

Povprečja

```
In[1]:= met := Random[Integer, {1, 6}]
```

```
In[2]:= met
```

```
Out[2]= 5
```

```
In[3]:= Table[met, {100}]  
Apply[Plus, %]
```

```
Out[3]= {6, 3, 1, 2, 1, 6, 5, 4, 1, 5, 1, 5, 4, 4, 6, 5, 5, 6, 1, 6, 5, 1, 1, 3, 3,  
2, 5, 1, 2, 4, 6, 1, 5, 1, 5, 2, 4, 1, 1, 5, 3, 2, 1, 4, 5, 2, 1, 4, 1, 5,  
5, 4, 1, 2, 3, 6, 5, 3, 1, 6, 1, 2, 4, 6, 5, 2, 2, 1, 3, 3, 2, 4, 2, 4, 1,  
1, 4, 2, 1, 3, 6, 5, 4, 3, 1, 3, 4, 6, 1, 6, 4, 2, 4, 4, 4, 4, 2, 1, 5, 4}
```

```
Out[4]= 325
```

```
In[5]:= dogodek[n_] := Apply[Plus, Table[met, {n}]]
```

```
In[6]:= dogodek[100]
```

```
Out[6]= 355
```

```
In[7]:=
```

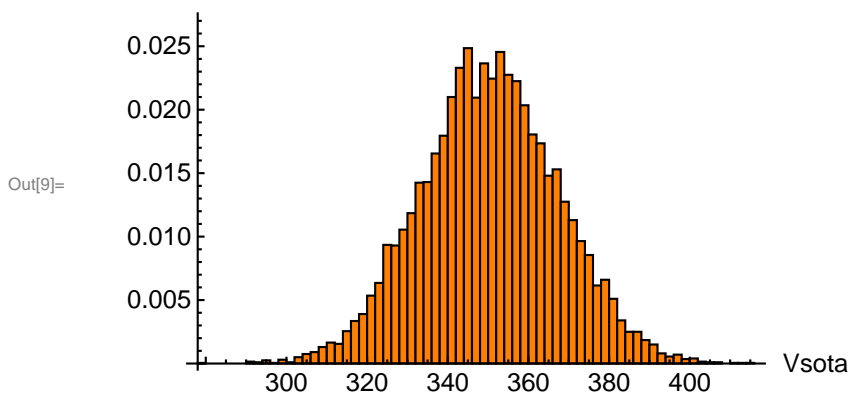
```
In[8]:= (tab1 = Table[dogodek[100], {10 000}]) // Short
```

```
Out[8]/Short=
```

```
{359, 348, 350, 334, 327, 386, 357, 365, 350, 348, 352, 362, 354,  
341, 337, 356, 329, 319, 330, <<9962>>, 376, 331, 376, 344, 345,  
340, 377, 362, 354, 341, 348, 321, 299, 366, 338, 336, 361, 348, 356}
```

```
In[9]:= hist = Histogram[tab1, Automatic, "PDF",  
AxesLabel → {"Vsota", "Verjetnostna gostota"},  
ChartStyle → Orange, ChartBaseStyle → EdgeForm[Thickness[Medium]],  
ImageSize → 5 × 72,  
TicksStyle → Thickness[Medium], AxesStyle → Thickness[Medium],  
LabelStyle → Directive[FontFamily → "Helvetica", FontSize → 12]]
```

Verjetnostna gostota



In[10]:=

```

vsota = 0;
vsota2 = 0;
n = Length[tab1];
For[i = 1, i ≤ n, ++i,
  vsota = vsota + tab1[[i]];
  vsota2 = vsota2 + tab1[[i]] ^ 2;
]
pov = vsota / n;
σ = √(vsota2 / n - pov^2);
Print["Povprečje: " <> ToString[N[pov]]]
Print["Disperzija: " <> ToString[N[σ]]]

```

Povprečje: 349.849

Disperzija: 16.9666

In[18]:= **x0** = N[Mean[tab1]]

