

# Stochastik III: Zufallsgrößen

## Lösungen

### 1) Glücksspiel

| <p>erster Ausdruck: W'keiten<br/>(mindestens eine Sechs; keine 6 und dann mindestens eine 6; gar keine 6)<br/>zweiter Ausdruck: Verteilung G</p> | <table border="1"> <thead> <tr> <th>F1+</th> <th>F2+</th> <th>F3+</th> <th>F4+</th> <th>F5+</th> </tr> <tr> <th>Diverse</th> <th>Algebra</th> <th>Analysis</th> <th>Funktionen</th> <th>Vektoren</th> </tr> </thead> <tbody> <tr> <td colspan="4">■ <math>1 - (5/6)^2</math></td> <td>11/36</td> </tr> <tr> <td colspan="4">■ <math>25/36 \cdot 11/36</math></td> <td>275/1296</td> </tr> <tr> <td colspan="4">■ <math>(25/36)^2</math></td> <td>625/1296</td> </tr> <tr> <td colspan="5">◀(25/36)^2▶</td> </tr> <tr> <td colspan="5">MAIN RAD AUTO FUNC 3/30</td> </tr> </tbody> </table>   | F1+      | F2+        | F3+                                 | F4+ | F5+ | Diverse | Algebra | Analysis | Funktionen | Vektoren | ■ $1 - (5/6)^2$  |  |  |  | 11/36 | ■ $25/36 \cdot 11/36$                      |  |  |  | 275/1296 | ■ $(25/36)^2$ |  |  |  | 625/1296                            | ◀(25/36)^2▶                |  |  |  |  | MAIN RAD AUTO FUNC 3/30 |  |  |  |          | <table border="1"> <thead> <tr> <th>F1+</th> <th>F2+</th> <th>F3+</th> <th>F4+</th> <th>F5+</th> </tr> <tr> <th>Diverse</th> <th>Algebra</th> <th>Analysis</th> <th>Funktionen</th> <th>Vektoren</th> </tr> </thead> <tbody> <tr> <td colspan="5">■ <math>\left\{ \begin{matrix} 11/36 &amp; 275 &amp; 625 \\ &amp; 1296 &amp; 1296 \end{matrix} \right\} \rightarrow p</math></td> </tr> <tr> <td colspan="5">■ <math>\left\{ \begin{matrix} 11/36 &amp; 275 &amp; 625 \\ &amp; 1296 &amp; 1296 \end{matrix} \right\}</math></td> </tr> <tr> <td colspan="5">■ <math>\langle 62.5 \quad 25 \quad -x \rangle \rightarrow g</math></td> </tr> <tr> <td colspan="5">■ <math>\langle 62.5 \quad 25 \quad -x \rangle</math></td> </tr> <tr> <td colspan="5">◀(62.5, 25, -x)▶g▶</td> </tr> <tr> <td colspan="5">MAIN RAD AUTO FUNC 5/30</td> </tr> </tbody> </table> | F1+ | F2+ | F3+ | F4+ | F5+                     | Diverse | Algebra | Analysis | Funktionen | Vektoren | ■ $\left\{ \begin{matrix} 11/36 & 275 & 625 \\ & 1296 & 1296 \end{matrix} \right\} \rightarrow p$ |  |  |  |  | ■ $\left\{ \begin{matrix} 11/36 & 275 & 625 \\ & 1296 & 1296 \end{matrix} \right\}$ |  |  |  |  | ■ $\langle 62.5 \quad 25 \quad -x \rangle \rightarrow g$ |  |  |  |  | ■ $\langle 62.5 \quad 25 \quad -x \rangle$ |  |  |  |  | ◀(62.5, 25, -x)▶g▶ |  |  |  |  | MAIN RAD AUTO FUNC 5/30 |  |  |  |  |
|--|--|----------|------------|-------------------------------------|-----|-----|---------|---------|----------|------------|----------|--|--|--|--|-------|--|--|--|--|----------|---------------|--|--|--|-------------------------------------|----------------------------|--|--|--|--|-------------------------|--|--|--|----------|---|-----|-----|-----|-----|-------------------------|---------|---------|----------|------------|----------|---|--|--|--|--|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--------------------|--|--|--|--|-------------------------|--|--|--|--|
| F1+  | F2+  | F3+      | F4+        | F5+                                 |     |     |         |         |          |            |          |  |  |  |  |       |  |  |  |  |          |               |  |  |  |                                     |                            |  |  |  |  |                         |  |  |  |          |   |     |     |     |     |                         |         |         |          |            |          |   |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                    |  |  |  |  |                         |  |  |  |  |
| Diverse  | Algebra  | Analysis | Funktionen | Vektoren                            |     |     |         |         |          |            |          |  |  |  |  |       |  |  |  |  |          |               |  |  |  |                                     |                            |  |  |  |  |                         |  |  |  |          |   |     |     |     |     |                         |         |         |          |            |          |   |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                    |  |  |  |  |                         |  |  |  |  |
| ■ $1 - (5/6)^2$  |  |          |            | 11/36                               |     |     |         |         |          |            |          |  |  |  |  |       |  |  |  |  |          |               |  |  |  |                                     |                            |  |  |  |  |                         |  |  |  |          |   |     |     |     |     |                         |         |         |          |            |          |   |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                    |  |  |  |  |                         |  |  |  |  |
| ■ $25/36 \cdot 11/36$  |  |          |            | 275/1296                            |     |     |         |         |          |            |          |  |  |  |  |       |  |  |  |  |          |               |  |  |  |                                     |                            |  |  |  |  |                         |  |  |  |          |   |     |     |     |     |                         |         |         |          |            |          |   |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                    |  |  |  |  |                         |  |  |  |  |
| ■ $(25/36)^2$  |  |          |            | 625/1296                            |     |     |         |         |          |            |          |  |  |  |  |       |  |  |  |  |          |               |  |  |  |                                     |                            |  |  |  |  |                         |  |  |  |          |   |     |     |     |     |                         |         |         |          |            |          |   |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                    |  |  |  |  |                         |  |  |  |  |
| ◀(25/36)^2▶  |  |          |            |                                     |     |     |         |         |          |            |          |  |  |  |  |       |  |  |  |  |          |               |  |  |  |                                     |                            |  |  |  |  |                         |  |  |  |          |   |     |     |     |     |                         |         |         |          |            |          |   |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                    |  |  |  |  |                         |  |  |  |  |
