

5à ' !KÂNİ5à?Ô , ð2ö á,X#Å z ÝL\$,X , ð2ö
 D Ô n?UE' Ô#Å !6Ñ9< k ð2ö4\$ p , E- ã G- #Å z
 ì ð2ö K Ý` S z ì ð2ö Ô ,X` Û ù , 5à è S
 *ü S z ì ð2ö 3 á ÃÑ üEW# ,X ð2ö ò Þ ¼ !9<
 k ð2ö4\$ p . S*ü S z ì ð2ö,X5 &• ü bLÔ?U4È x
 Ô Þ E` Î,XKó ë ± , ð2ö á(Š Ō , 1k"© î ÝEWP-
 ,XONKÈ á z [13].

V p S*ü#Å z ì ð2ö , + b Æ4£ ð2öE>4\$&•,X
 Ý á ·4\$&•FÑ Ã 1 á a ± , , LÔ?U ± ,,X ð2ö á(Š
 Ō ù û £ á . ð2ö á,X(Š ŌLÔ?UA,,) ü Ü , V p S
 *ü JavaScript P-4(AÁ?ÔKÈ yEæ &,X/ß cA'Au • ã G
 Ã\1T â,X r), ð2ö Ü , à Ê , #Å z ì ð2ö üE- ÞKÁ
 NI Þ,X ° Ô Þ ì " V p Ý Ô 5 ð2öCÁ X ð2ö Ý
 -½ 6 + !7 • 6,X • , _ V Î), Ò 4(a) /,X ™ % ,
 G Ã,È y4\$ 3 ð2ö , S z ì ð2ö ü9< kE- Ô4\$ p
 ! ™NO v# Ý,XEW# 4\$&•, LÔ?U " 1,X4\$&• DG£
 !"#Å z ì ð2ö î . V p ü4£ L!7 • ê1k"©,X Î. Þ
 t 9#Å z ì ð2ö T , Ã 1 k Î Þ#Å z ì ð2ö
 ,X!7 • ê1k"© (Depth-first Search Squarifytk"©, 1T/Å
 DSS1k"©), !81k"©Ã 1 Ý E` Ô4œ x 4\$ p .

V p S*ü JavaScript Þ --Ö , Ô Þ ` H ð2ö Ý x
 • ,X DSS1k"© Ã 1*ü 1 ß Ñ D></ :
 function DSSquarify (rectObjs, itemIndex,
 currentRowRect, currentLiveRect) {
 if (currentRowRect.width > 0 &&
 currentRowRect.height > 0) {
 inRowEvaRadio = evaluateAspectRatio(rectObjs, evaluateAspectRatio
 itemIndex, true, currentRowRect, currentLiveRect, function evaluateAspectRatio (rectObjs, itemIndex,
 false, newCtx_inRow);
 }
 newRowShortEvaRadio = //we have to layout all, and then count the average
 evaluateAspectRatio(rectObjs, itemIndex, false, aspect ratio
 currentRowRect, currentLiveRect, false, if(isInCurrentRow) {
 newCtx_newRowShort); insertAndLayoutRow(newRowRect,
 //for the last item, new long row is the same as newcurrentLiveRect, newRectObjs, itemIndex);
 short row. }
 if (itemIndex !== rectObjs.length - 1) {
 newRowLongEvaRadio = makeNewRowAndLayout(newRowRect,
 evaluateAspectRatio(rectObjs, itemIndex, false, newLiveRect, newRectObjs, itemIndex, isLongFirst);
 currentRowRect, currentLiveRect, true, }
 newCtx_newRowLong) if(((itemIndex + 1) <= (rectObjs.length - 1)) {

