

```

(* 1. Группировка данных *)
FindC[start_, end_, seq_] := (
  nn = Length[seq];
  count = 0;
  For[j = 1, j ≤ nn, j++,
    If[seq[[j]] ≥ start && seq[[j]] < end, count++];
    If[seq[[j]] ≥ end, Break[]];
  ];
  Return[count];
);

x = {3.22, 2.58, 3.03, 2, 2.53, 2.61, 1.87, 4.41, 4.48, 3.10,
  4.99, 1.82, 3.3, 2.93, 1.16, 4.12, 2.1, 2.47, 4.16, 2.14,
  2.89, 1.94, 3.29, 2.98, 3.75, 2.51, 3.17, 4.43, 2.83, 3.56,
  4.36, 1.64, 2.74, 4.13, 5.13, 2.44, 2.51, 3.97, 2.86, 2.96,
  2.99, 2.77, 2.43, 2.24, 4.34, 3.05, 2.53, 2.25, 3.64, 3.45};
x = Sort[x];
Print["sort ", x];
n = Length[x];
Print["n=", n];

$$\Delta t = \frac{x[[n]] - x[[1]]}{1 + \text{Log}[2, n]}$$

Print["Δt = ", Δt];
NN = Ceiling[(x[[n]] - x[[1]]) / Δt];
Print["N=", NN];
first = Table[{}, {i, NN}, {j, 6}];
For[i = 1, i ≤ NN, i++,
  first[[i, 1]] = i;
  first[[i, 2]] = x[[1]] + (i - 1) * Δt;
  If[i ≠ NN, first[[i, 3]] = x[[1]] + i * Δt, first[[i, 3]] = x[[n]]];
  first[[i, 4]] =  $\frac{\text{first}[[i, 2]] + \text{first}[[i, 3]]}{2}$ ;
  first[[i, 5]] = FindC[first[[i, 2]], first[[i, 3]], x];
  If[i == NN, first[[i, 5]] ++];
  first[[i, 6]] = first[[i, 5]] / n;
];
Print[TableForm[first, TableHeadings →
  {None, {"№", "Начало", "Конец", "Середина", "Частота", "Частость"}}]];

```

```
sort {1.16, 1.64, 1.82, 1.87, 1.94, 2, 2.1, 2.14, 2.24, 2.25, 2.43, 2.44,
      2.47, 2.51, 2.51, 2.53, 2.53, 2.58, 2.61, 2.74, 2.77, 2.83, 2.86, 2.89,
      2.93, 2.96, 2.98, 2.99, 3.03, 3.05, 3.1, 3.17, 3.22, 3.29, 3.3, 3.45, 3.56,
      3.64, 3.75, 3.97, 4.12, 4.13, 4.16, 4.34, 4.36, 4.41, 4.43, 4.48, 4.99, 5.13}
```

n=50

$\Delta t = 0.597545$

N=7

№	Начало	Конец	Середина	Частота	Частость
1	1.16	1.75754	1.45877	2	$\frac{1}{25}$
2	1.75754	2.35509	2.05632	8	$\frac{4}{25}$
3	2.35509	2.95263	2.65386	15	$\frac{3}{10}$
4	2.95263	3.55018	3.25141	11	$\frac{11}{50}$
5	3.55018	4.14772	3.84895	6	$\frac{3}{25}$
6	4.14772	4.74527	4.44649	6	$\frac{3}{25}$
7	4.74527	5.13	4.93763	2	$\frac{1}{25}$

```

Np = NN - 2;
second = Table[{}, {i, Np}, {j, 6}];
second[[1, 1]] = 1;
second[[1, 2]] = x[[1]];
second[[1, 3]] = first[[2, 3]];
second[[1, 4]] =  $\frac{\text{second}[[1, 2]] + \text{second}[[1, 3]]}{2}$ ;
second[[1, 5]] = first[[1, 5]] + first[[2, 5]];
second[[1, 6]] = second[[1, 5]] / n;
For[i = 2, i ≤ Np - 1, i++,
  second[[i, 1]] = i;
  second[[i, 2]] = first[[i + 1, 2]];
  second[[i, 3]] = first[[i + 1, 3]];
  second[[i, 4]] = first[[i + 1, 4]];
  second[[i, 5]] = first[[i + 1, 5]];
  second[[i, 6]] = first[[i + 1, 6]];
];

second[[Np, 1]] = Np;
second[[Np, 2]] = first[[NN - 1, 2]];
second[[Np, 3]] = first[[NN, 3]];
second[[Np, 4]] =  $\frac{\text{second}[[Np, 2]] + \text{second}[[Np, 3]]}{2}$ ;
second[[Np, 5]] = first[[Np + 1, 5]] + first[[Np + 2, 5]];
second[[Np, 6]] = second[[Np, 5]] / n;
Print[TableForm[second, TableHeadings →
  {None, {"№", "Начало", "Конец", "Середина", "Частота", "Частость"}}]];

```

№	Начало	Конец	Середина	Частота	Частость
1	1.16	2.35509	1.75754	10	$\frac{1}{5}$
2	2.35509	2.95263	2.65386	15	$\frac{3}{10}$
3	2.95263	3.55018	3.25141	11	$\frac{11}{50}$
4	3.55018	4.14772	3.84895	6	$\frac{3}{25}$
5	4.14772	5.13	4.63886	8	$\frac{4}{25}$

