# Tables

**Table 1:** Binomial Probabilities
Table gives $P(x|n,p)$ rounded to 3 decimal places.
* indicates a value $< 0.0005$ but still positive.

| n = 2 | p | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| x | 0.01 | 0.05 | 0.10 | 0.20 | 0.30 | 0.40 | 0.50 | 0.60 | 0.70 | 0.80 | 0.90 | 0.95 | 0.99 |
| 0 | 0.980 | 0.903 | 0.810 | 0.640 | 0.490 | 0.360 | 0.250 | 0.160 | 0.090 | 0.040 | 0.010 | 0.003 | * |
| 1 | 0.020 | 0.095 | 0.180 | 0.320 | 0.420 | 0.480 | 0.500 | 0.480 | 0.420 | 0.320 | 0.180 | 0.095 | 0.020 |
| 2 | * | 0.003 | 0.010 | 0.040 | 0.090 | 0.160 | 0.250 | 0.360 | 0.490 | 0.640 | 0.810 | 0.903 | 0.980 |

| n = 3 | p | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| x | 0.01 | 0.05 | 0.10 | 0.20 | 0.30 | 0.40 | 0.50 | 0.60 | 0.70 | 0.80 | 0.90 | 0.95 | 0.99 |
| 0 | 0.970 | 0.857 | 0.729 | 0.512 | 0.343 | 0.216 | 0.125 | 0.064 | 0.027 | 0.008 | 0.001 | * | * |
| 1 | 0.029 | 0.135 | 0.243 | 0.384 | 0.441 | 0.432 | 0.375 | 0.288 | 0.189 | 0.096 | 0.027 | 0.007 | * |
| 2 | * | 0.007 | 0.027 | 0.096 | 0.189 | 0.288 | 0.375 | 0.432 | 0.441 | 0.384 | 0.243 | 0.135 | 0.029 |
| 3 | * | * | 0.001 | 0.008 | 0.027 | 0.064 | 0.125 | 0.216 | 0.343 | 0.512 | 0.729 | 0.857 | 0.970 |

| n = 4 | p | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| x | 0.01 | 0.05 | 0.10 | 0.20 | 0.30 | 0.40 | 0.50 | 0.60 | 0.70 | 0.80 | 0.90 | 0.95 | 0.99 |
| 0 | 0.961 | 0.815 | 0.656 | 0.410 | 0.240 | 0.130 | 0.063 | 0.026 | 0.008 | 0.002 | * | * | * |
| 1 | 0.039 | 0.171 | 0.292 | 0.410 | 0.412 | 0.346 | 0.250 | 0.154 | 0.076 | 0.026 | 0.004 | * | * |
| 2 | 0.001 | 0.014 | 0.049 | 0.154 | 0.265 | 0.346 | 0.375 | 0.346 | 0.265 | 0.154 | 0.049 | 0.014 | 0.001 |
| 3 | * | * | 0.004 | 0.026 | 0.076 | 0.154 | 0.250 | 0.346 | 0.412 | 0.410 | 0.292 | 0.171 | 0.039 |
| 4 | * | * | * | 0.002 | 0.008 | 0.026 | 0.063 | 0.130 | 0.240 | 0.410 | 0.656 | 0.815 | 0.961 |

| n = 5 | p | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| x | 0.01 | 0.05 | 0.10 | 0.20 | 0.30 | 0.40 | 0.50 | 0.60 | 0.70 | 0.80 | 0.90 | 0.95 | 0.99 |
| 0 | 0.951 | 0.774 | 0.590 | 0.328 | 0.168 | 0.078 | 0.031 | 0.010 | 0.002 | * | * | * | * |
| 1 | 0.048 | 0.204 | 0.328 | 0.410 | 0.360 | 0.259 | 0.156 | 0.077 | 0.028 | 0.006 | * | * | * |
| 2 | 0.001 | 0.021 | 0.073 | 0.205 | 0.309 | 0.346 | 0.313 | 0.230 | 0.132 | 0.051 | 0.008 | 0.001 | * |
| 3 | * | 0.001 | 0.008 | 0.051 | 0.132 | 0.230 | 0.313 | 0.346 | 0.309 | 0.205 | 0.073 | 0.021 | 0.001 |
| 4 | * | * | * | 0.006 | 0.028 | 0.077 | 0.156 | 0.259 | 0.360 | 0.410 | 0.328 | 0.204 | 0.048 |
| 5 | * | * | * | * | 0.002 | 0.010 | 0.031 | 0.078 | 0.168 | 0.328 | 0.590 | 0.774 | 0.951 |

| n = 6 | p | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| x | 0.01 | 0.05 | 0.10 | 0.20 | 0.30 | 0.40 | 0.50 | 0.60 | 0.70 | 0.80 | 0.90 | 0.95 | 0.99 |
| 0 | 0.941 | 0.735 | 0.531 | 0.262 | 0.118 | 0.047 | 0.016 | 0.004 | 0.001 | * | * | * | * |
| 1 | 0.057 | 0.232 | 0.354 | 0.393 | 0.303 | 0.187 | 0.094 | 0.037 | 0.010 | 0.002 | * | * | * |
| 2 | 0.001 | 0.031 | 0.098 | 0.246 | 0.324 | 0.311 | 0.234 | 0.138 | 0.060 | 0.015 | 0.001 | * | * |
| 3 | * | 0.002 | 0.015 | 0.082 | 0.185 | 0.276 | 0.313 | 0.276 | 0.185 | 0.082 | 0.015 | 0.002 | * |
| 4 | * | * | 0.001 | 0.015 | 0.060 | 0.138 | 0.234 | 0.311 | 0.324 | 0.246 | 0.098 | 0.031 | 0.001 |
| 5 | * | * | * | 0.002 | 0.010 | 0.037 | 0.094 | 0.187 | 0.303 | 0.393 | 0.354 | 0.232 | 0.057 |
| 6 | * | * | * | * | 0.001 | 0.004 | 0.016 | 0.047 | 0.118 | 0.262 | 0.531 | 0.735 | 0.941 |

**Table 1:** Binomial Probabilities (continued)
Table gives $P(x|n,p)$ rounded to 3 decimal places.
* indicates a value $< 0.0005$ but still positive.

