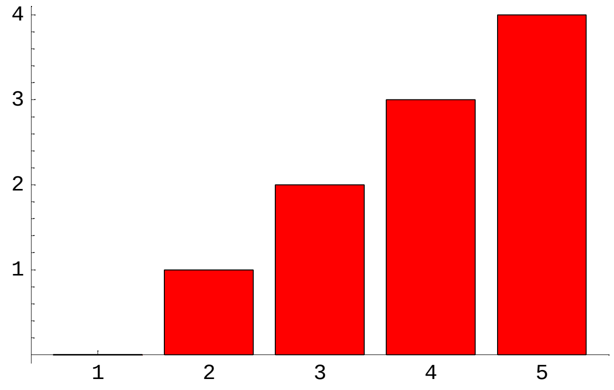
Lösungen / Statistik 1/09

```
Remove["Global`*"]

<< Statistics`DescriptiveStatistics`;
<< Statistics`DataManipulation`;
<< Graphics`Graphics`;
```

1.

```
tA = Range[0, 4]

{0, 1, 2, 3, 4}

tB = Range[1, 10]

{1, 2, 3, 4, 5, 6, 7, 8, 9, 10}

tC = Range[1, 50]

{1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16,
 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33,
 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50}

tD = Range[1, 100]

{1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22,
 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41,
 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61,
 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81,
 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100}

tE = Range[1, 1000] ;  (* ";" !!!!!! *)

tF = Table[n, {n, 1, 10}, {k, 1, n}];
tF1 = Flatten[tF]

{1, 2, 2, 3, 3, 3, 4, 4, 4, 4, 5, 5, 5, 5, 5, 6, 6, 6, 6, 6, 6, 7, 7, 7, 7, 7, 7, 7, 8, 8,
 8, 8, 8, 8, 8, 8, 9, 9, 9, 9, 9, 9, 9, 9, 9, 10, 10, 10, 10, 10, 10, 10, 10, 10, 10}

tF // TableForm

1
2     2
3     3     3
4     4     4     4
5     5     5     5     5
6     6     6     6     6     6
7     7     7     7     7     7     7
8     8     8     8     8     8     8     8
9     9     9     9     9     9     9     9     9
10    10    10    10    10    10    10    10    10    10
```

```
BarChart[tA];
```

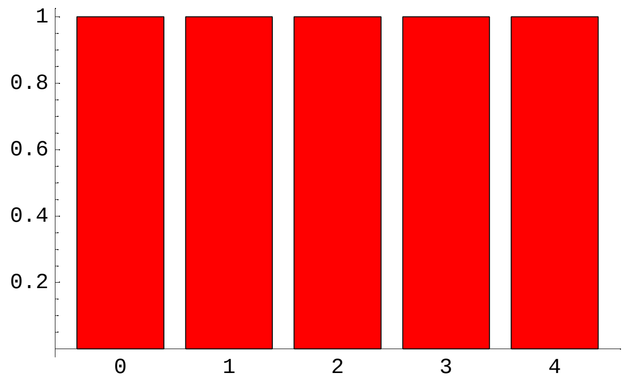


Falsch / Faux

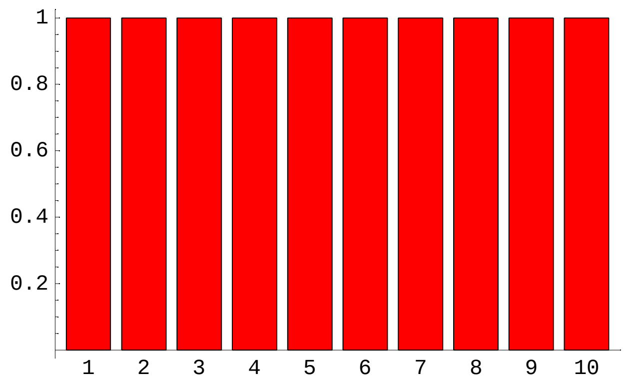
```
Frequencies[tA]
```

```
{{1, 0}, {1, 1}, {1, 2}, {1, 3}, {1, 4}}
```

```
b[x_] := BarChart[Frequencies[x]];
b[tA];
```




```
b[tB];
```

