Status Oct4 2021.

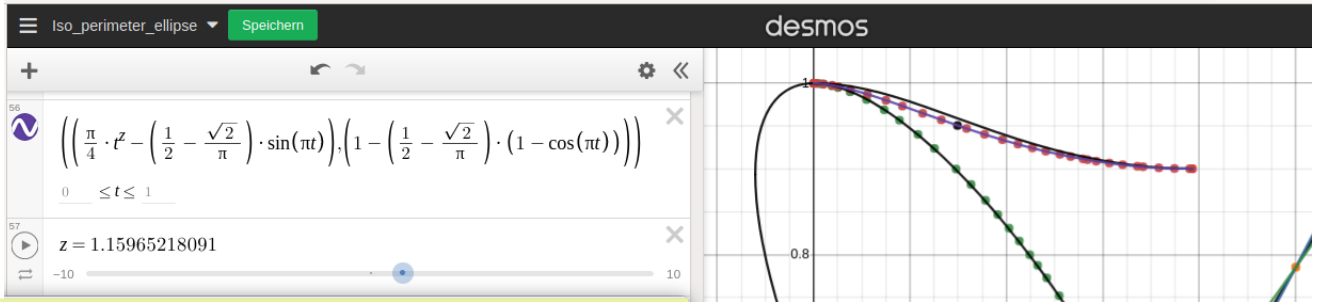
CALPERE function (additional comments to the TXT file) :

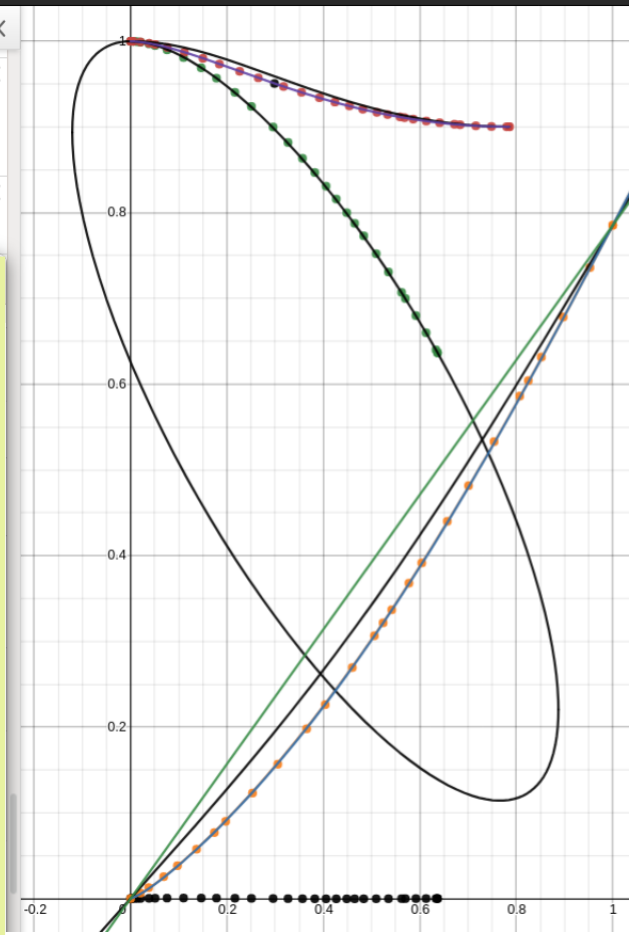
it calculates the perimeter of an ellipse by the given halfparameter a and b.

HowTo (can be done manually; take only b>a):
a) solve **t** which will verify ((pi/4)*t**AE) – ((1/2) – (SQRT(2)/pi))*sin(pi*t)=(pi/2) – atan (b/a)
b) with the **t** from above, calculate 4*(SQRT(a**2+b**2))/(1-((1/2) – (SQRT(2)/pi))*(cos(pi*t)-1)
c).. the result of it is your perimeter
AE = 1000*ae (ae=1.15965218091; see page 3 of https://www.physik.uzh.ch/dam/jcr:3efb63a6-21c8-4481-bbb0-c0e2a4aa4d8d/kt19_protonff.pdf or page 56 of https://arxiv.org/pdf/1909.12245.pdf which is called the electron magnetic moment anomaly, ae, is: ae ≈ *1.15965218091*×10−3 see page 351 of ISBN 978-3-030-36418-2).
Why this „ae“ factor (from quantum mechanic) appear here is not explained for now. See more there
https://en.wikipedia.org/wiki/Anomalous_magnetic_dipole_moment

Maximum deviation of the CALPERE calculus: 0.025% on the HP41 with the current SOLVING and serial calculation setups.
See results below of CMPPERE for 100 steps of an isoperimeter of 4.

