Test Generátorov

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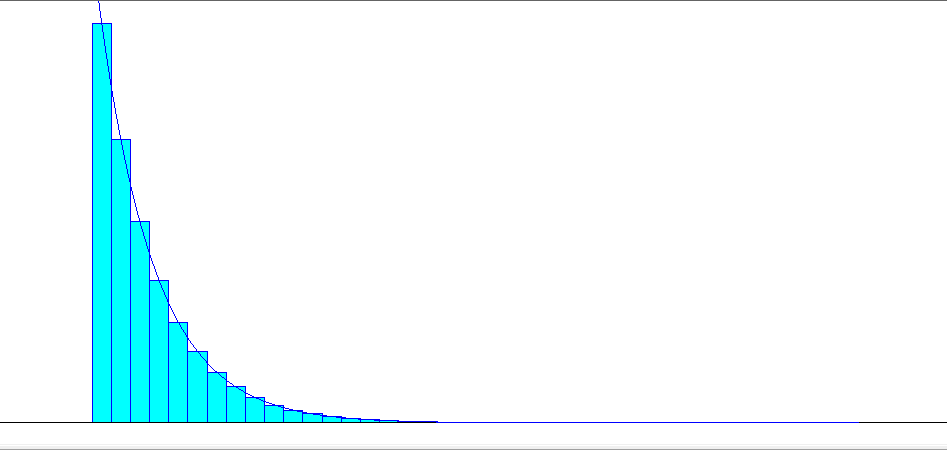
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# Generátor 1 - EXPO(300) – Príchod zákazníkov do systému

Prúd zákazníkov prichádzajúcich do autoservisu je poissonovsky prúd s intenzitou z = 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

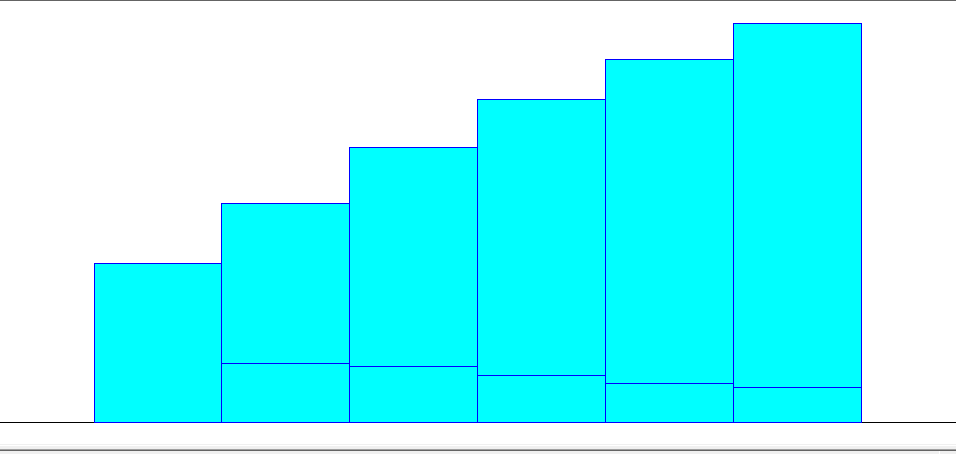
Pravdepodobnosti počtu opráv, ktoré bude zákazník požadovať

