Lösungen / Statistik 1/11

```
Remove["Global`*"]

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

1.

```
u = 100;  a = 50; b = a; c = a; ab = 30; bc = 25; ac = 20; abc = 5;

aUbUc = a + b + c - ab - ac - ab + abc
```

```
75
```

```
u - abc
```

```
95
```

```
u - aUbUc
```

```
25
```

2.

```
m = {{173, 177, 176, 175, 174},
  {178, 177, 177, 173, 173},
  {177, 169, 169, 179, 179},
  {173, 183, 177, 178, 169},
  {184, 185, 173, 177, 179},
  {161, 183, 163, 168, 168},
  {162, 173, 192, 158, 174},
  {169, 192, 165, 183, 194},
  {154, 182, 156, 187, 160},
  {188, 181, 159, 175, 187}}
```

```
{{173, 177, 176, 175, 174}, {178, 177, 177, 173, 173},
 {177, 169, 169, 179, 179}, {173, 183, 177, 178, 169},
 {184, 185, 173, 177, 179}, {161, 183, 163, 168, 168}, {162, 173, 192, 158, 174},
 {169, 192, 165, 183, 194}, {154, 182, 156, 187, 160}, {188, 181, 159, 175, 187}}
```

```
m // Transpose // MatrixForm
```

$$\begin{pmatrix} 173 & 178 & 177 & 173 & 184 & 161 & 162 & 169 & 154 & 188 \\ 177 & 177 & 169 & 183 & 185 & 183 & 173 & 192 & 182 & 181 \\ 176 & 177 & 169 & 177 & 173 & 163 & 192 & 165 & 156 & 159 \\ 175 & 173 & 179 & 178 & 177 & 168 & 158 & 183 & 187 & 175 \\ 174 & 173 & 179 & 169 & 179 & 168 & 174 & 194 & 160 & 187 \end{pmatrix}$$

```
m = Flatten[m]
```

```
{173, 177, 176, 175, 174, 178, 177, 177, 173, 173, 177, 169, 169, 179, 179, 173, 183, 177,
 178, 169, 184, 185, 173, 177, 179, 161, 183, 163, 168, 168, 162, 173, 192, 158,
 174, 169, 192, 165, 183, 194, 154, 182, 156, 187, 160, 188, 181, 159, 175, 187}
```

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

```
{154, 194}
```

```
BarChart[m];
```


```
r = Table[k - 2.5, {k, 152, 200, 5}]
```

```
{149.5, 154.5, 159.5, 164.5, 169.5, 174.5, 179.5, 184.5, 189.5, 194.5}
```

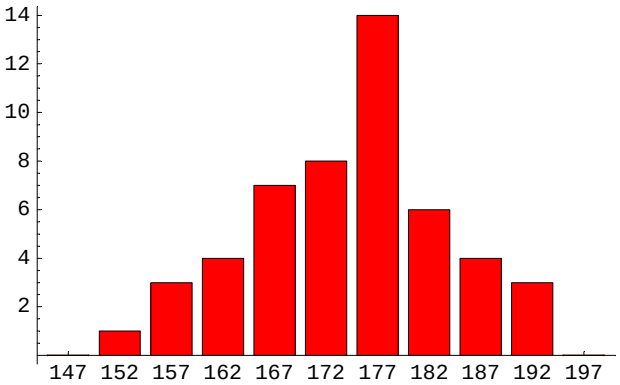
```
r1 = Table[k, {k, 147, 200, 5}]
```

```
{147, 152, 157, 162, 167, 172, 177, 182, 187, 192, 197}
```

```
mr = RangeCounts[m, r]
```

```
{0, 1, 3, 4, 7, 8, 14, 6, 4, 3, 0}
```

```
BarChart[mr, BarLabels → r1];
```




```
mNew = Table[Table[r1[[k]], {j, 1, mr[[k]]}], {k, 1, Length[mr]}] // Flatten
```

```
{152, 157, 157, 157, 162, 162, 162, 162, 167, 167, 167, 167, 167, 167, 167, 172, 172, 172,
 172, 172, 172, 172, 172, 177, 177, 177, 177, 177, 177, 177, 177, 177, 177, 177,
 177, 177, 177, 182, 182, 182, 182, 182, 182, 187, 187, 187, 187, 192, 192, 192}
```

```
Length[mNew]
```

```
50
```

```
(172 + 177) / 2
```

$$\frac{349}{2}$$

```
Union[LocationReport[mNew], DispersionReport[mNew]]
```

$$\left\{\text{HarmonicMean} \to \frac{1114905822295224960}{6419289545206117},\ \text{Mean} \to \frac{871}{5},\ \text{MeanDeviation} \to \frac{953}{125},\right.$$
$$\text{Median} \to 177,\ \text{MedianDeviation} \to 5,\ \text{QuartileDeviation} \to \frac{15}{2},$$
$$\left.\text{SampleRange} \to 40,\ \text{StandardDeviation} \to \frac{\sqrt{4458}}{7},\ \text{Variance} \to \frac{4458}{49}\right\}$$

