍎11↓⍞'TOTAL TIME: '
[12]   PHI←(⍴A)↑PHI,0∘D←(-/⍴B)↑PHI←T SYS A,B
[13]   D←D+.×UU
[14]   →((1↓⍴A)=1↑⍴X←⍎19↓⍞'INITIAL CONDITIONS: ')/16
[15]   →14∘⍞←'INCOMPATIBLE WITH A'
[16]   Z←(1,1+1↑⍴C)⍴K←0∘N←⌈TT÷T
[17]   Y←C+.×X
[18]   K←K+1∘Z←Z,[1](K×T),⍉Y
[19]   U←K×T×(∧/UT='STEP')+∧/UT='RAMP'
[20]   →(0≤N-K)/17∘X←(PHI+.×X)+D×U
[21]   Z←1 0↓Z∘⍞PT←0
    ∇


    ∇R←T SYS K;A;B;L;NA;RR;S
[1]   A←(2⍴A)↑K,B←((A←1↑⍴K),-/⍴K)↑K
[2]   NA←⌊/(⌈/+/|A),(⌈/+≠|A)∘K←0
[3]   →3∘T←T÷2∘K←K+1∘→(1>T×NA)/4
[4]   R←(⍴A)⍴1,(1⍴⍴A)⍴0∘L←1∘S←T×A
[5]   S←(T÷L←L+1)×A+.×S∘R←R+S
[6]   →(1E¯14<⌈/|,S)/5
[7]   RR←(⍴A)⍴1,(1⍴⍴A)⍴0∘L←2∘S←T×A÷2
[8]   S←(T÷L←L+1)×A+.×S∘RR←RR×S
[9]   →(1E¯14<⌈/|,S)/8
```

```
[10]   RR←T×RR
[11]   K←K-1∘→(K=0)/14
[12]   RR←RR+R+.×RR
[13]   →11∘R←R+.×R
[14]   R←R,RR+.×B
    ∇


    ∇X LS Y;A;B;J;K;N
[1]   N←2
[2]   A←⌹X∘.*J←¯1+⍳N
[3]   A←A+.×Y
[4]   B←(N,N)↑J⌽(N,K)⍴⍳K←¯1+2×N
[5]   B←(+⌿X∘.*¯1+⍳K)[B]
[6]   A←INV B+.×A
[7]   B←(+/(Y-A EVAL X)*2)÷⍴X
[8]   N;' TERM ERROR: ';B
[9]   N;' TERM COEFF: ';A
[10]   →((N≤⍴X)∧11≥N←N+1)/2
    ∇


    ∇Z←X LS1 Y
[1]   Z←INV 2 2⍴(⍴X),(2⍴+/X),+/X*2
[2]   Z←Z+.×(+/Y),+/X×Y
[3]   Z←Z,(+/(Y-Z EVAL X)*2)÷⍴X
    ∇


    ∇Z←X LS2 Y;A ]
[1]   Z←INV 3 3⍴+/⌹X∘.*0 1 2 1 2 3 2 3 4
[2]   A←(+/Y),(+/Y×X),+/Y×X×X
[3]   Z←Z+.×A
[4]   Z←Z,(+/(Y-Z EVAL X)*2)÷⍴X
    ∇


    ∇C←X FIT Y;D
[1]   D←1+DEGREE⌊¯1+⍴X←,X∘Y←,Y
[2]   C←⌽(DEGREE+1)↑Y⌹X∘.*(⍳D)-⍳1
    ∇


    ∇Y←X FUN C
[1]   Y←C+.×⌹X∘.*⌽(⍳⍴,C)-⍳1
    ∇


    ∇Z←N NINT Y;C;D
[1]   Z←(⍴,N)⍴1↑Y∘D←(⍴,N)⍴1+C←0
[2]   →2×⍳1<⍴Y∘Z←Z+(1↑Y←(1↓Y)-¯1↓Y)×D←D×(N-C)÷C←C+1
    ∇
```

```
    ∇M←DTB Y;N
[1]   M←N←Y
[2]   M←M,N,((ρY)-ρN←(1↓N)-¯1↓N)ρ0
[3]   →(1<ρN)/2
[4]   M←⍉((ρY),ρY)ρM
    ∇


    ∇Z←N SBL X
[1]   Z←((○÷2×X)*0.5)×(N+0.5) FBL X
    ∇


    ∇Z←N SBS X
[1]   Z←((○÷2×X)*0.5)×(N+0.5) FBS X
    ∇


    ∇Z←N FBL X;T;K
[1]   Z←T←((0.5×X)*N)÷!⌊N+K←0
[2]   →2×ιv/,(|T)>|1E¯12×Z←Z+T←-T×X×X÷4×K×N+K←K+1
    ∇


    ∇Z←N FBS X;K
[1]   Z←((0.5×X)∘.*N+2×K)-.÷(!K)×!⌊N+K←0,ι20+10×v/,10⩽X
    ∇


    ∇Z←N BSN X
[1]   Z←0.025×(2|N+1)++/2○(((ρN),39)ρX×1○T)-N∘.×T←(○0.025)×ι39
    ∇


    ∇Z←N HBS X
[1]   S←(F←X*M)÷×/1+2×¯1+ι(K←1)+M←N-0.5
[2]   S←S+F×((¯0.5×X*2)*K)÷(!K)××/1+2×¯1+ιM+K+1
[3]   Z←S×(2×X÷○1)*0.5∘→(12⩾K←K+1)/2
    ∇