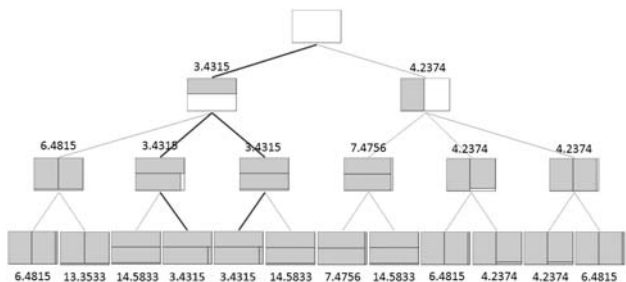
}
 minRatio = min(inRowEvaRadio,
 newRowShortEvaRadio, newRowLongEvaRadio);
 if (minRatio === inRowEvaRadio) {
 return newCtx_inRow;
 }
 else if(minRatio ===newRowShortEvaRadio) {
 return newCtx_newRowShort;
 }
 else {
 return newCtx_newRowLong;
 }
 }

DSS 1k"©,X ;> LÔ?UA× DSSquarify Ñ D,
 rectObjs '!*ü b x ,X D4~ , itemIndex Ú '!
 *ü b x ,X D4~ 2 ð2ö é ü ñ Ý(Š Ō ß 0,
 currentRowRect</ '! ,X Row, ñ Ý(Š Ō ßKS 'FÑ
 0, currentLiveRect</ '! Þ>? ,X-½ 60NKÈ .
 evaluateAspectRatioÑ D*ü bAu1k ' ! x • ,X
 Ý-½ 6 G KS '!' , Au1k â9< k,X newCtx_inRow,
 newCtx_newRowShort, newCtx_newRowLong) ÿ Ý
 ` H,X x • . DSSquarify Ñ D rL Þ !'EW Ý
 /! • ,X G KS '!' , *ü min Ñ DEÝ ½ G KS '!' Ô
 ", X , ' â E " ² Ô " Í h, X x • .
 evaluateAspectRatioÑ D ZAu1k Î Ý-½ 6 +,X G
 K S '!', L Ô ? U ` ä H Þ x . E > / ß
 Ñ D,X Þ --Ö V ß :
 function evaluateAspectRatio (rectObjs, itemIndex,
 isInCurrentRow, currentRowRect, currentLiveRect,
 isLongFirst, newCtx) {
 //we have to layout all, and then count the average
 evaluateAspectRatio(rectObjs, itemIndex, false, aspect ratio
 currentRowRect, currentLiveRect, false, if(isInCurrentRow) {
 insertAndLayoutRow(newRowRect,
 //for the last item, new long row is the same as newcurrentLiveRect, newRectObjs, itemIndex);
 short row. }
 else {
 makeNewRowAndLayout(newRowRect,
 evaluateAspectRatio(rectObjs, itemIndex, false, newLiveRect, newRectObjs, itemIndex, isLongFirst);
 currentRowRect, currentLiveRect, true, }
 if(((itemIndex + 1) <= (rectObjs.length - 1)) {

```

allRects = DSSquarify(newRectObjs, itemIndex + 1, KSE, Row, E- S*ü4£ LI7 • ê1k"© "©9< k,X
newRowRect, newtLiveRect);
}
return evaluateAllRects(allRects);
}
    Ä 1,ß Ĩ , evaluateAspectRatiŃ D,X ;> E>/ß r
L  P      A x iršertAndLayoutRow  ê 5 Ü
makeNewRowAndLayoutŃ D Ý'; á à,X •
!,X-½ 6 +, ' âEæ & Ax*ü4ý ā ZKĀNI?~ õ,X
DSSquarify Ń D ` ä = ß-½ 6 +,X , Ô âE~> Í
b'!• ,X . J ,X insertAndLayoutRow '
!-½ 6 + ! 9 ' !Row ,X x E >/ß 5à
makeNewRowAndLayout '!-½ 6 +,,Ĩ Row ,X x
E>/ß , -D isLongFirst Ũ n Z Row M4KSE•E- M4
-ÁE• üAx*ü DSSquarify ` ä Z = ß,X-½ 6 + x
â , evaluateAspectRatiŃ D Ax*üevaluateAllRects` ä
Í b'!x • ,X , ,XE>/ß Au1k Ý
-½ 6 +,X G KS '!".