CALPERE cannot be considered for now as an approximation function:
a) identification of used curve of type „cycloid“ and a point of it must be found (numerically)
b) constant ae from quantum mechanic is used





Numerical representation done in desmos.com:

Green points: isoperimeter (of 4) points in the area 0 to pi/4, when interpolated with a conic curve fitting, show an ellipse (black line) passing through them (deviations seen with a small quadrat calculation curve fitting; not much; but deviations).

Pink points: they are the green points modified from X-Y into Angle-Radius. The black curve above the pink points is a standard shortened cycloid. The magenta line is the curve of desmos in line 56: t on the left side of the cycloid formula is changed to t**z (z=1.159..).

Yellow points:
- they are the points which should be for the pink points of a modified shortened cycloid
- black curve (above them) is a standard shortened cycloid
- blue curve: this is in fact the left part of the modified cycloid in desmos.com line 56

These points are for a double check of a curve fitting with the standard and modified cycloid

ELLIPSE CALC
ISOPERIME OF
4.000000000 *
IN
100.0000000 *
STEPS

X & Y
0.636619771 ***
0.636619774 ***
CALPERE
4.000000000 ***
in % vs PERIM:
0.000000000 ***
RADIUS & ANGLE
0.900316316 ***
0.785398162 ***

X & Y
0.630253573 ***
0.642954297 ***
CALPERE
4.000003944 ***
in % vs PERIM:
0.000098600 ***
RADIUS & ANGLE
0.900338711 ***
0.775423121 ***

X & Y
0.623887376 ***
0.649226087 ***

CALPERE
 4.000015216 ***
in % vs PERIM:
 0.000380400 ***
RADIUS & ANGLE
 0.900405447 ***
 0.765497843 ***

X & Y
 0.617521178 ***
 0.655436030 ***
CALPERE
 4.000033028 ***
in % vs PERIM:
 0.000825700 ***
RADIUS & ANGLE
 0.900515849 ***
 0.755622107 ***

X & Y
 0.611154980 ***
 0.661584965 ***
CALPERE
 4.000056620 ***
in % vs PERIM:
 0.001415500 ***
RADIUS & ANGLE
 0.900669238 ***
 0.745795715 ***

X & Y
 0.604788783 ***
 0.667673702 ***
CALPERE

4.000085280 ***
in % vs PERIM:
0.002132000 ***
RADIUS & ANGLE
0.900864942 ***
0.736018477 ***

X & Y
0.598422585 ***
0.673703000 ***
CALPERE
4.000118324 ***
in % vs PERIM:
0.002958100 ***
RADIUS & ANGLE
0.901102282 ***
0.726290222 ***

X & Y
0.592056387 ***
0.679673589 ***
CALPERE
4.000155124 ***
in % vs PERIM:
0.003878100 ***
RADIUS & ANGLE
0.901380582 ***
0.716610789 ***

X & Y
0.585690189 ***
0.685586159 ***
CALPERE
4.000195048 ***

in % vs PERIM:
 0.004876200 ***
RADIUS & ANGLE
 0.901699162 ***
 0.706980030 ***

X & Y
 0.579323992 ***
 0.691441368 ***
CALPERE
 4.000237536 ***
in % vs PERIM:
 0.005938400 ***
RADIUS & ANGLE
 0.902057344 ***
 0.697397801 ***

X & Y
 0.572957794 ***
 0.697239845 ***
CALPERE
 4.000282048 ***
in % vs PERIM:
 0.007051200 ***
RADIUS & ANGLE
 0.902454450 ***
 0.687863968 ***