Out[18]= 349.849

In[19]:= **σ** = N[Sqrt[CentralMoment[tab1, 2]]]

Out[19]= 16.9666

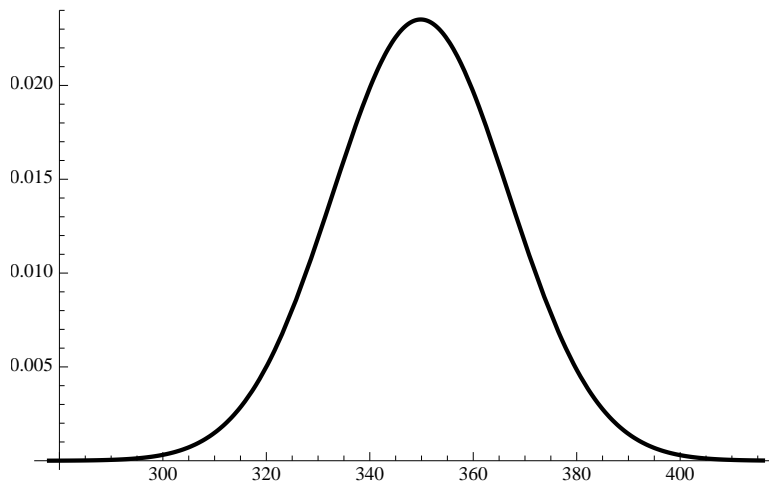
In[20]:= $g[x_, x0_, \sigma_] := \frac{1}{\sqrt{2\pi\sigma^2}} \text{Exp}\left[-\frac{(x-x0)^2}{2\sigma^2}\right]$

```

gauss = Plot[g[x, x0, σ],
  {x, (PlotRange /. Options[hist])[[1, 1]], (PlotRange /. Options[hist])[[1, 2]]},
  PlotStyle → Directive[Thickness → Large, Black]]

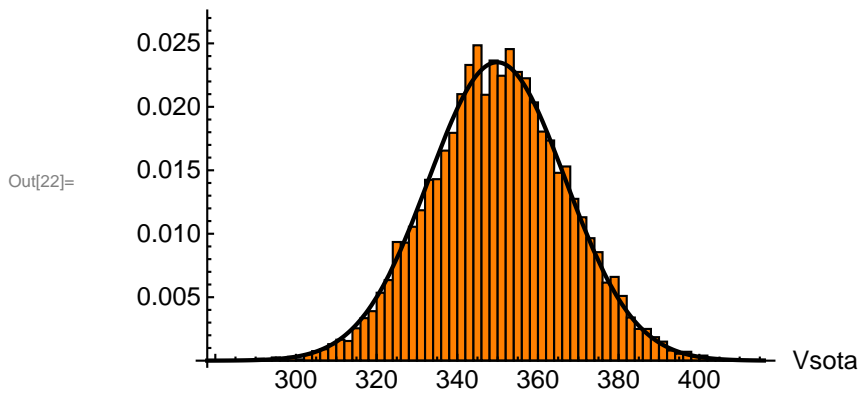
```

