Lösungen / Statistik 1/01

1. Download Software

Link siehe Uebungsblatt

1. Download Skripts zu Software

Links siehe Uebungsblatt

3. a) Erst ein Programm zum Würfeln

Allgemeines

```
? Random
```

Random[ ] gives a uniformly distributed pseudorandom Real in the range
   0 to 1. Random[type, range] gives a pseudorandom number of the specified
   type, lying in the specified range. Possible types are: Integer, Real and
   Complex. The default range is 0 to 1. You can give the range {min, max}
   explicitly; a range specification of max is equivalent to {0, max}. Mehr...

```
Random[Integer, {1, 6}]
```

6

Beispiel: gewürfelte Tabelle - gewürfelte 3-er-Gruppen

```
Table[Random[Integer, {1, 6}], {n, 1, 20}]
```

{6, 3, 6, 5, 6, 4, 2, 2, 6, 1, 1, 1, 6, 6, 5, 5, 5, 1, 3, 6}

```
Table[Table[Random[Integer, {1, 6}], {n, 1, 3}], {m, 1, 20}]
```

{{4, 5, 4}, {3, 6, 4}, {2, 1, 6}, {6, 6, 6}, {1, 4, 2}, {6, 1, 5},
 {1, 6, 2}, {6, 2, 4}, {3, 1, 3}, {4, 5, 3}, {2, 3, 1}, {2, 2, 4}, {1, 6, 3},
 {2, 6, 6}, {4, 3, 4}, {2, 5, 1}, {1, 6, 3}, {2, 5, 5}, {1, 6, 3}, {4, 1, 3}}

```
Table[Table[Random[Integer, {1, 6}], {n, 1, 3}], {m, 1, 20}] // MatrixForm
```

$$\begin{pmatrix} 2 & 2 & 5 \\ 2 & 6 & 1 \\ 5 & 3 & 3 \\ 6 & 1 & 1 \\ 1 & 5 & 6 \\ 4 & 4 & 2 \\ 4 & 5 & 4 \\ 2 & 6 & 3 \\ 6 & 2 & 3 \\ 2 & 4 & 3 \\ 6 & 4 & 6 \\ 5 & 2 & 1 \\ 5 & 1 & 3 \\ 4 & 2 & 5 \\ 3 & 5 & 4 \\ 2 & 1 & 4 \\ 4 & 2 & 2 \\ 6 & 1 & 6 \\ 2 & 3 & 1 \\ 3 & 3 & 5 \end{pmatrix}$$

3. b) Lösungen

Run   ganz rechts auf blaue linie klicken, Enter (mehrmals möglich!!!!!)

L = Lektion   -- Sprechstunde

W = Work / Arbeit

A=Anhang/ Appendice

Notwendige Packages laden

```
<< Graphics`Graphics`
```

```
<< Statistics`DescriptiveStatistics`
```

Ueb 1

Kurs

Home page Rolf Wirz

rowicus.ch

Ueb 2   L / W

a   Würfeln

Zufallszahlen:

```
p[x_] := Random[]; k[i_] := Round[5 {p[x], p[x], p[x], p[x], p[x]} + 1];
k[1]
```

{2, 1, 2, 1, 2}

```
k[1]
```

{2, 3, 4, 1, 2}

```
k[2]
```

{2, 3, 6, 5, 3}

Zahlen werden jedesmal neu generiert! Kann man das vermeiden?

```
u = k[2]
```

{6, 5, 2, 4, 2}

```
u = k[2]
```

{4, 2, 4, 3, 3}

```
u
```

{4, 2, 4, 3, 3}

```
u
```

{4, 2, 4, 3, 3}

```
u
```

{4, 2, 4, 3, 3}

```
k[2]
```

{2, 3, 3, 2, 6}

```
k[2]
```

{6, 5, 2, 4, 4}

```
u
```

{4, 2, 4, 3, 3}

```
u
```

{4, 2, 4, 3, 3}

```
k[3]
```

{3, 2, 5, 2, 3}

```
k[4]
```

{3, 5, 3, 2, 6}

Nun sollte es klar sein, wie es funktioniert.

