

Test Generátorov

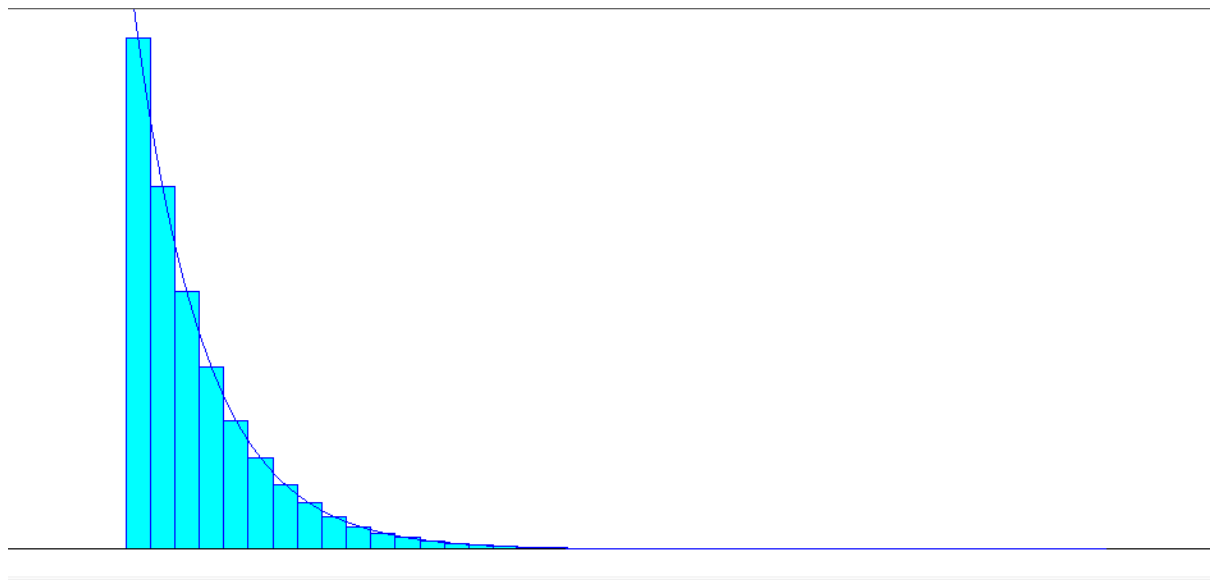
Obsah

Generátor 1 - EXPO(300) – Príchod zákazníkov do systému	2
Generátor 2 - Empirical – Počet požadovaných opráv zákazníka.....	3
Generátor 3 - UNIF(70, 310) – Prevzatie objednávky od zákazníka	5
Generátor 4 – UNIF(80, 160) - Prevzatie auta od zákazníka.....	6
Generátor 5 – TRIA(120, 240, 540) – Preparkovanie auta z parkoviska.....	7
Generátor 6 – UNIF(123, 257) – Prevzatie opraveného auta.....	8
Generátor 10 – Empirical - Trvanie opravy.....	9
Generátor 7 - UNIF(1.5, 20.5) – Pomocný generátor – Jednoduchá oprava.....	12
Generátor 8 – Pomocný generátor – Jednoduchá oprava	13
Generátor 9 – diskkrétne rozdelenie	15

Generátor 1 - EXPO(300) – Príchod zákazníkov do systému

Prúd zákazníkov prichádzajúcich do autoservisu je poissonovsky prúd s intenzitou $\lambda = 12$ zákazníkov za hodinu. Modelujem to exponenciálnym rozdelením 300 s. Každých 300 s vygeneruje nového zákazníka.

Exponenciálne rozdelenie - 300



Distribution Summary

Distribution: Exponential

Expression: EXPO(300)

Square Error: 0.000001

Chi Square Test

Number of intervals = 32

Degrees of freedom = 30

Test Statistic = 33

Corresponding p-value = 0.335

Data Summary

Number of Data Points = 1000000

Min Data Value = 0.000352

Max Data Value = 4.12e+003

Sample Mean = 300

Sample Std Dev = 299

Histogram Summary

Histogram Range = 0 to 4.12e+003

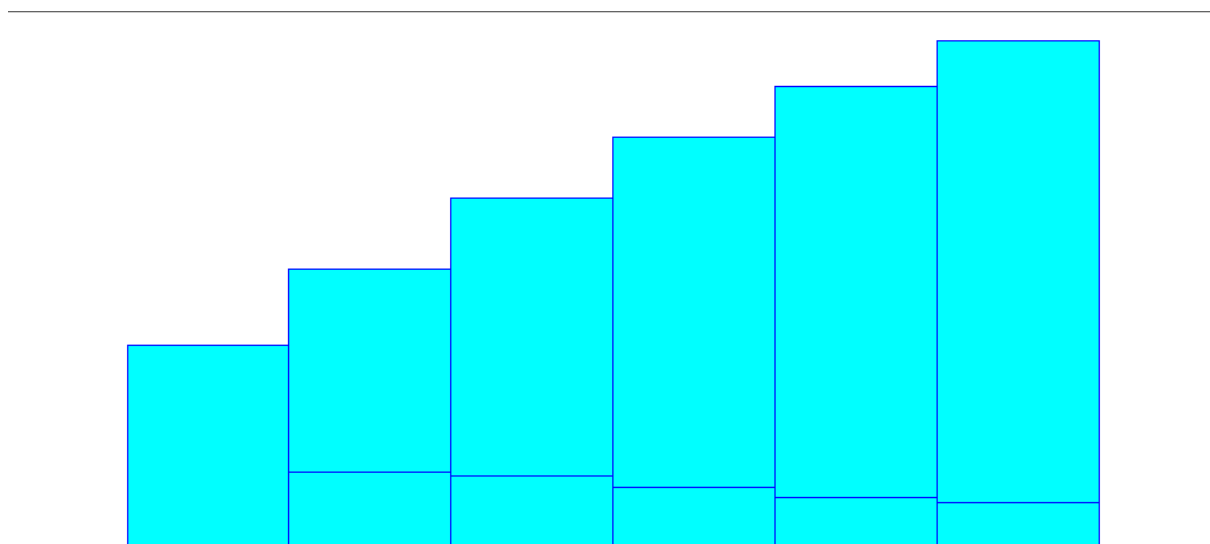
Number of Intervals = 40

Generátor 2 - Empirical – Počet požadovaných opráv zákazníka

Pravdepodobnosti počtu opráv, ktoré bude zákazník požadovať

Empirické rozdelenie – 1 – 6

Počet opráv:	1	2	3	4	5	6
Pravdepodobnosť	0.4	0.15	0.14	0.12	0.1	0.09
Kumulatívne	0,4	0,55	0,69	0,81	0,91	1