    ∇Z←N BSX X;T
[1]   Z←0.025×(2|N+1)++/2○(X∘.×1○T)-((ρX),39)ρN×T←(○0.025)×ι39
    ∇


    ∇Y←PSI X;N
[1]   Y←((×N)×+/÷(X⌈Y)-ι⌈N)-0.5772156649015329--/REZ×(¯1+Y←X-N←⌊X-0.5)*ι35
    ∇


    ∇Z←N LEG X;K;P
[1]   Z←(X∘.*P)-.×(!N+P)÷(2*N)×(!K)×(!N-K)×!P←N-2×K←0,ι⌊N÷2
    ∇
```

```
    ∇Z←N LAG X;K
[1]   Z←(X∘.*K)-.×((¯1*N)×!N)÷((!K←N-K)*2)×!K←0,⍳N
    ∇


    ∇Z←N HRM X;K;S
[1]   Z←((2×X)∘.*K)-.×(!N)÷(!K←N-2×S)×!S←0,⍳⌊N÷2
    ∇


    ∇Z←ERF X;K
[1]   Z←1.128379167095513×(X∘.*K)-.÷(K←1+2×K)×!K←0,⍳40
    ∇


    ∇M←N CHEB X
[1]   M←2○N∘.×¯2○X
    ∇


    ∇Z←ER BAIR A;B;C;D;DI;M;N;U
[1]   Z←((N←¯1+⍴A),2)⍴D←2⍴0
[2]   U←1 1
[3]   ⎕LC∘C←(B←A[1],A[2]+C)+0,C←U[1]×A[1]
[4]   →((N+1)≤⍴B)/7
[5]   B←B,A[1+⍴B]+U+.×⌽¯2↑B
[6]   ⎕LC∘→4∘C←C,(¯1↑B)+U+.×⌽¯2↑C
[7]   D[1]←((B[M]×C[M-3])-B[M-1]×C[M-2])÷(C[M-2]*2)-×/C[¯3 ¯1+M←⍴C]
[8]   D[2]←((B[M]×C[M-2])-B[M-1]×C[M-1])÷(×/C[M-1 3])-C[M-2]*2
[9]   →(∧/ER≥|D)/11
[10]   →3∘U←U+D∘⎕←⎕LC
[11]   →(0.0001≥|DI←(U[1]*2)+4×U[2])/15
[12]   →→(0>DI)/16
[13]   Z[N;]←(0.5×U[1]+DI*0.5).5
[14]   →18∘Z[N-1;]←(0.5×U[1]-DI*0.5),0
[15]   →18∘Z[N;]←Z[N-1;]←0.5×U[1],0
[16]   Z[N;]←1 2⍴ (U[1]÷2),0.5×(|DI)*0.5
[17]   Z[N-1;]←1 2⍴   Z[N;1],-Z[N;2]
[18]   →(0 1 2=N←N-2)/0 21 20
[19]   →2∘A←¯2↓B
[20]   →11∘U[1 2]←-B[2 3]÷B[1]
[21]   Z[1;]←-(÷/B[2 1]),0
    ∇


    ∇COPY
[1]   N←⍴GPS∘ GPS←⎕XN⍳0
[2]   ⎕XS GP∘GP←GPS[N]
[3]   GP ⎕XW[2] ⎕XN GP
[4]   →(N>0)/2∘N←N-1
[5]   ⎕XF[2] ⍳0∘⎕XF ⍳0
[6]   'COPY COMPLETE'
    ∇
```

```
    ∇LFIT;B;D;D2;M;N;Q;S;S1;S2;S3;S4;T;X;Y
[1]   X←,⍎13↓⍞'ENTER X DATA: '
[2]   →4×⍳(N←⍴X)=⍴Y←,⍎13↓⍞'ENTER Y DATA: '
[3]   →0∘⎕←'LENGTH ERROR (⍴X)≠(⍴Y)'
[4]   'SLOPE: ';M←((N×S3←+/X×Y)-S1×S2←+/Y)÷Q←(N×S4←+/X×X)-(S1←+/X)*2
[5]   'INTERCEPT: ';B←((S4×S2)-S1×S3)÷Q
[6]   ⎕←D←Y-B+M×X∘⎕←'DEVIATIONS OF Y FROM BEST FIT:'
[7]   D2←+/D*2
[8]   →(N≥3)/10
[9]   →0∘⎕←'ERROR. USE AT LEAST 3 PAIRS'
[10]   S←((D2÷N-2)*0.5)×((N,S4)÷(N×S4)-S1*2)*0.5
[11]   'STD. DEV. IN SLOPE: ';S[1]
[12]   'STD. DEV. IN INTERCEPT: ';S[2]
[13]   'ERROR IN SLOPE (95∘/∘): ';2×S[1]
[14]   'ERROR IN INTERCEPT (95∘/∘): ';2×S[2]
[15]   →0×⍳0=+/T←(2×S[2])<|D
[16]   'FOLLOWING Y VALUES > LIMITS:'
[17]   T×Y
    ∇


    ∇Z←R  CBIN N
[1]   Z←R!N
    ∇



NAMES IN GROUP 60:
TR   AΔ   BΔ   CΔ   DRI  ARA  ROM  DAY  MAG  MG4


    ∇Z←TR X
[1]   →(0≠+/X←(3⍴10)⊤X)/3∘Z←⍳0
[2]   →0∘Z←AΔ[1;]
[3]   →(0=1⍴X)/7
[4]   →(1≠1⍴X)/6
[5]   →7∘Z←CΔ[9;]
[6]   Z←AΔ[1+X[1];],CΔ[9;]
[7]   →(0≠+/1↓X)/9
[8]   →16
[9]   →(0≠X[2])/11
[10]   →16∘Z←Z,AΔ[1+X[3];]
[11]   →(1≠X[2])/13
[12]   →16∘Z←Z,BΔ[1+X[3];]
[13]   →(0=X[3])/15
[14]   →16∘Z←Z,AΔ[1+X[3];],((1=X[3])/'S'),'UND',CΔ[X[2]-1;]
[15]   Z←Z,CΔ[X[2]-1;]
[16]   Z←(Z≠' ')/Z
    ∇

AΔ    [6 by 10 array of type char; element size 1 byte(s)]
NULL
EIN
ZWEI
DREI
VIER
```

```
FUENF
SECHS
SIEBEN
ACHT
NEUN


BΔ    [10 by 10 array of type char; element size 1 byte(s)]
ZEHN
ELF
ZWOELF
DREIZEHN
VIERZEHN
FUENFZEHN
SECHZEHN
SIEBZEHN
ACHTZEHN
NEUNZEHN


CΔ    [8 by 9 array of type char; element size 1 byte(s)]
ZWANZIG
DREISSIG
VIERZIG
FUENFZIG
SECHZIG
SIEBZIG
ACHTZIG
NEUNZIG
HUNDERT



    ∇DRILL;A;C;M;Q;P;S;T
[1]   A←'0123456789'∘M←2 2ρ9∘⍞PT←6∘T←0 0
[2]   S←'+-×÷'[2]∘Q←A[⌈/1+?M]
[3]   C←('0'=1↑C)↓C←A[1+10 10⊤|P←⌸Q[1],(¯1↑S,(S='÷')/'×'),Q[2]],'=',Q[1],S,Q[2]
[4]   →6×⍳S≠'÷'
[5]   →9∘C←' =',C[⍳1+6=ρC],¯2↑C
[6]   C[(⍳2=Q),Q←(6=ρC)+1 3 5[?3]]←' '
[7]   →9×⍳Sv.='+×'
[8]   C←(Qρ((Q∧' '=1↑C)/' '),(Q←0>P)/'¯'),C
[9]   →12×⍳'S'v.=Q←(C⍳' ')⍞C
[10]   →9∘⍞←'WRONG. TRY AGAIN.'∘T←T+0 1∘→11×⍳⌸Q
[11]   →2∘⍞←'RIGHT'∘T←T+1
[12]   'YOUR SCORE IS ';⌊.5+100×÷/T⌈0 1;' PERCENT'∘⍞PT←0
    ∇



    ∇A←ARABIC R
[1]   A←A+.×¯1+2×A⩾(A,0)[1+⍳ρA←1 5 10 50 100 500 1000['IVXLCDM'⍳,R]]
    ∇
```

```
    ∇R←ROMAN X;Q
[1]   Q←1+(4⍴10)⊤''⍴X
[2]   R←,(10 4⍴(1 3[1+,(⍳4)∘.≤⍳4]),1,(6⍴0 3 3),(7⍴3 0 1 3),1 3 0,(4⍴1),¯1 3 3)[Q;]
[3]   R←'MDCLXVI'[(R≠3)/R+2×⌊.25×¯1+⍳16]
    ∇


    ∇R←DAY;D;M;Y
[1]   D←⍎20↓⍞'ENTER DAY OF MONTH: '
[2]   M←⍎21↓⍞'ENTER MONTH OF YEAR: '
[3]   M←M,⍎12↓⍞'ENTER YEAR: '
[4]   →((0 12⊥1752 9)≥0 12⊥⌽M)/8
[5]   Y←100|1↓M←1 0+⌽0 12⊤¯3+0 12⊥⌽M∘⎕PT←0 Δ
[6]   Y← 1+7|D+Y+(⌊¯0.2+2.6×M[1])+(⌊Y÷4)-⌈1.75×⌊M[2]÷100
[7]   →0∘R←(7 3⍴'SUNMONTUEWEDTHUFRISAT')[Y;]
[8]   →1∘⎕←'DATE MUST BE ≥ OCT. 1752'∘⎕PT←20
    ∇