{a,b,c,d,e}.{f,g,h,i,j} ist das Skalarprodukt

```
{a, b, c, d, e}.{1, 1, 1, 1, 1}
```

a + b + c + d + e

```
s[i_] := k[i].{1, 1, 1, 1, 1}; s[1]
```

21

```
s[2]
```

18

```
s[3]
```

19

```
tab = Table[s[i], {i, 50}]
```

{21, 16, 16, 17, 16, 21, 17, 21, 17, 20, 20, 21, 24, 18, 21,
 15, 18, 19, 20, 13, 19, 22, 17, 19, 18, 18, 24, 20, 17, 25, 24, 15,
 17, 18, 16, 14, 17, 17, 17, 14, 13, 15, 16, 20, 15, 20, 13, 21, 19, 16}

```
tab
```

{21, 16, 16, 17, 16, 21, 17, 21, 17, 20, 20, 21, 24, 18, 21,
 15, 18, 19, 20, 13, 19, 22, 17, 19, 18, 18, 24, 20, 17, 25, 24, 15,
 17, 18, 16, 14, 17, 17, 17, 14, 13, 15, 16, 20, 15, 20, 13, 21, 19, 16}

```
tab = Sort[tab]
```

{13, 13, 13, 14, 14, 15, 15, 15, 15, 16, 16, 16, 16, 16, 16,
 17, 17, 17, 17, 17, 17, 17, 17, 17, 18, 18, 18, 18, 18, 19, 19, 19,
 19, 20, 20, 20, 20, 20, 20, 21, 21, 21, 21, 21, 21, 22, 24, 24, 24, 25}

b   Klassen

Klassen einteilen

```
Range[27]
```

{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}

```
rg = Range[27] + 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}

```
rP = Partition[rg, 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}}

Klassenmitten

```
(Min[rP[[1]]] + Max[rP[[1]]]) / 2
```

5

```
rPMean = Table[(Min[rP[[i]]] + Max[rP[[i]]]) / 2, {i, 1, Length[rP]}]
```

{5, 8, 11, 14, 17, 20, 23, 26, 29}

Extreme Werte der 5. Klasse

```
Max[rP[[5]]]
```

18

```
Min[rP[[5]]]
```

16

Werte aus tab den Klassen zuordnen

```
Select[tab, (Min[rP[[5]]] < #1 < Max[rP[[5]]]) &]
```

{17, 17, 17, 17, 17, 17, 17, 17, 17}

```
freq = Table[Select[tab, (Min[rP[[i]]] - 1 < #1 < Max[rP[[i]]] + 1) &], {i, 1, Length[rP]}]
```

{{}, {}, {}, {13, 13, 13, 14, 14, 15, 15, 15, 15},
 {16, 16, 16, 16, 16, 16, 17, 17, 17, 17, 17, 17, 17, 17, 17, 18, 18, 18, 18, 18},
 {19, 19, 19, 19, 20, 20, 20, 20, 20, 20, 21, 21, 21, 21, 21, 21},
 {22, 24, 24, 24}, {25}, {}}

Werte durch Klassenmittelwerte ersetzen

```
freq1 = Table[Table[rPMean[[i]], {k, 1, Length[freq[[i]]]}], {i, 1, Length[rP]}]
```

{{}, {}, {}, {14, 14, 14, 14, 14, 14, 14, 14, 14},
 {17, 17, 17, 17, 17, 17, 17, 17, 17, 17, 17, 17, 17, 17, 17, 17, 17, 17, 17, 17},
 {20, 20, 20, 20, 20, 20, 20, 20, 20, 20, 20, 20, 20, 20, 20, 20},
 {23, 23, 23, 23}, {26}, {}}

Leere Klassen entfernen

freq2 = freq1 /. {} → missing

```
{missing, missing, missing, {14, 14, 14, 14, 14, 14, 14, 14, 14},
 {17, 17, 17, 17, 17, 17, 17, 17, 17, 17, 17, 17, 17, 17, 17, 17, 17, 17, 17, 17},
 {20, 20, 20, 20, 20, 20, 20, 20, 20, 20, 20, 20, 20, 20, 20, 20},
 {23, 23, 23, 23}, {26}, missing}
```

freq3 = DeleteCases[freq2, missing]

```
{{14, 14, 14, 14, 14, 14, 14, 14, 14},
 {17, 17, 17, 17, 17, 17, 17, 17, 17, 17, 17, 17, 17, 17, 17, 17, 17, 17, 17, 17},
 {20, 20, 20, 20, 20, 20, 20, 20, 20, 20, 20, 20, 20, 20, 20, 20}, {23, 23, 23, 23}, {26}}
```