Distribution Summary

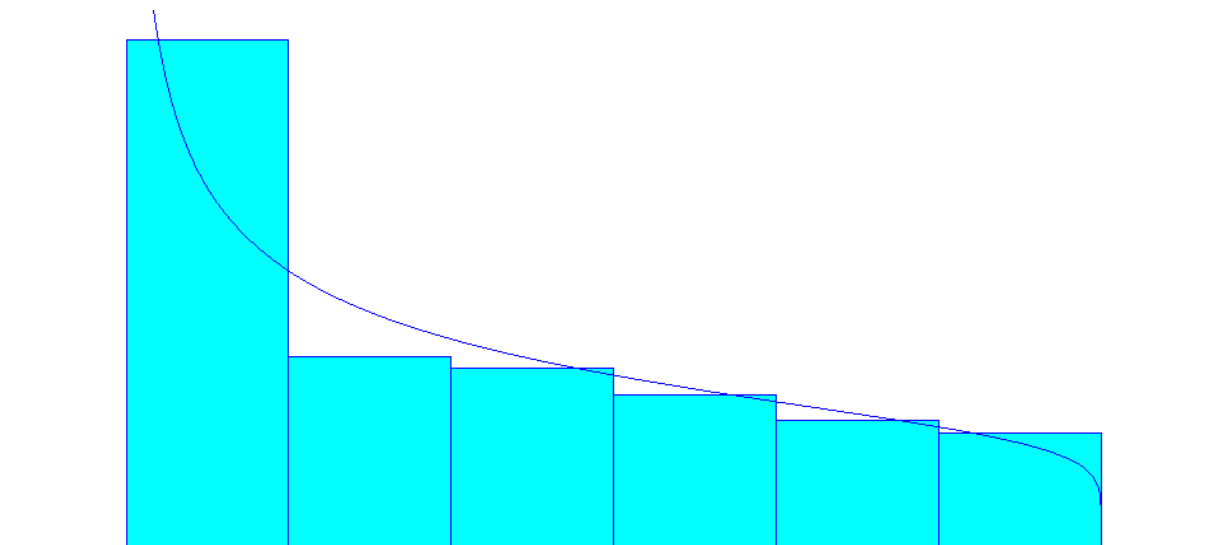
Distribution: Empirical
Expression: CONT or DISC (0.000, 0.500,
0.400, 1.500,
0.550, 2.500,
0.690, 3.500,
0.810, 4.500,
0.910, 5.500,
0.910, 6.500)

Data Summary

Number of Data Points = 1000000
Min Data Value = 1
Max Data Value = 6
Sample Mean = 2.64
Sample Std Dev = 1.72

Histogram Summary

Histogram Range = 0.5 to 6.5
Number of Intervals = 6



Distribution Summary

Distribution: Beta
Expression: $0.5 + 6 * \text{BETA}(0.643, 1.16)$
Square Error: 0.002490

Chi Square Test

Number of intervals = 6
Degrees of freedom = 3
Test Statistic = $1.19\text{e}+004$
Corresponding p-value < 0.005

Data Summary

Number of Data Points = 1000000
Min Data Value = 1
Max Data Value = 6
Sample Mean = 2.64
Sample Std Dev = 1.72

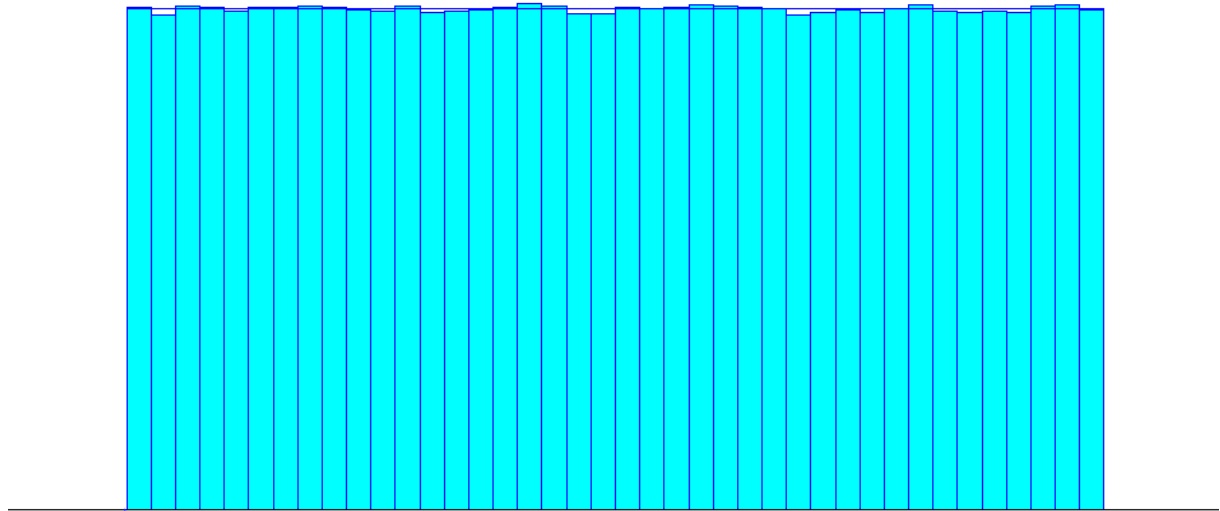
Histogram Summary

Histogram Range = 0.5 to 6.5
Number of Intervals = 6

Generátor 3 - UNIF(70, 310) – Prevzatie objednávky od zákazníka

Čas potrebný na prevzatie objednávky od zákazníka $\mu = 190 \text{ s} \pm 120 \text{ s}$.