```



Ö 6 ` < ð2ö,X DSS1k"©;>/ ä Ö

Ö 6*ü á 6 Ö,È? - / Z ` < ð2ö,X DSS1k"©,X
 Ô p;> E>/ß , J -½ 60NKÈKS 150, ' 100, LÖ
 ?U 9,X-½ 6 + c ë [48, 48, 4]. Ä 1,ß Ĩ , DSS1k
 "© Ô EE~> Z Ý ð2ö , ð2ö,XE>/ß 1#Ä z ì
 ,X • äF! Z H p à 64\$ X , J ü Ê \$4\$&•E~> Au
 1k, 5à!£ Ô p(4\$&•,X FŃ + Ô ä,X Ê \$4\$&•
 ‡ n,X . Ô8 5à?Ô ü!£ Ô ð2öFŃ Ý Ý/i ÄEÝ,X
 • , ¼ Ý1 Ô ` Ô y _ê (1 Ê \$4\$&• ð2ö
 ,X Ô y), + b ü Ô y ¼ = ß Ô p-½ 6 + , ¼ Ý!
 9 Row ` ? <F¼0N,Q,,Ĩ RowE- ø/i • ā , 5à
 ü1 Ô , + b RowE~"u Ý ÎÖ, á , ü ! 9 Row,X
 • ā , TM6Ń1 ø/i á à • ā,,Ĩ Row. ø Ö Ä
 1,ß Ĩ , 4v4" t2k,X ø/i • ,X Ô4œ 3.4315,
 ø/i • Ô ā , 5àE- ø/i • ,X1 Ô!9FŃ M4

4 Í ` H ð2ö,XDSS 1k"©,X E~
 ` H ð2ö,X DSS 1k"© " Æ4£ üEiE>,,Ĩ Row
 9Eä!9 ` ä x ,X Š ß4-Ĩ Z Ô p Ô ì,X?• ‡ •
 ' 5à , ` H ð2ö,X DSS 1k"© 5 #r*ü E ,X , J Ô
 ü,XKĀNI ü b ÊKÈ ü6Ń B p [,X Ú d , ü Ô8 TM
 %o ß !£ Ô ð2öFŃ Ý Ý/i Ä6Ń,X x • ā , G S
 n!£ Ô ,X x ÊKÈ ÔJÔ D , ` ä n 4X
 2LXKPE' O(3), E- Ũ D ÊKÈ,X1k"©,
 rL P!£ Ô x ,X ÊKÈE-â n G , üE> , ÊKÈ
 ÔJÔ ilC- n,XFEET , !8A1k"© Ô8 á6Ń*ü
 b rL h*ü/ß c . JavaScriptAA?Ô P KM6 á ÍB5 ` Ń D
 ā4ê/ßNç , Æ4£ ü Ä?š êEC Ê Ô ¥ k S~ h
 *ü^[14]. V p h*ü/ß c S*ü JavaScript4ê JE> b
 Chrome , ' n=20 Ê , ` H ð2ö,X DSS 1k"© ü Ô Ä
 CPU Intel Core 2 Duo 2.20GHz p Ž+ 6á p,XE>
 ÊKÈ Æ4£CYB/! , E- ,X ü6Ń , Ž "©y «,X
 + b ÊKÈ,X ÔJÔ + b ð2ö D,X rt , Z
 E~ ` H ð2ö,X DSS1k"©, Ô p Ô,È?-,X1*+9 £ á
 ð2ö D , G Ũ n Ô p ð2ö D S, !£ õ ð2ö Ê TM ð
 2ö '! !5B Ô Ÿ,X S , üE~"u Ý Ý-½ 6 + ` ä
 x ,X TM %o ß , S*ü Æ4£ ` ä x ,X S -½ 6 +E~>
 . V p 1 N ></-½ 6 + p D , Ä?• ` H ð2ö,X
 DSS1k"© S=N, 5à4£ LI7 • ê1k"© G S=1,X DSS
 1k"© £ á ð2ö D rL P Ô/iBüG£ `),X!>K
 , J i&• Ä 1 :+t Ĩ 1k"©E> Eó z , 3 S k
 4\$ p á ó š.B , ø5à Ä6Ń "©9< k ` H ð2ö,X DSS1k
 "© Ä 19< k,X Ô ì •