    ∇Z←MAGICSQ X;M
[1]   →(0≠2⊤X)/3
[2]   →0∘⎕←'NOT ODD ORDER'
[3]   M←(X,X)⍴⍳X×X
[4]   Z←(⌈X÷2)⌽(¯1+⍳X)⊖(¯1+⍳X)⌽M
    ∇


    ∇Z←MG4 N;M;T
[1]   →3×⍳0=4|N
[2]   →0∘⎕←'NOT FORM 4×N'
[3]   M←(N,N)⍴(⍳N)∈(1+N-T),T←(N÷4)?N÷2
[4]   Z←((~M)×⊖Z)+M×Z←(N,N)⍴⍳N*2
[5]   M←⌽(N,N)⍴(⍳N)∈(1+N-T),T←(N÷4)?N÷2
[6]   Z←((~M)×⌽Z)+M×Z
    ∇



NAMES IN GROUP 80:
SL   GUN  RD   RN   MOO  CRA  RL   HOR  F    MΔ   C    X3
HIT  FΔ   CD   DΔ   HΔ   PLA  PAY  TOT  J3   LN   N    STR
ST   ALP  HAN  WOR  GO   CLE  AGG  ADD  DAY  MG4  MAG


    ∇SL;F;T;Z;V;N;NEW;P;HIT;J;K;IX
[1]   F←15 49 42 61 88 58 75 94 97 3 6 14 37 41 69 79 89 99
[2]   T←9 12 17 22 36 45 47 64 65 37 16 32 56 85 87 98 91 77
[3]   'ENTER PLAYERS'' NAMES 1 PER LINE'∘⎕IO←~⎕PT←0
[4]   'TO END THE LIST'
[5]   'DEPRESS RETURN ONLY'
[6]   N←(1,⍴N)⍴N←⍞''
[7]   NXT:→PL⌈⍳0=⍴NEW←⍞''
[8]   →NXT∘N←N⍪(1,1↓⍴N)⍴NEW,((1↓⍴N)-⍴NEW)⍴' '∘→FN⌈⍳(⍴NEW)>1↓⍴N
[9]   FN:→NXT∘N←(N,(('')⍴⍴N),(⍴NEW)-1↓⍴N)⍴' ')⍪(1,⍴NEW)⍴NEW
[10]   PL:⎕RL←⎕∘⎕←'INPUT RANDOM SEED ''MAX: 32767'''
[11]   'PLAYERS SELECTED RANDOMLY'∘P←(J←''⍴⍴N)⍴0∘K←3 2⍴9 8 7
```

```
[12]   'WHEN YOUR NAME IS SELECTED'
[13]   'KEY DIGIT 1 2 OR 3.'
[14]   LP:IX←?J
[15]   →LP⌈⍳V≠3⌊1⌈⌈V∘→⎕LC⌈⍳0=V←''⍴⍋¯1↑⍸N[IX;],':'∘⎕PT←9
[16]   'THROWN: ';V←?((?3)⊖K)[V;]
[17]   →WIN⌈⍳99<V←P[IX]+V←+/V
[18]   N[IX;];' HAS HIT AT: ';V∘→TST⌈⍳~V∈F
[19]   31⍴('↓↑'[1+F[HIT]<V←T[HIT←F⍳V]]),' '
[20]   TST:→STB⌈⍳V∈P
[21]   DONE:N[IX;];' IS AT: ';P[IX]←V
[22]   '∘∘∘ ';P;' ∘∘∘'∘⎕PT←5×⍴P
[23]   →LP∘K←3⌈K-1∘→LP⌈⍳50⩾⌊/P∘→LP⌈⍳1≠?5
[24]   STB:N[IX;];' HAS STUMBLED ON: ';N[Z;]∘⎕PT←30∘→DONE⌈⍳IX=Z←P⍳V
[25]   'SORRY, ';N[Z;];' YOU ARE AT 0' .
[26]   →DONE∘P[Z]←0
[27]   WIN:'CONGRATULATIONS ';N[IX;]∘⎕PT←30∘→MIS⌈⍳100≠V
[28]   Z←'0123456789'∘⎕IO←⎕PT←0∘P[IX]←100∘⎕←'POSITIONS:'
[29]   Z[1+(10⊤⍳⍴P)∘.+,0],' ',N[PP;],' ',Z[⍉10 10 10⊤P[PP←⍒P]] ?
[30]   →0
[31]   MISS:'PAST 100 LAST TROW IGNORED'
[32]   →DONE∘V←P[IX]
    ∇


    ∇GUN ;A;M;S;TM;TR
[1]    S←0 0∘⎕RL←RL
[2]    S[1]←1+S[1]∘⎕PT←30
[3]    'EST''D TARGET RANGE ';RD(.9×TR)+?⌊.2×TR←4000+?8000;' YDS.'
[4]    →0×⍳'S'∧.=A←25↓⍸'ENTER EST''D GUN ELEVATION '
[5]    S[2]←S[2]+1∘A←⍋A
[6]    M←(.9×|TM)+?⌈.2×|TM←TR-TM+.002×RN×TM←12000×1○2×○A÷180
[7]    →(50⩾|TM)/10
[8]    6⍴(6×TM>0)⌽' OVER SHORT ';RD M;' YDS. TRY AGAIN.'
[9]    →4
[10]    'GOOD SHOT!'∘⎕PT←5
[11]   'YOU HAVE SUNK ';S[1];' TARGET';(1≠1↑S)/'S'∘⎕PT←20
[12]   'IN ';S[2];' SHOT',((1≠1↓S)/'S'),'.'
[13]   'AVERAGE ';TM;' SHOT',((1≠TM←÷/⌽S)/'S'),'/TARGET.'
[14]   →2×⍳'Y'∊¯5↑⍸'LIKE ANOTHER? '
[15]    RL←⎕RL
    ∇



    ∇T←RD X
[1]    T←((X⩽100),((X>100)∧X⩽1000),X>1000)/10 50 100
[2]    T←T×⌊(÷T)×X+.5×T
    ∇


    ∇T←RN
[1]    T←.01×¯612++/?12⍴101
    ∇
```

```
    ∇MOO;B;C;G;NG;X;Y
[1]   NG←×⎕RL←RL
[2]   →5⌈⍳~NG◦⎕PT←10
[3]   'NEW GAME'◦⎕PT←10◦G←NG←0
[4]   Y←'1234567890'[(10=1↑X)⌽X←3?10]
[5]   →((∧/X∈'1234567890'),'S'⍴.=X←¯3↑⍞'ENTER GUESS: ')/7 15
[6]   →5◦⎕←'3-DIGIT NUMBER PLEASE '
[7]   →8+1∧.=+/X◦.=X
[8]   →5◦⎕←'NO REPETITIONS PLEASE'
[9]   C←(+/Y∈X)-B←Y+.=X
[10]   B;' BULL';((B≠1)/'S');',';C;' COW';(C≠1)/'S'
[11]   →2⌈⍳~NG←3=B◦G←G+1
[12]   'GAME OVER'
[13]   'YOU USED ';G;' GUESSES'
[14]   →2
[15]   ⎕PT←0◦RL←⎕RL
    ∇