Spojité rovnomerné rozdelenie – $\langle 70, 310 \rangle$



Distribution Summary

Distribution: Uniform

Expression: UNIF(70, 310)

Square Error: 0.000001

Chi Square Test

Number of intervals = 40

Degrees of freedom = 39

Test Statistic = 38.7

Corresponding p-value = 0.486

Data Summary

Number of Data Points = 1000000

Min Data Value = 70

Max Data Value = 310

Sample Mean = 190

Sample Std Dev = 69.3

Histogram Summary

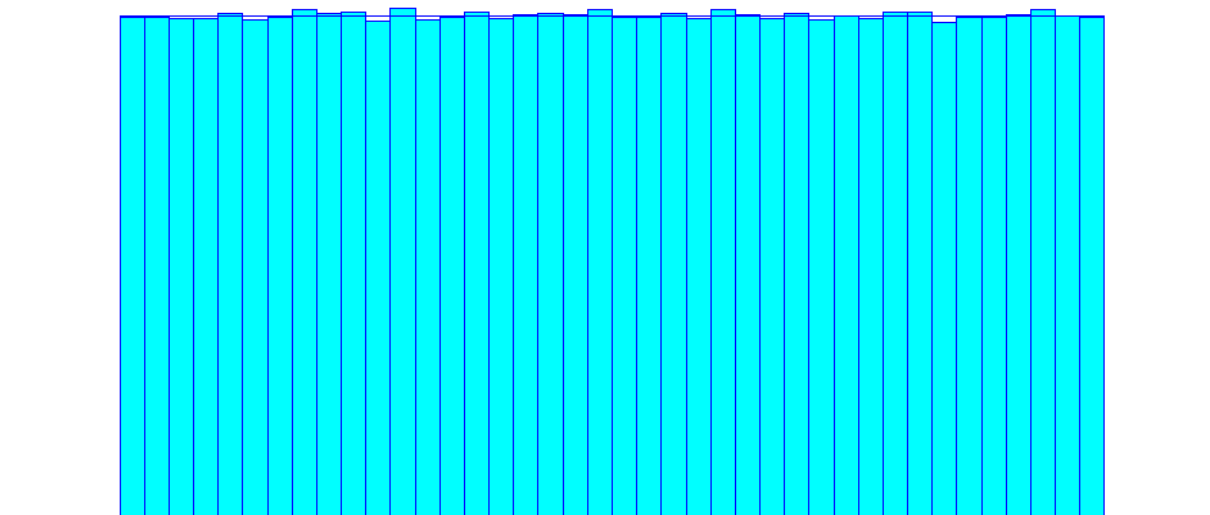
Histogram Range = 70 to 310

Number of Intervals = 40

Generátor 4 – UNIF(80, 160) - Prevzatie auta od zákazníka

Čas potrebný na prevzatie auta od zákazníka $p = 120s \pm 40s$

Spojité rovnomerné rozdelenie – $\langle 80, 160 \rangle$



Distribution Summary

Distribution: Uniform

Expression: UNIF(80, 160)

Square Error: 0.000001

Chi Square Test

Number of intervals = 40

Degrees of freedom = 39

Test Statistic = 45.3

Corresponding p-value = 0.231

Data Summary

Number of Data Points = 1000000

Min Data Value = 80

Max Data Value = 160

Sample Mean = 120

Sample Std Dev = 23.1

Histogram Summary

Histogram Range = 80 to 160

Number of Intervals = 40

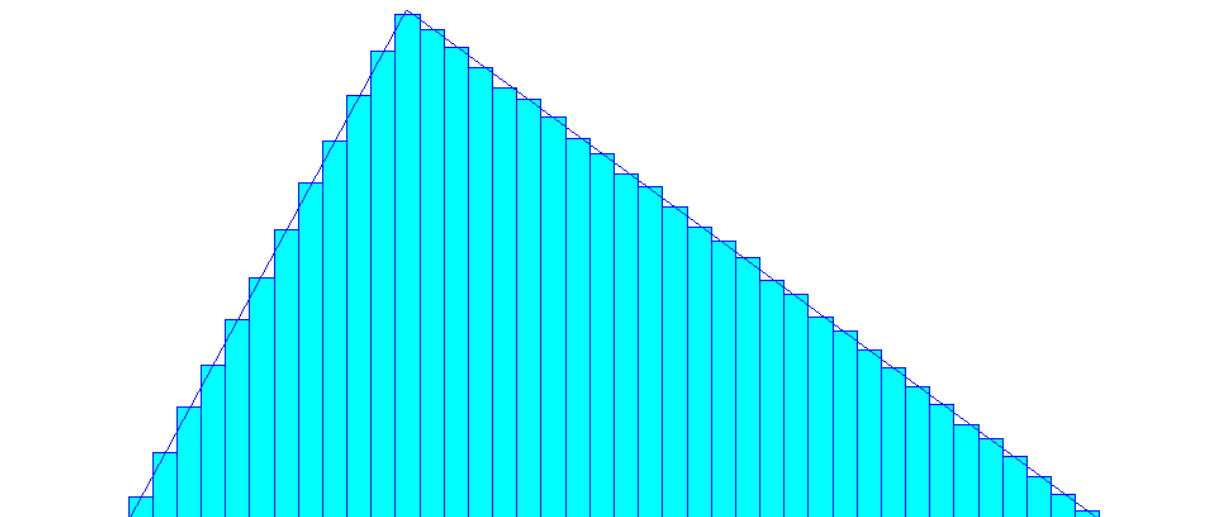
Generátor 5 – TRIA(120, 240, 540) – Preparkovanie auta z parkoviska