| MAIN RAD AUTO FUNC 3/30  |  |          |            |                                     |     |     |         |         |          |            |          |  |  |  |  |       |  |  |  |  |          |               |  |  |  |                                     |                            |  |  |  |  |                         |  |  |  |          |   |     |     |     |     |                         |         |         |          |            |          |   |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                    |  |  |  |  |                         |  |  |  |  |
| F1+  | F2+  | F3+      | F4+        | F5+                                 |     |     |         |         |          |            |          |  |  |  |  |       |  |  |  |  |          |               |  |  |  |                                     |                            |  |  |  |  |                         |  |  |  |          |   |     |     |     |     |                         |         |         |          |            |          |   |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                    |  |  |  |  |                         |  |  |  |  |
| Diverse  | Algebra  | Analysis | Funktionen | Vektoren                            |     |     |         |         |          |            |          |  |  |  |  |       |  |  |  |  |          |               |  |  |  |                                     |                            |  |  |  |  |                         |  |  |  |          |   |     |     |     |     |                         |         |         |          |            |          |   |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                    |  |  |  |  |                         |  |  |  |  |
| ■ $\left\{ \begin{matrix} 11/36 & 275 & 625 \\ & 1296 & 1296 \end{matrix} \right\} \rightarrow p$  |  |          |            |                                     |     |     |         |         |          |            |          |  |  |  |  |       |  |  |  |  |          |               |  |  |  |                                     |                            |  |  |  |  |                         |  |  |  |          |   |     |     |     |     |                         |         |         |          |            |          |   |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                    |  |  |  |  |                         |  |  |  |  |
| ■ $\left\{ \begin{matrix} 11/36 & 275 & 625 \\ & 1296 & 1296 \end{matrix} \right\}$  |  |          |            |                                     |     |     |         |         |          |            |          |  |  |  |  |       |  |  |  |  |          |               |  |  |  |                                     |                            |  |  |  |  |                         |  |  |  |          |   |     |     |     |     |                         |         |         |          |            |          |   |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                    |  |  |  |  |                         |  |  |  |  |
| ■ $\langle 62.5 \quad 25 \quad -x \rangle \rightarrow g$   |  |          |            |                                     |     |     |         |         |          |            |          |  |  |  |  |       |  |  |  |  |          |               |  |  |  |                                     |                            |  |  |  |  |                         |  |  |  |          |   |     |     |     |     |                         |         |         |          |            |          |   |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                    |  |  |  |  |                         |  |  |  |  |
| ■ $\langle 62.5 \quad 25 \quad -x \rangle$   |  |          |            |                                     |     |     |         |         |          |            |          |  |  |  |  |       |  |  |  |  |          |               |  |  |  |                                     |                            |  |  |  |  |                         |  |  |  |          |   |     |     |     |     |                         |         |         |          |            |          |   |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                    |  |  |  |  |                         |  |  |  |  |
| ◀(62.5, 25, -x)▶g▶   |  |          |            |                                     |     |     |         |         |          |            |          |  |  |  |  |       |  |  |  |  |          |               |  |  |  |                                     |                            |  |  |  |  |                         |  |  |  |          |   |     |     |     |     |                         |         |         |          |            |          |   |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                    |  |  |  |  |                         |  |  |  |  |
| MAIN RAD AUTO FUNC 5/30  |  |          |            |                                     |     |     |         |         |          |            |          |  |  |  |  |       |  |  |  |  |          |               |  |  |  |                                     |                            |  |  |  |  |                         |  |  |  |          |   |     |     |     |     |                         |         |         |          |            |          |   |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                    |  |  |  |  |                         |  |  |  |  |
| <p>E(G) ausgeschrieben<br/>Für faires Spiel muss E(G) = 0 sein.<br/>Auflösen nach x.<br/>Also 50.60 Fr.</p>                                      | <table border="1"> <thead> <tr> <th>F1+</th> <th>F2+</th> <th>F3+</th> <th>F4+</th> <th>F5+</th> </tr> <tr> <th>Diverse</th> <th>Algebra</th> <th>Analysis</th> <th>Funktionen</th> <th>Vektoren</th> </tr> </thead> <tbody> <tr> <td colspan="5">■ <math>\langle 62.5 \quad 25 \quad -x \rangle \rightarrow g</math></td> </tr> <tr> <td colspan="5">■ <math>\langle 62.5 \quad 25 \quad -x \rangle</math></td> </tr> <tr> <td colspan="4">■ dotP(p, g)</td> <td><math>24.402 - \frac{625 \cdot x}{1296}</math></td> </tr> <tr> <td colspan="5">■ solve(dotP(p, g) = 0, x)</td> </tr> <tr> <td colspan="4"></td> <td>x = 50.6</td> </tr> <tr> <td colspan="5">Solve(DotP(p, g)=0, x)</td> </tr> <tr> <td colspan="5">MAIN RAD AUTO FUNC 7/30</td> </tr> </tbody> </table> | F1+      | F2+        | F3+                                 | F4+ | F5+ | Diverse | Algebra | Analysis | Funktionen | Vektoren | ■ $\langle 62.5 \quad 25 \quad -x \rangle \rightarrow g$ |  |  |  |       | ■ $\langle 62.5 \quad 25 \quad -x \rangle$ |  |  |  |          | ■ dotP(p, g)  |  |  |  | $24.402 - \frac{625 \cdot x}{1296}$ | ■ solve(dotP(p, g) = 0, x) |  |  |  |  |                         |  |  |  | x = 50.6 | Solve(DotP(p, g)=0, x)  |     |     |     |     | MAIN RAD AUTO FUNC 7/30 |         |         |          |            |          |   |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                    |  |  |  |  |                         |  |  |  |  |