    ∇CRAPS;B;D;S
[1]   ⎕RL←32000⌊|⌊S←⌽21↓⍞'WHAT ARE YOUR STAKES? '
[2]   'YOUR STAKE IS NOW $';S◦⎕PT←15
[3]   →18×⍳0=B←|⌽22↓⍞'PLACE YOUR BET PLEASE. '
[4]   →16×⍳B>S
[5]   S←S-B
[6]   →18×⍳∨/'OSQ'∈20↓⍞'ROLL FOR YOUR POINT.'
[7]   →12×⍳(D←+/⎕←?6 6)∈2 3 12
[8]   →13×⍳D∈7 11
[9]   'YOUR POINT IS ';D
[10]   →18×⍳∨/'OQS'∈5↓⍞'ROLL.'
[11]   →10◦→((D,7)=X←+/⎕←?6 6)/14,⎕PT←15
[12]   →15◦⎕←'YOU HAVE CRAPS.'
[13]   'YOU HAVE A NATURAL.'
[14]   →2◦S←S+2×B◦⎕←'YOU WIN.'
[15]   →2◦→17×⍳S≤0◦⎕←'YOU LOSE.'
[16]   →3◦⎕←'BET CAN''T EXCEED STAKE.'
[17]   →⎕PT←0◦⎕←'GAME OVER.  YOU ARE BROKE.'
[18]   'GAME OVER.'
[19]   'YOUR STAKE IS $';S
[20]   ⎕PT←0
    ∇

RL    [numeric scalar: element size=2 byte(s)]
23826


    ∇HORSE;P;R;W
[1]   'THEY''RE AT THE POST.'◦⎕PT←2×⍴P←5⍴0
[2]   5 1⍴⍳5◦⎕PT←4
[3]   'THEY''RE OFF!!!!'◦⎕PT←8
[4]   ((1↑P←30⌊P+?9 9 9 9 9)⍴' ');1
[5]   (P[2]⍴' ');2
[6]   (P[3]⍴' ');3
[7]   (P[4]⍴' ');4
[8]   (P[5]⍴' ');5
[9]   →4×⍳30>⌈/P
```

```
[10]   W←,(P=30)/⍳5
[11]   R←-/2↑P←P[⍒P]
[12]   P←((R=0)/'A NOSE'),((R>0)/('0123456789'[1+R]),' LENGTH'),((1<R)/'S'),' IS
NO. '
[13]   'AND THE WINNER'∘⍞PT←10
[14]   'BY ',P;W[?⍴W]∘⍞PT←0
    ∇

F     [vector of type char of length 3; element size 1 byte(s)]


MΔ    [4 by 3 array of type char; element size 1 byte(s)]
LOSE
PUSH
WIN


C     [3 by 13 array of type char; element size 1 byte(s)]
  A
  2
  3
  4
  5
  6
  7
  8
  9
 10
  J
  Q
  K


X3    [6 by 2 array of type char; element size 1 byte(s)]
 UP
DOWN



    ∇Z←HIT Y
[1]   DΔ Z←Y,CD
    ∇


    ∇K FΔ Z;B;Y
[1]   B←1↑Z
[2]   →7 6[(1+0≠1↑Y←1↓Z)×⍳K=2]
[3]   →6⌈⍳21≠TOT Y
[4]   'WIN 'PAY ¯1.5×B
[5]   →0∘U←U,Y
[6]   →7 11 9 14 6['SHDP'⍳J←1↑12↓⍞'S,H,D OR P? ']
[7]   T←T,B,TOT Y
[8]   →0∘S←S,Y
[9]   →6⌈⍳2≠⍴Y
[10]   B←B+B
[11]   →6 7[('HD'⍳J)×⍳21≥TOT Y←HIT Y]
```

```
[12]   'LOSE' PAY B
[13]   →0
[14]   →6⌈⍳~(K=1)∧(2=⍴Y)∧=/Y
[15]   'YOU: ',DΔ Y←Z,CD
[16]   2 FΔ B,Y
[17]   'YOU: ',DΔ Y←Z,CD
[18]   2 FΔ B,Y
    ∇


    ∇C←CD
[1]   →4⌈⍳0<⍴D
[2]   ⎕PT←0∘⎕←'SHUFFLE'∘⎕PT←7
[3]   U←0⍴D←U[(⍴U)?⍴U]
[4]   C←1↑D
[5]   D←1↓D
    ∇


    ∇Y←DΔ M
[1]   Y←,C[1+M;]
    ∇


    ∇HΔ
[1]   M←CD
[2]   'DEALER SHOWS: ',DΔ M
[3]   M←M,CD
[4]   'YOU: ',DΔ Y←CD,CD
    ∇


    ∇PLAY;S;B;D;DB;J;K;M;SI;U;Y;Z
[1]   U←13|⍳52∘D←⍳DB←0∘⎕RL←RL
[2]   B←1000⌊0⌈⍎⍞∘→16⌈⍳'S'∈Z←20↓⎕'NEW HAND PLACE BET  '
[3]   HΔ
[4]   →6⌈⍳0≠1↑M
[5]   →10 10 6['IY'⍳11↓⎕'INSURANCE? ']
[6]   →14⌈⍳21≠TOT M
[7]   'DEALER:  ',DΔ M
[8]   MΔ[2-K;] PAY B×K←21≠TOT Y
[9]   →2∘U←U,Y,M
[10]   →13⌈⍳21≠TOT M
[11]   'WIN INSURANCE'
[12]   →7∘DB←DB-B
[13]   DB←DB+B÷2∘⎕←'LOSE INSURANCE'
[14]   J3
[15]   →2∘U←U,S,M
[16]   RL←⎕RL
    ∇


    ∇A PAY B
[1]   A,': YOU''RE ',,X3[1+0⌈×DB;];|DB←DB+B
    ∇
```

```
    ∇T←TOT X;I
[1]   X←1+X
[2]   →0×ι21≥T←+/11 2 3 4 5 6 7 8 9 10 10 10 10 1 [X]
[3]   →0×ι(ρX)<I←Xι1
[4]   →2∘X[I]←X[I]+13
    ∇


    ∇J3 ;T
[1]   1 FΔ B,Y,S←T←ι0
[2]   'DEALER: ',DΔ M
[3]   →0×ι0=ρT
[4]   →(16<I←TOT M)/6
[5]   →4∘M←HIT M
[6]   I←I×21≥I
[7]   MΔ[2-K;] PAY T[1]×K←×I-T[2]
[8]   →(0<ρT←2↓T)/7
    ∇

LN    [numeric vector of length 8; element size 1 byte(s)]
3 5 8 5 6 8 5 10

N     [numeric scalar: element size=1 byte(s)]
1

STR   [vector of type char of length 50; element size 1 byte(s)]
DOGAPPLEFEBRUARYHOUSESHOWERCUCUMBEREXTRABATH HOUSE

ST    [numeric vector of length 9; element size 1 byte(s)]
0 3 8 16 21 27 35 40 50

ALP   [vector of type char of length 26; element size 1 byte(s)]
ABCDEFGHIJKLMNOPQRSTUVWXYZ