Ö 7 4£ LI7 • ê1k"© ` ` H ð2ö,X DSS1k"© x !EW

° Ô p pP- ÊKÈ ú6Ñ, X1*+9 ü Ô ŸE> EW á õ, X
 ð2ö, ™ ü Ô â L E> ` < ð2ö . Ô7 /, X ü-½
 60NKÈKS 100, ' 30, X ™ %ß Ú Ÿ S*ü4£ L!7
 • ê1k"© ` ` H ð2ö, X DSS 1k"© Í c ë [3366, 1857,
 5437, 2668, 3867, 1920, 2695, 9192, 2605, 588]x
 9< k, X4§ p , J , X 2.039785` 1.447654 ø/ j x
 • , X G KS '!' . Ã 1, ß Î , ` H ð2ö, X DSS 1k
 "©9< k, X4§ pEW i, ø/ j1k"© Í b Ô Ÿ, X 6 p-½
 6+, X x • ` < Ô , X , Ÿ ™ ü b Ô â 4 p
 -½ 6 + x , X á à , ø J Ô â Ô p-½ 6 + . E- Ô),
 B5, X Î), á J', X , 5à 4£ L!7 • ê1k"©, X Bp — s
 í ð7È, X. ü x , X Ô Ÿ L !%, + b = ß, X-½ 6 + p
 DEW î KS '!' _EW ú, X-½ 6 + E- Ã6Ñ ü á4Á, X x
 k A x H , Í b á4Á, X-½ 6 + , A x H, X íC^
 9C^ á, ø5à Ô â, X ' p-½ 6 + x • T TEW Á ,
 E j Z Ÿ-½ 6 +, X G KS '!' . E i E > Í4£ L!7 • ê
 1k"©*ó ä, X úG£ x • E-> 4³Au , Ã-1 üCYE > 85%
 , X ™ %ß KS '!' ÔP-, X Fw p-½ 6 + Î), ü Ô â 10%
 , X-½ 6 + .

¶! 4£ L!7 • ê1k"©, X &• ?ULš ü Ô â, X '
 p-½ 6 + , ™ ü Ô â L E> ` < ð2ö G Ã ü ÊKÈ .
 ÈEW á, X ™ %ß 9< KEW i, X x , _ V, ™ LÔ ð2ö Ô
 á ø G ÁFS !Ò 3/ á, X Í b [4800, 4800, 400]6Ñ
 9< k Ô î?, X ™ %ß . ü é 9 S 0 ð2ö D ` L 0
 Ô4œ ` < ð2ö DE- ø p - D â , Ã 19< k Ô8 6
 á, X, È t K Ÿ r*ü È , X DSS 1k"©, Ã B r L, X

.@ Ê" G ` h*ü CEÝ ½ ÜEÖ, X S ` L. Ô8 ™ %ß
 ü DSS1k"©, X Eα> a S=1, L=6 G Á9< k ÊKÈ ú6ÑEW
 Q, à Ê â ì b4£ L!7 • ê1k"©, X4§ p . üE-G 3
 áL', ß Î , ` < ð2ö, X DSS1k"© `4£ L!7 • ê1k"© r
 L pFÑ DSS1k"©, X ø p(M _ , ü ` < ð2ö, X DSS1k
 "© S=N, L=N, 5à ü4£ L!7 • ê1k"© S=1, L=1.

5 rP` `E` Ô!9 Ú d

ü K Ý r L ā , X μ C Á?š êE>/ß , E> ú, X N
 T T î ð7È î D /, X-½ 6 + M6/ÁE > á5áL' 1, ß#Ü ,
 Ô8 îG>*üEÖ', X D B6. Ü • ā 1 S N, X á î \
 û, N ü 100 Y, X ™ %ß!EW ?• . BEĭ*ü Í b Ô 6
 \$ § Ä y «, X1 Y ÊKÈ Ô8 ü 3 /! Y , 5x<% .@ Ê
 , X ¥) , ü rP` Ax 6 /! DSS1k"© Ô û Ä y «Eα
 > ÊKÈ