| n = 7 | p | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| x | 0.01 | 0.05 | 0.10 | 0.20 | 0.30 | 0.40 | 0.50 | 0.60 | 0.70 | 0.80 | 0.90 | 0.95 | 0.99 |
| 0 | 0.932 | 0.698 | 0.478 | 0.210 | 0.082 | 0.028 | 0.008 | 0.002 | * | * | * | * | * |
| 1 | 0.066 | 0.257 | 0.372 | 0.367 | 0.247 | 0.131 | 0.055 | 0.017 | 0.004 | * | * | * | * |
| 2 | 0.002 | 0.041 | 0.124 | 0.275 | 0.318 | 0.261 | 0.164 | 0.077 | 0.025 | 0.004 | * | * | * |
| 3 | * | 0.004 | 0.023 | 0.115 | 0.227 | 0.290 | 0.273 | 0.194 | 0.097 | 0.029 | 0.003 | * | * |
| 4 | * | * | 0.003 | 0.029 | 0.097 | 0.194 | 0.273 | 0.290 | 0.227 | 0.115 | 0.023 | 0.004 | * |
| 5 | * | * | * | 0.004 | 0.025 | 0.077 | 0.164 | 0.261 | 0.318 | 0.275 | 0.124 | 0.041 | 0.002 |
| 6 | * | * | * | * | 0.004 | 0.017 | 0.055 | 0.131 | 0.247 | 0.367 | 0.372 | 0.257 | 0.066 |
| 7 | * | * | * | * | * | 0.002 | 0.008 | 0.028 | 0.082 | 0.210 | 0.478 | 0.698 | 0.932 |

| n = 8 | p | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| x | 0.01 | 0.05 | 0.10 | 0.20 | 0.30 | 0.40 | 0.50 | 0.60 | 0.70 | 0.80 | 0.90 | 0.95 | 0.99 |
| 0 | 0.923 | 0.663 | 0.430 | 0.168 | 0.058 | 0.017 | 0.004 | 0.001 | * | * | * | * | * |
| 1 | 0.075 | 0.279 | 0.383 | 0.336 | 0.198 | 0.090 | 0.031 | 0.008 | 0.001 | * | * | * | * |
| 2 | 0.003 | 0.051 | 0.149 | 0.294 | 0.296 | 0.209 | 0.109 | 0.041 | 0.010 | 0.001 | * | * | * |
| 3 | * | 0.005 | 0.033 | 0.147 | 0.254 | 0.279 | 0.219 | 0.124 | 0.047 | 0.009 | * | * | * |
| 4 | * | * | 0.005 | 0.046 | 0.136 | 0.232 | 0.273 | 0.232 | 0.136 | 0.046 | 0.005 | * | * |
| 5 | * | * | * | 0.009 | 0.047 | 0.124 | 0.219 | 0.279 | 0.254 | 0.147 | 0.033 | 0.005 | * |
| 6 | * | * | * | 0.001 | 0.010 | 0.041 | 0.109 | 0.209 | 0.296 | 0.294 | 0.149 | 0.051 | 0.003 |
| 7 | * | * | * | * | 0.001 | 0.008 | 0.031 | 0.090 | 0.198 | 0.336 | 0.383 | 0.279 | 0.075 |
| 8 | * | * | * | * | * | 0.001 | 0.004 | 0.017 | 0.058 | 0.168 | 0.430 | 0.663 | 0.923 |

| n = 9 | p | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| x | 0.01 | 0.05 | 0.10 | 0.20 | 0.30 | 0.40 | 0.50 | 0.60 | 0.70 | 0.80 | 0.90 | 0.95 | 0.99 |
| 0 | 0.914 | 0.630 | 0.387 | 0.134 | 0.040 | 0.010 | 0.002 | * | * | * | * | * | * |
| 1 | 0.083 | 0.299 | 0.387 | 0.302 | 0.156 | 0.060 | 0.018 | 0.004 | * | * | * | * | * |
| 2 | 0.003 | 0.063 | 0.172 | 0.302 | 0.267 | 0.161 | 0.070 | 0.021 | 0.004 | * | * | * | * |
| 3 | * | 0.008 | 0.045 | 0.176 | 0.267 | 0.251 | 0.164 | 0.074 | 0.021 | 0.003 | * | * | * |
| 4 | * | 0.001 | 0.007 | 0.066 | 0.172 | 0.251 | 0.246 | 0.167 | 0.074 | 0.017 | 0.001 | * | * |
| 5 | * | * | 0.001 | 0.017 | 0.074 | 0.167 | 0.246 | 0.251 | 0.172 | 0.066 | 0.007 | 0.001 | * |
| 6 | * | * | * | 0.003 | 0.021 | 0.074 | 0.164 | 0.251 | 0.267 | 0.176 | 0.045 | 0.008 | * |
| 7 | * | * | * | * | 0.004 | 0.021 | 0.070 | 0.161 | 0.267 | 0.302 | 0.172 | 0.063 | 0.003 |
| 8 | * | * | * | * | * | 0.004 | 0.018 | 0.060 | 0.156 | 0.302 | 0.387 | 0.299 | 0.083 |
| 9 | * | * | * | * | * | * | 0.002 | 0.010 | 0.040 | 0.134 | 0.387 | 0.630 | 0.914 |

| n = 10 | p | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| x | 0.01 | 0.05 | 0.10 | 0.20 | 0.30 | 0.40 | 0.50 | 0.60 | 0.70 | 0.80 | 0.90 | 0.95 | 0.99 |
| 0 | 0.904 | 0.599 | 0.349 | 0.107 | 0.028 | 0.006 | 0.001 | * | * | * | * | * | * |
| 1 | 0.091 | 0.315 | 0.387 | 0.268 | 0.121 | 0.040 | 0.010 | 0.002 | * | * | * | * | * |
| 2 | 0.004 | 0.075 | 0.194 | 0.302 | 0.233 | 0.121 | 0.044 | 0.011 | 0.001 | * | * | * | * |
| 3 | * | 0.010 | 0.057 | 0.201 | 0.267 | 0.215 | 0.117 | 0.042 | 0.009 | 0.001 | * | * | * |
| 4 | * | 0.001 | 0.011 | 0.088 | 0.200 | 0.251 | 0.205 | 0.111 | 0.037 | 0.006 | * | * | * |
| 5 | * | * | 0.001 | 0.026 | 0.103 | 0.201 | 0.246 | 0.201 | 0.103 | 0.026 | 0.001 | * | * |
| 6 | * | * | * | 0.006 | 0.037 | 0.111 | 0.205 | 0.251 | 0.200 | 0.088 | 0.011 | 0.001 | * |
| 7 | * | * | * | 0.001 | 0.009 | 0.042 | 0.117 | 0.215 | 0.267 | 0.201 | 0.057 | 0.010 | * |
| 8 | * | * | * | * | 0.001 | 0.011 | 0.044 | 0.121 | 0.233 | 0.302 | 0.194 | 0.075 | 0.004 |
| 9 | * | * | * | * | * | 0.002 | 0.010 | 0.040 | 0.121 | 0.268 | 0.387 | 0.315 | 0.091 |
| 10 | * | * | * | * | * | * | 0.001 | 0.006 | 0.028 | 0.107 | 0.349 | 0.599 | 0.904 |

**Table 1:** Binomial Probabilities (continued)
Table gives $P(x|n,p)$ rounded to 3 decimal places.
* indicates a value $< 0.0005$ but still positive.