| F1+  | F2+  | F3+      | F4+        | F5+                                 |     |     |         |         |          |            |          |  |  |  |  |       |  |  |  |  |          |               |  |  |  |                                     |                            |  |  |  |  |                         |  |  |  |          |   |     |     |     |     |                         |         |         |          |            |          |   |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                    |  |  |  |  |                         |  |  |  |  |
| Diverse  | Algebra  | Analysis | Funktionen | Vektoren                            |     |     |         |         |          |            |          |  |  |  |  |       |  |  |  |  |          |               |  |  |  |                                     |                            |  |  |  |  |                         |  |  |  |          |   |     |     |     |     |                         |         |         |          |            |          |   |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                    |  |  |  |  |                         |  |  |  |  |
| ■ $\langle 62.5 \quad 25 \quad -x \rangle \rightarrow g$   |  |          |            |                                     |     |     |         |         |          |            |          |  |  |  |  |       |  |  |  |  |          |               |  |  |  |                                     |                            |  |  |  |  |                         |  |  |  |          |   |     |     |     |     |                         |         |         |          |            |          |   |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                    |  |  |  |  |                         |  |  |  |  |
| ■ $\langle 62.5 \quad 25 \quad -x \rangle$   |  |          |            |                                     |     |     |         |         |          |            |          |  |  |  |  |       |  |  |  |  |          |               |  |  |  |                                     |                            |  |  |  |  |                         |  |  |  |          |   |     |     |     |     |                         |         |         |          |            |          |   |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                    |  |  |  |  |                         |  |  |  |  |
| ■ dotP(p, g)   |  |          |            | $24.402 - \frac{625 \cdot x}{1296}$ |     |     |         |         |          |            |          |  |  |  |  |       |  |  |  |  |          |               |  |  |  |                                     |                            |  |  |  |  |                         |  |  |  |          |   |     |     |     |     |                         |         |         |          |            |          |   |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                    |  |  |  |  |                         |  |  |  |  |
| ■ solve(dotP(p, g) = 0, x)   |  |          |            |                                     |     |     |         |         |          |            |          |  |  |  |  |       |  |  |  |  |          |               |  |  |  |                                     |                            |  |  |  |  |                         |  |  |  |          |   |     |     |     |     |                         |         |         |          |            |          |   |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                    |  |  |  |  |                         |  |  |  |  |
|  |  |          |            | x = 50.6                            |     |     |         |         |          |            |          |  |  |  |  |       |  |  |  |  |          |               |  |  |  |                                     |                            |  |  |  |  |                         |  |  |  |          |   |     |     |     |     |                         |         |         |          |            |          |   |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                    |  |  |  |  |                         |  |  |  |  |
| Solve(DotP(p, g)=0, x)   |  |          |            |                                     |     |     |         |         |          |            |          |  |  |  |  |       |  |  |  |  |          |               |  |  |  |                                     |                            |  |  |  |  |                         |  |  |  |          |   |     |     |     |     |                         |         |         |          |            |          |   |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                    |  |  |  |  |                         |  |  |  |  |
| MAIN RAD AUTO FUNC 7/30  |  |          |            |                                     |     |     |         |         |          |            |          |  |  |  |  |       |  |  |  |  |          |               |  |  |  |                                     |                            |  |  |  |  |                         |  |  |  |          |   |     |     |     |     |                         |         |         |          |            |          |   |  |  |  |  |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                    |  |  |  |  |                         |  |  |  |  |

### 2) Dodekaeder

| <p>Rechne zuerst für einen Wurf.<br/>E(G1) = 9/4 = 2.25<br/>V(G1) = 401/48 = 8.354<br/>Dann alles mit 4 multiplizieren.<br/>(unabhängige Stufen)</p> | <table border="1"> <thead> <tr> <th>F1+</th> <th>F2+</th> <th>F3+</th> <th>F4+</th> <th>F5+</th> </tr> <tr> <th>Diverse</th> <th>Algebra</th> <th>Analysis</th> <th>Funktionen</th> <th>Vektoren</th> </tr> </thead> <tbody> <tr> <td colspan="5">■ <math>\langle 0 \quad 1 \quad 2 \quad 5 \quad 10 \rangle \rightarrow g</math></td> </tr> <tr> <td colspan="5">■ <math>\langle 0 \quad 1 \quad 2 \quad 5 \quad 10 \rangle</math></td> </tr> <tr> <td colspan="5">■ <math>\langle 4/12 \quad 3/12 \quad 2/12 \quad 2/12 \rangle</math></td> </tr> <tr> <td colspan="5">■ <math>\langle 1/3 \quad 1/4 \quad 1/6 \quad 1/6 \quad 1/6 \rangle</math></td> </tr> <tr> <td colspan="4">■ dotP(g, p)</td> <td>9/4</td> </tr> <tr> <td colspan="5">DotP(g, p)</td> </tr> <tr> <td colspan="5">MAIN RAD AUTO FUNC 3/30</td> </tr> </tbody> </table> | F1+      | F2+        | F3+      | F4+ | F5+ | Diverse | Algebra | Analysis | Funktionen | Vektoren | ■ $\langle 0 \quad 1 \quad 2 \quad 5 \quad 10 \rangle \rightarrow g$ |  |  |  |  | ■ $\langle 0 \quad 1 \quad 2 \quad 5 \quad 10 \rangle$ |  |  |  |  | ■ $\langle 4/12 \quad 3/12 \quad 2/12 \quad 2/12 \rangle$ |  |  |  |  | ■ $\langle 1/3 \quad 1/4 \quad 1/6 \quad 1/6 \quad 1/6 \rangle$ |  |  |  |  | ■ dotP(g, p) |  |  |  | 9/4 | DotP(g, p) |  |  |  |  | MAIN RAD AUTO FUNC 3/30 |  |  |  |  | <table border="1"> <thead> <tr> <th>F1+</th> <th>F2+</th> <th>F3+</th> <th>F4+</th> <th>F5+</th> </tr> <tr> <th>Diverse</th> <th>Algebra</th> <th>Analysis</th> <th>Funktionen</th> <th>Vektoren</th> </tr> </thead> <tbody> <tr> <td colspan="4">■ dotP((g - 9/4)^2, p)</td> <td>401/48</td> </tr> <tr> <td colspan="4">■ 4 · 9</td> <td>9</td> </tr> <tr> <td colspan="4">■ 4 · 401</td> <td>401</td> </tr> <tr> <td colspan="4">■ 48</td> <td>12</td> </tr> <tr> <td colspan="5">4*401/48</td> </tr> <tr> <td colspan="5">MAIN RAD AUTO FUNC 6/30</td> </tr> </tbody> </table> | F1+ | F2+ | F3+ | F4+ | F5+ | Diverse | Algebra | Analysis | Funktionen | Vektoren | ■ dotP((g - 9/4)^2, p) |  |  |  | 401/48 | ■ 4 · 9 |  |  |  | 9 | ■ 4 · 401 |  |  |  | 401 | ■ 48 |  |  |  | 12 | 4*401/48 |  |  |  |  | MAIN RAD AUTO FUNC 6/30 |  |  |  |  |