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

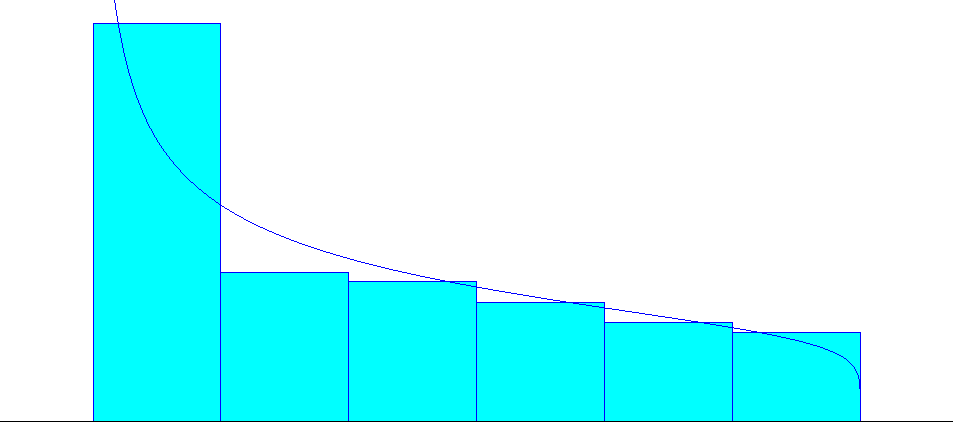
Sample Mean = 2.64

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 \* BETA(0.643, 1.16)

Square Error: 0.002490

Chi Square Test

Number of intervals = 6

Degrees of freedom = 3

Test Statistic = 1.19e+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

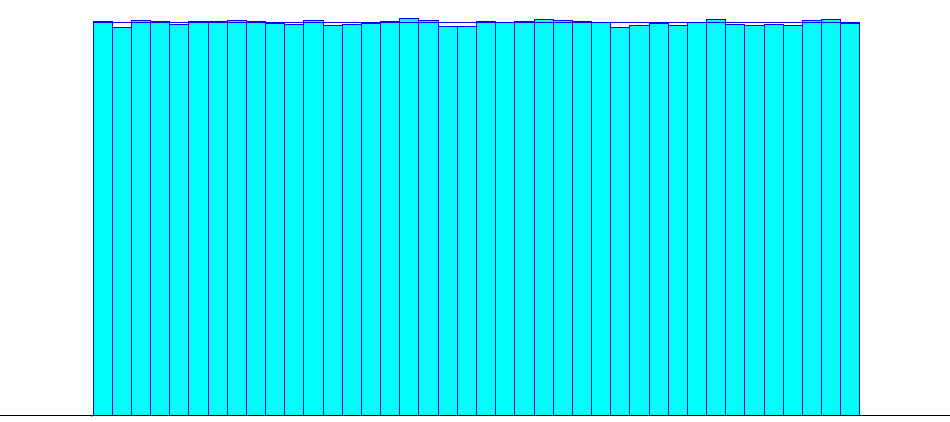
Histogram Range = 0.5 to 6.5

Number of Intervals = 6

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

Čas potrebný na prevzatie objednávky od zákazníka o = 190 s +- 120 s .