    ∇HANG;F;U;T;P;I;W;R;E;S;M;L;G;Q;FΔΔ R
[1]   INIT:→(((E←T←0)=R←ρW←WORD N←N+1),N=0)/DONE,LIST∘F←'   '∘U←'_'
[2]   F;'NEW MESSAGE '
[3]   LIST:F;P←(,⍉Sρ(~M),M←(W≠W[1])∧(W≠W[R])∧W∈ALPH)/,⍉(S←2,R)ρW,RρU
[4]   L←L[ιM-1],((ρL)|M←LιW[1])↓L←L[ιM-0],((ρL)|M←LιW[R]) ↓ L←ALPH
[5]   READ:→((I=0),(I=1),2=I←ρG←,⍞'')/READ,LTR,SPEC
[6]   FULL:→(R≠I)/LENE
[7]   →(∨/(M/G)≠(M←P≠U)/W)/TYPO
[8]   →(((∧/W=G),T←T+1)[1])/WIN
[9]   MISS:→(M,~M←10=ρ⎕←F,'HANGMAN'[ιE←E+1])/LOSE,READ
[10]   LTR:→((~G∈ALPH),~G∈L)/LTE,USED
[11]   →(((~G∈W),T←T+1)[1])/(MISS,ρL←L[ιM-1],(M←LιG)↓L)[1] |
[12]   F;P←(,⍉SρM,~M←(G=W)∨P≠U)/,⍉SρW,P
[13]   →(M,~M←∧/P≠U)/WIN,READ
[14]   LENE:→READ,ρ⎕←F;'YOUR GUESS IS NOT THE SAME LENGHT AS THE MESSAGE'
[15]   SPEC:→((Q='S'),(Q='M'),(Q='P'),'L'≠Q←G[2])/SCR,END,PAT,FULL ⍀
[16]   →READ,ρ⎕←F,'YOU HAVEN''T TRIED: ',L =
[17]   SCR:→(E=0)/NONE N
[18]   →READ,ρ⎕←F,'YOU HAVE ACCUMULATED: ','HANGMAN'[ιE]
[19]   NONE:→READ,ρ⎕←F,'NO ERRORS.'
```

```
[20]   LOSE:F;'YOU LOSE.'
[21]   END:→INIT,ρ⍞←F,'THE MESSAGE WAS: ',W
[22]   TYPO:→READ,ρ⍞←F,'YOU MUST HAVE MADEA TYPO ERROR.'
[23]   LTE:→READ,ρ⍞←F;'THAT''S NOT A LETTER.'
[24]   WIN:'YOU WIN IN ';T;' GUESS';' ES '[(T≠1)+⍳1+2×T≠1]
[25]   'WITH ';E;' ERROR';'.S.'[(E≠1)+⍳1+E≠1]
[26]   →INIT
[27]   PAT:→READ,ρ⍞←F,'THE PATTERN IS: ',P
[28]   USED:→READ,ρ⍞←F,'''',G,'''ALREADY ','FAILWORK'[(⍳4)+4×G∈W],'ED.'
[29]   DONE:'SORRY NO MORE MESSAGES.'
    ∇


    ∇W←WORD N
[1]     →2×N<ρST,W←''
[2]   W←STR[ST[N]+⍳LN[N]]
    ∇


    ∇GO
[1]   N←N-1
[2]   HANG
    ∇


    ∇CLEAR
[1]   LN←STR←''
[2]   N←0
[3]   ST←,0
    ∇


    ∇AGG;A
[1]   LN←LN,ρA←,⍞''
[2]   ST←ST,ST[ρST]+ρA
[3]   STR←STR,A
    ∇


    ∇ADD;A
[1]   LN←LN,ρA←,⍞''
[2]   ST←ST,ST[ρST]+ρA
[3]   STR←STR,A
    ∇


    ∇R←DAY;D;M;Y
[1]   D←⌶20↓⍞'ENTER DAY OF MONTH: '
[2]   M←⌶21↓⍞'ENTER MONTH OF YEAR: '
[3]   M←M,⌶12↓⍞'ENTER YEAR: '
[4]   →((0 12⊥1752 9)⩾0 12⊥⌽M)/8
[5]   Y←100|1↓M←1 0+⌽0 12⍑¯3+0 12⊥⌽M∘⍞PT←0 Δ
[6]   Y← 1+7|D+Y+(⌊¯0.2+2.6×M[1])+(⌊Y÷4)-⌈1.75×⌊M[2]÷100
[7]   →0∘R←(7 3ρ'SUNMONTUEWEDTHUFRISAT')[Y;]
[8]   →1∘⍞←'DATE MUST BE ⩾ OCT. 1752'∘⍞PT←20
    ∇
```

```
    ∇Z←MG4 N;M;T
[1]   →3×⍳0=4|N
[2]   →0∘⍞←'NOT FORM 4×N'
[3]   M←(N,N)⍴(⍳N)∈(1+N-T),T←(N÷4)?N÷2
[4]   Z←((~M)×⊖Z)+M×Z←(N,N)⍴⍳N*2
[5]   M←⌽(N,N)⍴(⍳N)∈(1+N-T),T←(N÷4)?N÷2
[6]   Z←((~M)×⌽Z)+M×Z
    ∇


    ∇Z←MAGICSQ X;M
[1]   →(0≠2⊤X)/3
[2]   →0∘⍞←'NOT ODD ORDER'
[3]   M←(X,X)⍴⍳X×X
[4]   Z←(⌈X÷2)⌽(¯1+⍳X)⊖(¯1+⍳X)⌽M
    ∇



NAMES IN GROUP 100:
IWT  ILT


    ∇IWT;NMS
[1]   ∘⍞'COPYRIGHT - MCM 1975'
[2]   →0∘⍞'WRONG PROCEDURE'∘→3⌈⍳0=⍴,⎕XV
[3]   (⍳0)⎕XI 0
[4]   0 ⎕XC NMS←⎕XN[1+⎕IO]1
[5]   1 ⎕XR[1+⎕IO]NMS∘⎕XS 0
[6]   L1:NMS←6↑(10↓(10+⎕IO)⍞'LIB NAME:→      ←'),6⍴' '
[7]   →L1∘⍞'ILLEGAL NAME'∘→L2⌈⍳∧/(2 3⍴'MCM   ')∨.≠3↑NMS
[8]   L2:ΔΔΔ[⎕IO;]←' ',NMS
[9]   Δ_Δ[⎕IO;⎕IO]←⌊1E6|100⊥⍟6↓(6+⎕IO)⍞'DATE: YY MM DD'
[10]   ⎕WC∘⍞'DO: ⎕XS 0'
    ∇