Preparkovanie auta z parkoviska do dielne alebo naspäť sa riadi

Trojuholníkovým rozdelením s parametrami

min = 120 s, max 540, a modus = 240 s

Trojuholníkové rozdelenie – TRIA(120, 240, 540)



Distribution Summary

Distribution: Triangular

Expression: TRIA(120, 240, 540)

Square Error: 0.000001

Chi Square Test

Number of intervals = 40

Degrees of freedom = 38

Test Statistic = 52.9

Corresponding p-value = 0.0562

Data Summary

Number of Data Points = 1000000

Min Data Value = 120

Max Data Value = 540

Sample Mean = 300

Sample Std Dev = 88.3

Histogram Summary

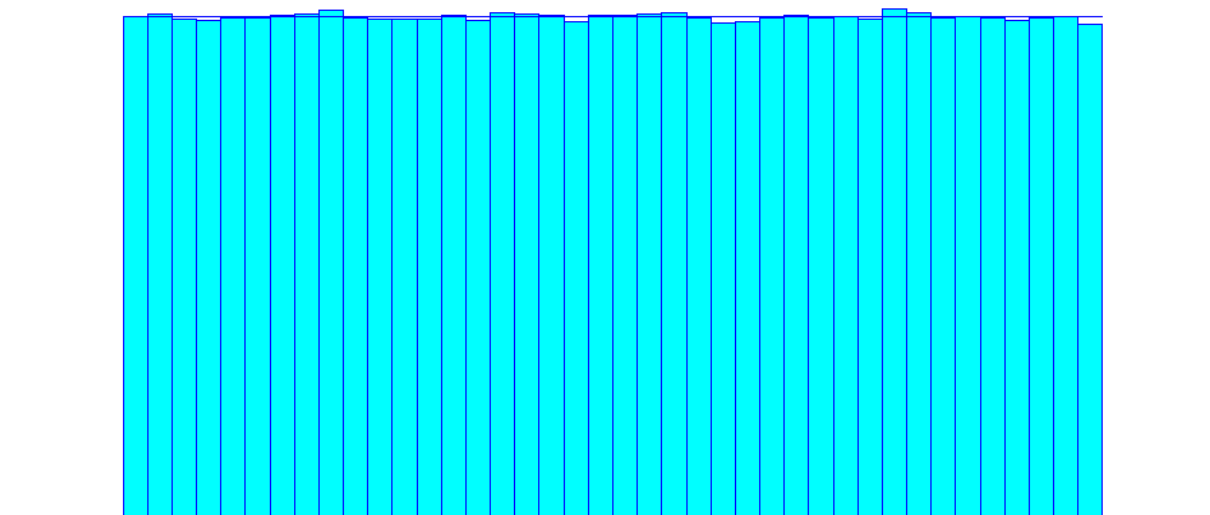
Histogram Range = 120 to 540

Number of Intervals = 40

Generátor 6 – UNIF(123, 257) – Prevzatie opraveného auta

Prevzatie opraveného auta trvá $s = 190 \text{ s} \pm 67 \text{ s}$

Spojité rovnomerné rozdelenie – $\langle 123, 257 \rangle$



Distribution Summary

Distribution: Uniform
Expression: UNIF(123, 257)
Square Error: 0.000001

Chi Square Test

Number of intervals = 40
Degrees of freedom = 39
Test Statistic = 38.2
Corresponding p-value = 0.508

Data Summary

Number of Data Points = 1000000
Min Data Value = 123
Max Data Value = 257
Sample Mean = 190
Sample Std Dev = 38.7

Histogram Summary

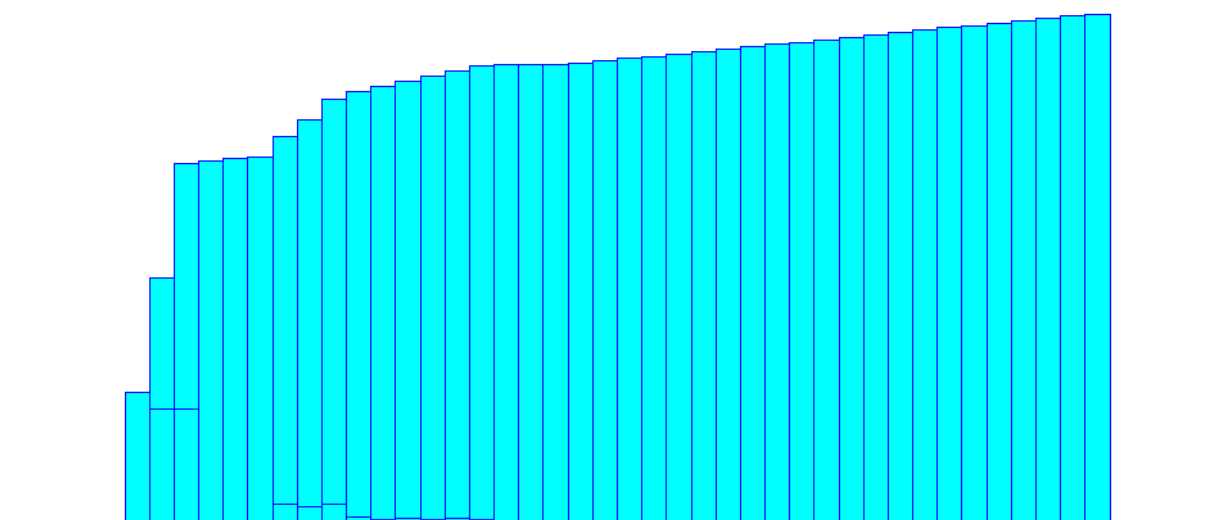
Histogram Range = 123 to 257
Number of Intervals = 40

Generátor 10 – Empirical - Trvanie opravy

Empirické rozdelenie

Pravdepodobnosti jednotlivých opráv a ich trvanie sú v tabuľke:

Typ opravy	Doba opravy		Pravdepodobnosť
	Typ rozdelenia	Čas v minútach	P
Jednoduchá	Diskrétné rovnomerné	Tmin = 2, Tmax = 20	p = 0.7
Stredne ťažká	Diskrétné empirické	Tmin = 10, Tmax = 40, p = 0.1 Tmin = 41, Tmax = 51, p = 0.6 Tmin = 62, Tmax = 100, p = 0.3	p = 0.2
Zložitá	Diskrétné rovnomerné	Tmin = 120, Tmax = 260	p = 0.1



Distribution Summary

Distribution: Empirical

Expression: CONT or DISC (0.000, 1.999,

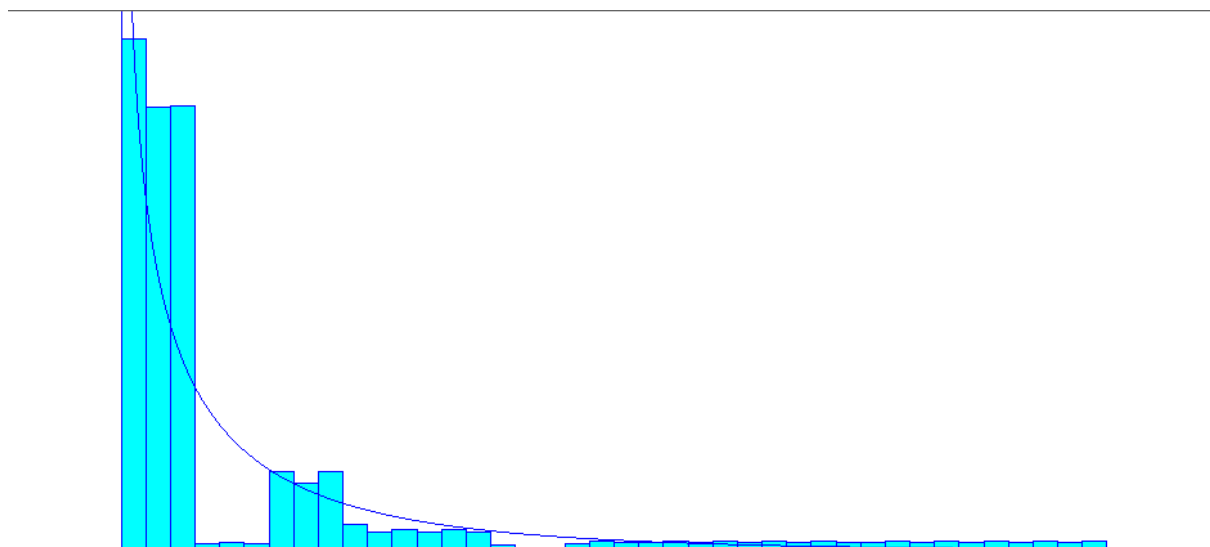
0.258, 8.449,	0.834, 60.049,	0.900, 111.650,	0.931, 163.250,	0.967, 214.851,
0.482, 14.899,	0.847, 66.499,	0.900, 118.100,	0.935, 169.700,	0.972, 221.301,
0.707, 21.349,	0.857, 72.950,	0.903, 124.550,	0.940, 176.150,	0.977, 227.751,
0.711, 27.799,	0.867, 79.400,	0.908, 131.000,	0.945, 182.600,	0.981, 234.201,
0.716, 34.249,	0.877, 85.850,	0.913, 137.450,	0.949, 189.050,	0.986, 240.651,
0.719, 40.699,	0.888, 92.300,	0.917, 143.900,	0.954, 195.501,	0.991, 247.101,
0.759, 47.149,	0.897, 98.750,	0.922, 150.350,	0.958, 201.951,	0.995, 253.551,
0.793, 53.599,	0.900, 105.200,	0.926, 156.800,	0.963, 208.401,	0.995, 260.001)

Data Summary

Number of Data Points = 1000000
 Min Data Value = 2
 Max Data Value = 260
 Sample Mean = 38.2
 Sample Std Dev = 56.2

Histogram Summary

Histogram Range = 2 to 260
 Number of Intervals = 40



Distribution Summary

Distribution: Weibull
Expression: $2 + \text{WEIB}(27.2, 0.688)$
Square Error: 0.036107

Chi Square Test

Number of intervals = 40
Degrees of freedom = 37
Test Statistic = 5.47×10^5
Corresponding p-value < 0.005