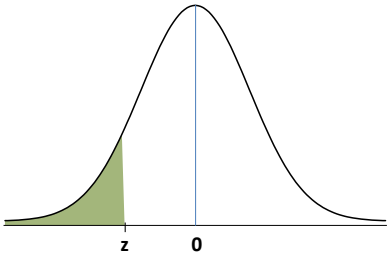
| n = 15 | p | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| x | 0.01 | 0.05 | 0.10 | 0.20 | 0.30 | 0.40 | 0.50 | 0.60 | 0.70 | 0.80 | 0.90 | 0.95 | 0.99 |
| 0 | 0.860 | 0.463 | 0.206 | 0.035 | 0.005 | * | * | * | * | * | * | * | * |
| 1 | 0.130 | 0.366 | 0.343 | 0.132 | 0.031 | 0.005 | * | * | * | * | * | * | * |
| 2 | 0.009 | 0.135 | 0.267 | 0.231 | 0.092 | 0.022 | 0.003 | * | * | * | * | * | * |
| 3 | * | 0.031 | 0.129 | 0.250 | 0.170 | 0.063 | 0.014 | 0.002 | * | * | * | * | * |
| 4 | * | 0.005 | 0.043 | 0.188 | 0.219 | 0.127 | 0.042 | 0.007 | 0.001 | * | * | * | * |
| 5 | * | 0.001 | 0.010 | 0.103 | 0.206 | 0.186 | 0.092 | 0.024 | 0.003 | * | * | * | * |
| 6 | * | * | 0.002 | 0.043 | 0.147 | 0.207 | 0.153 | 0.061 | 0.012 | 0.001 | * | * | * |
| 7 | * | * | * | 0.014 | 0.081 | 0.177 | 0.196 | 0.118 | 0.035 | 0.003 | * | * | * |
| 8 | * | * | * | 0.003 | 0.035 | 0.118 | 0.196 | 0.177 | 0.081 | 0.014 | * | * | * |
| 9 | * | * | * | 0.001 | 0.012 | 0.061 | 0.153 | 0.207 | 0.147 | 0.043 | 0.002 | * | * |
| 10 | * | * | * | * | 0.003 | 0.024 | 0.092 | 0.186 | 0.206 | 0.103 | 0.010 | 0.001 | * |
| 11 | * | * | * | * | 0.001 | 0.007 | 0.042 | 0.127 | 0.219 | 0.188 | 0.043 | 0.005 | * |
| 12 | * | * | * | * | * | 0.002 | 0.014 | 0.063 | 0.170 | 0.250 | 0.129 | 0.031 | * |
| 13 | * | * | * | * | * | * | 0.003 | 0.022 | 0.092 | 0.231 | 0.267 | 0.135 | 0.009 |
| 14 | * | * | * | * | * | * | * | 0.005 | 0.031 | 0.132 | 0.343 | 0.366 | 0.130 |
| 15 | * | * | * | * | * | * | * | * | 0.005 | 0.035 | 0.206 | 0.463 | 0.860 |

| n = 20 | p | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| x | 0.01 | 0.05 | 0.10 | 0.20 | 0.30 | 0.40 | 0.50 | 0.60 | 0.70 | 0.80 | 0.90 | 0.95 | 0.99 |
| 0 | 0.818 | 0.358 | 0.122 | 0.012 | 0.001 | * | * | * | * | * | * | * | * |
| 1 | 0.165 | 0.377 | 0.270 | 0.058 | 0.007 | * | * | * | * | * | * | * | * |
| 2 | 0.016 | 0.189 | 0.285 | 0.137 | 0.028 | 0.003 | * | * | * | * | * | * | * |
| 3 | 0.001 | 0.060 | 0.190 | 0.205 | 0.072 | 0.012 | 0.001 | * | * | * | * | * | * |
| 4 | * | 0.013 | 0.090 | 0.218 | 0.130 | 0.035 | 0.005 | * | * | * | * | * | * |
| 5 | * | 0.002 | 0.032 | 0.175 | 0.179 | 0.075 | 0.015 | 0.001 | * | * | * | * | * |
| 6 | * | * | 0.009 | 0.109 | 0.192 | 0.124 | 0.037 | 0.005 | * | * | * | * | * |
| 7 | * | * | 0.002 | 0.055 | 0.164 | 0.166 | 0.074 | 0.015 | 0.001 | * | * | * | * |
| 8 | * | * | * | 0.022 | 0.114 | 0.180 | 0.120 | 0.035 | 0.004 | * | * | * | * |
| 9 | * | * | * | 0.007 | 0.065 | 0.160 | 0.160 | 0.071 | 0.012 | * | * | * | * |
| 10 | * | * | * | 0.002 | 0.031 | 0.117 | 0.176 | 0.117 | 0.031 | 0.002 | * | * | * |
| 11 | * | * | * | * | 0.012 | 0.071 | 0.160 | 0.160 | 0.065 | 0.007 | * | * | * |
| 12 | * | * | * | * | 0.004 | 0.035 | 0.120 | 0.180 | 0.114 | 0.022 | * | * | * |
| 13 | * | * | * | * | 0.001 | 0.015 | 0.074 | 0.166 | 0.164 | 0.055 | 0.002 | * | * |
| 14 | * | * | * | * | * | 0.005 | 0.037 | 0.124 | 0.192 | 0.109 | 0.009 | * | * |
| 15 | * | * | * | * | * | 0.001 | 0.015 | 0.075 | 0.179 | 0.175 | 0.032 | 0.002 | * |
| 16 | * | * | * | * | * | * | 0.005 | 0.035 | 0.130 | 0.218 | 0.090 | 0.013 | * |
| 17 | * | * | * | * | * | * | 0.001 | 0.012 | 0.072 | 0.205 | 0.190 | 0.060 | 0.001 |
| 18 | * | * | * | * | * | * | * | 0.003 | 0.028 | 0.137 | 0.285 | 0.189 | 0.016 |
| 19 | * | * | * | * | * | * | * | * | 0.007 | 0.058 | 0.270 | 0.377 | 0.165 |
| 20 | * | * | * | * | * | * | * | * | 0.001 | 0.012 | 0.122 | 0.358 | 0.818 |

## **Table 2:** *z*-table

The Cumulative Standardized Normal Distribution.