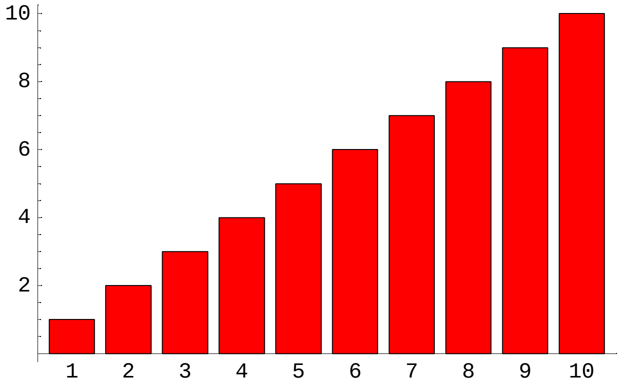


b[**tC**];

b[**tD**];

b[**tE**];

b[**tF1**];



```
c[x_] := Flatten[{LocationReport[x], DispersionReport[x]}] // N

c[tA]

{Mean → 2., HarmonicMean → 0., Median → 2., Variance → 2.5, StandardDeviation → 1.58114,
 SampleRange → 4., MeanDeviation → 1.2, MedianDeviation → 1., QuartileDeviation → 1.25}

sDr = 1.5811388300841898 / 4

0.395285

c[tB]

{Mean → 5.5, HarmonicMean → 3.41417, Median → 5.5,
 Variance → 9.16667, StandardDeviation → 3.02765, SampleRange → 9.,
 MeanDeviation → 2.5, MedianDeviation → 2.5, QuartileDeviation → 2.5}

sDr = 3.0276503540974917 / 9

0.336406

c[tC]

{Mean → 25.5, HarmonicMean → 11.1131, Median → 25.5,
 Variance → 212.5, StandardDeviation → 14.5774, SampleRange → 49.,
 MeanDeviation → 12.5, MedianDeviation → 12.5, QuartileDeviation → 12.5}

sDr = 14.577379737113251 / 49

0.297498

c[tD]

{Mean → 50.5, HarmonicMean → 19.2776, Median → 50.5,
 Variance → 841.667, StandardDeviation → 29.0115, SampleRange → 99.,
 MeanDeviation → 25., MedianDeviation → 25., QuartileDeviation → 25.}

sDr = 29.011491975882016 / 99

0.293045

c[tE]

{Mean → 500.5, HarmonicMean → 133.592, Median → 500.5,
 Variance → 83416.7, StandardDeviation → 288.819, SampleRange → 999.,
 MeanDeviation → 250., MedianDeviation → 250., QuartileDeviation → 250.}

sDr = 288.8194360957494 / 999

0.289109

c[tF1]

{Mean → 7., HarmonicMean → 5.5, Median → 7.,
 Variance → 6.11111, StandardDeviation → 2.47207, SampleRange → 9.,
 MeanDeviation → 2.03636, MedianDeviation → 2., QuartileDeviation → 2.}

sDr = 2.4720661623652207 / 9

0.274674
```

```
modus = 10
```