|--|---|----------|------------|----------|-----|-----|---------|---------|----------|------------|----------|--|--|--|--|--|--|--|--|--|--|---|--|--|--|--|---|--|--|--|--|--------------|--|--|--|-----|------------|--|--|--|--|-------------------------|--|--|--|--|---|-----|-----|-----|-----|-----|---------|---------|----------|------------|----------|------------------------|--|--|--|--------|---------|--|--|--|---|-----------|--|--|--|-----|------|--|--|--|----|----------|--|--|--|--|-------------------------|--|--|--|--|
| F1+  | F2+   | F3+      | F4+        | F5+      |     |     |         |         |          |            |          |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |   |  |  |  |  |              |  |  |  |     |            |  |  |  |  |                         |  |  |  |  |   |     |     |     |     |     |         |         |          |            |          |                        |  |  |  |        |         |  |  |  |   |           |  |  |  |     |      |  |  |  |    |          |  |  |  |  |                         |  |  |  |  |
| Diverse  | Algebra   | Analysis | Funktionen | Vektoren |     |     |         |         |          |            |          |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |   |  |  |  |  |              |  |  |  |     |            |  |  |  |  |                         |  |  |  |  |   |     |     |     |     |     |         |         |          |            |          |                        |  |  |  |        |         |  |  |  |   |           |  |  |  |     |      |  |  |  |    |          |  |  |  |  |                         |  |  |  |  |
| ■ $\langle 0 \quad 1 \quad 2 \quad 5 \quad 10 \rangle \rightarrow g$   |   |          |            |          |     |     |         |         |          |            |          |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |   |  |  |  |  |              |  |  |  |     |            |  |  |  |  |                         |  |  |  |  |   |     |     |     |     |     |         |         |          |            |          |                        |  |  |  |        |         |  |  |  |   |           |  |  |  |     |      |  |  |  |    |          |  |  |  |  |                         |  |  |  |  |
| ■ $\langle 0 \quad 1 \quad 2 \quad 5 \quad 10 \rangle$   |   |          |            |          |     |     |         |         |          |            |          |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |   |  |  |  |  |              |  |  |  |     |            |  |  |  |  |                         |  |  |  |  |   |     |     |     |     |     |         |         |          |            |          |                        |  |  |  |        |         |  |  |  |   |           |  |  |  |     |      |  |  |  |    |          |  |  |  |  |                         |  |  |  |  |
| ■ $\langle 4/12 \quad 3/12 \quad 2/12 \quad 2/12 \rangle$  |   |          |            |          |     |     |         |         |          |            |          |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |   |  |  |  |  |              |  |  |  |     |            |  |  |  |  |                         |  |  |  |  |   |     |     |     |     |     |         |         |          |            |          |                        |  |  |  |        |         |  |  |  |   |           |  |  |  |     |      |  |  |  |    |          |  |  |  |  |                         |  |  |  |  |
| ■ $\langle 1/3 \quad 1/4 \quad 1/6 \quad 1/6 \quad 1/6 \rangle$  |   |          |            |          |     |     |         |         |          |            |          |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |   |  |  |  |  |              |  |  |  |     |            |  |  |  |  |                         |  |  |  |  |   |     |     |     |     |     |         |         |          |            |          |                        |  |  |  |        |         |  |  |  |   |           |  |  |  |     |      |  |  |  |    |          |  |  |  |  |                         |  |  |  |  |
| ■ dotP(g, p)   |   |          |            | 9/4      |     |     |         |         |          |            |          |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |   |  |  |  |  |              |  |  |  |     |            |  |  |  |  |                         |  |  |  |  |   |     |     |     |     |     |         |         |          |            |          |                        |  |  |  |        |         |  |  |  |   |           |  |  |  |     |      |  |  |  |    |          |  |  |  |  |                         |  |  |  |  |
| DotP(g, p)   |   |          |            |          |     |     |         |         |          |            |          |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |   |  |  |  |  |              |  |  |  |     |            |  |  |  |  |                         |  |  |  |  |   |     |     |     |     |     |         |         |          |            |          |                        |  |  |  |        |         |  |  |  |   |           |  |  |  |     |      |  |  |  |    |          |  |  |  |  |                         |  |  |  |  |
| MAIN RAD AUTO FUNC 3/30  |   |          |            |          |     |     |         |         |          |            |          |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |   |  |  |  |  |              |  |  |  |     |            |  |  |  |  |                         |  |  |  |  |   |     |     |     |     |     |         |         |          |            |          |                        |  |  |  |        |         |  |  |  |   |           |  |  |  |     |      |  |  |  |    |          |  |  |  |  |                         |  |  |  |  |
| F1+  | F2+   | F3+      | F4+        | F5+      |     |     |         |         |          |            |          |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |   |  |  |  |  |              |  |  |  |     |            |  |  |  |  |                         |  |  |  |  |   |     |     |     |     |     |         |         |          |            |          |                        |  |  |  |        |         |  |  |  |   |           |  |  |  |     |      |  |  |  |    |          |  |  |  |  |                         |  |  |  |  |