Table entries represent the area under the curve to the left of the chosen $z$-value represented by the shaded area in the graph.




| Negative *Z* Values | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| ***Z*** | **0.00** | **0.01** | **0.02** | **0.03** | **0.04** | **0.05** | **0.06** | **0.07** | **0.08** | **0.09** |
| **< -3.5** | For z-values of -3.5 or lower, use area = 0.0001 or software results. | | | | | | | | | |
| **-3.4** | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0002 |
| **-3.3** | 0.0005 | 0.0005 | 0.0005 | 0.0004 | 0.0004 | 0.0004 | 0.0004 | 0.0004 | 0.0004 | 0.0003 |
| **-3.2** | 0.0007 | 0.0007 | 0.0006 | 0.0006 | 0.0006 | 0.0006 | 0.0006 | 0.0005 | 0.0005 | 0.0005 |
| **-3.1** | 0.0010 | 0.0009 | 0.0009 | 0.0009 | 0.0008 | 0.0008 | 0.0008 | 0.0008 | 0.0007 | 0.0007 |
| **-3.0** | 0.0013 | 0.0013 | 0.0013 | 0.0012 | 0.0012 | 0.0011 | 0.0011 | 0.0011 | 0.0010 | 0.0010 |
| **-2.9** | 0.0019 | 0.0018 | 0.0018 | 0.0017 | 0.0016 | 0.0016 | 0.0015 | 0.0015 | 0.0014 | 0.0014 |
| **-2.8** | 0.0026 | 0.0025 | 0.0024 | 0.0023 | 0.0023 | 0.0022 | 0.0021 | 0.0021 | 0.0020 | 0.0019 |
| **-2.7** | 0.0035 | 0.0034 | 0.0033 | 0.0032 | 0.0031 | 0.0030 | 0.0029 | 0.0028 | 0.0027 | 0.0026 |
| **-2.6** | 0.0047 | 0.0045 | 0.0044 | 0.0043 | 0.0041 | 0.0040 | 0.0039 | 0.0038 | 0.0037 | 0.0036 |
| **-2.5** | 0.0062 | 0.0060 | 0.0059 | 0.0057 | 0.0055 | 0.0054 | 0.0052 | 0.0051 ★ | 0.0049 | 0.0048 |
| **-2.4** | 0.0082 | 0.0080 | 0.0078 | 0.0075 | 0.0073 | 0.0071 | 0.0069 | 0.0068 | 0.0066 | 0.0064 |
| **-2.3** | 0.0107 | 0.0104 | 0.0102 | 0.0099 | 0.0096 | 0.0094 | 0.0091 | 0.0089 | 0.0087 | 0.0084 |
| **-2.2** | 0.0139 | 0.0136 | 0.0132 | 0.0129 | 0.0125 | 0.0122 | 0.0119 | 0.0116 | 0.0113 | 0.0110 |
| **-2.1** | 0.0179 | 0.0174 | 0.0170 | 0.0166 | 0.0162 | 0.0158 | 0.0154 | 0.0150 | 0.0146 | 0.0143 |
| **-2.0** | 0.0228 | 0.0222 | 0.0217 | 0.0212 | 0.0207 | 0.0202 | 0.0197 | 0.0192 | 0.0188 | 0.0183 |
| **-1.9** | 0.0287 | 0.0281 | 0.0274 | 0.0268 | 0.0262 | 0.0256 | 0.0250 | 0.0244 | 0.0239 | 0.0233 |
| **-1.8** | 0.0359 | 0.0351 | 0.0344 | 0.0336 | 0.0329 | 0.0322 | 0.0314 | 0.0307 | 0.0301 | 0.0294 |
| **-1.7** | 0.0446 | 0.0436 | 0.0427 | 0.0418 | 0.0409 | 0.0401 | 0.0392 | 0.0384 | 0.0375 | 0.0367 |
| **-1.6** | 0.0548 | 0.0537 | 0.0526 | 0.0516 | 0.0505 ● | 0.0495 | 0.0485 | 0.0475 | 0.0465 | 0.0455 |
| **-1.5** | 0.0668 | 0.0655 | 0.0643 | 0.0630 | 0.0618 | 0.0606 | 0.0594 | 0.0582 | 0.0571 | 0.0559 |
| **-1.4** | 0.0808 | 0.0793 | 0.0778 | 0.0764 | 0.0749 | 0.0735 | 0.0721 | 0.0708 | 0.0694 | 0.0681 |
| **-1.3** | 0.0968 | 0.0951 | 0.0934 | 0.0918 | 0.0901 | 0.0885 | 0.0869 | 0.0853 | 0.0838 | 0.0823 |
| **-1.2** | 0.1151 | 0.1131 | 0.1112 | 0.1093 | 0.1075 | 0.1056 | 0.1038 | 0.1020 | 0.1003 | 0.0985 |
| **-1.1** | 0.1357 | 0.1335 | 0.1314 | 0.1292 | 0.1271 | 0.1251 | 0.1230 | 0.1210 | 0.1190 | 0.1170 |
| **-1.0** | 0.1587 | 0.1562 | 0.1539 | 0.1515 | 0.1492 | 0.1469 | 0.1446 | 0.1423 | 0.1401 | 0.1379 |
| **-0.9** | 0.1841 | 0.1814 | 0.1788 | 0.1762 | 0.1736 | 0.1711 | 0.1685 | 0.1660 | 0.1635 | 0.1611 |
| **-0.8** | 0.2119 | 0.2090 | 0.2061 | 0.2033 | 0.2005 | 0.1977 | 0.1949 | 0.1922 | 0.1894 | 0.1867 |
| **-0.7** | 0.2420 | 0.2389 | 0.2358 | 0.2327 | 0.2296 | 0.2266 | 0.2236 | 0.2206 | 0.2177 | 0.2148 |
| **-0.6** | 0.2743 | 0.2709 | 0.2676 | 0.2643 | 0.2611 | 0.2578 | 0.2546 | 0.2514 | 0.2483 | 0.2451 |
| **-0.5** | 0.3085 | 0.3050 | 0.3015 | 0.2981 | 0.2946 | 0.2912 | 0.2877 | 0.2843 | 0.2810 | 0.2776 |
| **-0.4** | 0.3446 | 0.3409 | 0.3372 | 0.3336 | 0.3300 | 0.3264 | 0.3228 | 0.3192 | 0.3156 | 0.3121 |
| **-0.3** | 0.3821 | 0.3783 | 0.3745 | 0.3707 | 0.3669 | 0.3632 | 0.3594 | 0.3557 | 0.3520 | 0.3483 |
| **-0.2** | 0.4207 | 0.4168 | 0.4129 | 0.4090 | 0.4052 | 0.4013 | 0.3974 | 0.3936 | 0.3897 | 0.3859 |
| **-0.1** | 0.4602 | 0.4562 | 0.4522 | 0.4483 | 0.4443 | 0.4404 | 0.4364 | 0.4325 | 0.4286 | 0.4247 |
| **-0.0** | 0.5000 | 0.4960 | 0.4920 | 0.4880 | 0.4840 | 0.4801 | 0.4761 | 0.4721 | 0.4681 | 0.4641 |

| z-score | Area | |
|---|---|---|
| -1.645 | 0.0500 | ● |
| -2.575 | 0.0050 | ★ |

**Common Critical Values for Confidence Intervals**

| Confidence Level | Critical Value |
|---|---|
| 0.90 | 1.645 |
| 0.95 | 1.96 |
| 0.99 | 2.575 |

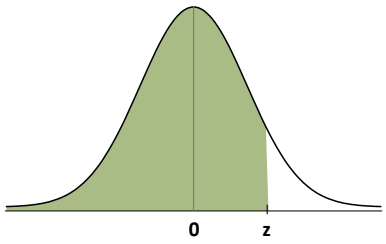
**Common Critical Values for Hypothesis Testing**

| Significance Level | Left Tailed Test | Right Tailed Test | Two Tailed Test |
|---|---|---|---|
| 0.01 | -2.33 | 2.33 | +/- 2.575 |
| 0.05 | -1.645 | 1.645 | +/- 1.96 |
| 0.10 | -1.28 | 1.28 | +/- 1.645 |

## **Table 2:** $z$-table (continued)

The Cumulative Standardized Normal Distribution.