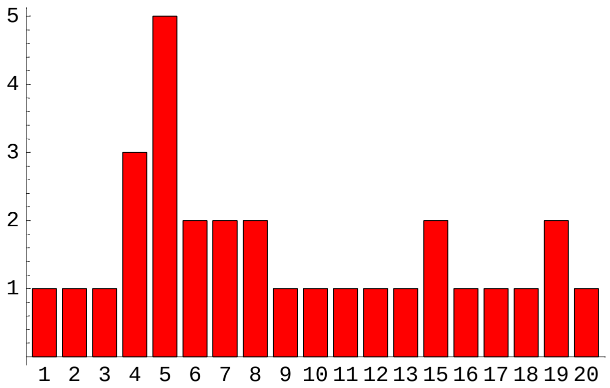
```
10
```

2.

```
m = {5, 6, 5, 7, 5, 8, 7, 9, 4, 10, 15, 18, 12,
  15, 19, 20, 1, 3, 2, 4, 8, 6, 11,  5, 16, 17, 13, 5, 19, 4}
```

```
{5, 6, 5, 7, 5, 8, 7, 9, 4, 10, 15, 18, 12,
 15, 19, 20, 1, 3, 2, 4, 8, 6, 11, 5, 16, 17, 13, 5, 19, 4}
```

```
b[m];
```




```
c[m]
```

```
{Mean → 9.3, HarmonicMean → 5.57607, Median → 7.5,
 Variance → 32.631, StandardDeviation → 5.71236, SampleRange → 19.,
 MeanDeviation → 4.89333, MedianDeviation → 3.5, QuartileDeviation → 5.}
```

```
? BinCounts
```

BinCounts[{x1, x2, ...}, {xmin, xmax, dx}] gives a list of the number of elements in the data {x1, x2, ...} that lie in bins from xmin to xmax in steps of dx. The bin boundaries are {xmin < x <= xmin + dx, ..., xmax - dx < x <= xmax}. BinCounts[{{x1, y1}, {x2, y2}, ...}, {xmin, xmax, dx}, {ymin, ymax, dy}] gives a 2-dimensional array of bin counts for the bivariate data {{x1, y1}, {x2, y2}, ...}. In general, BinCounts gives a p-dimensional array of bin counts for p-variate data. Mehr…

```
bc = BinCounts[m, {0, 20, 2}]
```

```
{2, 4, 7, 4, 2, 2, 1, 3, 2, 3}
```

```
{Length[m], Min[m], Max[m], Length[bc]}
```

```
{30, 1, 20, 10}
```

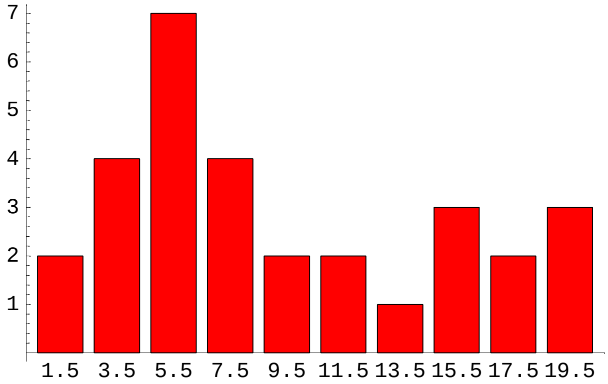
```
Table[2 n - 0.5, {n, 1, 10}]
```

```
{1.5, 3.5, 5.5, 7.5, 9.5, 11.5, 13.5, 15.5, 17.5, 19.5}
```

```
bc1 = Transpose[{bc, Table[2 n - 0.5, {n, 1, 10}]}]
```

```
{{2, 1.5}, {4, 3.5}, {7, 5.5}, {4, 7.5}, {2, 9.5},
 {2, 11.5}, {1, 13.5}, {3, 15.5}, {2, 17.5}, {3, 19.5}}
```

```
BarChart[bc1];
```




```
m11 = Table[Table[bc1[[i]][[2]], {k, 1, bc1[[i]][[1]]}], {i, 1, Length[bc1]}]

{{1.5, 1.5}, {3.5, 3.5, 3.5, 3.5}, {5.5, 5.5, 5.5, 5.5, 5.5, 5.5, 5.5},
 {7.5, 7.5, 7.5, 7.5}, {9.5, 9.5}, {11.5, 11.5}, {13.5},
 {15.5, 15.5, 15.5}, {17.5, 17.5}, {19.5, 19.5, 19.5}}

m1 = m11 // Flatten

{1.5, 1.5, 3.5, 3.5, 3.5, 3.5, 5.5, 5.5, 5.5, 5.5, 5.5, 5.5, 5.5, 7.5, 7.5, 7.5,
 7.5, 9.5, 9.5, 11.5, 11.5, 13.5, 15.5, 15.5, 15.5, 17.5, 17.5, 19.5, 19.5, 19.5}

c[m1]

{Mean → 9.36667, HarmonicMean → 5.76652, Median → 7.5,
 Variance → 33.0851, StandardDeviation → 5.75196, SampleRange → 18.,
 MeanDeviation → 4.91556, MedianDeviation → 4., QuartileDeviation → 5.}
```

