Vol. II 91.19 A40 B156(151) C52186(2.19) D52 三九答為千今 Now we have area, two hundred and 百百旦方五有 thirty four thousand, five hundred and sixty-seven . # 六四幾百積 We ask: be this a square of edge 十十万何。六一 how much? Answer saith: four hundred and 一八八十十 eighty-four to three hundred and 分十七三 eleven nine-hundred and sixty-eighths of 步四步。萬 之步 閏四 J234567-452 = 484 311 45 Here we have an algorithm for computing the square root. Method saith: put down the area, two hundred and thirty four thousand, five hundred and sixty seven to, as the dividend. 百份行 六目。 十畳 DE LANG 十續 Dividend, &: d = 234567 步二 d 1 234567 為十 零三 THE THE PARTY IN

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Next, bornow one rod, to be the lower divisor. IT	了步欢
Next, bornow one rod, to be the lower divisor. It's step it, jumping over one place, unto the hundreds, It and step.	一之借
and step. lever	#D . K
	超一
起: 比也, jumping ever, or stapping	一算
ise take double steps, so 100 is in fact 10000.	
	位,为
Number of digits of radicand: ASSE N:= [legro d] + 1 = 6 Number of digits of spirited part of square mot;	至下
N:= [legto d] + 1 = 6	1000
Number of digits of spin the part of square mot;	页选。
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12 Txt . Cth	1
Lower divisor, Fitz: (take n-1=2 double steps,	1 1 1 1 1 1
$L := (10^{n-1})^2 = 10^4$	· V
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d 1 意 234567	To Table 1
	31-7-1
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	To was 1
Largest a such that $a^2L \leq d$,	<u> 191</u>
or $10000 a^2 \le 234567$	174
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and the state of t	於
上海 4	/J(
d \$ 234567	晋
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Versions A & C are mady have just 圈 Ror 上商.	-
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Substitionly, put down forty-thousand below and above the lower divisor, its name & upright divisor.	the durdena,
and above the lower divisor its name of	the it is
lynght divisor,	7) [1]
5 = (morally) upright	上,萬
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康进: incompt divon	為實
腾连: honest divisor 腾	15 BUNG
which I refer to hence forth as the shaight of	livisors, B.Z
which shought as in straight appear, a	
to or bent copper.	the letter of the last
Dupright druison, 方谜 (1st straight)	divisor:
D:= aL = 4 x 10000 = 400	1.75
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d 8. 234567	5 44
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Command the upper quotient's four hund	dred to dride the bi
dividend.	
解: duide; or remove from	12
	- X 40000
d := d - ap = 234567 - 4 $= 74567$	
(Actually the text only di-d- 4002 La	it the Ame of one
Destruction of extended appropriate planed 1	a the form above
generalize property.)	17
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	n A	. (6
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		١.
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The upright alivison retreateth one the lower divisor retreateth two	again it its	
1) + there the again;		
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Versions A&C missing 方战 for P := 1/10 = 80000/ L := L/100 = 10000/	10 = 8000	
I:= I/100 = 10000/	100 = 100	
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上 下法一门		
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largest b such that	為五	. 1
6(p+6L) < d	7	
or $b(8000 + 100b) \leq 7456$		
13 6:=8; this R the tens o	ight of IM	
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	the incompt divion.	之八
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•	Incomint divisor, 2 2 (2nd straight divisor):	上百
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•	eighty, to divide the dividend.	一大原
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	~ 2
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the lavor distor retreateth again.	去法
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to follow the upright divisor Fire in its rebreat.)	再一
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9:= 9/10 = 1600/10 = 160 0 7001 8	
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or c (800 + 160 + c) \(\le 416/	
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Dividend (\$) d:= X Upper quotient (£ 1/8) digits alc-list := [] Straight divisus, i.e. upright, incompt, honest divisus (5/4/4/10) gyn-list := [] White True Determine largest integer a such that \(\int(2944+10)\) + \(\alpha\) = d Neirest straight divisor: P:= \(\int(2)\) Amend \(\rho\) to gyn-list: Update the straight divisor d:= d - \(\alpha\) (p+q+r+) Double the natest graight divisor	