Table entries represent the area under the curve to the left of the chosen $z$-value represented by the shaded area in the graph.




| Positive *Z* Values | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| ***Z*** | **0.00** | **0.01** | **0.02** | **0.03** | **0.04** | **0.05** | **0.06** | **0.07** | **0.08** | **0.09** |
| **0.0** | 0.5000 | 0.5040 | 0.5080 | 0.5120 | 0.5160 | 0.5199 | 0.5239 | 0.5279 | 0.5319 | 0.5359 |
| **0.1** | 0.5398 | 0.5438 | 0.5478 | 0.5517 | 0.5557 | 0.5596 | 0.5636 | 0.5675 | 0.5714 | 0.5753 |
| **0.2** | 0.5793 | 0.5832 | 0.5871 | 0.5910 | 0.5948 | 0.5987 | 0.6026 | 0.6064 | 0.6103 | 0.6141 |
| **0.3** | 0.6179 | 0.6217 | 0.6255 | 0.6293 | 0.6331 | 0.6368 | 0.6406 | 0.6443 | 0.6480 | 0.6517 |
| **0.4** | 0.6554 | 0.6591 | 0.6628 | 0.6664 | 0.6700 | 0.6736 | 0.6772 | 0.6808 | 0.6844 | 0.6879 |
| **0.5** | 0.6915 | 0.6950 | 0.6985 | 0.7019 | 0.7054 | 0.7088 | 0.7123 | 0.7157 | 0.7190 | 0.7224 |
| **0.6** | 0.7257 | 0.7291 | 0.7324 | 0.7357 | 0.7389 | 0.7422 | 0.7454 | 0.7486 | 0.7517 | 0.7549 |
| **0.7** | 0.7580 | 0.7611 | 0.7642 | 0.7673 | 0.7704 | 0.7734 | 0.7764 | 0.7794 | 0.7823 | 0.7852 |
| **0.8** | 0.7881 | 0.7910 | 0.7939 | 0.7967 | 0.7995 | 0.8023 | 0.8051 | 0.8078 | 0.8106 | 0.8133 |
| **0.9** | 0.8159 | 0.8186 | 0.8212 | 0.8238 | 0.8264 | 0.8289 | 0.8315 | 0.8340 | 0.8365 | 0.8389 |
| **1.0** | 0.8413 | 0.8438 | 0.8461 | 0.8485 | 0.8508 | 0.8531 | 0.8554 | 0.8577 | 0.8599 | 0.8621 |
| **1.1** | 0.8643 | 0.8665 | 0.8686 | 0.8708 | 0.8729 | 0.8749 | 0.8770 | 0.8790 | 0.8810 | 0.8830 |
| **1.2** | 0.8849 | 0.8869 | 0.8888 | 0.8907 | 0.8925 | 0.8944 | 0.8962 | 0.8980 | 0.8997 | 0.9015 |
| **1.3** | 0.9032 | 0.9049 | 0.9066 | 0.9082 | 0.9099 | 0.9115 | 0.9131 | 0.9147 | 0.9162 | 0.9177 |
| **1.4** | 0.9192 | 0.9207 | 0.9222 | 0.9236 | 0.9251 | 0.9265 | 0.9279 | 0.9292 | 0.9306 | 0.9319 |
| **1.5** | 0.9332 | 0.9345 | 0.9357 | 0.9370 | 0.9382 | 0.9394 | 0.9406 | 0.9418 | 0.9429 | 0.9441 |
| **1.6** | 0.9452 | 0.9463 | 0.9474 | 0.9484 | 0.9495 ● | 0.9505 | 0.9515 | 0.9525 | 0.9535 | 0.9545 |
| **1.7** | 0.9554 | 0.9564 | 0.9573 | 0.9582 | 0.9591 | 0.9599 | 0.9608 | 0.9616 | 0.9625 | 0.9633 |
| **1.8** | 0.9641 | 0.9649 | 0.9656 | 0.9664 | 0.9671 | 0.9678 | 0.9686 | 0.9693 | 0.9699 | 0.9706 |
| **1.9** | 0.9713 | 0.9719 | 0.9726 | 0.9732 | 0.9738 | 0.9744 | 0.9750 | 0.9756 | 0.9761 | 0.9767 |
| **2.0** | 0.9772 | 0.9778 | 0.9783 | 0.9788 | 0.9793 | 0.9798 | 0.9803 | 0.9808 | 0.9812 | 0.9817 |
| **2.1** | 0.9821 | 0.9826 | 0.9830 | 0.9834 | 0.9838 | 0.9842 | 0.9846 | 0.9850 | 0.9854 | 0.9857 |
| **2.2** | 0.9861 | 0.9864 | 0.9868 | 0.9871 | 0.9875 | 0.9878 | 0.9881 | 0.9884 | 0.9887 | 0.9890 |
| **2.3** | 0.9893 | 0.9896 | 0.9898 | 0.9901 | 0.9904 | 0.9906 | 0.9909 | 0.9911 | 0.9913 | 0.9916 |
| **2.4** | 0.9918 | 0.9920 | 0.9922 | 0.9925 | 0.9927 | 0.9929 | 0.9931 | 0.9932 | 0.9934 | 0.9936 |
| **2.5** | 0.9938 | 0.9940 | 0.9941 | 0.9943 | 0.9945 | 0.9946 | 0.9948 | 0.9949 ★ | 0.9951 | 0.9952 |
| **2.6** | 0.9953 | 0.9955 | 0.9956 | 0.9957 | 0.9959 | 0.9960 | 0.9961 | 0.9962 | 0.9963 | 0.9964 |
| **2.7** | 0.9965 | 0.9966 | 0.9967 | 0.9968 | 0.9969 | 0.9970 | 0.9971 | 0.9972 | 0.9973 | 0.9974 |
| **2.8** | 0.9974 | 0.9975 | 0.9976 | 0.9977 | 0.9977 | 0.9978 | 0.9979 | 0.9979 | 0.9980 | 0.9981 |
| **2.9** | 0.9981 | 0.9982 | 0.9982 | 0.9983 | 0.9984 | 0.9984 | 0.9985 | 0.9985 | 0.9986 | 0.9986 |
| **3.0** | 0.9987 | 0.9987 | 0.9987 | 0.9988 | 0.9988 | 0.9989 | 0.9989 | 0.9989 | 0.9990 | 0.9990 |
| **3.1** | 0.9990 | 0.9991 | 0.9991 | 0.9991 | 0.9992 | 0.9992 | 0.9992 | 0.9992 | 0.9993 | 0.9993 |
| **3.2** | 0.9993 | 0.9993 | 0.9994 | 0.9994 | 0.9994 | 0.9994 | 0.9994 | 0.9995 | 0.9995 | 0.9995 |
| **3.3** | 0.9995 | 0.9995 | 0.9995 | 0.9996 | 0.9996 | 0.9996 | 0.9996 | 0.9996 | 0.9996 | 0.9997 |
| **3.4** | 0.9997 | 0.9997 | 0.9997 | 0.9997 | 0.9997 | 0.9997 | 0.9997 | 0.9997 | 0.9997 | 0.9998 |
| **> 3.5** | For z-scores of 3.5 or higher, use area = 0.9999 | | | | | | | | | |