Spojité rovnomerné rozdelenie – <70, 310>



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

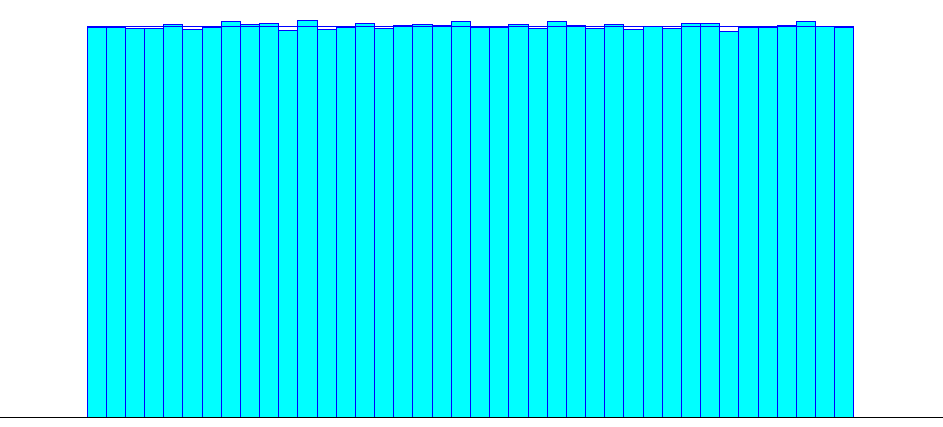
Histogram Range = 70 to 310

Number of Intervals = 40

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

Čas potrebný na prevzatie auta od zákazníka p = 120s +- 40 s

Spojité rovnomerné rozdelenie – <80, 160>



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

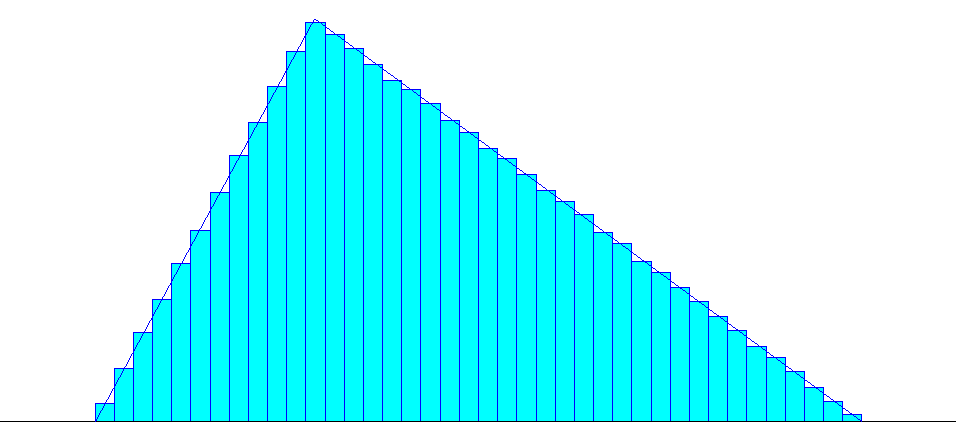
# Generátor 5 – TRIA(120, 240, 540) – Preparkovanie auta z parkoviska