><1 ë Î Z DSS1k"© ü á à , X S ` L ßEα
 > , X rP` 4§ p , rP`, X.@ Ê 5 Ê Ô Ä CPU Intel
 Core i7 2.93 GHz, Y , 16GB, X p Ž+ 6á , EC Ê) f W
 Windows 7 Ō î(, DSS1k"© S*ü JavaScriptr), ,
 Eα> b Chrome###?œ <>< , X rP` 4§ pFÑ aLc
 DEα> 100 õ á, X G , J N -><-½ 6 +, X
 p D, ÊKÈ, X)! !¿/! , S=1, L=1 G 4£ L!7 • ê1k
 "©, S=N, L=N ` H ð2ö, X DSS1k"©, ÚA,, N/A, X
) ></ ` LÔ?U, XEα> ÊKÈCYE > 6 /! (6000!¿/!)
 5à á \4³Au4§ p .

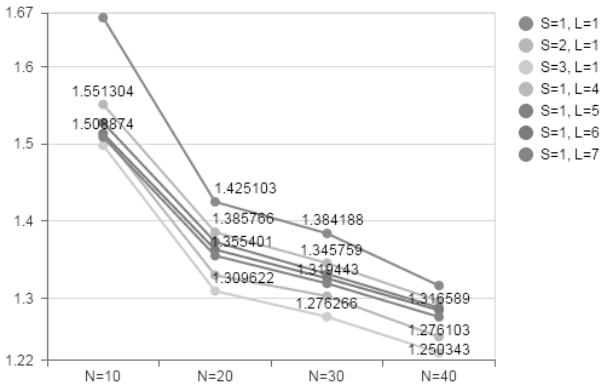
><1 DSS1k"© ü á à - D ßEα> , X rP` 4§ p

- D	N=10		N=20		N=30		N=40	
	G KS '!'	ÊKÈ	G KS '!'	ÊKÈ	G KS '!'	ÊKÈ	G KS '!'	ÊKÈ
S=1, L=1	1.663632	0.05885	1.425103	0.069	1.384188	0.10575	1.316589	0.1083
S=2, L=1	1.513185	0.65165	1.330135	6.8378	1.302991	9.16175	1.250343	19.42485
S=3, L=1	1.498192	9.52625	1.309622	118.17675	1.276266	912.49695	1.229501	3828.43025
S=1, L=4	1.551304	0.52455	1.385766	0.9652	1.345759	0.82115	1.296399	1.10335
S=1, L=5	1.527546	0.95545	1.373285	1.5016	1.331843	2.2142	1.288054	2.7916
S=1, L=6	1.513529	3.2202	1.363284	5.28695	1.326056	7.41005	1.284698	9.54015
S=1, L=7	1.508874	11.8702	1.355401	20.5595	1.319443	28.1447	1.276103	36.089
S=N, L=N	1.491229	814.49005	N/A	N/A	N/A	N/A	N/A	N/A

E i E > rP` D B áL', ß Î , S ` L C^ ú , G KS
 '!'C^ " , LÔ?U, X ÊKÈ 3C^KS ZE` Ô!9 Ú d
 >< , X D B , Ã 1 S*ü Ã?š ê, X • ā Í G KS '!'

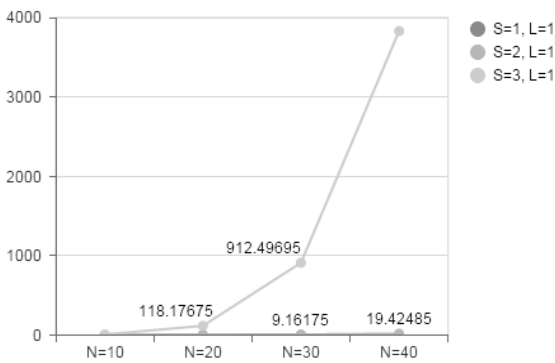
` ÊKÈ, X - e Ú Ÿ*ó ä I4" Ò . Ò 8 / Z G KS '
 !' - e, X I4" Ò , ø Ô 6 Ã-1 G KS '!'Lc- N, X r
 t5áL! " , 5à S ` L Í b G KS '!', X E j ü NEW á