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d:= x · Upper quotient (t 19) digits abc-list := [] · Strought divisus, i.e. upwight, incompt, honest divisus (FAMILIA) gyn-list := [] White True · Determine largest integer a such that \(\alpha \) [paque) + \(\alpha \) \(\alpha \) · and Append \(\alpha \) to acc-list. · Neirost straight divisor: p:= \(\alpha \) Append \(\beta \) to pyn-list: · thetale that all Divide the dividend (PAMZ) d:= d - \(\alpha \) (p+q+r+) · Double the naiest groupht divisor	
· Upper quotient (上傳) digits abc-list := [] · Straight divisors, i.e. upwight, incompt, honest divisors (方無情流) gyn-list := [] White True · Determine largest integer of such that ox [(244+10)+ ox]] ≤ d · cook Appard of to dox-list. · Neirest straight divisor: p:= ox Appard p to syn-list: · the date time of Divide the dividend (音形) d:= d - ox (2+q+r+) · Double the racest graciful divisor	d:=x
abc-list := [] Straight divisors, i.e. upwight, incompt, honest divisors (FARMINE) gyr-list := [] White True Determine largest integer of such that \(\sigma [paq+1] \) + \(\sigma] \(\sigma) + \(\sigma] \) Neirot shright divisor: P:= \(\sigma \left \) Append \(\rho \) pyr-list: Other that \(\sigma \rho \) pyr-list: Other divide the divident (PAP2) d:= \(d - \pi (p+q+r+) \) Double the najest graight divisor	· Upper quotient (1 %) digits
white True • Determine largest integer of such that $\infty[(p+q+p-1)+\alpha L] \leq d$ • and Append α to abortist. • Neurot straight divisor: $\rho := \alpha L$ Append ρ to syn-list: • Update that α Divide the dividend (PAPE) $d := d - \alpha (p+q+r+1)$ • Double the namest grought divisor	abc-list = [
white True • Determine largest integer of such that $\infty[(p+q+p-1)+\alpha L] \leq d$ • and Append α to abortist. • Neurot shright divisor: $\rho = \alpha L$ Append ρ to syn-list: • that the third Divide the dividend (PAPE) $d := d - \alpha (p+q+r+1)$ • Double the namest grought divisor	· Straight divisas, i-e. upright, incompt, honest divisas (方康附記)
while True Determine largest integer of such that $\propto [pqq+10]+ \propto 1 \leq d$ Repeat Append \propto to doc-list. Neinest shright divisor: $\rho := \propto L$ Append ρ to syn-list: Otherst shright divisor $d := d - \propto (p+q+r+)$ Double the newest growight divisor	pyn-list := []
· Determine largest integer of such that $\propto (p+q+m)+ \propto (1 \le d)$ · Cook Append \propto to abortist. · Neirest straight divisor: p:= $\propto L$ Append ρ to syntist: · Update the trained Divide the dividend (PAVZ) $d := d - \propto (p+q+r+)$ · Double the newest grought divisor	While True
News straight aimson: $ \rho := \alpha L $ Amend ρ to sign-list: • the date the trained Divide the dividend (PAVZ) $ d := d - \alpha (p + q + r +) $ • Double the natest graight divisor	· Determine largest integer a such that $\propto (999+10)+ \propto L \leq d$
News straight ainson: $ \rho := \alpha L $ Amend ρ to sign-list: • that is the trained Divide the dividend (PAVZ) $ d := d - \alpha (p + q + r +) $ • Double the natest graight divisor	· and Appard & to about tist.
Amend ρ to syntist: • that the transformation of the dividend (PAPE) $d := d - \alpha (p + q + r +)$ • Double the newest growth divisor	· Neiret shaight din3or:
otherwise Divide the dividend (17-12) $d := d - \alpha (p + q + r +)$ • Double the newst growth divisor	
otherwise Divide the dividend (17-12) $d := d - \alpha (p + q + r +)$ • Double the newst growth divisor	Amend p to syntist.
$d := d - \alpha (p + q + r +)$ • Double the newst graight divisor	· thodate thinked Divide the dividend (PAPE)
· Double the newst grought divisor	$d := d - \alpha (p + q + r + \dots)$
	· Double the natest ground divisor
p:= 2p, where p is the last clamant of parties.	p := 2p, where p is the last clamant of service.

```
. If not done, retreat; otherise Great loop.
   If L>1
      aprilot:= pgriot/10
          L := L/100
   FISO
     Break
  tndIf
Endhlile
 · upper quotient
   U= 10n-1 a+10n-2 b+10n-3 c+...
  L= 2+9trt ...
   Ri= A
Return U+R/L.
For an implementation in Python, see (code / shuen-sqrt.py
Why does this work? Store at the following identition for a
long time: = 102. a2 + 1- b (200+6)
 (100 a +106+c) = 104. a2 + 102.6(00a+6)
                         + 1.c(200a+20b+c)
(1000 a + 100b + 10c+a)2
 = 106 a2 + 104 b (20a+6)
       +10° c(2000+20b+c)
         + 1. d(2000 a + 2006 + 20c+d)
           ek.
```

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