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

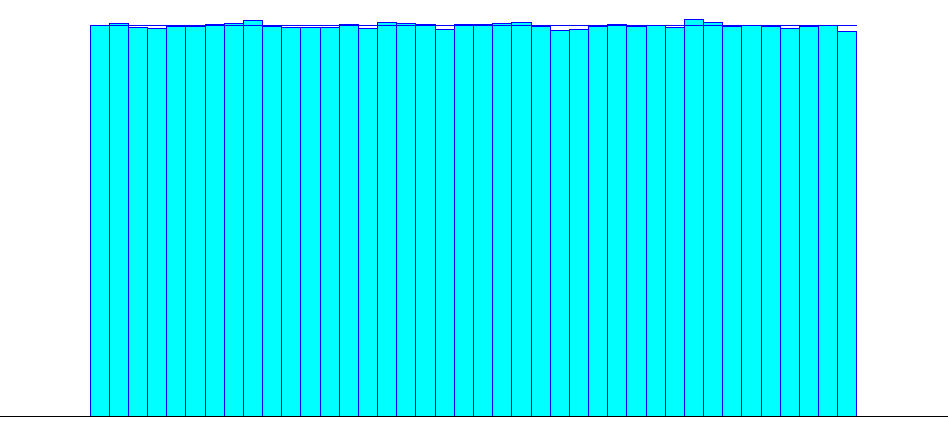
Histogram Range = 120 to 540

Number of Intervals = 40

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

Prevzatie opraveného auta trvá s = 190 s +- 67s

Spojité rovnomerné rozdelenie – <123, 257>



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

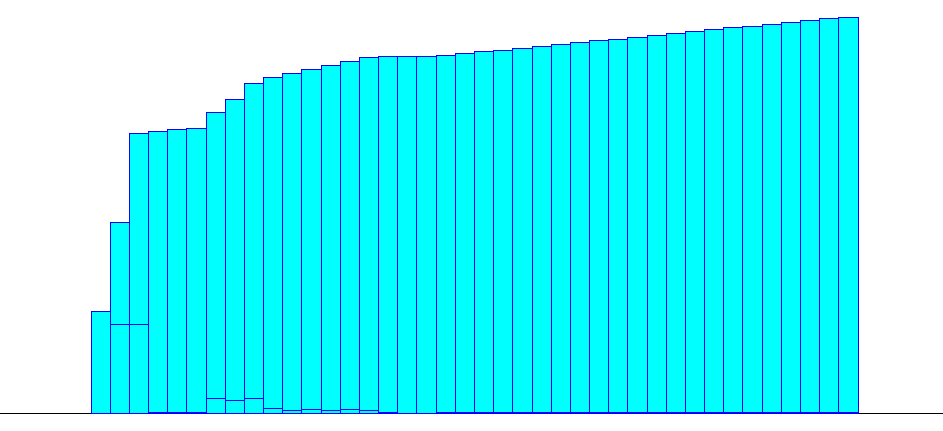
Number of Intervals = 40

# 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** | Diskrétne rovnomerné | Tmin = 2, Tmax = 20 | p = 0.7 |
| **Stredne ťažká** | Diskrétne 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** | Diskrétne rovnomerné | Tmin = 120, Tmax = 260 | p = 0.1 |



Distribution Summary

Distribution: Empirical

Expression: CONT or DISC (0.000, 1.999,

0.258, 8.449,

0.482, 14.899,

0.707, 21.349,

0.711, 27.799,

0.716, 34.249,

0.719, 40.699,

0.759, 47.149,

0.793, 53.599,

0.834, 60.049,

0.847, 66.499,

0.857, 72.950,

0.867, 79.400,

0.877, 85.850,

0.888, 92.300,

0.897, 98.750,

0.900, 105.200,

0.900, 111.650,

0.900, 118.100,

0.903, 124.550,

0.908, 131.000,

0.913, 137.450,

0.917, 143.900,

0.922, 150.350,

0.926, 156.800,

0.931, 163.250,

0.935, 169.700,

0.940, 176.150,

0.945, 182.600,

0.949, 189.050,

0.954, 195.501,

0.958, 201.951,

0.963, 208.401,

0.967, 214.851,

0.972, 221.301,

0.977, 227.751,

0.981, 234.201,

0.986, 240.651,

0.991, 247.101,

0.995, 253.551,

0.995, 260.001)

Data Summary

Number of Data Points = 1000000

Min Data Value = 2

Max Data Value = 260

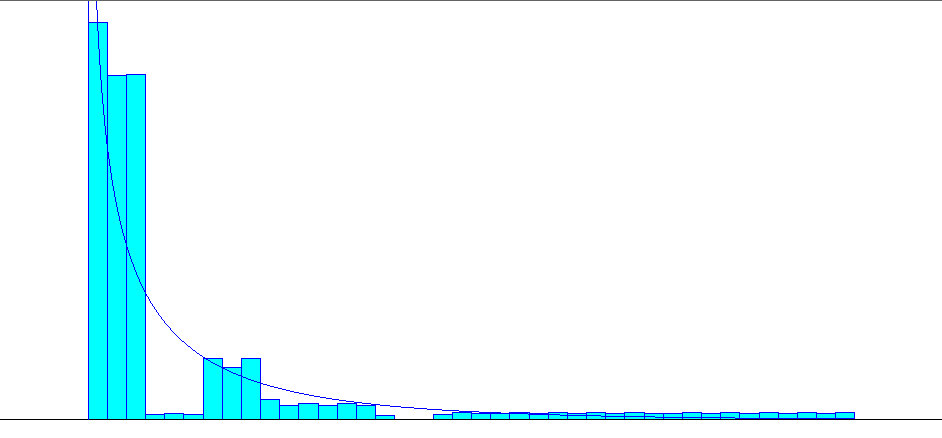
Sample Mean = 38.2

Sample Std Dev = 56.2

Histogram Summary

Histogram Range = 2 to 260

Number of Intervals = 40



Distribution Summary

Distribution: Weibull

Expression: 2 + WEIB(27.2, 0.688)