Ê È t :+ . E-AÈ à ü S*ü DSS 1k"© Ê, Æ 1 üKÂNI
 ?~ ðEW ã(N EW ã Ê S*üEW ù,XS ` L 19<k È ì
 4\$ p, + bKÂNI?~ ð ã, ñ Î,X ÊKÈ · È ÝL\$, 5à ü
 KÂNI?~ ðEW ù Ê+ b G KS '!' ìL! " , Æ 1'EÖ '
 £ ã S ` L 19<k È ì,X ÊKÈ ü6Ñ .



Ò8 G KS '!' ñ ê l4" Ò

Ò9 /,X Eα> ÊKÈLc S ` N ñ ê,X l4"
 Ò. ç Ò Æ 1, Æ Î ÊKÈ, X#5ë Í S ,X ñ êP- z #
 ó, SEW ù Ê Eα> ÊKÈLdN rKS \ ç , E¥ b Û D
 Æ4", E- + ð2ö1k"©, X(M&· ñ n, X . ü L=1, N=40
 ,X TM % ß S=3 Ê1k"©LÔ?U, X ;> ÊKÈ S=2 Ê, X ÚE¥
 200 á, yE¥ 4 /! . ü rL, X h*ü , Ò8 á p^aEW ù
 ,X S .

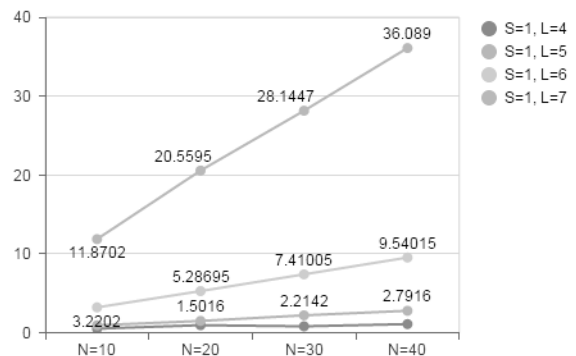


Ò9 Eα> ÊKÈLc S ` N ñ ê,X l4" Ò

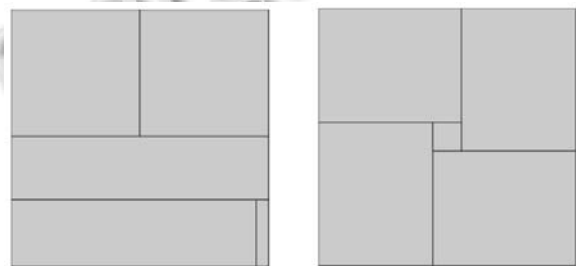
Ò10 /,X Eα> ÊKÈLc L ` N ñ ê,X l
 4" Ò. áL', Æ Î , ' L ñ ù Ê , Eα> ÊKÈLdN, X rKS
) [3 ñ ù , rKS, X C_ "!' EW G4ç, E¥ b4" ù .
 ü rL, X h*ü , Æ 15x<%^a L=6 ê L=7.

Zα DSS 1k"©, X ÊKÈ ü6Ñ L8 ZEÝ ½EÖ ', X
 S ` L ê , E- Æ 15x<% Ê ì1*+9, _ V ü ð2öE>/B