| z-score | Area | |
|---|---|---|
| 1.645 | 0.9500 | ● |
| 2.575 | 0.9950 | ★ |

**Common Critical Values for Confidence Intervals**

| Confidence Level | Critical Value |
|---|---|
| 0.90 | 1.645 |
| 0.95 | 1.96 |
| 0.99 | 2.575 |

**Common Critical Values for Hypothesis Testing**

| Significance Level | Left Tailed Test | Right Tailed Test | Two Tailed Test |
|---|---|---|---|
| 0.01 | -2.33 | 2.33 | +/- 2.575 |
| 0.05 | -1.645 | 1.645 | +/- 1.96 |
| 0.10 | -1.28 | 1.28 | +/- 1.645 |

**Table 3:** *t*-table: Critical $t$ Values
**Note:** If your degrees of freedom (d.f.) is not in the table, use the closest **lower** value.

| The t-distribution: Critical Values | | | | | | |
|---|---|---|---|---|---|---|
| | Confindence Intervals | 99% | 98% | 95% | 90% | 80% |
| | One Tail: $\alpha$ | 0.005 | 0.01 | 0.025 | 0.05 | 0.10 |
| d.f. | Two Tails: $\alpha$ | 0.01 | 0.02 | 0.05 | 0.10 | 0.20 |
| 1 | | 63.657 | 31.821 | 12.706 | 6.314 | 3.078 |
| 2 | | 9.925 | 6.965 | 4.303 | 2.920 | 1.886 |
| 3 | | 5.841 | 4.541 | 3.182 | 2.353 | 1.638 |
| 4 | | 4.604 | 3.747 | 2.776 | 2.132 | 1.533 |
| 5 | | 4.032 | 3.365 | 2.571 | 2.015 | 1.476 |
| 6 | | 3.707 | 3.143 | 2.447 | 1.943 | 1.440 |
| 7 | | 3.499 | 2.998 | 2.365 | 1.895 | 1.415 |
| 8 | | 3.355 | 2.896 | 2.306 | 1.860 | 1.397 |
| 9 | | 3.250 | 2.821 | 2.262 | 1.833 | 1.383 |
| 10 | | 3.169 | 2.764 | 2.228 | 1.812 | 1.372 |
| 11 | | 3.106 | 2.718 | 2.201 | 1.796 | 1.363 |
| 12 | | 3.055 | 2.681 | 2.179 | 1.782 | 1.356 |
| 13 | | 3.012 | 2.650 | 2.160 | 1.771 | 1.350 |
| 14 | | 2.977 | 2.624 | 2.145 | 1.761 | 1.345 |
| 15 | | 2.947 | 2.602 | 2.131 | 1.753 | 1.341 |
| 16 | | 2.921 | 2.583 | 2.120 | 1.746 | 1.337 |
| 17 | | 2.898 | 2.567 | 2.110 | 1.740 | 1.333 |
| 18 | | 2.878 | 2.552 | 2.101 | 1.734 | 1.330 |
| 19 | | 2.861 | 2.539 | 2.093 | 1.729 | 1.328 |
| 20 | | 2.845 | 2.528 | 2.086 | 1.725 | 1.325 |
| 21 | | 2.831 | 2.518 | 2.080 | 1.721 | 1.323 |
| 22 | | 2.819 | 2.508 | 2.074 | 1.717 | 1.321 |
| 23 | | 2.807 | 2.500 | 2.069 | 1.714 | 1.319 |
| 24 | | 2.797 | 2.492 | 2.064 | 1.711 | 1.318 |
| 25 | | 2.787 | 2.485 | 2.060 | 1.708 | 1.316 |
| 26 | | 2.779 | 2.479 | 2.056 | 1.706 | 1.315 |
| 27 | | 2.771 | 2.473 | 2.052 | 1.703 | 1.314 |
| 28 | | 2.763 | 2.467 | 2.048 | 1.701 | 1.313 |
| 29 | | 2.756 | 2.462 | 2.045 | 1.699 | 1.311 |
| 30 | | 2.750 | 2.457 | 2.042 | 1.697 | 1.310 |
| 31 | | 2.744 | 2.453 | 2.040 | 1.696 | 1.309 |
| 32 | | 2.738 | 2.449 | 2.037 | 1.694 | 1.309 |
| 33 | | 2.733 | 2.445 | 2.035 | 1.692 | 1.308 |
| 34 | | 2.728 | 2.441 | 2.032 | 1.691 | 1.307 |
| 35 | | 2.724 | 2.438 | 2.030 | 1.690 | 1.306 |
| 36 | | 2.719 | 2.434 | 2.028 | 1.688 | 1.306 |
| 37 | | 2.715 | 2.431 | 2.026 | 1.687 | 1.305 |
| 38 | | 2.712 | 2.429 | 2.024 | 1.686 | 1.304 |
| 39 | | 2.708 | 2.426 | 2.023 | 1.685 | 1.304 |
| 40 | | 2.704 | 2.423 | 2.021 | 1.684 | 1.303 |
| 41 | | 2.701 | 2.421 | 2.020 | 1.683 | 1.303 |
| 42 | | 2.698 | 2.418 | 2.018 | 1.682 | 1.302 |
| 43 | | 2.695 | 2.416 | 2.017 | 1.681 | 1.302 |
| 44 | | 2.692 | 2.414 | 2.015 | 1.680 | 1.301 |
| 45 | | 2.690 | 2.412 | 2.014 | 1.679 | 1.301 |

**Table 3:** *t*-table: Critical $t$ Values (continued)
**Note:** If your degrees of freedom (d.f.) is not in the table, use the closest **lower** value.