```
Union[LocationReport[mNew], DispersionReport[mNew]] // N
```

```
{HarmonicMean → 173.681, Mean → 174.2, MeanDeviation → 7.624,
 Median → 177., MedianDeviation → 5., QuartileDeviation → 7.5,
 SampleRange → 40., StandardDeviation → 9.53832, Variance → 90.9796}
```

```
Union[LocationReport[m], DispersionReport[m]]
```

$$\left\{\text{HarmonicMean} \to \frac{4940588048516446221795976414692354000 0}{2835349935128313381491858 30857829685 7},\ \text{Mean} \to \frac{4369}{25},\right.$$
$$\text{MeanDeviation} \to \frac{4587}{625},\ \text{Median} \to \frac{351}{2},\ \text{MedianDeviation} \to \frac{13}{2},\ \text{QuartileDeviation} \to 6,$$
$$\left.\text{SampleRange} \to 40,\ \text{StandardDeviation} \to \frac{\sqrt{109778}}{35},\ \text{Variance} \to \frac{109778}{1225}\right\}$$

```
Union[LocationReport[m], DispersionReport[m]] // N
```

```
{HarmonicMean → 174.25, Mean → 174.76, MeanDeviation → 7.3392,
 Median → 175.5, MedianDeviation → 6.5, QuartileDeviation → 6.,
 SampleRange → 40., StandardDeviation → 9.4665, Variance → 89.6147}
```

3.

a

```
no1AndNo2 = (36 - 4) (36 - 4) / (36 * 36)
```

$$\frac{64}{81}$$

```
no1AndNo2N = no1AndNo2 // N
```

```
0.790123
```

```
minKing = 1 - no1AndNo2
```

$$\frac{17}{81}$$

```
minKingN = 1 - no1AndNo2N
```

```
0.209877
```

b

Red, but no king

```
red1 = 16 / 36 * 16 / 36
```

$$\frac{16}{81}$$

```
red1N = red1 // N
```

```
0.197531
```

```
red2 = red1
```

$$\frac{16}{81}$$

```
red1And2 = 16 / 36  * 16 / 36
```

$$\frac{16}{81}$$

```
red1And2N = red1And2  // N
```

```
0.197531
```

```
red1OrRed2OrRed1And2 = red1 + red2 + red1And2
```

$$\frac{16}{27}$$

```
red1OrRed2OrRed1And2 // N
```

```
0.592593
```

King

```
minKing = 1 - no1AndNo2
```

$$\frac{17}{81}$$

```
minKing // N
```

```
0.209877
```

Red or king

```
red1OrRed2OrRed1And2 + minKing
```

$$\frac{65}{81}$$

```
red1OrRed2OrRed1And2 + minKing // N
```

```
0.802469
```

Control

```
r1b2Ub1r2Ur1r2Ukb1nkb2Unkb1kb2Ukb1kb2 =
 3 * (1 / 2) ^ 2 + 2 * (2 / 36 * 16 / 36) + (2 / 36) ^ 2
```

$$\frac{65}{81}$$

c

Once a king or queen

```
kingQueenBlack1AndRed2 = 4 / 36 * 18 / 36
```

$$\frac{1}{18}$$

```
kingQueenBlack1AndRed2 // N
```

```
0.0555556
```

```
kingQueenBlack2AndRed1 = kingQueenBlack1AndRed2
```

$$\frac{1}{18}$$

```
kingQueenBlack1AndRed2 + kingQueenBlack2AndRed1 // N
```

```
0.111111
```

```
kingQueenRed1AndBlack2 = 4 / 36 * 14 / 36
```

$$\frac{7}{162}$$

```
kingQueenRed1AndBlack2 // N
```

```
0.0432099
```

```
kingQueenRed2AndBlack1 = kingQueenRed1AndBlack2
```

$$\frac{7}{162}$$

```
kingQueenRed2AndBlack1 // N
```

```
0.0432099
```

```
kingQueenBlack1AndRed2 + kingQueenBlack2AndRed1 +
 kingQueenRed1AndBlack2 + kingQueenRed2AndBlack1
```

$$\frac{16}{81}$$

```
kingQueenBlack1AndRed2 + kingQueenBlack2AndRed1 +
  kingQueenRed1AndBlack2 + kingQueenRed2AndBlack1 // N
```

```
0.197531
```

4.

Auswählen und auf die 2 mal 10 Personen anordnen.

```
all = 50^20
```

```
95367431640625000000000000000000000
```

```
allDifferent = 50! / (50 - 20)!
```

```
1146607551121133739224530944000000
```

```
notDifferent = all - allDifferent
```

```
942208240895038662607754690560000
```

```
p = notDifferent / all
```

$$\frac{28753913601533162311027 67}{29103830456733703613281 25}$$

```
p // N
```

```
0.987977
```

5.

a

Punkte zwischen die Marken 0 ... 100.

```
? Binomi*
```

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

```
comb = Binomial[100, 2]
```

```
4950
```

```
Sum[k, {k, 1, 99}]
```

```
4950
```

b

Punkte auf die Marken 1 ... 100.

```
solv = Binomial[100, 2]
```

```
4950
```