File flach machen

freq4 = Flatten[freq3]

```
{14, 14, 14, 14, 14, 14, 14, 14, 14, 17, 17, 17, 17, 17, 17,
 17, 17, 17, 17, 17, 17, 17, 17, 17, 17, 17, 17, 17, 17, 20, 20, 20,
 20, 20, 20, 20, 20, 20, 20, 20, 20, 20, 23, 23, 23, 23, 26}
```

freq5 = Frequencies[freq4]

```
{{9, 14}, {20, 17}, {16, 20}, {4, 23}, {1, 26}}
```

MatrixForm[freq5]

$$
\begin{pmatrix}
9 & 14 \\
20 & 17 \\
16 & 20 \\
4 & 23 \\
1 & 26
\end{pmatrix}
$$

Remove[x1, x2]

freq6 = freq5 /. {x1_, x2_} → {x2, x1}

```
{{14, 9}, {17, 20}, {20, 16}, {23, 4}, {26, 1}}
```

MatrixForm[freq6]

$$
\begin{pmatrix}
14 & 9 \\
17 & 20 \\
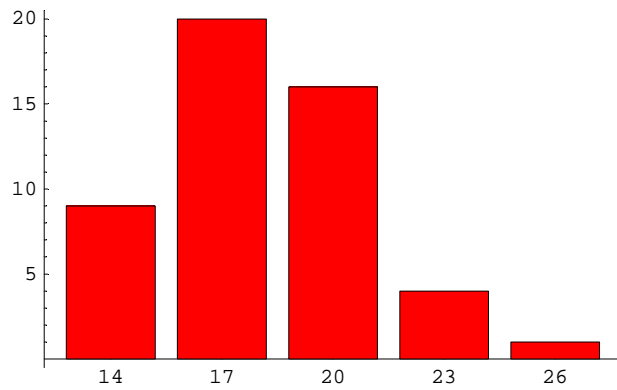20 & 16 \\
23 & 4 \\
26 & 1
\end{pmatrix}
$$

Namen anpassen

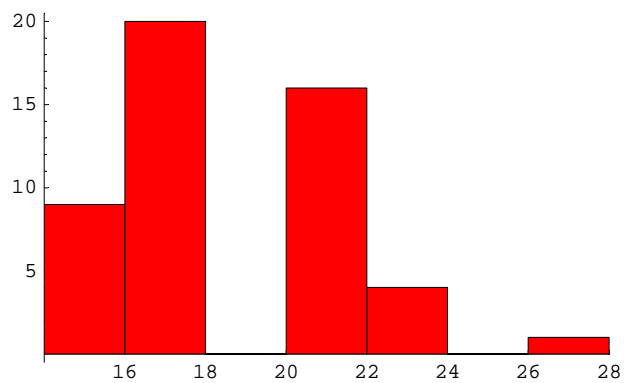**classes = freq4;**

classes1 = freq5;

c   Graphics

BarChart[classes1];

Histogram[classes];

d   LocationReport

tab

{13, 13, 13, 14, 14, 15, 15, 15, 15, 16, 16, 16, 16, 16, 16,
 17, 17, 17, 17, 17, 17, 17, 17, 17, 18, 18, 18, 18, 18, 19, 19, 19,
 19, 20, 20, 20, 20, 20, 20, 21, 21, 21, 21, 21, 21, 22, 24, 24, 24, 25}

freq4

{14, 14, 14, 14, 14, 14, 14, 14, 14, 17, 17, 17, 17, 17, 17,
 17, 17, 17, 17, 17, 17, 17, 17, 17, 17, 17, 17, 17, 17, 20, 20, 20,
 20, 20, 20, 20, 20, 20, 20, 20, 20, 20, 20, 20, 23, 23, 23, 23, 26}

{Mean[tab], Mean[classes]} // N

{18.14, 18.08}

LocationReport[tab] // N

{Mean → 18.14, HarmonicMean → 17.673, Median → 18.}

LocationReport[classes] // N

{Mean → 18.08, HarmonicMean → 17.6572, Median → 17.}

e DispersionReport

DispersionReport[tab] // N

{Variance → 8.77592, StandardDeviation → 2.96242, SampleRange → 12.,
 MeanDeviation → 2.4024, MedianDeviation → 2., QuartileDeviation → 2.}

DispersionReport[classes] // N

{Variance → 7.99347, StandardDeviation → 2.82727, SampleRange → 12.,
 MeanDeviation → 2.3328, MedianDeviation → 3., QuartileDeviation → 1.5}