| The t-distribution: Critical Values (*cont.*) | | | | | | |
|---|---|---|---|---|---|---|
| | Confindence Intervals | 99% | 98% | 95% | 90% | 80% |
| | One Tail: $\alpha$ | 0.005 | 0.01 | 0.025 | 0.05 | 0.10 |
| d.f. | Two Tails: $\alpha$ | 0.01 | 0.02 | 0.05 | 0.10 | 0.20 |
| 46 | | 2.687 | 2.410 | 2.013 | 1.679 | 1.300 |
| 47 | | 2.685 | 2.408 | 2.012 | 1.678 | 1.300 |
| 48 | | 2.682 | 2.407 | 2.011 | 1.677 | 1.299 |
| 49 | | 2.680 | 2.405 | 2.010 | 1.677 | 1.299 |
| 50 | | 2.678 | 2.403 | 2.009 | 1.676 | 1.299 |
| 51 | | 2.676 | 2.402 | 2.008 | 1.675 | 1.298 |
| 52 | | 2.674 | 2.400 | 2.007 | 1.675 | 1.298 |
| 53 | | 2.672 | 2.399 | 2.006 | 1.674 | 1.298 |
| 54 | | 2.670 | 2.397 | 2.005 | 1.674 | 1.297 |
| 55 | | 2.668 | 2.396 | 2.004 | 1.673 | 1.297 |
| 56 | | 2.667 | 2.395 | 2.003 | 1.673 | 1.297 |
| 57 | | 2.665 | 2.394 | 2.002 | 1.672 | 1.297 |
| 58 | | 2.663 | 2.392 | 2.002 | 1.672 | 1.296 |
| 59 | | 2.662 | 2.391 | 2.001 | 1.671 | 1.296 |
| 60 | | 2.660 | 2.390 | 2.000 | 1.671 | 1.296 |
| 65 | | 2.654 | 2.385 | 1.997 | 1.669 | 1.295 |
| 70 | | 2.648 | 2.381 | 1.994 | 1.667 | 1.294 |
| 75 | | 2.643 | 2.377 | 1.992 | 1.665 | 1.293 |
| 80 | | 2.639 | 2.374 | 1.990 | 1.664 | 1.292 |
| 85 | | 2.635 | 2.371 | 1.988 | 1.663 | 1.292 |
| 90 | | 2.632 | 2.368 | 1.987 | 1.662 | 1.291 |
| 95 | | 2.629 | 2.366 | 1.985 | 1.661 | 1.291 |
| 100 | | 2.626 | 2.364 | 1.984 | 1.660 | 1.290 |
| 105 | | 2.623 | 2.362 | 1.983 | 1.659 | 1.290 |
| 110 | | 2.621 | 2.361 | 1.982 | 1.659 | 1.289 |
| 115 | | 2.619 | 2.359 | 1.981 | 1.658 | 1.289 |
| 120 | | 2.617 | 2.358 | 1.980 | 1.658 | 1.289 |
| 125 | | 2.616 | 2.357 | 1.979 | 1.657 | 1.288 |
| 130 | | 2.614 | 2.355 | 1.978 | 1.657 | 1.288 |
| 135 | | 2.613 | 2.354 | 1.978 | 1.656 | 1.288 |
| 140 | | 2.611 | 2.353 | 1.977 | 1.656 | 1.288 |
| 145 | | 2.610 | 2.352 | 1.976 | 1.655 | 1.287 |
| 150 | | 2.609 | 2.351 | 1.976 | 1.655 | 1.287 |
| 200 | | 2.601 | 2.345 | 1.972 | 1.653 | 1.286 |
| 300 | | 2.592 | 2.339 | 1.968 | 1.650 | 1.284 |
| 400 | | 2.588 | 2.336 | 1.966 | 1.649 | 1.284 |
| 500 | | 2.586 | 2.334 | 1.965 | 1.648 | 1.283 |
| 600 | | 2.584 | 2.333 | 1.964 | 1.647 | 1.283 |
| 700 | | 2.583 | 2.332 | 1.963 | 1.647 | 1.283 |
| 800 | | 2.582 | 2.331 | 1.963 | 1.647 | 1.283 |
| 900 | | 2.581 | 2.330 | 1.963 | 1.647 | 1.282 |
| 1000 | | 2.581 | 2.330 | 1.962 | 1.646 | 1.282 |
| 2000 | | 2.578 | 2.328 | 1.961 | 1.646 | 1.282 |
| ∞ | | 2.576 | 2.326 | 1.960 | 1.645 | 1.282 |

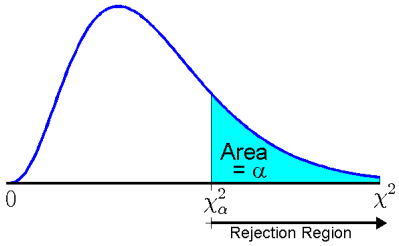
**Table 4:** Critical Values of the Pearson Correlation Coefficient $r$.

If $|r|$ is greater than the value given in the table, you can conclude (at the 0.05 significance level) that there is a significant linear correlation. In this table, $n$ is the sample size. If your sample size is not listed, use the nearest **lower** $n$.

| Critical Values of Pearson's Correlation Coefficient | | | |
|---|---|---|---|
| n | r | n | r |
| 3 | 0.997 | 51 | 0.276 |
| 4 | 0.950 | 52 | 0.273 |
| 5 | 0.878 | 53 | 0.271 |
| 6 | 0.811 | 54 | 0.268 |
| 7 | 0.754 | 55 | 0.266 |
| 8 | 0.707 | 56 | 0.263 |
| 9 | 0.666 | 57 | 0.261 |
| 10 | 0.632 | 58 | 0.259 |
| 11 | 0.602 | 59 | 0.256 |
| 12 | 0.576 | 60 | 0.254 |
| 13 | 0.553 | 61 | 0.252 |
| 14 | 0.532 | 62 | 0.250 |
| 15 | 0.514 | 63 | 0.248 |
| 16 | 0.497 | 64 | 0.246 |
| 17 | 0.482 | 65 | 0.244 |
| 18 | 0.468 | 66 | 0.242 |
| 19 | 0.456 | 67 | 0.240 |
| 20 | 0.444 | 68 | 0.239 |
| 21 | 0.433 | 69 | 0.237 |
| 22 | 0.423 | 70 | 0.235 |
| 23 | 0.413 | 71 | 0.234 |
| 24 | 0.404 | 72 | 0.232 |
| 25 | 0.396 | 73 | 0.230 |
| 26 | 0.388 | 74 | 0.229 |
| 27 | 0.381 | 75 | 0.227 |
| 28 | 0.374 | 76 | 0.226 |
| 29 | 0.367 | 77 | 0.224 |
| 30 | 0.361 | 78 | 0.223 |
| 31 | 0.355 | 79 | 0.221 |
| 32 | 0.349 | 80 | 0.220 |
| 33 | 0.344 | 85 | 0.213 |
| 34 | 0.339 | 90 | 0.207 |
| 35 | 0.334 | 95 | 0.202 |
| 36 | 0.329 | 100 | 0.197 |
| 37 | 0.325 | 110 | 0.187 |
| 38 | 0.320 | 120 | 0.179 |
| 39 | 0.316 | 130 | 0.172 |
| 40 | 0.312 | 140 | 0.166 |
| 41 | 0.308 | 150 | 0.160 |
| 42 | 0.304 | 160 | 0.155 |
| 43 | 0.301 | 170 | 0.151 |
| 44 | 0.297 | 180 | 0.146 |
| 45 | 0.294 | 190 | 0.142 |
| 46 | 0.291 | 200 | 0.139 |
| 47 | 0.288 | 250 | 0.124 |
| 48 | 0.285 | 500 | 0.088 |
| 49 | 0.282 | 1000 | 0.062 |
| 50 | 0.279 | 2000 | 0.044 |

