# Unit n°38

## A 3-7-Safari

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**Find** the n-digit primes among the $2^n$ 3-7-decimals for n=1(1)….

**Analyze** these primes (density, bandwidth, …).

n=1
3
7

n=2
33=3*11
37pi
73pa
77=7*11
Analysis
2 two-digit primes among $2^2$ 3-7-decimals.

$$\text{Bandwidth}(2) = \frac{1}{\frac{7}{3} - \frac{73\text{pa}}{37\text{pi}}} = 2.775\ .$$

n=3
333=3*3*37
337pi
373p
377=13*29
733p
737=11*67

773pa
777=3*7*37
Analysis
4 three-digit primes among $2^3$ 3-7-decimals.

$$\text{Bandwidth}(3) = \frac{1}{\frac{7}{3} - \frac{773pa}{337pi}} = 25.275\ .$$

n=4
3333=3*11*101
3337=47*71
3373pi
3377=11*307
3733p
3737=37*101
3773=7*7*7*11
3777=3*1259
7333pa
7337=11*23*29
7373=73*101
7377=3*2459
7733=11*19*37
7737=3*2579
7773=3*2591
7777=7*11*101
Analysis
3 four-digit primes among $2^4$ 3-7-decimals.

$$\text{Bandwidth}(4) = \frac{1}{\frac{7}{3} - \frac{7333pa}{3373pi}} = 6.277295285...\ .$$

n=5
33333=3 * 41 * 271

33337=17 * 37 * 53
33373=23 * 1451
33377pi
33733= 7 * 61 * 79
33737= 11 * 3067
33773p
33777= 3 * 3 * 3 * 3 * 3 * 139
37333= 37 * 1009
37337p
37373= 7 * 19 * 281
37377= 3 * 3 * 4153
37733= 97 * 389
37737= 3 * 3 * 7 * 599
37773= 3 * 3 * 3 * 1399
37777= 37 * 1021
73333= 13 * 5641
73337= 11 * 59 * 113
73373= 239 * 307
73377= 3 * 3 * 31 * 263
73733= 11 * 6703
73737= 3 * 3 * 3 * 2731
73773= 3 * 3 * 7 * 1171
73777= 11 * 19 * 353
77333= 17 * 4549
77337= 3 * 3 * 13 * 661
77373= 3 * 3 * 8597
77377p
77733= 3 * 3 * 3 * 2879
77737= 11 * 37 * 191
77773pa
77777= 7 * 41 * 271
Analysis
5 five-digit primes among $2^5$ 3-7-decimals.

$$\text{Bandwidth}(5) = \frac{1}{\frac{7}{3} - \frac{77773pa}{33377pi}} = 312.9093754...$$

n=6

333333=3 * 3 * 7 * 11 * 13 * 37

↓

333337pi3

333737p

373777p

377737pa3

733333pi7

733373p

737773p

773777p

777373p

777737pa7

↓

777777=3 * 7 * 7 * 11 * 13 * 37

Analysis

10 six-digit primes among $2^6$ 3-7-decimals.

$$\frac{1}{\frac{377737pa3}{333337pi3}-1}=7.50759009...$$

$$\frac{1}{\frac{777737pa7}{733333pi7}-1}=16.51502117...$$

$$\frac{1}{\frac{7}{3}-\frac{733333pi7}{333337pi3}}=7.498582784...$$

$$\frac{1}{\frac{7}{3}-\frac{777737pa7}{377737pa3}}=3.644374622...$$

$$\text{Bandwidth}(6)=\frac{1}{\frac{7}{3}-\frac{777737pa7}{333337pi3}}=6756.831173...\ .$$

n=7

3333333=3 * 239 * 4649

↓

3333373pi

3333773

3337333

3337777

3377377

7337333

7337777

7377373

7733377

7737337

7737733

7777337pa

↓

7777777=7*239 * 4649

Analysis

12 seven-digit primes among $2^7$ 3-7-decimals.

$$\text{Bandwidth}(7) = \frac{1}{\frac{7}{3} - \frac{7777337\text{pa}}{3333373\text{pi}}} = 6250.07461\ldots .$$

**Continue** for n=8(1)… .

** to select the primes among the $2^n$ 3-7-decimals,

** to record the value table and the graph of the number of primes among the 2n 3-7-decimals in function P of n,

** to calculate and to record the value table and the graph of the Bandwidth(n):

| n | P(n) | Bandwidth(n) |
|---|---|---|
| 2 | 2 | 2.775 |
| 3 | 4 | 25.275 |
| 4 | 3 | 6.277… |
| 5 | 5 | 315.909… |
| 6 | 10 | 6756.831… |
| 7 | 12 | 6250.074… |
| ↓ | | |
| ∞ | ? | |

**Find** an approximation for P(n).

**Perform** the same safari with other k-m-decimals;

k≠m and $k, m \in \{1,3,5,7,9\}$.

**Discuss** all your results.

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