Out[21]=



```
In[22]:= Show[hist, gauss]
```

Verjetnostna gostota



```
In[23]:= s = N[Skewness[tab1]]
```

Out[23]= 0.00678707

```
In[24]:= s0 = N[Sqrt[6 / 10 000]]
```

Out[24]= 0.0244949

```
In[25]:= s / s0
```

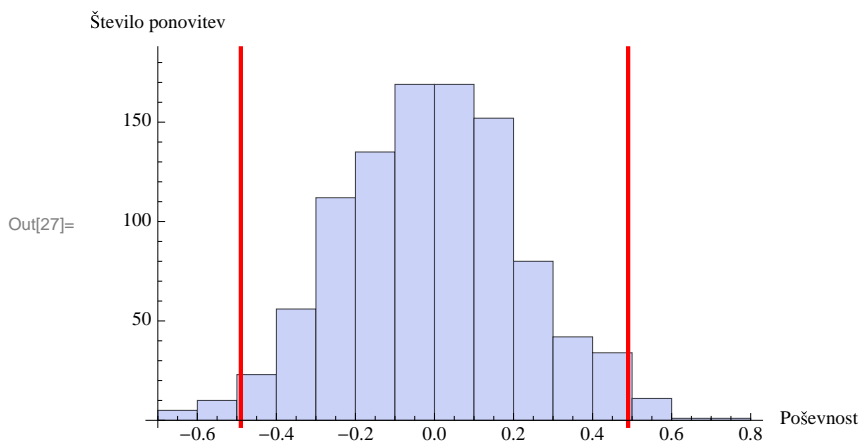
Out[25]= 0.277081

```
In[26]:= (tab2 = Map[N[Skewness[#] &, Table[Table[dogodek[100], {100}], {1000}]]]) // Short
```

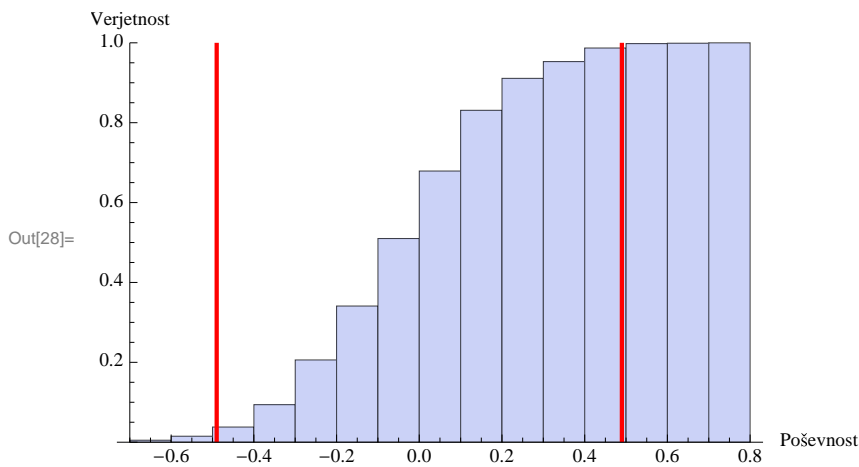
Out[26]//Short=

```
{0.0236718, -0.132964, 0.457401, <<994>>, -0.358297, -0.28872, 0.494433}
```

```
In[27]:= Histogram[tab2, AxesLabel -> {"Poševnost", "Število ponovitev"},
  GridLines -> {{-2 Sqrt[6 / 100], 2 Sqrt[6 / 100]}, {}},
  GridLinesStyle -> Directive[Thick, Red], Method -> {"GridLinesInFront" -> True}]
```



```
In[28]:= Histogram[tab2, Automatic, "CDF", AxesLabel → {"Poševnost", "Verjetnost"},
  GridLines → {{-2 Sqrt[6 / 100], 2 Sqrt[6 / 100]}, {}},
  GridLinesStyle → Directive[Thick, Red],
  PlotRange → {0, 1}, Method → {"GridLinesInFront" → True}]
```



```
In[29]:=
```