    ∇ILT;Δ0Δ;Δ1Δ;ΔPΔ;ΔQΔ
[1]   ∘⍞'COPYRIGHT MCM 1975'
[2]   →0∘⍞'WRONG PROCEDURE'∘→3⌈⍳2=⎕NC'ΔΔΔ'
[3]   Δ1Δ←1+⌈/(Δ1Δ<100)/Δ1Δ←Δ_Δ[;1+⎕IO]
[4]   Δ7Δ:∘⍞'MOUNT TAPE'
[5]   ∘⎕OU Δ0Δ∘→Δ8Δ⌈⍳1<8|¯1↑⎕OU 201∘Δ0Δ←1↑⎕OU⍳0
[6]   Δ1Δ←⍟8↓(12+⎕IO)⍞'TAPE NO.',5 0 0⍕Δ1Δ
[7]   →Δ9Δ⌈⍳(0≠1|Δ1Δ)∨99<1E3|Δ1Δ
[8]   →Δ9Δ⌈⍳(9099<Δ1Δ)∨1≠×/⍴Δ1Δ
[9]   ΔQΔ[⎕IO;1+⎕IO]←Δ1Δ∘ΔQΔ←1 4↑Δ_Δ
[10]   ΔPΔ←1 7↑ΔΔΔ
[11]   (⍳0)⎕XI[1+⎕IO]0∘⎕XF[1+⎕IO]⍳0
[12]   0 ⎕XW[1+⎕IO]'ΔPΔ ΔQΔ'
[13]   →0∘→Δ7Δ⌈⍳1E3<Δ1Δ←2E3|1E3+Δ1Δ∘⎕XF[1+⎕IO]⍳0
[14]   Δ9Δ:→0∘⍞'INVALID TAPE NO.'
[15]   Δ8Δ:→0∘⍞'NO TAPE'∘⎕OU Δ0Δ
    ∇
```

```
NAMES IN GROUP 101:
EJΔ  RLΔ  MMΔ  PPΔ  HQ   ΔLΔ  PRΔ  DIΔ


    ∇EJΔCT
[1]   PLΔ[⎕IO]←0∘⍞←((PSΔ[1+⎕IO]-1↑PLΔ),1)⍴' '
    ∇


    ∇RLΔ N
[1]   →NT⌈⍳0≠1↑PLΔ
[2]   PT:⍞←TTΔ,((⍴TTΔ)-⎕PW)↑(⎕PW⍴' '),' PAGE ',0 0 0⍕1↓PLΔ
[3]   PLΔ←PLΔ+2 1∘⍞←''
[4]   NT:→(PSΔ[⎕IO]<N+2,1↑PLΔ)/0,NP
[5]    →0∘PLΔ←PLΔ+N,0
[6]   NP:→PT∘N←0∘PLΔ[⎕IO]←N∘EJΔCT
    ∇


    ∇R←MMΔ X
[1]    →TE⌈⍳2=⍴⍴R←X
[2]    R←((×/¯1↓⍴X),¯1↑1,⍴X)⍴X
[3]   TE:→0×⍳0≠¯1↑⍴R
[4]    R←R,0\0⍴X
    ∇


    ∇N PPΔ X;I;M;NR;P
[1]    I←0∘N←1↑N∘M←¯1↑N∘P←1↑PSΔ
[2]   LP:→0×⍳0=NR←(N-I)⌊⌊(P-P|1↑PLΔ)÷M
[3]    ⍞←X[I+⍳NR;]∘RLΔ NR×M
[4]    →LP∘I←I+NR 4]
    ∇


    ∇R←HQ
[1]   R←1
[2]   LP:→OK⌈⍳66=1↑1↓⎕OU R
[3]   →0∘⎕OU 0∘→LP⌈⍳0≠R←10|R+1
[4]   OK:∘⎕OU R,16
    ∇


    ∇RΔ←ΔLΔ GNΔ;EΔ;GΔ;IΔ;MΔ;NΔ;NMΔ;PLΔ;PSΔ;TTΔ
[1]   GNΔ←GNΔ,(0=×/⍴GNΔ)/(8⩽2↓Δ_Δ[;3+⎕IO])/2↓Δ_Δ[;⎕IO]
[2]   →EXΔ⌈⍳0=⍴GNΔ←ΔFΔ GNΔ
[3]   →0×⍳0=IΔ←HQ
[4]   →0×⍳~2|¯1↑⎕OU IΔ,64∘⎕BO 120
[5]    'POSITION PAPER'∘⎕PT←200∘PSΔ←48 51,⎕PW←80
[6]   LGΔ:NΔ←×/⍴NMΔ←⎕XN GΔ←1↑GNΔ∘PLΔ←0 1
[7]   TTΔ←6 0 0⍕Δ_Δ[MΔ←''⍴⌽ΔYΔ GΔ;2+⎕IO]
[8]   TTΔ←' (',(⍕GΔ),')  SAVED:',(9⍴0 1 1)\TTΔ
[9]   TTΔ←'GROUP: ',ΔΔΔ[⎕IO;],' ',ΔΔΔ[MΔ;],TTΔ
```

```
[10]    IΔ←⎕IO∘'CONTENTS:'PRΔNT(1,NΔ)ρNMΔ
[11]   LNΔ:EΔ←(~GΔ∈0,⎕XV)/NΔ←NMΔ[IΔ;]
[12]    →DNΔ⌈ι(⎕NC EΔ)∈0 4
[13]    →ENΔ∘(NΔ,':')PRΔNT '*** CONFLICT ***'
[14]   DNΔ:⎕EX EΔ∘DIΔSP NΔ∘GΔ ⎕XR EΔ
[15]   ENΔ:→LNΔ⌈ι(⎕IO+1↑ρNMΔ)>IΔ←IΔ+1
[16]   Δ_Δ[MΔ;3+⎕IO]←8|Δ_Δ[MΔ;3+⎕IO]
[17]    →LGΔ⌈ι0<ρGNΔ←1↓GNΔ∘EJΔCT
[18]   EXΔ:RΔ←'END OF LIST'
[19]   ⎕PT←0∘⎕OU(1↑⎕OUι0),7×32
    ∇


     ∇P1 PRΔNT P2;N;R1;R2
[1]    R1←⌈(ρP1←MMΔ P1)÷1,⎕PW
[2]    R2←⌈(ρP2←MMΔ P2)÷1,⎕PW SP
[3]    →SP⌈ιPSΔ[⎕IO]<N←1+(×/R1)+×/R2
[4]    →0∘⎕←''∘⎕←P2∘⎕←P1∘RLΔ N
[5]   SP:RLΔ ¯5∘RLΔ 5
[6]    R2 PPΔ P2∘R1 PPΔ P1
[7]    ⎕←''∘RLΔ 1
    ∇


    ∇DIΔSP XΔ;DΔ;NΔ;TΔ
[1]    →ERΔ⌈ι1≠¯1↑1,¯1↓ρXΔ
[2]    →(NVΔ,VAΔ,VAΔ,FNΔ,ERΔ,A2Δ)[⎕IO+⎕NC XΔ]
[3]   ERΔ:+'INVALID NAME'
[4]   NVΔ:→0∘(XΔ,':') PRΔNT '** NO VALUE **'
[5]   A2Δ:→0∘(XΔ,':') PRΔNT '** α2 **'
[6]   VAΔ:TΔ←'(',(⍕ρDΔ),((0≠0\0ρDΔ←⍎XΔ)/',''),')'
[7]    →0∘(XΔ,TΔ,':') PRΔNT DΔ←⍕DΔ
[8]   FNΔ:NΔ←1↑ρDΔ←⎕CR XΔ
[9]    TΔ[;⎕IO]←']'∘TΔ←5 0 0⍕(ιNΔ)∘.-,⎕IO
[10]    TΔ[;⎕IO]←'['∘TΔ←(5-(TΔ≠' ')⊥1)⍕TΔ
[11]    TΔ[⎕IO;]←'    ∇'∘DΔ[⎕IO;⎕IO]←' '
[12]   ∘⍎NΔ←'TΔ←(1 0×ρDΔ)ρ''''∘DΔ←TΔ,DΔ'
[13]   DΔ PRΔNT '    ∇ '
    ∇