**Table 5:** Critical Values of Chi-Squared ($\chi^2$).

If your value of $\chi^2$ is greater than the value given in the table for your degrees of freedom and significance level ($\alpha$), then the test statistic lies in the rejection region and you can reject the null hypothesis.




**Critical Values of $\chi^2$**

| Degrees of Freedom | Area in Right Tail = α 0.10 | 0.05 | 0.01 |
|---|---|---|---|
| 1 | 2.706 | 3.841 | 6.635 |
| 2 | 4.605 | 5.991 | 9.210 |
| 3 | 6.251 | 7.815 | 11.345 |
| 4 | 7.779 | 9.488 | 13.277 |
| 5 | 9.236 | 11.070 | 15.086 |
| 6 | 10.645 | 12.592 | 16.812 |
| 7 | 12.017 | 14.067 | 18.475 |
| 8 | 13.362 | 15.507 | 20.090 |
| 9 | 14.684 | 16.919 | 21.666 |
| 10 | 15.987 | 18.307 | 23.209 |
| 11 | 17.275 | 19.675 | 24.725 |
| 12 | 18.549 | 21.026 | 26.217 |
| 13 | 19.812 | 22.362 | 27.688 |
| 14 | 21.064 | 23.685 | 29.141 |
| 15 | 22.307 | 24.996 | 30.578 |
| 16 | 23.542 | 26.296 | 32.000 |
| 17 | 24.769 | 27.587 | 33.409 |
| 18 | 25.989 | 28.869 | 34.805 |
| 19 | 27.204 | 30.144 | 36.191 |
| 20 | 28.412 | 31.410 | 37.566 |
| 21 | 29.615 | 32.671 | 38.932 |
| 22 | 30.813 | 33.924 | 40.289 |
| 23 | 32.007 | 35.172 | 41.638 |
| 24 | 33.196 | 36.415 | 42.980 |
| 25 | 34.382 | 37.652 | 44.314 |
| 26 | 35.563 | 38.885 | 45.642 |
| 27 | 36.741 | 40.113 | 46.963 |
| 28 | 37.916 | 41.337 | 48.278 |
| 29 | 39.087 | 42.557 | 49.588 |
| 30 | 40.256 | 43.773 | 50.892 |
| 31 | 41.422 | 44.985 | 52.191 |
| 32 | 42.585 | 46.194 | 53.486 |
| 33 | 43.745 | 47.400 | 54.776 |
| 34 | 44.903 | 48.602 | 56.061 |
| 35 | 46.059 | 49.802 | 57.342 |
| 36 | 47.212 | 50.998 | 58.619 |
| 37 | 48.363 | 52.192 | 59.893 |
| 38 | 49.513 | 53.384 | 61.162 |
| 39 | 50.660 | 54.572 | 62.428 |
| 40 | 51.805 | 55.758 | 63.691 |
| 41 | 52.949 | 56.942 | 64.950 |
| 42 | 54.090 | 58.124 | 66.206 |
| 43 | 55.230 | 59.304 | 67.459 |
| 44 | 56.369 | 60.481 | 68.710 |
| 45 | 57.505 | 61.656 | 69.957 |

**Critical Values of $\chi^2$**

| Degrees of Freedom | Area in Right Tail = α 0.10 | 0.05 | 0.01 |
|---|---|---|---|
| 46 | 58.641 | 62.830 | 71.201 |
| 47 | 59.774 | 64.001 | 72.443 |
| 48 | 60.907 | 65.171 | 73.683 |
| 49 | 62.038 | 66.339 | 74.919 |
| 50 | 63.167 | 67.505 | 76.154 |
| 51 | 64.295 | 68.669 | 77.386 |
| 52 | 65.422 | 69.832 | 78.616 |
| 53 | 66.548 | 70.993 | 79.843 |
| 54 | 67.673 | 72.153 | 81.069 |
| 55 | 68.796 | 73.311 | 82.292 |
| 56 | 69.919 | 74.468 | 83.513 |
| 57 | 71.040 | 75.624 | 84.733 |
| 58 | 72.160 | 76.778 | 85.950 |
| 59 | 73.279 | 77.931 | 87.166 |
| 60 | 74.397 | 79.082 | 88.379 |
| 61 | 75.514 | 80.232 | 89.591 |
| 62 | 76.630 | 81.381 | 90.802 |
| 63 | 77.745 | 82.529 | 92.010 |
| 64 | 78.860 | 83.675 | 93.217 |
| 65 | 79.973 | 84.821 | 94.422 |
| 66 | 81.085 | 85.965 | 95.626 |
| 67 | 82.197 | 87.108 | 96.828 |
| 68 | 83.308 | 88.250 | 98.028 |
| 69 | 84.418 | 89.391 | 99.228 |
| 70 | 85.527 | 90.531 | 100.425 |
| 71 | 86.635 | 91.670 | 101.621 |
| 72 | 87.743 | 92.808 | 102.816 |
| 73 | 88.850 | 93.945 | 104.010 |
| 74 | 89.956 | 95.081 | 105.202 |
| 75 | 91.061 | 96.217 | 106.393 |
| 76 | 92.166 | 97.351 | 107.583 |
| 77 | 93.270 | 98.484 | 108.771 |
| 78 | 94.374 | 99.617 | 109.958 |
| 79 | 95.476 | 100.749 | 111.144 |
| 80 | 96.578 | 101.879 | 112.329 |
| 81 | 97.680 | 103.010 | 113.512 |
| 82 | 98.780 | 104.139 | 114.695 |
| 83 | 99.880 | 105.267 | 115.876 |
| 84 | 100.980 | 106.395 | 117.057 |
| 85 | 102.079 | 107.522 | 118.236 |
| 86 | 103.177 | 108.648 | 119.414 |
| 87 | 104.275 | 109.773 | 120.591 |
| 88 | 105.372 | 110.898 | 121.767 |
| 89 | 106.469 | 112.022 | 122.942 |
| 90 | 107.565 | 113.145 | 124.116 |