

# Roots (Model A)

You are about to see your infallible micro make an unbelievably simple mistake - that even a four year-old child would spot!

In the section of the program where you are asked to enter numbers yourself, we have actually included an ABS function to help your computer out of its predicament! Computers are happiest in Binary arithmetic but would probably settle for Hexadecimal as a compromise - but if we humans insist that micros communicate with us in the Decimal system then we have only ourselves to blame if the computer seems to get it wrong occasionally.

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1 REM *** BBC VERSION ***
2 REM ***   ROOTS      ***
10 FORX=224TO230:VDU23,X:FORY=0TO7:READA:V
DUA:NEXT,
20  MODE6:PRINTTAB(16,0)"ROOTS."TAB(16)"
====="
30  VDU28,1,24,38,2,19,1,6;0;
40  PRINTTAB(0,23)"This program calculate
s roots using both the internal '^' functio
n in the computer ROM and the NEWTON/RAPHSON
reiterative approximation."
50  PRINT'"When is a 5 not a 5 ??'"
60  PRINT'"The program will demonstrate o
ne of the problems faced by your computer
when it tries to convert the result of its bi
nary system calculations into decimal for d
isplay on the screen."
70  PRINT'"Although we would need to empl
oy machine code methods to actually see
the BIT difference between two seemin
gly identical numbers, we can"
80  PRINT"show you the 'impossible' as yo
ur computer fails to recognise the number
for which it is searching!"
90  PRINT'"                               Press SPACE.";:REP
EATUNTILINKEY(-99)
100 PRINT'"'"Any root may be calculated

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by          reiterative approximation using"
110  PRINT"      A = 1"CHR$227"      N      + G*(
R-1)"CHR$229'"      R"CHR$228"G^(R-1)
      "CHR$230
120  PRINT"Where N=original number""
R=root required""      G=any number(constan
t)""      A=approximation to R"CHR$224" N"SP
C(17)"produced by the formula."
130  PRINT'"If A<>G then we let G=A and re
peatedly apply the formula, making G equal to
the preceding value of A until A=G. At this p
oint A= "CHR$224" N"
140  PRINT'"'"'      Press SPACE.";:R
EPEATUNTILINKEY(-99)
150  PRINT'"'"'      A = 1"CHR$227"      N
+ G*(R-1)"CHR$229'"      R"CHR$228"G^(R-1)
      "CHR$230
160  PRINT'"Example to find "CHR$225;CHR$2
24"16"
170  PRINT'"Let G=3 (A reasonable guess s
ince"CHR$225;CHR$224"16=4 as you know!)"
180  G=3:N=16
190  GOSUB210
200  GOTO220
210  A=(N/G+G)/2:RETURN
220  PRINT"G=";G" gives A=";A
230  PRINT'"We now let G=";A" and try""th
e formula again."'
240  G=A:GOSUB210
250  PRINT"G=";G" gives A=";A
260  IFA=G GOTO280
270  GOTO240
280  PRINT'"Therefore "CHR$225;CHR$224"16=
";A
290  PRINT"This computer says that "CHR$22
5;CHR$224"16=";SQR(16)
300  PRINT'"      Press SPACE.";:REPE
ATUNTILINKEY(-99)
310  PRINT'"'"'"Example to find "CHR$225;
CHR$224"25"
320  PRINT'"Let G=3 again ("CHR$225;CHR$22
4"25=5 as we know!)"'
330  G=3:N=25:GOSUB210
340  PRINT"G=";G" gives A=";A
350  PRINT'"We now let G=";A" and try""th

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e formula again." '
360   G=A:GOSUB210
370   PRINT"G=";G" gives A=";A
380   IFA=G GOTO400
390   GOTO360
400   PRINT"Therefore "CHR$224"25 = ";A
410   PRINT"But the computer failed to sto
p on thefirst G=5 gives A=5 because G does no
tequal exactly 5!!"
420   PRINTTAB(0,24)"Press R to repeat exa
mples or SPACE";: *FX15
430   X$=GET$:IFX$="R" GOTO150 ELSE IFX$<>"
" GOTO420
440   CLS
450   INPUTTAB(0,5)"Enter your number (N) "
N$:IFN$="Q" END ELSEIFVAL(N$)<=0 GOTO450
460   N=VALN$:IFN>1E7 GOTO450
470   INPUTTAB(0,8)"Enter number of desired
root"R$:IFVAL(R$)<=0 GOTO470
480   R=VALR$:IFR<2 OR R>99 GOTO470
490   G=2*(N^(1/R)):X=1
500   CLS:PRINTTAB(0,4)"Number ";N"Root ";
R"Let G=";G'
510   A=(N/G^(R-1)+G*(R-1))/R
520   PRINT"<;X> G=";G" gives A=";A
530   IFABS(A-G)<G/1E9 GOTO550
540   X=X+1:G=A:GOTO510
550   PRINT'''"The ";R" root of ";N" is ";A
560   PRINT'"The computer function says tha
t the";R" root of ";N" is ";N^(1/R)
570   PRINT'"          Press SPACE":REPEATU
NTILINKEY(-99)
580   CLS:PRINTTAB(0,4)"Enter 'Q' to quit o
r "
590   GOTO450
600   DATA31,16,16,16,144,80,32,0
610   DATA112,144,32,64,240,0,0,0,240,16,11
2,16,240,0,0,0
620   DATA2,4,8,8,16,16,32,32,32,16,16,8,8,
4,2,0,64,32,16,16,8,8,4,4,4,8,8,16,16,32,64,0
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