3.

```
m = {1, 2, 3, 4}

{1, 2, 3, 4}

p4 = Partition[m, 4]

{{1, 2, 3, 4}}
```

P(p4)=1

```
p3 = Flatten[Table[Partition[RotateLeft[Flatten[p4], k], 3], {k, 0, 3}], 1]

{{1, 2, 3}, {2, 3, 4}, {3, 4, 1}, {4, 1, 2}}
```

P(p3)=3/4

```
p2 = Flatten[Table[Flatten[Table[Partition[RotateLeft[p3[[u]], k], 2], {k, 0, 2}], 1],
     {u, 1, Length[p3]}], 1] // Union;
p2 = Table[Union[p2[[k]]], {k, 1, Length[p2]}] // Union

{{1, 2}, {1, 3}, {1, 4}, {2, 3}, {2, 4}, {3, 4}}
```

P(p2)=1/2

```
p1 = Flatten[Table[Partition[RotateLeft[Flatten[p4], k], 1], {k, 0, 3}], 1] // Union
```

```
{{1}, {2}, {3}, {4}}
```

```
p1 = Partition[Flatten[p4], 1]
```

```
{{1}, {2}, {3}, {4}}
```

P(p1)=1/4

```
p0 = {"."}
```

```
{.}
```

P(p0)=0

```
pP = Union[p4, p3, p2, p1, p0]
```

```
{., {1}, {2}, {3}, {4}, {1, 2}, {1, 3}, {1, 4}, {2, 3}, {2, 4},
 {3, 4}, {1, 2, 3}, {2, 3, 4}, {3, 4, 1}, {4, 1, 2}, {1, 2, 3, 4}}
```

```
Length[pP]
```

```
16
```

4.

```
? Binom*
```

```
Binomial[n, m] gives the binomial coefficient. Mehr…
```

```
Binomial[49, 6]
```

```
13983816
```

```
Binomial[49, 1]
```

```
49
```

```
(Binomial[49, 1] + Binomial[49, 2] + Binomial[49, 3]) / Binomial[49, 6]
```

$$\frac{401}{285384}$$

```
N[%]
```

```
0.00140512
```

5.

30 mal Geburtstag aus 365 auswählen, auf 30 Studenten verteilen
Choisir 30 fois un anniversaire parmis 365, répartir sur 30 étudiants

```
a1 = 365^30
```

```
739240809097003085713446696892352590821923009360323012331500649452209472656 25
```

30 verschiedene Geburtstage aus 365 auswählen,auf 30 Studenten verteilen
Choisir 30 fois un anniversaire différent parmis 365, répartir sur 30 étudiants

```
b1 = 365! / (365 - 30)!
```

```
217103018350855706605753347724808139946552034366767459652335681771929600000000
```

Mindestens zwei gleiche Geburtstage = alle minus verschiedene
Au moins deux anniversaires au même jour = tous moins ceux qui sont différents

```
c1 = a1 - b1
```

```
522137790746147379107693349167544450875370974993555552679164967680279872656 25
```

Wahrscheinlichkeit der verschiedenen = Anzahl verschiedene / alle
Probabilité de coux qui sont différents = nembre de coux qui sont différents / tous

```
p = c1 / a1 // N
```

```
0.706316
```

Vergleich / Pour comparer

```
a1 = 365^5; b1 = 365! / (365 - 5)!; c1 = a1 - b1; p = c1 / a1 // N
```

```
0.0271356
```

6.

```
Am = 1^2 Pi
```

π

```
Ad = (7 - 2) Sqrt[2] * 2 - 1 * 2
```

$-2 + 10 \sqrt{2}$

```
Atot = (7 - 2)^2
```

```
25
```

```
p = Ad / Atot
```

$\frac{1}{25} \left(-2 + 10 \sqrt{2}\right)$

```
N[%]
```

```
0.485685
```