Square Error: 0.036107

Chi Square Test

Number of intervals = 40

Degrees of freedom = 37

Test Statistic = 5.47e+005

Corresponding p-value < 0.005

Data Summary

Number of Data Points = 1000000

Min Data Value = 2

Max Data Value = 260

Sample Mean = 38.2

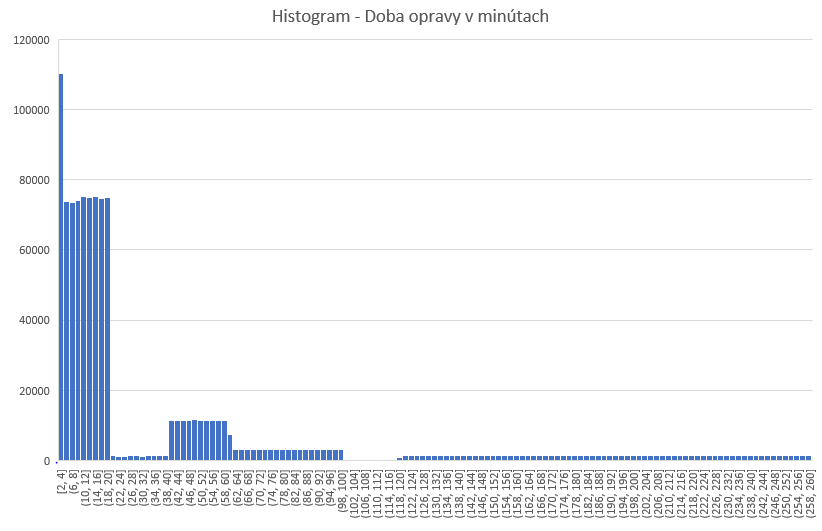
Sample Std Dev = 56.2

Histogram Summary

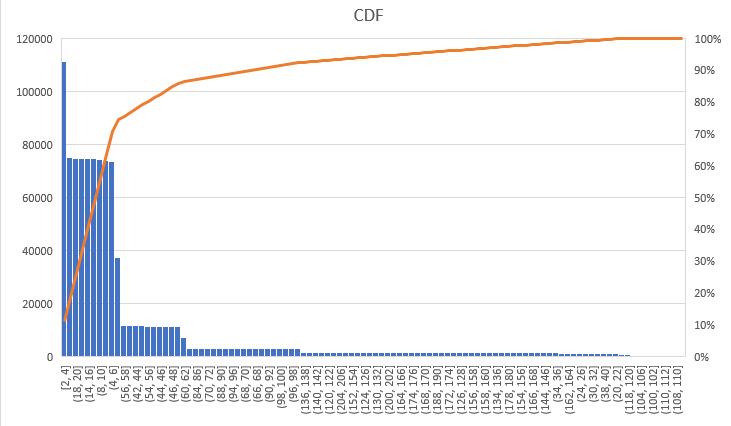
Histogram Range = 2 to 260

Number of Intervals = 40

Histogram – Doba opravy v minútach



Histogram s kumulatívnou funkciou

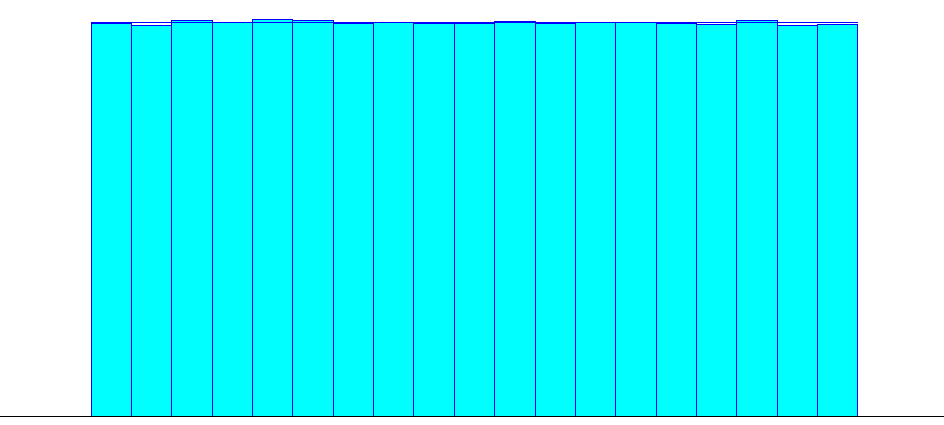


## Generátor 7 - UNIF(1.5, 20.5) – Pomocný generátor – Jednoduchá oprava

Jednoduchá oprava - trvanie v minútach

Diskrétne rovnomerne = Tmin = 2, Tmax = 20

Diskrétne 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

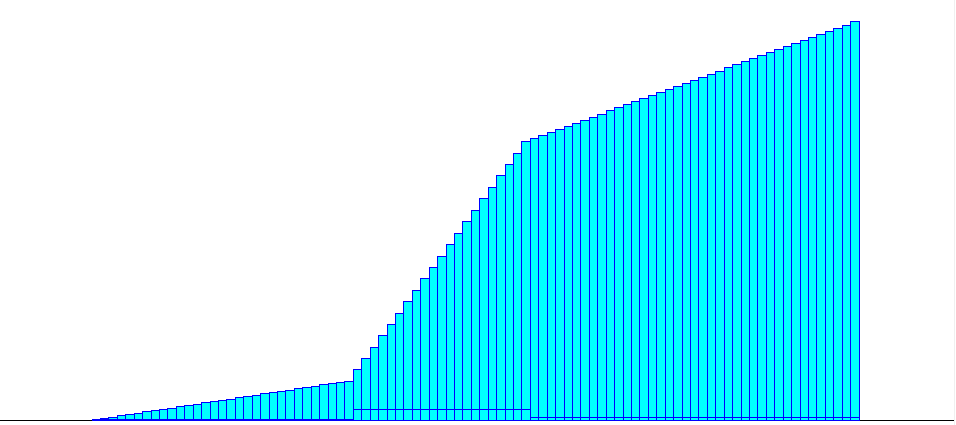
Diskrétne empirické rozdelenie

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,

0.003, 10.500,

0.006, 11.500,

0.010, 12.500,

0.013, 13.500,

0.016, 14.500,

0.019, 15.500,

0.023, 16.500,

0.026, 17.500,

0.029, 18.500,

0.032, 19.500,

0.036, 20.500,

0.039, 21.500,

0.042, 22.500,

0.045, 23.500,

0.049, 24.500,

0.052, 25.500,

0.055, 26.500,

0.058, 27.500,