X & Y
 0.566591596 ***
 0.702982181 ***
CALPERE
 4.000328068 ***
in % vs PERIM:

0.008201700 ***
RADIUS & ANGLE
0.902889796 ***
0.678378402 ***

X & Y
0.560225399 ***
0.708668945 ***
CALPERE
4.000375116 ***
in % vs PERIM:
0.009377900 ***
RADIUS & ANGLE
0.903362702 ***
0.668940980 ***

X & Y
0.553859201 ***
0.714300676 ***
CALPERE
4.000422752 ***
in % vs PERIM:
0.010568800 ***
RADIUS & ANGLE
0.903872485 ***
0.659551579 ***

X & Y
0.547493003 ***
0.719877883 ***
CALPERE
4.000470552 ***
in % vs PERIM:
0.011763800 ***

RADIUS & ANGLE
 0.904418463 ***
 0.650210081 ***

X & Y
 0.541126806 ***
 0.725401051 ***
CALPERE
 4.000518120 ***
in % vs PERIM:
 0.012953000 ***
RADIUS & ANGLE
 0.904999947 ***
 0.640916370 ***

X & Y
 0.534760608 ***
 0.730870638 ***
CALPERE
 4.000565080 ***
in % vs PERIM:
 0.014127000 ***
RADIUS & ANGLE
 0.905616253 ***
 0.631670329 ***

X & Y
 0.528394410 ***
 0.736287080 ***
CALPERE
 4.000611100 ***
in % vs PERIM:
 0.015277500 ***
RADIUS & ANGLE

0.906266692 ***
0.622471841 ***

X & Y
0.522028212 ***
0.741650789 ***
CALPERE
4.000655856 ***
in % vs PERIM:
0.016396400 ***
RADIUS & ANGLE
0.906950576 ***
0.613320789 ***

X & Y
0.515662015 ***
0.746962154 ***
CALPERE
4.000699064 ***
in % vs PERIM:
0.017476600 ***
RADIUS & ANGLE
0.907667215 ***
0.604217052 ***

X & Y
0.509295817 ***
0.752221542 ***
CALPERE
4.000740440 ***
in % vs PERIM:
0.018511000 ***
RADIUS & ANGLE
0.908415916 ***

0.595160507 ***

X & Y
0.502929619 ***
0.757429298 ***
CALPERE
4.000779744 ***
in % vs PERIM:
0.019493600 ***
RADIUS & ANGLE
0.909195988 ***
0.586151030 ***

X & Y
0.496563422 ***
0.762585748 ***
CALPERE
4.000816744 ***
in % vs PERIM:
0.020418600 ***
RADIUS & ANGLE
0.910006733 ***
0.577188492 ***

X & Y
0.490197224 ***
0.767691194 ***
CALPERE
4.000851224 ***
in % vs PERIM:
0.021280600 ***
RADIUS & ANGLE
0.910847455 ***
0.568272761 ***

X & Y
 0.483831026 ***
 0.772745923 ***
CALPERE
 4.000883004 ***
in % vs PERIM:
 0.022075100 ***
RADIUS & ANGLE
 0.911717458 ***
 0.559403698 ***

X & Y
 0.477464829 ***
 0.777750203 ***
CALPERE
 4.000911916 ***
in % vs PERIM:
 0.022797900 ***
RADIUS & ANGLE
 0.912616042 ***
 0.550581161 ***

X & Y
 0.471098631 ***
 0.782704277 ***
CALPERE
 4.000937796 ***
in % vs PERIM:
 0.023444900 ***
RADIUS & ANGLE
 0.913542503 ***
 0.541805003 ***

X & Y
 0.464732433 ***
 0.787608376 ***
CALPERE
 4.000960524 ***
in % vs PERIM:
 0.024013100 ***
RADIUS & ANGLE
 0.914496139 ***
 0.533075070 ***

X & Y
 0.458366235 ***
 0.792462713 ***
CALPERE
 4.000979972 ***
in % vs PERIM:
 0.024499300 ***
RADIUS & ANGLE
 0.915476246 ***
 0.524391202 ***