| Diverse  | Algebra   | Analysis | Funktionen | Vektoren |     |     |         |         |          |            |          |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |   |  |  |  |  |              |  |  |  |     |            |  |  |  |  |                         |  |  |  |  |   |     |     |     |     |     |         |         |          |            |          |                        |  |  |  |        |         |  |  |  |   |           |  |  |  |     |      |  |  |  |    |          |  |  |  |  |                         |  |  |  |  |
| ■ dotP((g - 9/4)^2, p)   |   |          |            | 401/48   |     |     |         |         |          |            |          |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |   |  |  |  |  |              |  |  |  |     |            |  |  |  |  |                         |  |  |  |  |   |     |     |     |     |     |         |         |          |            |          |                        |  |  |  |        |         |  |  |  |   |           |  |  |  |     |      |  |  |  |    |          |  |  |  |  |                         |  |  |  |  |
| ■ 4 · 9  |   |          |            | 9        |     |     |         |         |          |            |          |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |   |  |  |  |  |              |  |  |  |     |            |  |  |  |  |                         |  |  |  |  |   |     |     |     |     |     |         |         |          |            |          |                        |  |  |  |        |         |  |  |  |   |           |  |  |  |     |      |  |  |  |    |          |  |  |  |  |                         |  |  |  |  |
| ■ 4 · 401  |   |          |            | 401      |     |     |         |         |          |            |          |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |   |  |  |  |  |              |  |  |  |     |            |  |  |  |  |                         |  |  |  |  |   |     |     |     |     |     |         |         |          |            |          |                        |  |  |  |        |         |  |  |  |   |           |  |  |  |     |      |  |  |  |    |          |  |  |  |  |                         |  |  |  |  |
| ■ 48   |   |          |            | 12       |     |     |         |         |          |            |          |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |   |  |  |  |  |              |  |  |  |     |            |  |  |  |  |                         |  |  |  |  |   |     |     |     |     |     |         |         |          |            |          |                        |  |  |  |        |         |  |  |  |   |           |  |  |  |     |      |  |  |  |    |          |  |  |  |  |                         |  |  |  |  |
| 4*401/48   |   |          |            |          |     |     |         |         |          |            |          |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |   |  |  |  |  |              |  |  |  |     |            |  |  |  |  |                         |  |  |  |  |   |     |     |     |     |     |         |         |          |            |          |                        |  |  |  |        |         |  |  |  |   |           |  |  |  |     |      |  |  |  |    |          |  |  |  |  |                         |  |  |  |  |
| MAIN RAD AUTO FUNC 6/30  |   |          |            |          |     |     |         |         |          |            |          |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |   |  |  |  |  |              |  |  |  |     |            |  |  |  |  |                         |  |  |  |  |   |     |     |     |     |     |         |         |          |            |          |                        |  |  |  |        |         |  |  |  |   |           |  |  |  |     |      |  |  |  |    |          |  |  |  |  |                         |  |  |  |  |

### 3) Würfeln

| <p>Binomialverteilung:<br/>a) E(X) = 37.5; V(X) = 31.25<br/>b) 6.29 %<br/>c) 37 Sechser</p> | <table border="1"> <thead> <tr> <th>F1+</th> <th>F2+</th> <th>F3+</th> <th>F4+</th> <th>F5+</th> </tr> <tr> <th>Diverse</th> <th>Algebra</th> <th>Analysis</th> <th>Funktionen</th> <th>Vektoren</th> </tr> </thead> <tbody> <tr> <td colspan="4">■ <math>\frac{225 \cdot 1}{6}</math></td> <td>37.5</td> </tr> <tr> <td colspan="4">■ <math>\frac{225 \cdot 1}{6} \cdot 5</math></td> <td>31.25</td> </tr> <tr> <td colspan="5">225*1/6*5/6</td> </tr> <tr> <td colspan="5">MAIN RAD AUTO FUNC 2/30</td> </tr> </tbody> </table> | F1+      | F2+        | F3+      | F4+ | F5+ | Diverse | Algebra | Analysis | Funktionen | Vektoren | ■ $\frac{225 \cdot 1}{6}$ |  |  |  | 37.5 | ■ $\frac{225 \cdot 1}{6} \cdot 5$ |  |  |  | 31.25 | 225*1/6*5/6 |  |  |  |  | MAIN RAD AUTO FUNC 2/30 |  |  |  |  | <table border="1"> <thead> <tr> <th>F1+</th> <th>F2+</th> <th>F3+</th> <th>F4+</th> <th>F5+</th> </tr> <tr> <th>Diverse</th> <th>Algebra</th> <th>Analysis</th> <th>Funktionen</th> <th>Vektoren</th> </tr> </thead> <tbody> <tr> <td colspan="5">■ nCr(225, 40) · (1/6)<sup>40</sup> · (5/6)<sup>1</sup></td> </tr> <tr> <td colspan="5">■ nCr(225, x) · (1/6)<sup>x</sup> · (5/6)<sup>225</sup></td> </tr> <tr> <td colspan="5">■ <math>\dots \cdot (5/6)^{(225-x)} \mid x = \{37, 38\}</math></td> </tr> <tr> <td colspan="5">MAIN RAD AUTO FUNC 2/30</td> </tr> </tbody> </table> | F1+ | F2+ | F3+ | F4+ | F5+ | Diverse | Algebra | Analysis | Funktionen | Vektoren | ■ nCr(225, 40) · (1/6) <sup>40</sup> · (5/6) <sup>1</sup> |  |  |  |  | ■ nCr(225, x) · (1/6) <sup>x</sup> · (5/6) <sup>225</sup> |  |  |  |  | ■ $\dots \cdot (5/6)^{(225-x)} \mid x = \{37, 38\}$ |  |  |  |  | MAIN RAD AUTO FUNC 2/30 |  |  |  |  |
|---|---|----------|------------|----------|-----|-----|---------|---------|----------|------------|----------|---------------------------|--|--|--|------|-----------------------------------|--|--|--|-------|-------------|--|--|--|--|-------------------------|--|--|--|--|---|-----|-----|-----|-----|-----|---------|---------|----------|------------|----------|---|--|--|--|--|---|--|--|--|--|---|--|--|--|--|-------------------------|--|--|--|--|
| F1+   | F2+   | F3+      | F4+        | F5+      |     |     |         |         |          |            |          |                           |  |  |  |      |                                   |  |  |  |       |             |  |  |  |  |                         |  |  |  |  |   |     |     |     |     |     |         |         |          |            |          |   |  |  |  |  |   |  |  |  |  |   |  |  |  |  |                         |  |  |  |  |