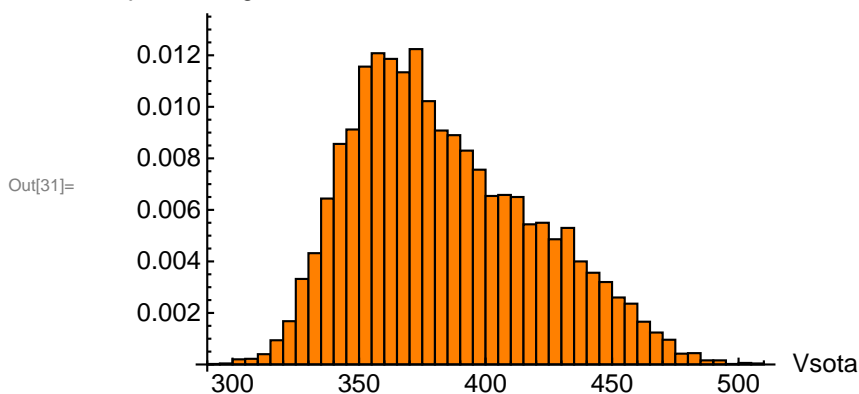
```
In[30]:= (tab1 = Table[dogodek[Module[{x}, x = Random[]; 100 + 30 x^2]], {10 000}]) // Short
```

```
Out[30]//Short=
```

```
{433, 457, 336, 428, 359, 373, 395, 330, 389, 432, 350, 452, 385,
  412, 400, 400, 315, 333, 352, <<9962>>, 386, 384, 349, 439, 355,
  387, 393, 421, 356, 427, 410, 354, 440, 364, 442, 404, 406, 429, 356}
```

```
In[31]:= hist = Histogram[tab1, Automatic, "PDF",
  AxesLabel → {"Vsota", "Verjetnostna gostota"},
  ChartStyle → Orange, ChartBaseStyle → EdgeForm[Thickness[Medium]],
  ImageSize → 5 × 72,
  TicksStyle → Thickness[Medium], AxesStyle → Thickness[Medium],
  LabelStyle → Directive[FontFamily → "Helvetica", FontSize → 12]]
```

Verjetnostna gostota



```
In[32]:= x0 = N[Mean[tab1]]
```

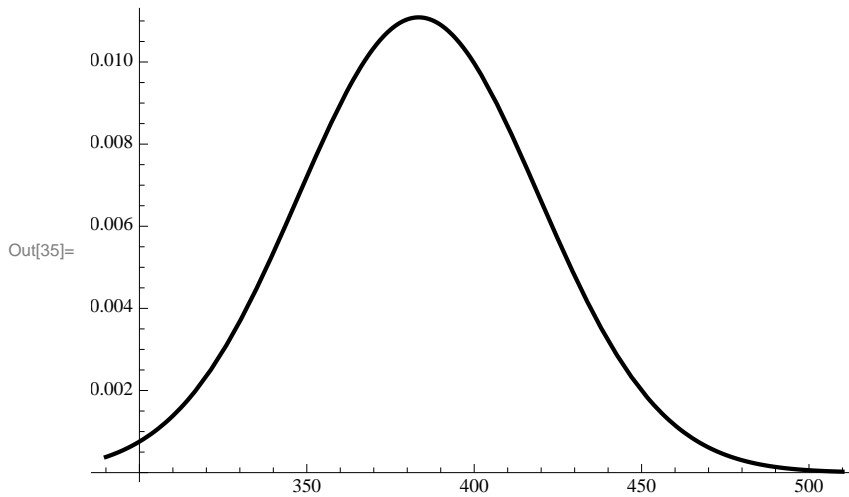
```
Out[32]= 383.413
```

```
In[33]:= σ = N[Sqrt[CentralMoment[tab1, 2]]]
```

```
Out[33]= 35.9835
```