X & Y
 0.452000038 ***
 0.797267478 ***
CALPERE
 4.000996044 ***
in % vs PERIM:
 0.024901100 ***
RADIUS & ANGLE
 0.916482114 ***
 0.515753235 ***

X & Y

0.445633840 ***
0.802022846 ***
CALPERE
4.001008652 ***
in % vs PERIM:
0.025216300 ***
RADIUS & ANGLE
0.917513033 ***
0.507160997 ***

X & Y
0.439267642 ***
0.806728980 ***
CALPERE
4.001017728 ***
in % vs PERIM:
0.025443200 ***
RADIUS & ANGLE
0.918568293 ***
0.498614307 ***

X & Y
0.432901445 ***
0.811386019 ***
CALPERE
4.001023220 ***
in % vs PERIM:
0.025580500 ***
RADIUS & ANGLE
0.919647178 ***
0.490112982 ***

X & Y
0.426535247 ***

0.815994091 ***
CALPERE
4.001025092 ***
in % vs PERIM:
0.025627300 * Worst of all**
RADIUS & ANGLE
0.920748974 ***
0.481656826 ***

X & Y
0.420169049 ***
0.820553300 ***
CALPERE
4.001023308 ***
in % vs PERIM:
0.025582700 ***
RADIUS & ANGLE
0.921872957 ***
0.473245642 ***

X & Y
0.413802852 ***
0.825063741 ***
CALPERE
4.001017860 ***
in % vs PERIM:
0.025446500 ***
RADIUS & ANGLE
0.923018405 ***
0.464879221 ***

X & Y
0.407436654 ***
0.829525492 ***

CALPERE
 4.001008760 ***
in % vs PERIM:
 0.025219000 ***
RADIUS & ANGLE
 0.924184596 ***
 0.456557347 ***

X & Y
 0.401070456 ***
 0.833938609 ***
CALPERE
 4.000996016 ***
in % vs PERIM:
 0.024900400 ***
RADIUS & ANGLE
 0.925370799 ***
 0.448279800 ***

X & Y
 0.394704258 ***
 0.838303140 ***
CALPERE
 4.000979660 ***
in % vs PERIM:
 0.024491500 ***
RADIUS & ANGLE
 0.926576282 ***
 0.440046346 ***

X & Y
 0.388338061 ***
 0.842619108 ***
CALPERE

4.000959732 ***
in % vs PERIM:
0.023993300 ***
RADIUS & ANGLE
0.927800307 ***
0.431856751 ***

X & Y
0.381971863 ***
0.846886528 ***
CALPERE
4.000936296 ***
in % vs PERIM:
0.023407400 ***
RADIUS & ANGLE
0.929042139 ***
0.423710765 ***

X & Y
0.375605665 ***
0.851105393 ***
CALPERE
4.000909408 ***
in % vs PERIM:
0.022735200 ***
RADIUS & ANGLE
0.930301030 ***
0.415608137 ***

X & Y
0.369239468 ***
0.855275685 ***
CALPERE
4.000879168 ***

in % vs PERIM:
 0.021979200 ***
RADIUS & ANGLE
 0.931576235 ***
 0.407548602 ***

X & Y
 0.362873270 ***
 0.859397363 ***
CALPERE
 4.000845660 ***
in % vs PERIM:
 0.021141500 ***
RADIUS & ANGLE
 0.932866999 ***
 0.399531893 ***

X & Y
 0.356507072 ***
 0.863470377 ***
CALPERE
 4.000809004 ***
in % vs PERIM:
 0.020225100 ***
RADIUS & ANGLE
 0.934172567 ***
 0.391557729 ***

X & Y
 0.350140875 ***
 0.867494652 ***
CALPERE
 4.000769304 ***
in % vs PERIM:

0.019232600 ***
RADIUS & ANGLE
0.935492172 ***
0.383625826 ***

X & Y
0.343774677 ***
0.871470107 ***
CALPERE
4.000726716 ***
in % vs PERIM:
0.018167900 ***
RADIUS & ANGLE
0.936825051 ***
0.375735887 ***