| Diverse   | Algebra   | Analysis | Funktionen | Vektoren |     |     |         |         |          |            |          |                           |  |  |  |      |                                   |  |  |  |       |             |  |  |  |  |                         |  |  |  |  |   |     |     |     |     |     |         |         |          |            |          |   |  |  |  |  |   |  |  |  |  |   |  |  |  |  |                         |  |  |  |  |
| ■ $\frac{225 \cdot 1}{6}$   |   |          |            | 37.5     |     |     |         |         |          |            |          |                           |  |  |  |      |                                   |  |  |  |       |             |  |  |  |  |                         |  |  |  |  |   |     |     |     |     |     |         |         |          |            |          |   |  |  |  |  |   |  |  |  |  |   |  |  |  |  |                         |  |  |  |  |
| ■ $\frac{225 \cdot 1}{6} \cdot 5$   |   |          |            | 31.25    |     |     |         |         |          |            |          |                           |  |  |  |      |                                   |  |  |  |       |             |  |  |  |  |                         |  |  |  |  |   |     |     |     |     |     |         |         |          |            |          |   |  |  |  |  |   |  |  |  |  |   |  |  |  |  |                         |  |  |  |  |
| 225*1/6*5/6   |   |          |            |          |     |     |         |         |          |            |          |                           |  |  |  |      |                                   |  |  |  |       |             |  |  |  |  |                         |  |  |  |  |   |     |     |     |     |     |         |         |          |            |          |   |  |  |  |  |   |  |  |  |  |   |  |  |  |  |                         |  |  |  |  |
| MAIN RAD AUTO FUNC 2/30   |   |          |            |          |     |     |         |         |          |            |          |                           |  |  |  |      |                                   |  |  |  |       |             |  |  |  |  |                         |  |  |  |  |   |     |     |     |     |     |         |         |          |            |          |   |  |  |  |  |   |  |  |  |  |   |  |  |  |  |                         |  |  |  |  |
| F1+   | F2+   | F3+      | F4+        | F5+      |     |     |         |         |          |            |          |                           |  |  |  |      |                                   |  |  |  |       |             |  |  |  |  |                         |  |  |  |  |   |     |     |     |     |     |         |         |          |            |          |   |  |  |  |  |   |  |  |  |  |   |  |  |  |  |                         |  |  |  |  |
| Diverse   | Algebra   | Analysis | Funktionen | Vektoren |     |     |         |         |          |            |          |                           |  |  |  |      |                                   |  |  |  |       |             |  |  |  |  |                         |  |  |  |  |   |     |     |     |     |     |         |         |          |            |          |   |  |  |  |  |   |  |  |  |  |   |  |  |  |  |                         |  |  |  |  |
| ■ nCr(225, 40) · (1/6) <sup>40</sup> · (5/6) <sup>1</sup>                                   |   |          |            |          |     |     |         |         |          |            |          |                           |  |  |  |      |                                   |  |  |  |       |             |  |  |  |  |                         |  |  |  |  |   |     |     |     |     |     |         |         |          |            |          |   |  |  |  |  |   |  |  |  |  |   |  |  |  |  |                         |  |  |  |  |
| ■ nCr(225, x) · (1/6) <sup>x</sup> · (5/6) <sup>225</sup>                                   |   |          |            |          |     |     |         |         |          |            |          |                           |  |  |  |      |                                   |  |  |  |       |             |  |  |  |  |                         |  |  |  |  |   |     |     |     |     |     |         |         |          |            |          |   |  |  |  |  |   |  |  |  |  |   |  |  |  |  |                         |  |  |  |  |
| ■ $\dots \cdot (5/6)^{(225-x)} \mid x = \{37, 38\}$   |   |          |            |          |     |     |         |         |          |            |          |                           |  |  |  |      |                                   |  |  |  |       |             |  |  |  |  |                         |  |  |  |  |   |     |     |     |     |     |         |         |          |            |          |   |  |  |  |  |   |  |  |  |  |   |  |  |  |  |                         |  |  |  |  |
| MAIN RAD AUTO FUNC 2/30   |   |          |            |          |     |     |         |         |          |            |          |                           |  |  |  |      |                                   |  |  |  |       |             |  |  |  |  |                         |  |  |  |  |   |     |     |     |     |     |         |         |          |            |          |   |  |  |  |  |   |  |  |  |  |   |  |  |  |  |                         |  |  |  |  |

### 4) Glücksrad

| <p>H<sub>0</sub>: p = 1/2<br/>H<sub>1</sub>: p ≠ 1/2<br/>(Das ist ein zweiseitiger Test, weil man nicht weiss, ob die Nullen oder die Einsen zu häufig resp. zu wenig oft vorkommen.)<br/>μ = 1000; σ = 22.36.<br/>Es muss Φ(z) = 0.975 sein.<br/>Also z = 1.96<br/>Löse (x - μ)/σ = 1.96<br/>Also bei mind. 1044 Einsen oder bei höchstens 956 Einsen (das entspricht 1044 Nullen)</p> | <table border="1"> <thead> <tr> <th>F1+</th> <th>F2+</th> <th>F3+</th> <th>F4+</th> <th>F5+</th> </tr> <tr> <th>Diverse</th> <th>Algebra</th> <th>Analysis</th> <th>Funktionen</th> <th>Vektoren</th> </tr> </thead> <tbody> <tr> <td colspan="4">■ 2000 ÷ n</td> <td>2000</td> </tr> <tr> <td colspan="4">■ <math>\frac{n \cdot 1}{2}</math></td> <td>1000</td> </tr> <tr> <td colspan="4">■ <math>\sqrt{n \cdot 1/2 \cdot 1/2}</math></td> <td>10 · √5</td> </tr> <tr> <td colspan="4">■ <math>\sqrt{n \cdot 1/2 \cdot 1/2}</math></td> <td>22.3607</td> </tr> <tr> <td colspan="5">√(n*(1/2)*(1/2))</td> </tr> <tr> <td colspan="5">MAIN RAD AUTO FUNC 4/30</td> </tr> </tbody> </table> | F1+      | F2+        | F3+         | F4+ | F5+ | Diverse | Algebra | Analysis | Funktionen | Vektoren | ■ 2000 ÷ n |  |  |  | 2000 | ■ $\frac{n \cdot 1}{2}$ |  |  |  | 1000 | ■ $\sqrt{n \cdot 1/2 \cdot 1/2}$ |  |  |  | 10 · √5 | ■ $\sqrt{n \cdot 1/2 \cdot 1/2}$ |  |  |  | 22.3607 | √(n*(1/2)*(1/2)) |  |  |  |  | MAIN RAD AUTO FUNC 4/30 |  |  |  |  | <table border="1"> <thead> <tr> <th>F1+</th> <th>F2+</th> <th>F3+</th> <th>F4+</th> <th>F5+</th> </tr> <tr> <th>Diverse</th> <th>Algebra</th> <th>Analysis</th> <th>Funktionen</th> <th>Vektoren</th> </tr> </thead> <tbody> <tr> <td colspan="4">■ <math>\sqrt{n \cdot 1/2 \cdot 1/2}</math></td> <td>22.3607</td> </tr> <tr> <td colspan="5">■ solve(phi(z) = .975, z)</td> </tr> <tr> <td colspan="4"></td> <td>z = 1.95996</td> </tr> <tr> <td colspan="5">■ solve(<math>\frac{x - 1000}{22.360679774998} = 1.95996</math>)</td> </tr> <tr> <td colspan="4"></td> <td>x = 1043.83</td> </tr> <tr> <td colspan="5">.9774998=1.95996398454, x)</td> </tr> <tr> <td colspan="5">MAIN RAD AUTO FUNC 5/30</td> </tr> </tbody> </table> | F1+ | F2+ | F3+ | F4+ | F5+ | Diverse | Algebra | Analysis | Funktionen | Vektoren | ■ $\sqrt{n \cdot 1/2 \cdot 1/2}$ |  |  |  | 22.3607 | ■ solve(phi(z) = .975, z) |  |  |  |  |  |  |  |  | z = 1.95996 | ■ solve( $\frac{x - 1000}{22.360679774998} = 1.95996$ ) |  |  |  |  |  |  |  |  | x = 1043.83 | .9774998=1.95996398454, x) |  |  |  |  | MAIN RAD AUTO FUNC 5/30 |  |  |  |  |