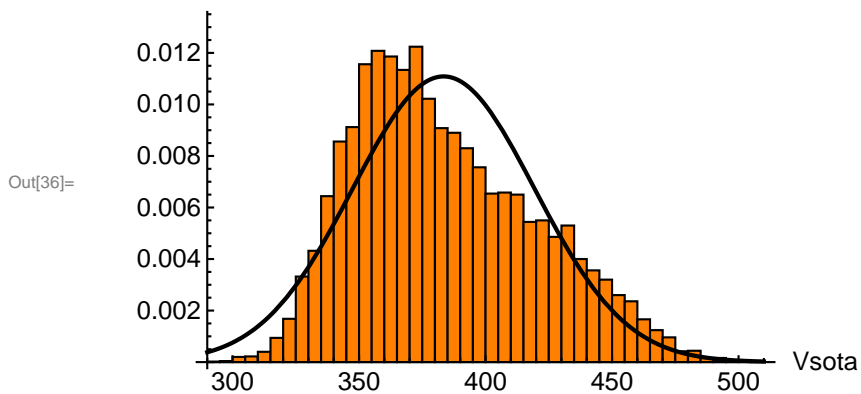
```
In[34]:= g[x_, x0_, σ_] :=  $\frac{1}{\sqrt{2 \pi \sigma^2}} \text{Exp}\left[-\frac{(x - x0)^2}{2 \sigma^2}\right]$ 
```

```
gauss = Plot[g[x, x0, σ],
  {x, (PlotRange /. Options[hist])[1, 1], (PlotRange /. Options[hist])[1, 2]},
  PlotStyle → Directive[Thickness → Large, Black]]
```



```
In[36]:= Show[hist, gauss]
```

Verjetnostna gostota



```
In[37]:= s = N[Skewness[tab1]]
```

Out[37]= 0.49713

```
In[38]:= s0 = N[Sqrt[6 / 10 000]]
```

Out[38]= 0.0244949

```
In[39]:= s / s0
```

Out[39]= 20.2953

```
In[40]:=
```

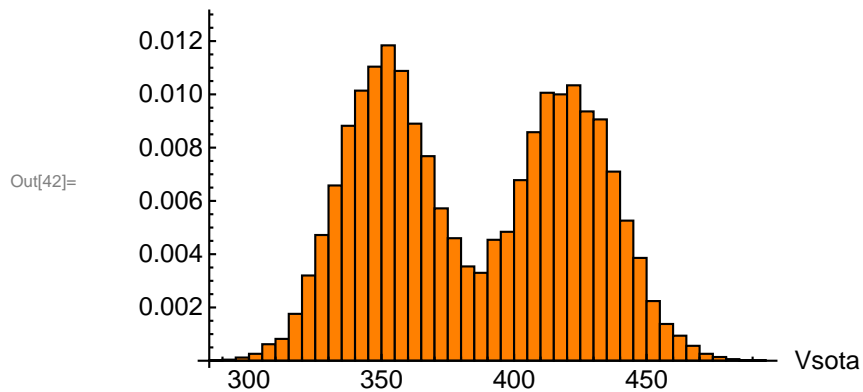
```
In[41]:= (tab1 = Table[dogodek[If[Random[] < 1 / 2, 100, 120]], {10 000}]) // Short
```

```
Out[41]//Short=
```

```
{440, 413, 432, 373, 429, 406, 392, 389, 354, 426, 338, 350, 369,
 343, 373, 374, 428, 325, 330, <<9962>>, 378, 333, 389, 416, 372,
 436, 386, 423, 363, 440, 415, 374, 325, 400, 344, 413, 331, 332, 348}
```

```
In[42]:= hist = Histogram[tab1, Automatic, "PDF",
  AxesLabel → {"Vsota", "Verjetnostna gostota"},
  ChartStyle → Orange, ChartBaseStyle → EdgeForm[Thickness[Medium]],
  ImageSize → 5 × 72,
  TicksStyle → Thickness[Medium], AxesStyle → Thickness[Medium],
  LabelStyle → Directive[FontFamily → "Helvetica", FontSize → 12]]
```

Verjetnostna gostota



```
In[43]:= x0 = N[Mean[tab1]]
```

```
Out[43]= 384.903
```

```
In[44]:= σ = N[Sqrt[CentralMoment[tab1, 2]]]
```