NAMES IN GROUP 200:
Y    M    M1   NAM  S    PS   DD   PD   MM   H    MON  DAT
PM

Y     [12 by 6 numeric array; element size 3 byte(s)]
767265 791386 779325 952591 950890 880609 880609 880609 880609 880609 880609
880609
114621 123739 122314 165220 247500 243481 242506 242506 242506 242506 242506
242506
471098 466819 559703 380902 329451 374722 338373 338373 338373 338373 338373
338373
327899 332997 333582 251832 281104 265729 264755 264755 264755 264755 264755
264755
109292 653135 339635 479483 349335 291251 291251 291251 291251 291251 291251
```

291251
447497 454487 454487 391619 544960 510561 426038 426038 426038 426038 426038
426038

M   [6 by 33 numeric array; element size 1 byte(s)]
0 0 0 0 0 100
0 0 0 0 100 0
25 50 0 15 0 10
0 0 100 0 0 0
85 0 0 15 0 0
100 0 0 0 0 0
100 0 0 0 0 0
80 20 0 0 0 0
100 0 0 0 0 0
75 0 25 0 0 0
0 0 80 20 0 0
100 0 0 0 0 0
80 0 0 20 0 0
0 0 90 10 0 0
0 0 100 0 0 0
0 10 0 90 0 0
0 50 0 50 0 0
0 0 100 0 0 0
0 20 0 20 0 60
0 0 100 0 0 0
0 0 0 0 100 0
0 0 0 0 100 0
0 0 100 0 0 0
0 0 0 0 100 0
0 0 0 0 100 0
0 0 100 0 0 0
0 0 0 0 75 25
0 0 0 0 0 100
0 0 100 0 0 0
25 50 0 25 0 0
0 0 0 0 30 70
0 0 0 0 0 100
0 0 0 0 100 0

M1   [6 by 33 numeric array; element size 1 byte(s)]
0 0 0 0 0 100
0 0 0 0 50 50
10 20 10 50 10 0
0 0 100 0 0 0
70 0 15 15 0 0
50 0 50 0 0 0
100 0 0 0 0 0
60 25 0 15 0 0
75 0 25 0 0 0
50 0 50 0 0 0
0 0 80 20 0 0
100 0 0 0 0 0
80 0 0 20 0 0
0 0 90 10 0 0

```
15 0 85 0 0 0
0 10 10 80 0 0
0 50 0 50 0 0
0 0 100 0 0 0
0 20 0 20 0 60
0 0 100 0 0 0
0 0 0 0 100 0
0 0 0 0 100 0
0 0 100 0 0 0
0 0 0 0 100 0
0 0 0 0 100 0
0 0 100 0 0 0
0 0 0 0 75 25
0 0 0 0 0 100
0 0 100 0 0 0
25 50 0 25 0 0
0 0 0 0 30 70
0 0 0 0 0 100
0 0 0 0 100 0
```

```
NAM   [13 by 33 array of type char; element size 1 byte(s)]
CASHIN
WOLFE
RAMER
WALLACE
LARAYA
COPELAND
ARPIN
EDWARDS
SEEDS
SWANSON
MOFFATT
FARNELL
HICKS
QUINTANA
RAMOS
RIVINGTON
JONES
NUGENT
BROWN
PERO
ANDREWS
HANSWILLE
BROWN
GORKA
VINETTE
TUCKER
MILLER
THURSTON
MABEE
PRESTIGIACOMO
BERG
WALLACE
HARRIS
```

```
S     [12 by 33 numeric array; element size 3 byte(s)]
90667 90667 90667 100667 86134 81600 0 0 0 0 0 0
182160 182160 182160 182160 173052 163944 163944 163944 163944 163944 163944
163944
182120 182120 182120 182120 176814 167508 167508 167508 167508 167508 167508
167508
0 13777 76661 73674 69990 78832 0 0 0 0 0 0
157872 157872 157872 157872 149978 142085 142085 142085 142085 142085 142085
142085
102666 102666 102666 102666 97533 92399 92399 92399 92399 92399 92399 92399
160827 160827 160827 160827 152786 144744 144744 144744 144744 144744 144744
144744
201006 241208 221107 221107 210052 198996 198996 198996 198996 198996 198996
198996
150700 150700 150700 150700 143165 135630 135630 135630 135630 135630 135630
135630
95744 95744 95744 60928 87040 91703 91703 91703 91703 91703 91703 91703
119680 119680 119680 119680 113696 107712 107712 107712 107712 107712 107712
107712
83014 83014 83014 83014 78863 74713 74713 74713 74713 74713 74713 74713
66352 66352 66352 66352 38796 0 0 0 0 0 0 0
70224 70224 70224 70224 66713 63202 63202 63202 63202 63202 63202 63202
58573 58573 58573 58573 55644 52716 52716 52716 52716 52716 52716 52716
158333 158333 158333 158333 150416 142500 142500 142500 142500 142500 142500
142500
13725 7200 14400 13050 14985 24240 24240 24240 24240 24240 24240 24240
47409 49703 49703 43402 0 7517 50000 50000 50000 50000 50000 50000
26250 37900 37900 37900 47743 42787 37916 37916 37916 37916 37916 37916
20350 0 0 0 0 0 0 0 0 0 0 0
0 79733 56333 56333 26146 0 0 0 0 0 0 0
0 174010 174010 0 0 0 0 0 0 0 0 0
0 0 30000 17875 0 0 0 0 0 0 0 0
0 140100 0 90990 0 0 0 0 0 0 0 0
0 150000 0 150000 0 0 0 0 0 0 0 0
0 0 0 13200 14288 0 0 0 0 0 0 0
0 0 0 0 0 69743 69743 69743 69743 69743 69743 69743
0 0 0 0 0 74102 74102 74102 74102 74102 74102 74102
0 0 0 0 16770 69680 69680 69680 69680 69680 69680 69680
0 0 0 0 170000 170000 170000 170000 170000 170000 170000 170000
0 0 0 0 250000 250000 250000 250000 250000 250000 250000 250000
250000 250000 250000 250000 237499 120000 120000 120000 120000 120000 120000
120000
0 0 0 0 75137 0 0 0 0 0 0 0
```

```
    ∇PS;I;T
[1]   □PP←8∘□PW←130∘□OU 1
[2]   □←'                              SALARIES, ACTUAL AND PROJECTED FOR 1975',
(30ρ' '),DAT
[3]   □←MON∘□←''∘I←1
[4]   □←''
[5]   □←(5 0 0⍕I),10 2 0⍕.01×S[I;] 0
[6]   →((1↑ρS)≥I←I+1)/5
[7]   □←''∘□←'MONTH TOTALS'∘□←''
```