|---|---|----------|------------|-------------|-----|-----|---------|---------|----------|------------|----------|------------|--|--|--|------|-------------------------|--|--|--|------|----------------------------------|--|--|--|---------|----------------------------------|--|--|--|---------|------------------|--|--|--|--|-------------------------|--|--|--|--|---|-----|-----|-----|-----|-----|---------|---------|----------|------------|----------|----------------------------------|--|--|--|---------|---------------------------|--|--|--|--|--|--|--|--|-------------|---|--|--|--|--|--|--|--|--|-------------|----------------------------|--|--|--|--|-------------------------|--|--|--|--|
| F1+   | F2+   | F3+      | F4+        | F5+         |     |     |         |         |          |            |          |            |  |  |  |      |                         |  |  |  |      |                                  |  |  |  |         |                                  |  |  |  |         |                  |  |  |  |  |                         |  |  |  |  |   |     |     |     |     |     |         |         |          |            |          |                                  |  |  |  |         |                           |  |  |  |  |  |  |  |  |             |   |  |  |  |  |  |  |  |  |             |                            |  |  |  |  |                         |  |  |  |  |
| Diverse   | Algebra   | Analysis | Funktionen | Vektoren    |     |     |         |         |          |            |          |            |  |  |  |      |                         |  |  |  |      |                                  |  |  |  |         |                                  |  |  |  |         |                  |  |  |  |  |                         |  |  |  |  |   |     |     |     |     |     |         |         |          |            |          |                                  |  |  |  |         |                           |  |  |  |  |  |  |  |  |             |   |  |  |  |  |  |  |  |  |             |                            |  |  |  |  |                         |  |  |  |  |
| ■ 2000 ÷ n  |   |          |            | 2000        |     |     |         |         |          |            |          |            |  |  |  |      |                         |  |  |  |      |                                  |  |  |  |         |                                  |  |  |  |         |                  |  |  |  |  |                         |  |  |  |  |   |     |     |     |     |     |         |         |          |            |          |                                  |  |  |  |         |                           |  |  |  |  |  |  |  |  |             |   |  |  |  |  |  |  |  |  |             |                            |  |  |  |  |                         |  |  |  |  |
| ■ $\frac{n \cdot 1}{2}$   |   |          |            | 1000        |     |     |         |         |          |            |          |            |  |  |  |      |                         |  |  |  |      |                                  |  |  |  |         |                                  |  |  |  |         |                  |  |  |  |  |                         |  |  |  |  |   |     |     |     |     |     |         |         |          |            |          |                                  |  |  |  |         |                           |  |  |  |  |  |  |  |  |             |   |  |  |  |  |  |  |  |  |             |                            |  |  |  |  |                         |  |  |  |  |
| ■ $\sqrt{n \cdot 1/2 \cdot 1/2}$  |   |          |            | 10 · √5     |     |     |         |         |          |            |          |            |  |  |  |      |                         |  |  |  |      |                                  |  |  |  |         |                                  |  |  |  |         |                  |  |  |  |  |                         |  |  |  |  |   |     |     |     |     |     |         |         |          |            |          |                                  |  |  |  |         |                           |  |  |  |  |  |  |  |  |             |   |  |  |  |  |  |  |  |  |             |                            |  |  |  |  |                         |  |  |  |  |
| ■ $\sqrt{n \cdot 1/2 \cdot 1/2}$  |   |          |            | 22.3607     |     |     |         |         |          |            |          |            |  |  |  |      |                         |  |  |  |      |                                  |  |  |  |         |                                  |  |  |  |         |                  |  |  |  |  |                         |  |  |  |  |   |     |     |     |     |     |         |         |          |            |          |                                  |  |  |  |         |                           |  |  |  |  |  |  |  |  |             |   |  |  |  |  |  |  |  |  |             |                            |  |  |  |  |                         |  |  |  |  |
| √(n*(1/2)*(1/2))  |   |          |            |             |     |     |         |         |          |            |          |            |  |  |  |      |                         |  |  |  |      |                                  |  |  |  |         |                                  |  |  |  |         |                  |  |  |  |  |                         |  |  |  |  |   |     |     |     |     |     |         |         |          |            |          |                                  |  |  |  |         |                           |  |  |  |  |  |  |  |  |             |   |  |  |  |  |  |  |  |  |             |                            |  |  |  |  |                         |  |  |  |  |