0.061, 28.500,

0.065, 29.500,

0.068, 30.500,

0.071, 31.500,

0.074, 32.500,

0.078, 33.500,

0.081, 34.500,

0.084, 35.500,

0.087, 36.500,

0.090, 37.500,

0.094, 38.500,

0.097, 39.500,

**0.100, 40.500,**

0.128, 41.500,

0.157, 42.500,

0.185, 43.500,

0.214, 44.500,

0.243, 45.500,

0.271, 46.500,

0.299, 47.500,

0.328, 48.500,

0.356, 49.500,

0.385, 50.500,

0.413, 51.500,

0.442, 52.500,

0.470, 53.500,

0.499, 54.500,

0.528, 55.500,

0.557, 56.500,

0.585, 57.500,

0.614, 58.500,

0.643, 59.500,

0.671, 60.500,

**0.700, 61.500,**

0.708, 62.500,

0.715, 63.500,

0.723, 64.500,

0.731, 65.500,

0.738, 66.500,

0.746, 67.500,

0.754, 68.500,

0.762, 69.500,

0.769, 70.500,

0.777, 71.500,

0.785, 72.500,

0.793, 73.500,

0.800, 74.500,

0.808, 75.500,

0.816, 76.500,

0.824, 77.500,

0.831, 78.500,

0.839, 79.500,

0.846, 80.500,

0.854, 81.500,

0.862, 82.500,

0.869, 83.500,

0.877, 84.500,

0.885, 85.500,

0.892, 86.500,

0.900, 87.500,

0.908, 88.500,

0.916, 89.500,

0.923, 90.500,

0.931, 91.500,

0.939, 92.500,

0.946, 93.500,

0.954, 94.500,

0.962, 95.500,

0.969, 96.500,

0.977, 97.500,

0.985, 98.500,

0.992, 99.500,

0.992, 100.500

)