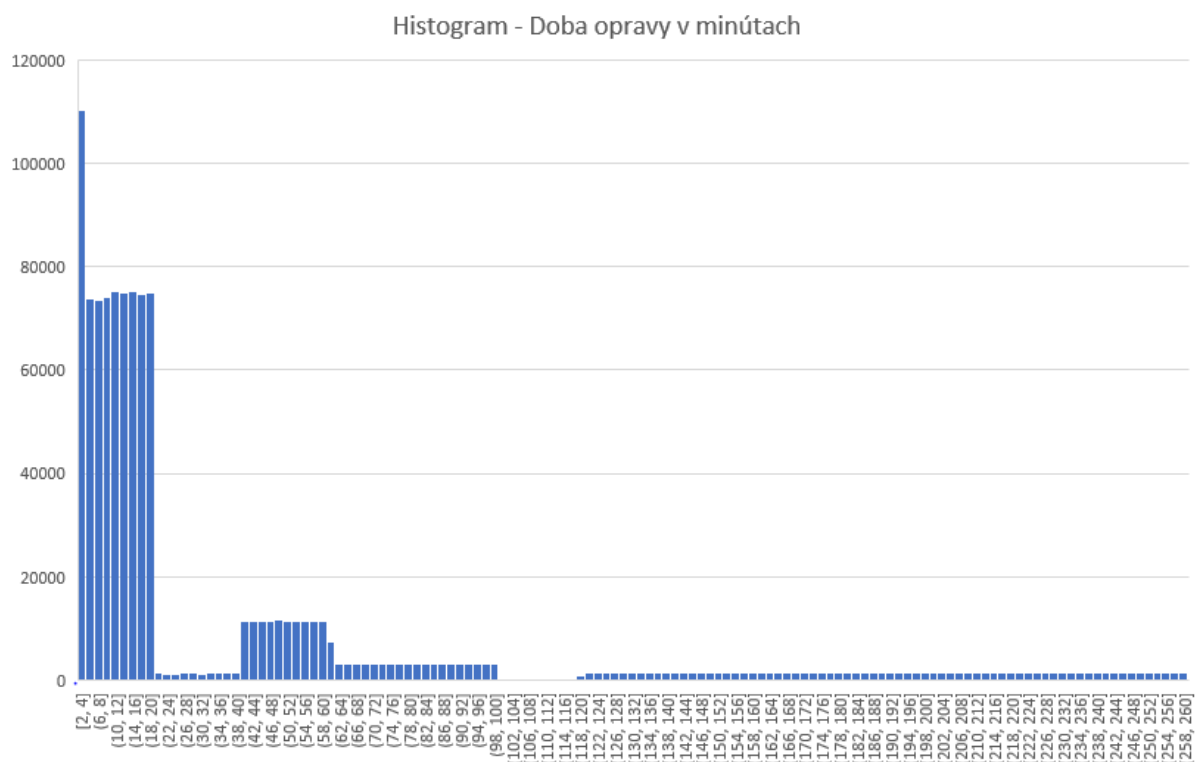
Data Summary

Number of Data Points = 1000000
Min Data Value = 2
Max Data Value = 260
Sample Mean = 38.2
Sample Std Dev = 56.2