```
[8]   ⎕←'     ',10 2 0⍕T←.01×+⌿S
[9]   ⎕←'YEAR TOTAL:  ',10 2 0⍕+/T∘⎕←''
    ∇


    ∇DD X;X1;MX
[1]   MX←⌽'M',(3≥X1←''⍴1↑X)/'1'
[2]   ⎕←Y[;X1]←[.5+.01×+⌿MX×⍉6 33⍴S[;X1]
[3]   →(0<⍴X←,1↓X)/1
    ∇


    ∇PD;I;T
[1]   ⎕PP←8∘⎕PW←130∘⎕OU 1∘I←1
[2]   ⎕←'                    PROJECTED SALARY DISTRIBUTION FOR 1975',(30⍴' '),DAT
[3]   ⎕←(8⍴' '),(,0 ¯1↓12 10⍴8↓MON),'  TOTAL'∘⎕←''∘T←.01×+/Y
[4]   ⎕←H[I;],(9 2 0⍕.01×Y[I;]),10 2 0⍕T[I]∘⎕←''
[5]   →((1↑⍴Y)≥I←I+1)/4
[6]   ⎕←125⍴'¯'∘⎕←''
[7]   ⎕←'TOTAL: ',(9 2 0⍕.01×+⌿Y),10 2 0⍕+/T
    ∇


    ∇MM;I
[1]   I←0
[2]   I←I+1
[3]   S[I;6]←1↑⌽1⍳⍨⍕S[I;6],I
[4]   →2×⍳I<1↑⍴M
    ∇

H     [7 by 6 array of type char; element size 1 byte(s)]
ENG DIR
ENG O H
MAN DIR
MAN O H
MRKTING
G ∧ A


MON   [vector of type char of length 128; element size 1 byte(s)]
        JANUARY   FEBRUARY  MARCH     APRIL     MAY       JUNE      JULY
AUGUST    SEPTEMBER OCTOBER   NOVEMBER  DECEMBER

DAT   [vector of type char of length 10; element size 1 byte(s)]
JULY 28/75


    ∇PM;I;T
[1]   ⎕PP←8∘⎕PW←130∘⎕OU 1∘I←1
[2]   ⎕←''∘⎕←(30⍴' '),'PERCENTAGE SALARY DISTRIBUTION',(20⍴' '),DAT
[3]   ⎕←'NUM.  NAME',(18⍴' '),T,'JAN - MAR',(22⍴' '),(T←'DISTRIBUTION FOR '),'APR - DEC'
[4]   ⎕←(18⍴' '),T,T←,H,6 1⍴' '∘⎕←''
[5]   ⎕←''
[6]   ⎕←(2⍕I),'  ',NAM[I;],8 0 0⍕M1[I;],M[I;]
[7]   →((1↑⍴M)≥I←I+1)/6
    ∇
```

```
NAMES IN GROUP 206:
LIΔ  DXΔ  RLΔ  CGΔ  DTΔ


    ∇LIΔST GNΔ;FVΔ;IΔ;GΔ;NΔ;NMΔ;NΔΔ;TΔ;PLΔ;PSΔ;MΔ
[1]   →L5Δ⌈⍳MΔ←0≠⍴GNΔ←,GNΔ
[2]   ⍞EX'ΔMΔ'∘GNΔ←,ΔMΔ∘0 ⍞XR'ΔMΔ'
[3]   L5Δ:GNΔ←GNΔ[⍋GNΔ←((GNΔ⍳GNΔ)=⍳⍴GNΔ)/GNΔ]
[4]    PSΔ←48 51,⍞PW←80∘⍞OU 1 16∘PLΔ←⍞IO←0
[5]   L1Δ:→EΔ⌈⍳0=⍴GNΔ
[6]    NMΔ←⍞XN GΔ←GNΔ[0]
[7]    RLΔ 1+FVΔ←2+⌈(×/⍴NMΔ)÷80
[8]    ⍞←' '∘⍞←'LISTING GROUP: ',⍕GΔ∘IΔ←¯1
[9]    →L2Δ∘⍞←' '∘⍞←(([⌈(×/⍴NMΔ)÷80),80)⍴NMΔ⍪40 4⍴' '∘→L4Δ⌈⍳3=FVΔ
[10]   L4Δ:⍞←' '∘⍞←,NMΔ
[11]   L2Δ:→E1Δ⌈⍳(IΔ←IΔ+1)=1↑⍴NMΔ
[12]    →L3Δ⌈⍳0=(NΔΔ←NΔ←NMΔ[IΔ;])⍞ZZ DTΔ
[13]    →L3Δ⌈⍳GΔ=CGΔ∘NΔΔ←''
[14]    →L2Δ∘DXΔ NΔ∘⍞←''∘⍞←'***CONFLICT: ',NΔ∘RLΔ 1
[15]   L3Δ:→L2Δ∘⍞EX NΔΔ∘DXΔ NΔ∘GΔ ⍞XR NΔΔ
[16]   E1Δ:PLΔ←0∘RLΔ 1+PSΔ[⍞IO]-PLΔ
[17]    →L1Δ∘GNΔ←1↓GNΔ
[18]   EΔ:0 ⍞XW'ΔMΔ'∘ΔMΔ←⍳0∘→E2Δ⌈⍳MΔ
[19]   E2Δ:⍞OFF∘→0
    ∇


    ∇DXΔ XΔ;DΔ;NΔ;NMΔ;OΔ
[1]   →(VΔΔ,FΔΔ,VΔ,VΔ,VΔ,A2Δ)[XΔ ⍞ZZ DTΔ]
[2]   FΔΔ:⍞EX NΔΔ∘RLΔ 2+NΔ←1↑⍴DΔ←⍞CR XΔ
[3]   DΔ←(6 1 0⍕(NΔ,1)⍴⍳NΔ),DΔ
[4]   DΔ[;(3-⍴⍕¯1+NΔ),4 5]←(NΔ,3)⍴'[] '
[5]   DΔ[0;⍳7]←'     ∇ '
[6]   ⍞←DΔ
[7]   FΔ:→EΔ∘⍞←'     ∇'
[8]   VΔ:RLΔ 2+1⌈×/¯1↓⍴DΔ←⍪XΔ
[9]   NMΔ←'(',(⍕⍴DΔ),((0≠0\0⍴DΔ)/''''),')'
[10]   NMΔ[(' '=NMΔ)/⍳⍴NMΔ]←','
[11]   →EΔ∘⍞←⍕DΔ∘⍞←XΔ,':  ',NMΔ
[12]   A2Δ:→EΔ∘⍞←XΔ,'  α2'∘RLΔ 2
[13]   VΔΔ:⍞←XΔ,' NO VALUE'∘RLΔ 2
[14]   EΔ:⍞←''
    ∇


    ∇RLΔ N
[1]   →0×⍳PSΔ[0]⩾PLΔ←PLΔ+N
[2]   PLΔ←N∘⍞←(((PSΔ[1]-PSΔ[1]|PLΔ-N)-4×¯1+⌊PLΔ÷PSΔ[0]),1)⍴' '
    ∇

CGΔ   [numeric scalar: element size=1 byte(s)]
81
```

```
DTΔ   [vector of type char of length 52; element size 2 byte(s)]
0630 5146 E01B 70A2 0B46 7B00 2546 7500 CF30 D725 C7F9 30CF FAD0 25F9 31FA 46EB
07B0 2B46 CE00 3C11 48AC 0B2E 0036 013D 1E01 4634 073D 3E00 4601 1D2E 2036 300E
0246 ED03 2BDF 15E7 0D3E 0211 2B3E 01C3 B033 3E04 2546 D100 2410 2BD7 353E 03C2
2402 2B3E 0507 0066
```