(* 2. *)

```

a = 0;
a =  $\frac{\sum_{i=1}^{Np} \text{second}[[i, 4]] * \text{second}[[i, 5]]}{n}$ ;

```

```
Print["a=", a];
```

a=3.06707

```

d =  $\frac{\sum_{i=1}^{Np} ((\text{second}[[i, 4]] - a)^2 * \text{second}[[i, 5]])}{n}$ ;

```

```
Print["d=", d];
```

d=0.870314

```

avg =  $\frac{\sum_{i=1}^n x[[i]]}{n}$ ;
Print["Выборочное среднее = ", avg];
Print["difference=", Abs[avg - a]];

Выборочное среднее = 3.056
difference=0.0110685

disp =  $\frac{\sum_{i=1}^n (x[[i]] - avg)^2}{n}$ ;
Print["Выборочная дисперсия = ", disp];
Print["difference = ", Abs[disp - d]];

Выборочная дисперсия = 0.797108
difference = 0.0732063

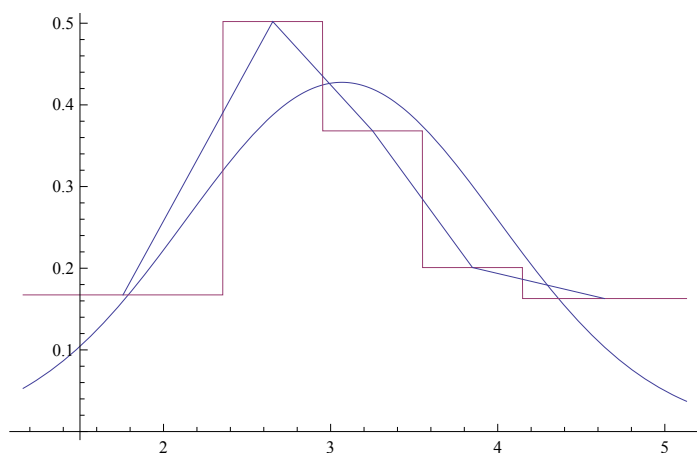
(* 3. Построение *)

Clear[result, gist];
gist[t_] := (
  result;
  For[j = 1, j ≤ Np, j++,
    If[t ≥ second[[j, 2]] && t < second[[j, 3]],
      result = second[[j, 6]] / (second[[j, 3]] - second[[j, 2]]);
    Return[result]];
];
If[t == second[[Np, 3]], result = second[[Np, 6]]];
Return[result];

list = {};
For[i = 1, i ≤ Np, i++,
  AppendTo[list,
    {second[[i, 4]], second[[i, 6]] / (second[[i, 3]] - second[[i, 2]])});
];

Show[Plot[{ $\frac{1}{\text{Sqrt}[2 \pi d]} e^{-\frac{(t-a)^2}{2 d}}$ , gist[t]}, {t, 1.16, 5.13}], ListLinePlot[list]]

```



(*4.Нахождение доверительных интервалов*)

p = 0.95;

aI = Interval[{ avg - Quantile[StudentTDistribution[Length[x] - 1], $\frac{1+p}{2}$] $\frac{\sqrt{\text{disp}}}{\sqrt{n-1}}$,
 avg + Quantile[StudentTDistribution[Length[x] - 1], $\frac{1+p}{2}$] $\frac{\sqrt{\text{disp}}}{\sqrt{n-1}}$ }]

Interval[{2.79969, 3.31231}]

σI = Interval[{ $\frac{n \text{ disp}}{\text{Quantile[ChiSquareDistribution[n - 1], $\frac{1+p}{2}$]}},$
 $\frac{n \text{ disp}}{\text{Quantile[ChiSquareDistribution[n - 1], $\frac{1-p}{2}$]}},$ }]

Interval[{0.56756, 1.26305}]

(* 5. Проверка гипотезы о нормальном
 распределении с помощью критерия согласия Пирсона*)

v = {};

p0 = {};

Clear[t];

For[i = 1, i ≤ Np, i++,

AppendTo[v, second[[i, 5]]];

AppendTo[p0, $\int_{\text{second}[[i, 2]]}^{\text{second}[[i, 3]]} \frac{1}{\text{Sqrt}[2 \pi d]} e^{-\frac{(t-\text{avg})^2}{2 \text{disp}}} dt$];

];

Print["Вектор частот попадания = ", v];

Print["Вектор вероятностей попадания в интервал при условии H₀ = ", p0];

$$t = \sum_{j=1}^{Np} \frac{v[[j]]^2}{n p0[[j]]} - n;$$

Print["t=", t];

α = 0.05;

χ = 9.5;

If[t >= χ, Print["Гипотеза отвергается"], Print["Гипотеза не отвергается"]];

Вектор частот попадания = {10, 15, 11, 6, 8}

Вектор вероятностей попадания в интервал при условии H₀ =
 {0.190789, 0.227489, 0.245119, 0.171549, 0.0962896}

t=7.62692

Гипотеза не отвергается