X & Y
0.337408479 ***
0.875396629 ***
CALPERE
4.000681364 ***
in % vs PERIM:
0.017034100 ***
RADIUS & ANGLE
0.938170422 ***
0.367887612 ***

X & Y
0.331042281 ***
0.879274103 ***
CALPERE
4.000633432 ***
in % vs PERIM:
0.015835800 ***

RADIUS & ANGLE
 0.939527509 ***
 0.360080689 ***

X & Y
 0.324676084 ***
 0.883102388 ***
CALPERE
 4.000583084 ***
in % vs PERIM:
 0.014577100 ***
RADIUS & ANGLE
 0.940895524 ***
 0.352314798 ***

X & Y
 0.318309886 ***
 0.886881326 ***
CALPERE
 4.000530516 ***
in % vs PERIM:
 0.013262900 ***
RADIUS & ANGLE
 0.942273670 ***
 0.344589613 ***

X & Y
 0.311943688 ***
 0.890610741 ***
CALPERE
 4.000475928 ***
in % vs PERIM:
 0.011898200 ***
RADIUS & ANGLE

0.943661145 ***
0.336904797 ***

X & Y
0.305577491 ***
0.894290437 ***
CALPERE
4.000419524 ***
in % vs PERIM:
0.010488100 ***
RADIUS & ANGLE
0.945057135 ***
0.329260007 ***

X & Y
0.299211293 ***
0.897920203 ***
CALPERE
4.000361552 ***
in % vs PERIM:
0.009038800 ***
RADIUS & ANGLE
0.946460822 ***
0.321654889 ***

X & Y
0.292845095 ***
0.901499803 ***
CALPERE
4.000302252 ***
in % vs PERIM:
0.007556300 ***
RADIUS & ANGLE
0.947871375 ***

0.314089084 ***

X & Y
0.286478898 ***
0.905028982 ***
CALPERE
4.000241880 ***
in % vs PERIM:
0.006047000 ***
RADIUS & ANGLE
0.949287953 ***
0.306562221 ***

X & Y
0.280112700 ***
0.908507468 ***
CALPERE
4.000180708 ***
in % vs PERIM:
0.004517700 ***
RADIUS & ANGLE
0.950709705 ***
0.299073922 ***

X & Y
0.273746502 ***
0.911934959 ***
CALPERE
4.000119024 ***
in % vs PERIM:
0.002975600 ***
RADIUS & ANGLE
0.952135766 ***
0.291623801 ***

X & Y
 0.267380304 ***
 0.915311139 ***
CALPERE
 4.000057124 ***
in % vs PERIM:
 0.001428100 ***
RADIUS & ANGLE
 0.953565262 ***
 0.284211462 ***

X & Y
 0.261014107 ***
 0.918635664 ***
CALPERE
 3.999995335 ***
in % vs PERIM:
-0.000116625 ***
RADIUS & ANGLE
 0.954997302 ***
 0.276836501 ***

X & Y
 0.254647909 ***
 0.921908166 ***
CALPERE
 3.999933972 ***
in % vs PERIM:
-0.001650700 ***
RADIUS & ANGLE
 0.956430982 ***
 0.269498504 ***

X & Y
 0.248281711 ***
 0.925128252 ***
CALPERE
 3.999873384 ***
in % vs PERIM:
-0.003165400 ***
RADIUS & ANGLE
 0.957865383 ***
 0.262197050 ***

X & Y
 0.241915514 ***
 0.928295503 ***
CALPERE
 3.999813918 ***
in % vs PERIM:
-0.004652050 ***
RADIUS & ANGLE
 0.959299566 ***
 0.254931705 ***

X & Y
 0.235549316 ***
 0.931409473 ***
CALPERE
 3.999755950 ***
in % vs PERIM:
-0.006101250 ***
RADIUS & ANGLE
 0.960732579 ***
 0.247702030 ***

X & Y

 0.229183118 ***
 0.934469686 ***
CALPERE
 3.999699847 ***
in % vs PERIM:
-0.007503825 ***
RADIUS & ANGLE
 0.962163446 ***
 0.240507572 ***