é 9 ¥ ã? í , 1 ž S*üONKÈ 6 ÊKÈ, X1*+94ç ,
 `Gj á y*ü KÈ 4\$ p . ¥ ã? í üACE î#Å z ì
 ð2ö1k"© *ü , Ò8 Ò o4£P?~ í , _ V ü ð
 2ö Ò p(4\$&· Ê , ü Æ4£ ` ä x , X-½ 6+ V p
 Î), KS '!' ù b 10, X TM % ß í 016 ð2öA14\$&·, X Ý
 \$4\$&·, J A14\$&· 'OK ù . ¥ ã? í Æ 1
 Ý L! " ð2ö ÊKÈ, X#5ë , 3 Ý Æ6ÑJíE> Ò o Ò Ý
 x EW Æ á4Á x EW Q, X · . ü Í x ·, X ð
 2öE>/B , Ý Æ6Ñ Î), Gj á, X x TM % , _ V ü Ò 6
 , X1 Ý G Î), Z Q ' Í Gj á x . V p !, X x
 Æ4£>·4ç , , í ü Î), Gj á x Ê , V p Gj á
 , X x á Ò ý 4\$&· , Æ 1FS ! í \$4\$&·, X Gj á
 ð2ö, TM LÔE" ² Æ4ç , X G Æ . Gj á y*ü KÈ
 4\$ p, X · GK LÔ?U r), ç Eó, X x !"EW ` ÜEÖ
 , X4ç, 4\$ X [15].



Ò10 Eα> ÊKÈLd ` N ñ ê,X l4" Ò



(a) 3.0386 (b) 1.2

Ò11 S*ü ` H ð2ö DSS1k"© á6Ñ9<k D : P Ò ì?
 ,X TM %

!8 ê , TMNO α , X Ô&· , ü-½ 60NKÈ Í8' F
 -½ 6+ x Ò p NP L'KÂNI, ?U9<k D : ã P, X
 Ò ì?·M2 ÄL' . DSS 1k"©, X r), , í ""*ü Z4£ L!7
 ·ê1k"©, X Î ñCÃ , GEã +-½ 6 á ·M4E· , Î Row
 ê : 9 Æ Ý, X Row, ÚON, Q ³ ±+- üM4-½ 60NKÈ?!

: ,X • , E- Ô ñCÃ "©#%o,ª Ý Ã6Ñ,X x ,X .
 G S ` H ð2ö,X DSS1k"© ü ð o TM %o ß9< k,X q
 ' á D : ā Þ,X Ô ì?· . _ V Ò 11 / ,X TM %o ,
 -½ 60NKÈKS ' 9, -½ 6 + c ë [20, 20, 20, 20, 1],
 Ò 11(a) / ,X ` H ð2ö,X DSS1k"©9< k,X x , G
 KS '!" 3.0386, Ò 11(b) Ô Þ ' ,X È G x
 , G KS '!" TM 1.2, ' 5à , Ò 11(b),XE- Ô x
 á Ã6ÑÈÈÈ> DSS1k"© ð2ö ,X , ' Ô á,X ā-½ 6 +
 á>• ±+- ü-½ 60NKÈ,X Ĩ) Ô Þ?!: Þ .

6 4ŞAŽ

DSS1k"© ü Í b Treemap,X4£ L!7 • ê x 1k
 "©E-> #Å 9 Ú d,X Ĩ. Þ ð Ĩ,X , ç Bü Þ 9AÈ, W
 Í4£ L!7 • ê x 1k"©,X Ô /i =) , ' È Ĩ,X ÈKÈ
 `ONKÈ 6 È ì?· , GEÈÈ> Í b ð2ö(Š Ō á Þ È Ĩ4Ş&•
 ,X v# 9< k È G,X x 4Ş p . DSS 1k"© ,X - D ,
 Bü Þ 1k"© û6Ñ ` È Ĩ4Ş p KÈ,X Ô /i l>K , 5à4£ L
 !7 • ê x 1k"© rL Þ DSS1k"©,X Ô Þ ÈKÈ à0N
 KÈ . È Ô ā , ' 5à x p Ô Ĩ,X(M _ . ü rL h*ü
 , LÔ?U4Ş Ü rL TM %o S*ü ÔÈÖ Ü ' ! h*ü C,X -
 DA'5B, 3 Ã5x<% S*ü ÿ ā~ Ĩ `4ç , T E- Ô!9
 E- DSS1k"© ç 1/ß,X?! z 9AÈ , DSS1k"© Æ4£ â
 X Z4£ L!7 • ê1k"©,X x 4Ş p , V p?U9<
 k D : ā Þ,X Ô Ĩ4Ş p , Ĩ' LÔ?U È Ĩ v2ö .

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