Data Summary

Number of Data Points = 1000000

Min Data Value = 10

Max Data Value = 100

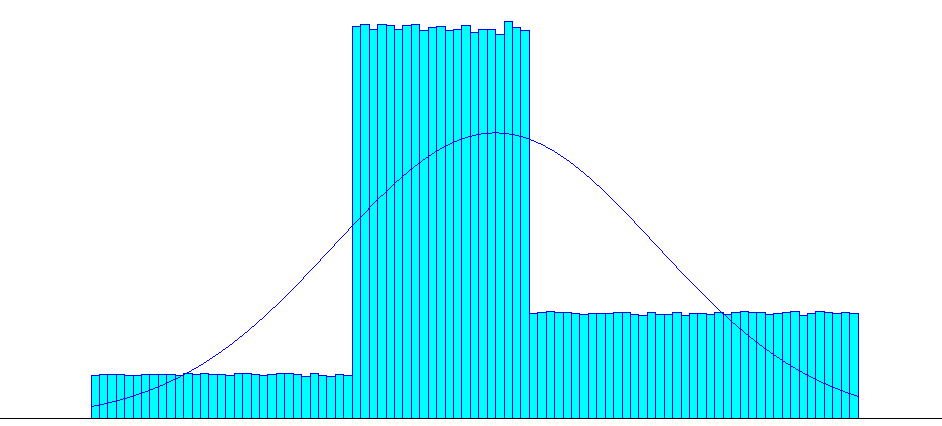
Sample Mean = 57.4

Sample Std Dev = 19.1

Histogram Summary

Histogram Range = 9.5 to 101

Number of Intervals = 91



Distribution Summary

Distribution: Normal

Expression: NORM(57.4, 19.1)

Square Error: 0.004467

Chi Square Test

Number of intervals = 91

Degrees of freedom = 88

Test Statistic = 3.81e+005

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

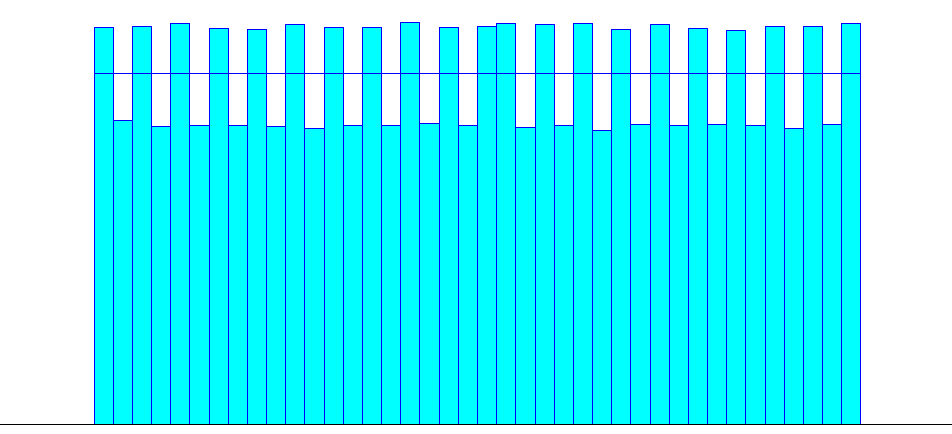
Histogram Range = 9.5 to 101

Number of Intervals = 91

## Generátor 9 – diskrétne rozdelenie – Ťažká oprava

Zložitá oprava

diskrétne rovnomerne Tmin = 120, Tmax = 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