X & Y
 0.222816921 ***
 0.937475635 ***
CALPERE
 3.999646000 ***
in % vs PERIM:
-0.008850000 ***
RADIUS & ANGLE
 0.963591172 ***
 0.233347872 ***

X & Y
 0.216450723 ***
 0.940426783 ***
CALPERE
 3.999594809 ***
in % vs PERIM:
-0.010129775 ***
RADIUS & ANGLE
 0.965014741 ***
 0.226222459 ***

X & Y
 0.210084525 ***

0.943322557 ***
CALPERE
3.999546680 ***
in % vs PERIM:
-0.011333000 ***
RADIUS & ANGLE
0.966433109 ***
0.219130852 ***

X & Y
0.203718327 ***
0.946162350 ***
CALPERE
3.999502011 ***
in % vs PERIM:
-0.012449725 ***
RADIUS & ANGLE
0.967845210 ***
0.212072558 ***

X & Y
0.197352130 ***
0.948945516 ***
CALPERE
3.999461221 ***
in % vs PERIM:
-0.013469475 ***
RADIUS & ANGLE
0.969249945 ***
0.205047075 ***

X & Y
0.190985932 ***
0.951671371 ***

CALPERE
 3.999424731 ***
in % vs PERIM:
-0.014381725 ***
RADIUS & ANGLE
 0.970646189 ***
 0.198053888 ***

X & Y
 0.184619734 ***
 0.954339186 ***
CALPERE
 3.999392940 ***
in % vs PERIM:
-0.015176500 ***
RADIUS & ANGLE
 0.972032781 ***
 0.191092471 ***

X & Y
 0.178253537 ***
 0.956948186 ***
CALPERE
 3.999366256 ***
in % vs PERIM:
-0.015843600 ***
RADIUS & ANGLE
 0.973408524 ***
 0.184162285 ***

X & Y
 0.171887339 ***
 0.959497552 ***
CALPERE

 3.999345088 ***
in % vs PERIM:
-0.016372800 ***
RADIUS & ANGLE
 0.974772184 ***
 0.177262780 ***

X & Y
 0.165521141 ***
 0.961986408 ***
CALPERE
 3.999329799 ***
in % vs PERIM:
-0.016755025 ***
RADIUS & ANGLE
 0.976122481 ***
 0.170393388 ***

X & Y
 0.159154944 ***
 0.964413822 ***
CALPERE
 3.999320753 ***
in % vs PERIM:
-0.016981175 ***
RADIUS & ANGLE
 0.977458090 ***
 0.163553533 ***

X & Y
 0.152788746 ***
 0.966778805 ***
CALPERE
 3.999318288 ***

in % vs PERIM:
-0.017042800 ***
RADIUS & ANGLE
 0.978777635 ***
 0.156742618 ***

X & Y
 0.146422548 ***
 0.969080299 ***
CALPERE
 3.999322698 ***
in % vs PERIM:
-0.016932550 ***
RADIUS & ANGLE
 0.980079684 ***
 0.149960035 ***

X & Y
 0.140056350 ***
 0.971317175 ***
CALPERE
 3.999334230 ***
in % vs PERIM:
-0.016644250 ***
RADIUS & ANGLE
 0.981362744 ***
 0.143205156 ***

X & Y
 0.133690153 ***
 0.973488228 ***
CALPERE
 3.999353086 ***
in % vs PERIM:

-0.016172850 ***
RADIUS & ANGLE
 0.982625253 ***
 0.136477336 ***

X & Y
 0.127323955 ***
 0.975592168 ***
CALPERE
 3.999379398 ***
in % vs PERIM:
-0.015515050 ***
RADIUS & ANGLE
 0.983865574 ***
 0.129775912 ***

X & Y
 0.120957757 ***
 0.977627608 ***
CALPERE
 3.999413205 ***
in % vs PERIM:
-0.014669875 ***
RADIUS & ANGLE
 0.985081986 ***
 0.123100201 ***

X & Y
 0.114591560 ***
 0.979593062 ***
CALPERE
 3.999454466 ***
in % vs PERIM:
-0.013638350 ***