| MAIN RAD AUTO FUNC 4/30   |   |          |            |             |     |     |         |         |          |            |          |            |  |  |  |      |                         |  |  |  |      |                                  |  |  |  |         |                                  |  |  |  |         |                  |  |  |  |  |                         |  |  |  |  |   |     |     |     |     |     |         |         |          |            |          |                                  |  |  |  |         |                           |  |  |  |  |  |  |  |  |             |   |  |  |  |  |  |  |  |  |             |                            |  |  |  |  |                         |  |  |  |  |
| F1+   | F2+   | F3+      | F4+        | F5+         |     |     |         |         |          |            |          |            |  |  |  |      |                         |  |  |  |      |                                  |  |  |  |         |                                  |  |  |  |         |                  |  |  |  |  |                         |  |  |  |  |   |     |     |     |     |     |         |         |          |            |          |                                  |  |  |  |         |                           |  |  |  |  |  |  |  |  |             |   |  |  |  |  |  |  |  |  |             |                            |  |  |  |  |                         |  |  |  |  |
| Diverse   | Algebra   | Analysis | Funktionen | Vektoren    |     |     |         |         |          |            |          |            |  |  |  |      |                         |  |  |  |      |                                  |  |  |  |         |                                  |  |  |  |         |                  |  |  |  |  |                         |  |  |  |  |   |     |     |     |     |     |         |         |          |            |          |                                  |  |  |  |         |                           |  |  |  |  |  |  |  |  |             |   |  |  |  |  |  |  |  |  |             |                            |  |  |  |  |                         |  |  |  |  |
| ■ $\sqrt{n \cdot 1/2 \cdot 1/2}$  |   |          |            | 22.3607     |     |     |         |         |          |            |          |            |  |  |  |      |                         |  |  |  |      |                                  |  |  |  |         |                                  |  |  |  |         |                  |  |  |  |  |                         |  |  |  |  |   |     |     |     |     |     |         |         |          |            |          |                                  |  |  |  |         |                           |  |  |  |  |  |  |  |  |             |   |  |  |  |  |  |  |  |  |             |                            |  |  |  |  |                         |  |  |  |  |
| ■ solve(phi(z) = .975, z)   |   |          |            |             |     |     |         |         |          |            |          |            |  |  |  |      |                         |  |  |  |      |                                  |  |  |  |         |                                  |  |  |  |         |                  |  |  |  |  |                         |  |  |  |  |   |     |     |     |     |     |         |         |          |            |          |                                  |  |  |  |         |                           |  |  |  |  |  |  |  |  |             |   |  |  |  |  |  |  |  |  |             |                            |  |  |  |  |                         |  |  |  |  |
|   |   |          |            | z = 1.95996 |     |     |         |         |          |            |          |            |  |  |  |      |                         |  |  |  |      |                                  |  |  |  |         |                                  |  |  |  |         |                  |  |  |  |  |                         |  |  |  |  |   |     |     |     |     |     |         |         |          |            |          |                                  |  |  |  |         |                           |  |  |  |  |  |  |  |  |             |   |  |  |  |  |  |  |  |  |             |                            |  |  |  |  |                         |  |  |  |  |
| ■ solve( $\frac{x - 1000}{22.360679774998} = 1.95996$ )   |   |          |            |             |     |     |         |         |          |            |          |            |  |  |  |      |                         |  |  |  |      |                                  |  |  |  |         |                                  |  |  |  |         |                  |  |  |  |  |                         |  |  |  |  |   |     |     |     |     |     |         |         |          |            |          |                                  |  |  |  |         |                           |  |  |  |  |  |  |  |  |             |   |  |  |  |  |  |  |  |  |             |                            |  |  |  |  |                         |  |  |  |  |
|   |   |          |            | x = 1043.83 |     |     |         |         |          |            |          |            |  |  |  |      |                         |  |  |  |      |                                  |  |  |  |         |                                  |  |  |  |         |                  |  |  |  |  |                         |  |  |  |  |   |     |     |     |     |     |         |         |          |            |          |                                  |  |  |  |         |                           |  |  |  |  |  |  |  |  |             |   |  |  |  |  |  |  |  |  |             |                            |  |  |  |  |                         |  |  |  |  |
| .9774998=1.95996398454, x)  |   |          |            |             |     |     |         |         |          |            |          |            |  |  |  |      |                         |  |  |  |      |                                  |  |  |  |         |                                  |  |  |  |         |                  |  |  |  |  |                         |  |  |  |  |   |     |     |     |     |     |         |         |          |            |          |                                  |  |  |  |         |                           |  |  |  |  |  |  |  |  |             |   |  |  |  |  |  |  |  |  |             |                            |  |  |  |  |                         |  |  |  |  |
| MAIN RAD AUTO FUNC 5/30   |   |          |            |             |     |     |         |         |          |            |          |            |  |  |  |      |                         |  |  |  |      |                                  |  |  |  |         |                                  |  |  |  |         |                  |  |  |  |  |                         |  |  |  |  |   |     |     |     |     |     |         |         |          |            |          |                                  |  |  |  |         |                           |  |  |  |  |  |  |  |  |             |   |  |  |  |  |  |  |  |  |             |                            |  |  |  |  |                         |  |  |  |  |