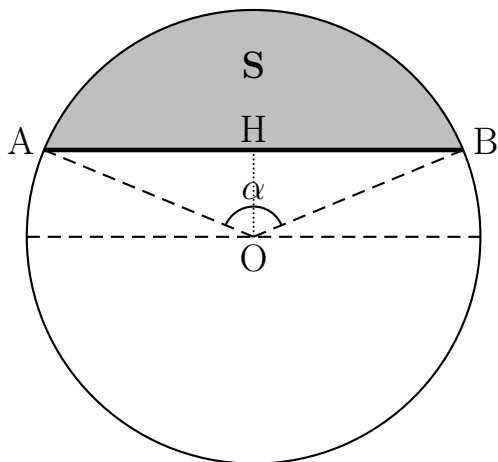# Longueur de la corde en fonction de la portion de surface désirée

Alain Brobecker

Si on appelle R le rayon du cercle et $D = 2 \times R$ son diamètre, alors on a:

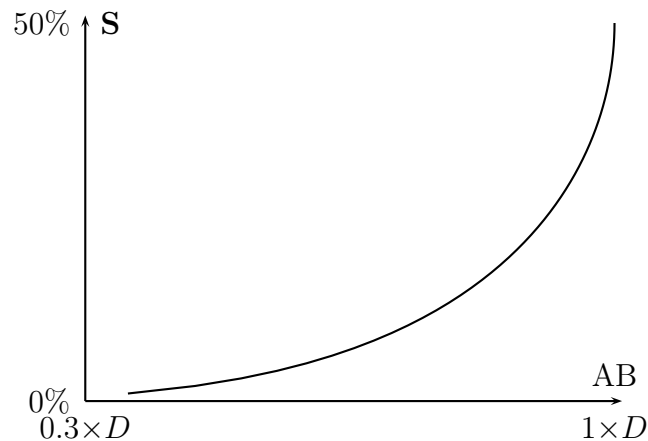$$AB = 2AH = 2R\sin\left(\frac{\alpha}{2}\right)$$

$$\mathbf{S} = \pi R^2 \times \frac{\alpha}{2\pi} - surface(AOB)$$

$$= R^2 \times \frac{\alpha}{2} - OH \times AH$$

$$= R^2 \times \frac{\alpha}{2} - R\sin\left(\frac{\alpha}{2}\right) \times R\cos\left(\frac{\alpha}{2}\right)$$

$$= R^2 \times \frac{\alpha}{2} - R^2\sin\left(\frac{2\alpha}{2}\right)$$

$$= \frac{R^2}{2} \times (\alpha - \sin(\alpha))$$

Les valeurs sur la table ci-contre ont été trouvées par dichotomie. Pour vérification, lorsque $\alpha = 90$ degrés on doit trouver AB$= R\sqrt{2} = D\frac{\sqrt{2}}{2}$ et $\mathbf{S} = \frac{\pi R^2}{4} - \frac{R^2}{2} = \pi R^2 \times \left(\frac{1}{4} - \frac{1}{2\pi}\right)$.

On a bien $\frac{\sqrt{2}}{2} \simeq 0.707106781$ et $\frac{1}{4} - \frac{1}{2\pi} \simeq 9.0845056\%$ ce qui correspond aux valeurs trouvées de la table.

L'histogramme ci-dessous montre le caractère non linéaire entre AB et $\mathbf{S}$.

S	AB	α (degrés)
50%	$1 \times D$	180
49%	$0.999877 \times D$	178.2
48%	$0.999506 \times D$	176.399
47%	$0.998888 \times D$	174.596
46%	$0.998022 \times D$	172.79
45%	$0.996905 \times D$	170.981
44%	$0.995535 \times D$	169.168
43%	$0.993912 \times D$	167.349
42%	$0.992031 \times D$	165.523
41%	$0.989888 \times D$	163.69
40%	$0.987481 \times D$	161.849
39%	$0.984805 \times D$	159.998
38%	$0.981854 \times D$	158.137
37%	$0.978623 \times D$	156.263
36%	$0.975105 \times D$	154.377
35%	$0.971294 \times D$	152.477
34%	$0.967181 \times D$	150.561
33%	$0.962758 \times D$	148.628
32%	$0.958014 \times D$	146.676
31%	$0.952939 \times D$	144.705
30%	$0.947522 \times D$	142.711
29%	$0.941748 \times D$	140.694
28%	$0.935603 \times D$	138.652
27%	$0.929071 \times D$	136.581
26%	$0.922134 \times D$	134.48
25%	$0.914771 \times D$	132.346
24%	$0.90696 \times D$	130.177
23%	$0.898675 \times D$	127.969
22%	$0.889888 \times D$	125.718
21%	$0.880566 \times D$	123.421
20%	$0.870673 \times D$	121.074
19%	$0.860167 \times D$	118.671
18%	$0.849001 \times D$	116.206
17%	$0.837118 \times D$	113.674
16%	$0.824454 \times D$	111.066
15%	$0.810934 \times D$	108.375
14%	$0.796468 \times D$	105.588
13%	$0.780949 \times D$	102.695
12%	$0.764247 \times D$	99.68
11%	$0.746201 \times D$	96.5247
10%	$0.726611 \times D$	93.2061
9%	$0.705222 \times D$	89.695
8%	$0.681698 \times D$	85.9529
7%	$0.655586 \times D$	81.9281
6%	$0.62625 \times D$	77.548
5%	$0.592754 \times D$	72.7054
4%	$0.553616 \times D$	67.2308
3%	$0.50625 \times D$	60.8288
2%	$0.445381 \times D$	52.8954
1%	$0.356402 \times D$	41.7587