RADIUS & ANGLE
 0.986272676 ***
 0.116449496 ***

X & Y
 0.108225362 ***
 0.981486927 ***
CALPERE
 3.999503012 ***
in % vs PERIM:
-0.012424700 ***
RADIUS & ANGLE
 0.987435728 ***
 0.109823069 ***

X & Y
 0.101859164 ***
 0.983307473 ***
CALPERE
 3.999558548 ***
in % vs PERIM:
-0.011036300 ***
RADIUS & ANGLE
 0.988569105 ***
 0.103220163 ***

X & Y
 0.095492966 ***
 0.985052825 ***
CALPERE
 3.999620591 ***
in % vs PERIM:
-0.009485225 ***
RADIUS & ANGLE

0.989670639 ***
0.096639998 ***

X & Y
0.089126769 ***
0.986720945 ***
CALPERE
3.999688487 ***
in % vs PERIM:
-0.007787825 ***
RADIUS & ANGLE
0.990738010 ***
0.090081759 ***

X & Y
0.082760571 ***
0.988309615 ***
CALPERE
3.999761346 ***
in % vs PERIM:
-0.005966350 ***
RADIUS & ANGLE
0.991768726 ***
0.083544602 ***

X & Y
0.076394373 ***
0.989816396 ***
CALPERE
3.999837994 ***
in % vs PERIM:
-0.004050150 ***
RADIUS & ANGLE
0.992760091 ***

0.077027644 ***

X & Y
0.070028176 ***
0.991238607 ***
CALPERE
3.999916953 ***
in % vs PERIM:
-0.002076175 ***
RADIUS & ANGLE
0.993709173 ***
0.070529960 ***

X & Y
0.063661978 ***
0.992573274 ***
CALPERE
3.999996368 ***
in % vs PERIM:
-0.000090800 ***
RADIUS & ANGLE
0.994612765 ***
0.064050583 ***

X & Y
0.057295780 ***
0.993817076 ***
CALPERE
4.000073920 ***
in % vs PERIM:
0.001848000 ***
RADIUS & ANGLE
0.995467321 ***
0.057588492 ***

X & Y
 0.050929583 ***
 0.994966273 ***
CALPERE
 4.000146776 ***
in % vs PERIM:
 0.003669400 ***
RADIUS & ANGLE
 0.996268893 ***
 0.051142610 ***

X & Y
 0.044563385 ***
 0.996016603 ***
CALPERE
 4.000211464 ***
in % vs PERIM:
 0.005286600 ***
RADIUS & ANGLE
 0.997013023 ***
 0.044711790 ***

X & Y
 0.038197187 ***
 0.996963147 ***
CALPERE
 4.000263788 ***
in % vs PERIM:
 0.006594700 ***
RADIUS & ANGLE
 0.997694613 ***
 0.038294809 ***

X & Y
 0.031830989 ***
 0.997800119 ***
CALPERE
 4.000298660 ***
in % vs PERIM:
 0.007466500 ***
RADIUS & ANGLE
 0.998307713 ***
 0.031890353 ***

X & Y
 0.025464792 ***
 0.998520551 ***
CALPERE
 4.000309992 ***
in % vs PERIM:
 0.007749800 ***
RADIUS & ANGLE
 0.998845207 ***
 0.025496995 ***

X & Y
 0.019098594 ***
 0.999115754 ***
CALPERE
 4.000290628 ***
in % vs PERIM:
 0.007265700 ***
RADIUS & ANGLE
 0.999298277 ***
 0.019113169 ***

X & Y

0.012732396 ***
0.999574289 ***
CALPERE
4.000232616 ***
in % vs PERIM:
0.005815400 ***
RADIUS & ANGLE
0.999655377 ***
0.012737130 ***

X & Y
0.006366199 ***
0.999879555 ***
CALPERE
4.000129276 ***
in % vs PERIM:
0.003231900 ***
RADIUS & ANGLE
0.999899821 ***
0.006366880 ***

X & Y
0.000000001 ***
1.000000000 ***
CALPERE
4.000000000 ***
in % vs PERIM:
0.000000000 ***
RADIUS & ANGLE
1.000000000 ***
0.000000001 ***