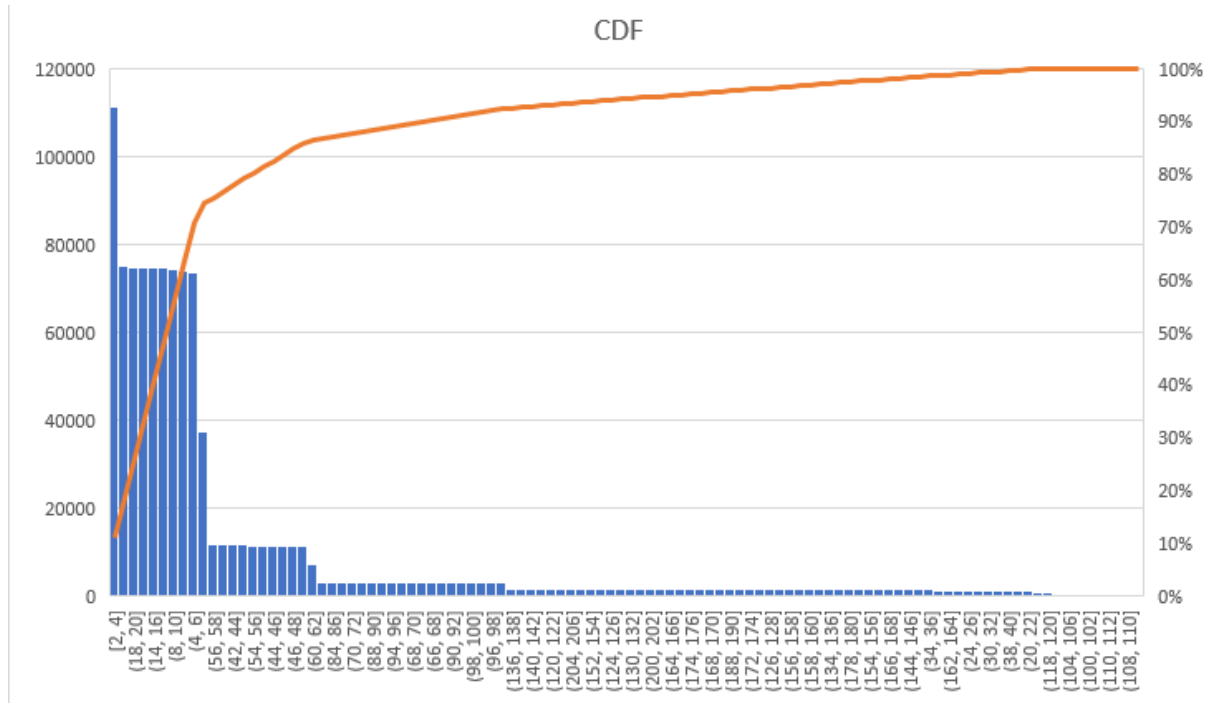
Histogram Summary

Histogram Range = 2 to 260
Number of Intervals = 40

Histogram – Doba opravy v minútach



Histogram s kumulatívnou funkciou

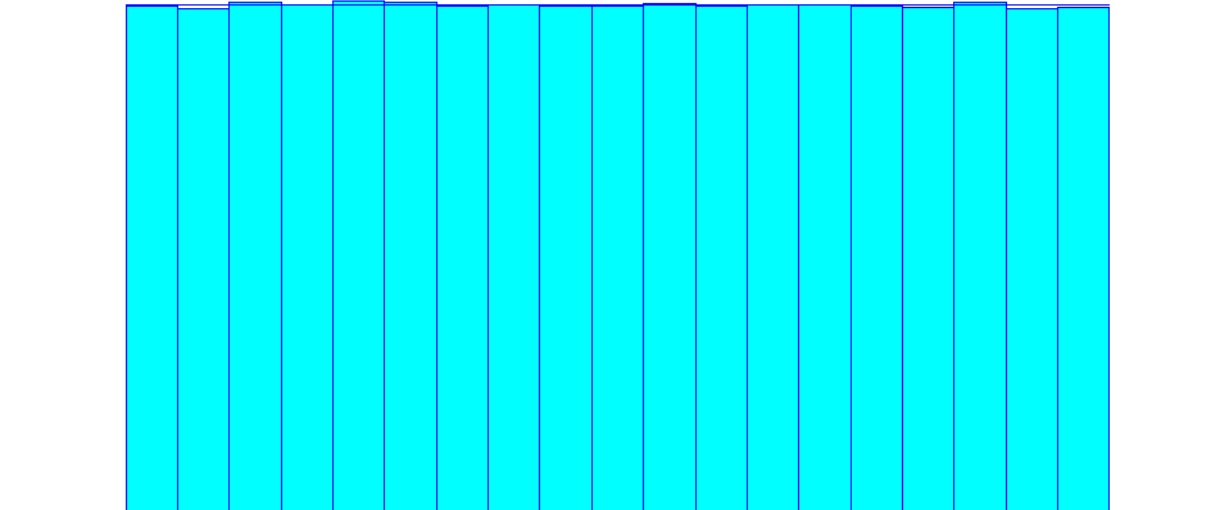


Generátor 7 - UNIF(1.5, 20.5) – Pomocný generátor – Jednoduchá oprava

Jednoduchá oprava - trvanie v minútach

Diskrétné rovnomerne = $T_{\min} = 2$, $T_{\max} = 20$

Diskrétné rovnomerné rozdelenie – 2, 20



Distribution Summary

Distribution: Uniform

Expression: UNIF(1.5, 20.5)

Square Error: 0.000001

Chi Square Test

Number of intervals = 19

Degrees of freedom = 18

Test Statistic = 26.2

Corresponding p-value = 0.096

Data Summary

Number of Data Points = 1000000

Min Data Value = 2

Max Data Value = 20

Sample Mean = 11

Sample Std Dev = 5.48

Histogram Summary

Histogram Range = 1.5 to 20.5

Number of Intervals = 19

Generátor 8 – Pomocný generátor – Stredne ťažká oprava

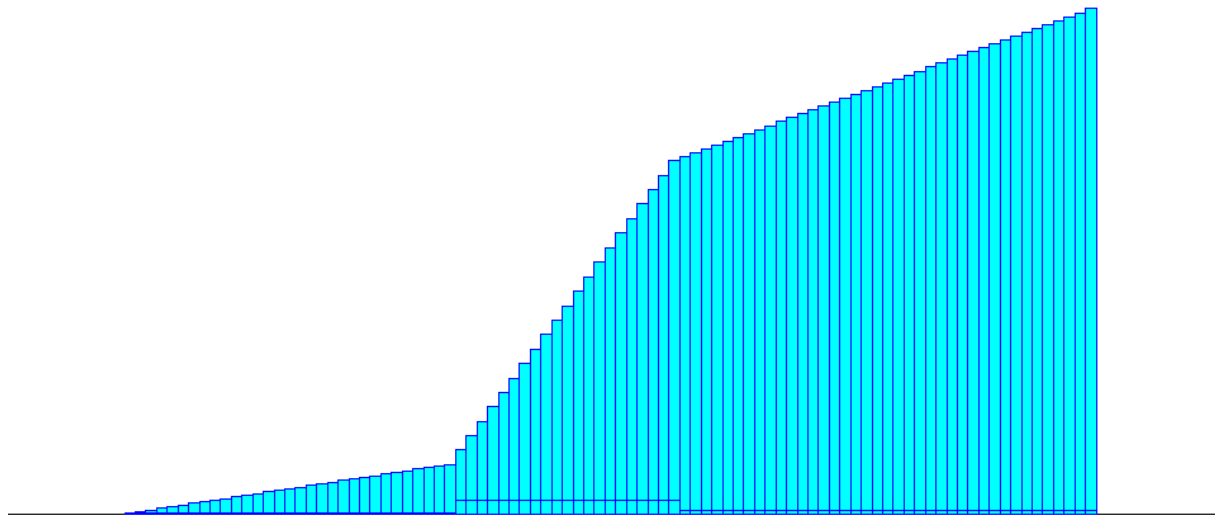
Diskrétné empirické rozdelenie

Stredne ťažká oprava - trvanie v sekundách

T: 10 - 40 41– 61 62 – 100

p: 0.1 0.6 0.3

k: 0,1 0,7 1



Distribution Summary

Distribution: Empirical

Expression: CONT or DISC (

0.000, 9.500,	0.052, 25.500,	0.128, 41.500,	0.585, 57.500,	0.793, 73.500,	0.916, 89.500,
0.003, 10.500,	0.055, 26.500,	0.157, 42.500,	0.614, 58.500,	0.800, 74.500,	0.923, 90.500,
0.006, 11.500,	0.058, 27.500,	0.185, 43.500,	0.643, 59.500,	0.808, 75.500,	0.931, 91.500,
0.010, 12.500,	0.061, 28.500,	0.214, 44.500,	0.671, 60.500,	0.816, 76.500,	0.939, 92.500,
0.013, 13.500,	0.065, 29.500,	0.243, 45.500,	0.700, 61.500,	0.824, 77.500,	0.946, 93.500,
0.016, 14.500,	0.068, 30.500,	0.271, 46.500,	0.708, 62.500,	0.831, 78.500,	0.954, 94.500,
0.019, 15.500,	0.071, 31.500,	0.299, 47.500,	0.715, 63.500,	0.839, 79.500,	0.962, 95.500,
0.023, 16.500,	0.074, 32.500,	0.328, 48.500,	0.723, 64.500,	0.846, 80.500,	0.969, 96.500,
0.026, 17.500,	0.078, 33.500,	0.356, 49.500,	0.731, 65.500,	0.854, 81.500,	0.977, 97.500,
0.029, 18.500,	0.081, 34.500,	0.385, 50.500,	0.738, 66.500,	0.862, 82.500,	0.985, 98.500,
0.032, 19.500,	0.084, 35.500,	0.413, 51.500,	0.746, 67.500,	0.869, 83.500,	0.992, 99.500,
0.036, 20.500,	0.087, 36.500,	0.442, 52.500,	0.754, 68.500,	0.877, 84.500,	0.992, 100.500
0.039, 21.500,	0.090, 37.500,	0.470, 53.500,	0.762, 69.500,	0.885, 85.500,)
0.042, 22.500,	0.094, 38.500,	0.499, 54.500,	0.769, 70.500,	0.892, 86.500,	
0.045, 23.500,	0.097, 39.500,	0.528, 55.500,	0.777, 71.500,	0.900, 87.500,	
0.049, 24.500,	0.100, 40.500,	0.557, 56.500,	0.785, 72.500,	0.908, 88.500,	