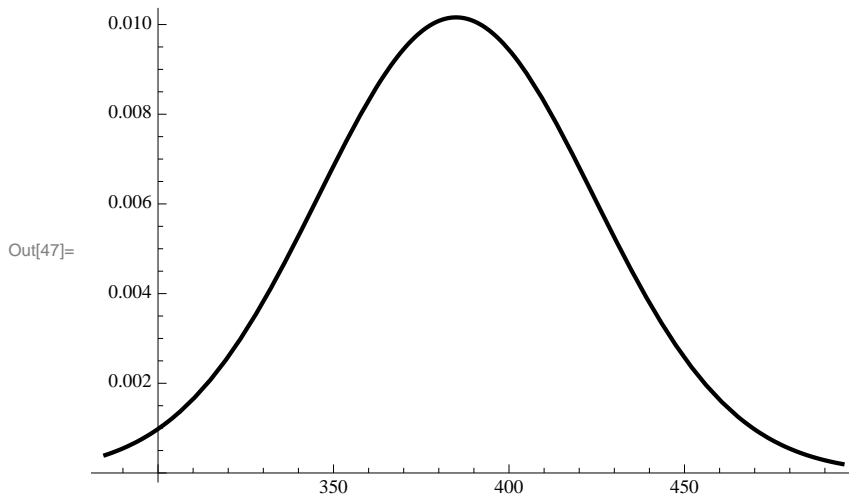
```
Out[44]= 39.2679
```

```
In[45]:= N[Skewness[tab1]]
```

```
Out[45]= 0.0591237
```

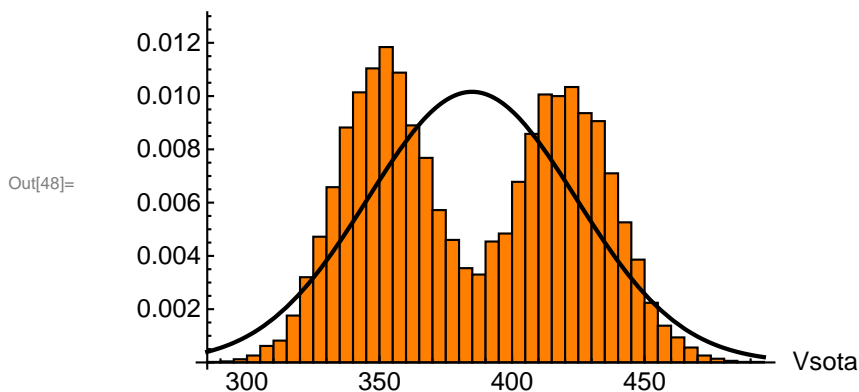
```
In[46]:= g[x_, x0_, σ_] :=  $\frac{1}{\sqrt{2 \pi \sigma^2}} \text{Exp}\left[-\frac{(x - x0)^2}{2 \sigma^2}\right]$ 
```

```
gauss = Plot[g[x, x0, σ],
  {x, (PlotRange /. Options[hist])[1, 1], (PlotRange /. Options[hist])[1, 2]},
  PlotStyle → Directive[Thickness → Large, Black]]
```



```
In[48]:= Show[hist, gauss]
```

Verjetnostna gostota



```
In[49]:=
```

```
In[50]:= tab2 = Table[Table[dogodek[n], {100}], {n, 10, 100, 10}];
```

```
In[51]:= n = Table[n, {n, 10, 100, 10}]
```

```
Out[51]= {10, 20, 30, 40, 50, 60, 70, 80, 90, 100}
```

```
In[52]:= x0 = Map[N[Mean[#]] &, tab2]
```