Data Summary

Number of Data Points = 1000000

Min Data Value = 10

Max Data Value = 100

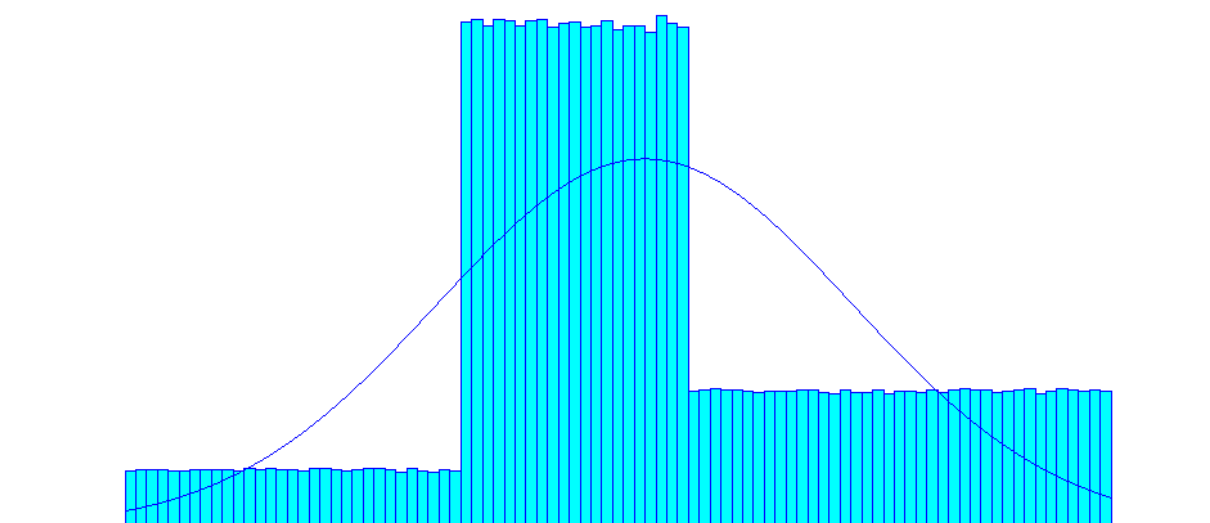
Sample Mean = 57.4

Sample Std Dev = 19.1

Histogram Summary

Histogram Range = 9.5 to 101

Number of Intervals = 91



Distribution Summary

Distribution: Normal
Expression: $\text{NORM}(57.4, 19.1)$
Square Error: 0.004467

Chi Square Test

Number of intervals = 91
Degrees of freedom = 88
Test Statistic = 3.81×10^5
Corresponding p-value < 0.005

Data Summary

Number of Data Points = 1000000
Min Data Value = 10
Max Data Value = 100
Sample Mean = 57.4
Sample Std Dev = 19.1

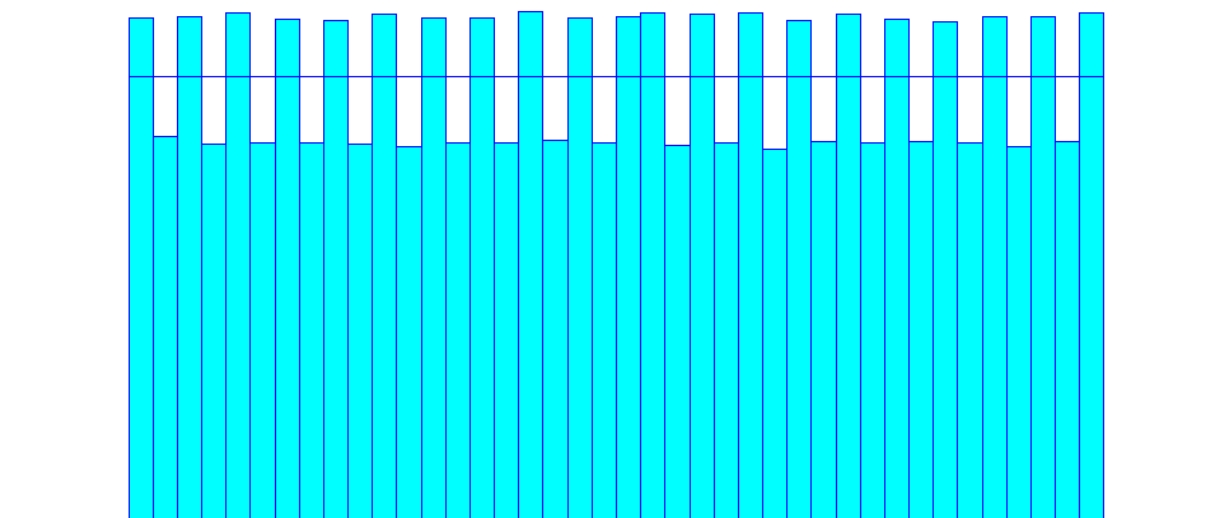
Histogram Summary

Histogram Range = 9.5 to 101
Number of Intervals = 91

Generátor 9 – diskrétné rozdelenie – Ťažká oprava

Zložité oprava

diskrétné rovnomerne $T_{\min} = 120$, $T_{\max} = 260$



Distribution Summary
Distribution Summary

Distribution: Uniform
Expression: UNIF(120, 260)
Square Error: 0.000504

Chi Square Test

Number of intervals = 40
Degrees of freedom = 39
Test Statistic = 2.02e+004
Corresponding p-value < 0.005

Data Summary

Number of Data Points = 1000000
Min Data Value = 120
Max Data Value = 260
Sample Mean = 190
Sample Std Dev = 40.7

Histogram Summary

Histogram Range = 120 to 260
Number of Intervals = 40