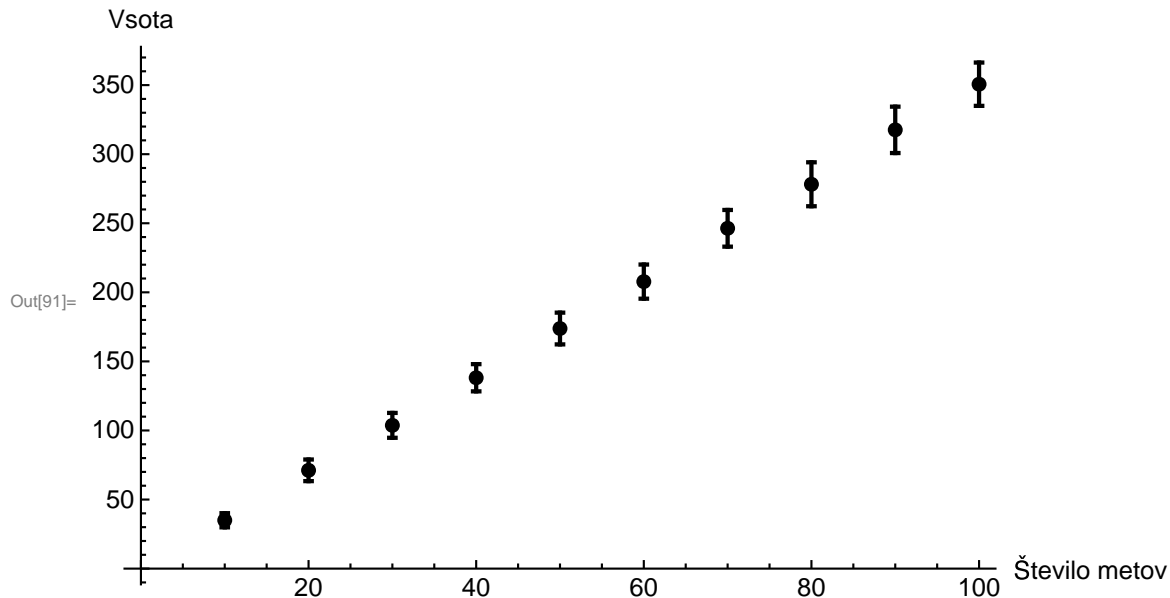
```
Out[52]= {35., 71.15, 103.7, 138.16, 173.8, 207.75, 246.34, 278.22, 317.61, 350.65}
```

```
In[53]:= σ = Map[N[Sqrt[CentralMoment[#, 2]]] &, tab2]
```

```
Out[53]= {5.12445, 7.82991, 8.99722, 9.84857,
  11.49, 12.3607, 13.2757, 15.9032, 16.7856, 15.6725}
```

```
In[54]:= Needs["ErrorBarPlots`"]
```

```
In[90]:= tab3 = Table[{{n[[i]], x0[[i]]}, ErrorBar[σ[[i]]]}, {i, Length[n]};
ErrorListPlot[tab3, BaseStyle → EdgeForm[Thickness[Medium]], ImageSize → 7 × 72,
TicksStyle → Thickness[Medium], AxesStyle → Thickness[Medium],
PlotStyle → {Black, PointSize[Large], Thickness[Large]},
LabelStyle → Directive[FontFamily → "Helvetica", FontSize → 12],
AxesLabel → {"Število metov", "Vsota"}]
```



```
In[57]:=
```

Naloga 1: Določi povprečji, disperziji in poševnosti za spremenljivki v podatkih *Agxx.dat* iz prejšnje teme in v podatkih *Ozadje.dat*, ki prikazujejo rezultate meritve absorpcije rentgenskih žarkov (logaritem razmerja vpadnega in prepuščenega toka, drugi stolpec) brez merjenja, tako da pričakujemo konstantne ali skoraj konstantne vrednosti. Primerjaj histogram verjetnostne gostote z grafom Gaussove porazdelitve z enakim povprečjem in disperzijo.

Naloga 2: Datoteka *TG_STAID000228.txt* vsebuje podatke o povprečni dnevni temperaturi na merilni postaji Ljubljana Bežigrad v obdobju od 1. 1. 1900 do 31. 1. 2013. Za vsak mesec v letu izračunaj povprečje in disperzijo povprečnih dnevni temperatur v obdobjih 1900-1909 in 2000-2009 in jih prikaži na grafu. Ali katera od mesečnih verjetnostnih porazdelitev močno odstopa od Gaussove?


```
In[58]:= data1 = Import["~/vaje/rovf12/vaja3/TG_STAID000228.txt",
  "Table", "HeaderLines" -> 20, "FieldSeparators" -> ","]
```

A very large output was generated. Here is a sample of it:

```
Out[58]= {{100 705, 19 000 101, 81, 0}, {100 705, 19 000 102, 86, 0},
  {100 705, 19 000 103, 105, 0}, {100 705, 19 000 104, 97, 0},
  {100 705, 19 000 105, 83, 0}, {100 705, 19 000 106, 32, 0},
  {100 705, 19 000 107, 33, 0}, {100 705, 19 000 108, 30, 0},
  {100 705, 19 000 109, 19, 0}, {100 705, 19 000 110, -4, 0},
  {100 705, 19 000 111, -30, 0}, {100 705, 19 000 112, -23, 0}, <<41 280>>,
  {914 015, 20 130 120, -9999, 9}, {914 015, 20 130 121, -9999, 9},
  {914 015, 20 130 122, -9999, 9}, {914 015, 20 130 123, -9999, 9},
  {914 015, 20 130 124, -9999, 9}, {914 015, 20 130 125, -9999, 9},
  {914 015, 20 130 126, -9999, 9}, {914 015, 20 130 127, -9999, 9},
  {914 015, 20 130 128, -9999, 9}, {914 015, 20 130 129, -9999, 9},
  {914 015, 20 130 130, -9999, 9}, {914 015, 20 130 131, -9999, 9}}
```

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```
In[59]:= data2 = Select[data1, #[[4]] == 0 &]
```

A very large output was generated. Here is a sample of it:

```
Out[59]= {{100 705, 19 000 101, 81, 0}, {100 705, 19 000 102, 86, 0},
  {100 705, 19 000 103, 105, 0}, {100 705, 19 000 104, 97, 0},
  {100 705, 19 000 105, 83, 0}, {100 705, 19 000 106, 32, 0},
  {100 705, 19 000 107, 33, 0}, {100 705, 19 000 108, 30, 0},
  {100 705, 19 000 109, 19, 0}, {100 705, 19 000 110, -4, 0},
  {100 705, 19 000 111, -30, 0}, {100 705, 19 000 112, -23, 0},
  <<40 850>>, {100 705, 20 121 224, 76, 0}, {100 705, 20 121 225, 92, 0},
  {100 705, 20 121 226, 78, 0}, {100 705, 20 121 227, 41, 0},
  {100 705, 20 121 228, 49, 0}, {100 705, 20 121 229, -3, 0},
  {100 705, 20 121 230, -18, 0}, {100 705, 20 121 231, -13, 0},
  {914 015, 20 130 102, 38, 0}, {914 015, 20 130 105, 83, 0},
  {914 015, 20 130 114, -9, 0}, {914 015, 20 130 115, -1, 0}}
```

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```
In[64]:= data3 = Map[{
  FromDigits[IntegerDigits#[[2]][[1 ;; 4]]],
  FromDigits[IntegerDigits#[[2]][[5 ;; 6]]],
  0.1#[[3]]
} &, data2]
```

A very large output was generated. Here is a sample of it:

Out[64]=

```
{ {1900, 1, 8.1}, {1900, 1, 8.6}, {1900, 1, 10.5}, {1900, 1, 9.7},
  {1900, 1, 8.3}, {1900, 1, 3.2}, {1900, 1, 3.3}, {1900, 1, 3.},
  {1900, 1, 1.9}, {1900, 1, -0.4}, {1900, 1, -3.}, {1900, 1, -2.3},
  {1900, 1, -3.9}, {1900, 1, -6.3}, <<40847>>, {2012, 12, 3.1},
  {2012, 12, 7.6}, {2012, 12, 9.2}, {2012, 12, 7.8}, {2012, 12, 4.1},
  {2012, 12, 4.9}, {2012, 12, -0.3}, {2012, 12, -1.8}, {2012, 12, -1.3},
  {2013, 1, 3.8}, {2013, 1, 8.3}, {2013, 1, -0.9}, {2013, 1, -0.1}}
```

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