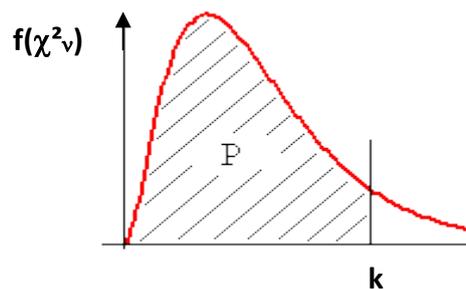


Table de la loi du χ^2_v

Fractiles F_P de la loi de khi-deux à v degrés de liberté

$$P = F(k) = P(\chi^2_v \leq k)$$



| v | P | 0.010 | 0.020 | 0.025 | 0.050 | 0.100 | 0.150 | 0.200 | 0.800 | 0.900 | 0.950 | 0.975 | 0.980 | 0.990 |
|-----|-----|--------|--------|--------|--------|--------|--------|--------|--------|--------|---------------|--------|--------|--------|
| 1 | | 0.000 | 0.001 | 0.001 | 0.004 | 0.016 | 0.036 | 0.064 | 1.642 | 2.706 | 3.841 | 5.024 | 5.412 | 6.64 |
| 2 | | 0.020 | 0.040 | 0.051 | 0.103 | 0.211 | 0.325 | 0.446 | 3.219 | 4.605 | 5.991 | 7.378 | 7.824 | 9.21 |
| 3 | | 0.115 | 0.185 | 0.216 | 0.352 | 0.584 | 0.798 | 1.005 | 4.642 | 6.251 | 7.815 | 9.348 | 9.837 | 11.35 |
| 4 | | 0.297 | 0.429 | 0.484 | 0.711 | 1.064 | 1.366 | 1.649 | 5.989 | 7.779 | 9.488 | 11.143 | 11.668 | 13.28 |
| 5 | | 0.554 | 0.752 | 0.831 | 1.145 | 1.610 | 1.994 | 2.343 | 7.289 | 9.236 | 11.070 | 12.833 | 13.388 | 15.09 |
| 6 | | 0.872 | 1.134 | 1.237 | 1.635 | 2.204 | 2.661 | 3.070 | 8.558 | 10.645 | 12.592 | 14.449 | 15.033 | 16.81 |
| 7 | | 1.239 | 1.564 | 1.690 | 2.167 | 2.833 | 3.358 | 3.822 | 9.803 | 12.017 | 14.067 | 16.013 | 16.622 | 18.48 |
| 8 | | 1.646 | 2.032 | 2.180 | 2.733 | 3.490 | 4.078 | 4.594 | 11.030 | 13.362 | 15.507 | 17.535 | 18.168 | 20.09 |
| 9 | | 2.088 | 2.532 | 2.700 | 3.325 | 4.168 | 4.817 | 5.380 | 12.242 | 14.684 | 16.919 | 19.023 | 19.679 | 21.67 |
| 10 | | 2.558 | 3.059 | 3.247 | 3.940 | 4.865 | 5.570 | 6.179 | 13.442 | 15.987 | 18.307 | 20.483 | 21.161 | 23.21 |
| 11 | | 3.053 | 3.609 | 3.816 | 4.575 | 5.578 | 6.336 | 6.989 | 14.631 | 17.275 | 19.675 | 21.920 | 22.618 | 24.73 |
| 12 | | 3.571 | 4.178 | 4.404 | 5.226 | 6.304 | 7.114 | 7.807 | 15.812 | 18.549 | 21.026 | 23.337 | 24.054 | 26.22 |
| 13 | | 4.107 | 4.765 | 5.009 | 5.892 | 7.042 | 7.901 | 8.634 | 16.985 | 19.812 | 22.362 | 24.736 | 25.472 | 27.69 |
| 14 | | 4.660 | 5.368 | 5.629 | 6.571 | 7.790 | 8.696 | 9.467 | 18.151 | 21.064 | 23.685 | 26.119 | 26.873 | 29.14 |
| 15 | | 5.229 | 5.985 | 6.262 | 7.261 | 8.547 | 9.499 | 10.307 | 19.311 | 22.307 | 24.996 | 27.488 | 28.259 | 30.58 |
| 16 | | 5.812 | 6.614 | 6.908 | 7.962 | 9.312 | 10.309 | 11.152 | 20.465 | 23.542 | 26.296 | 28.845 | 29.633 | 32.00 |
| 17 | | 6.408 | 7.255 | 7.564 | 8.672 | 10.085 | 11.125 | 12.002 | 21.615 | 24.769 | 27.587 | 30.191 | 30.995 | 33.41 |
| 18 | | 7.015 | 7.906 | 8.231 | 9.390 | 10.865 | 11.946 | 12.857 | 22.760 | 25.989 | 28.869 | 31.526 | 32.346 | 34.81 |
| 19 | | 7.633 | 8.567 | 8.907 | 10.117 | 11.651 | 12.773 | 13.716 | 23.900 | 27.204 | 30.144 | 32.852 | 33.687 | 36.19 |
| 20 | | 8.260 | 9.237 | 9.591 | 10.851 | 12.443 | 13.604 | 14.578 | 25.038 | 28.412 | 31.410 | 34.170 | 35.020 | 37.57 |
| 21 | | 8.897 | 9.915 | 10.283 | 11.591 | 13.240 | 14.439 | 15.445 | 26.171 | 29.615 | 32.671 | 35.479 | 36.343 | 38.93 |
| 22 | | 9.542 | 10.600 | 10.982 | 12.338 | 14.041 | 15.279 | 16.314 | 27.301 | 30.813 | 33.924 | 36.781 | 37.659 | 40.29 |
| 23 | | 10.196 | 11.293 | 11.689 | 13.091 | 14.848 | 16.122 | 17.187 | 28.429 | 32.007 | 35.172 | 38.076 | 38.968 | 41.64 |
| 24 | | 10.856 | 11.992 | 12.401 | 13.848 | 15.659 | 16.969 | 18.062 | 29.553 | 33.196 | 36.415 | 39.364 | 40.270 | 42.98 |
| 25 | | 11.524 | 12.697 | 13.120 | 14.611 | 16.473 | 17.818 | 18.940 | 30.675 | 34.382 | 37.652 | 40.646 | 41.566 | 44.31 |
| 26 | | 12.198 | 13.409 | 13.844 | 15.379 | 17.292 | 18.671 | 19.820 | 31.795 | 35.563 | 38.885 | 41.923 | 42.856 | 45.64 |
| 27 | | 12.879 | 14.125 | 14.573 | 16.151 | 18.114 | 19.527 | 20.703 | 32.912 | 36.741 | 40.113 | 43.195 | 44.140 | 46.96 |
| 28 | | 13.565 | 14.847 | 15.308 | 16.928 | 18.939 | 20.386 | 21.588 | 34.027 | 37.916 | 41.337 | 44.461 | 45.419 | 48.28 |
| 29 | | 14.256 | 15.574 | 16.047 | 17.708 | 19.768 | 21.247 | 22.475 | 35.139 | 39.087 | 42.557 | 45.722 | 46.693 | 49.59 |
| 30 | | 14.953 | 16.306 | 16.791 | 18.493 | 20.599 | 22.110 | 23.364 | 36.250 | 40.256 | 43.773 | 46.979 | 47.962 | 50.89 |
| 40 | | 22.164 | 23.838 | 24.433 | 26.509 | 29.051 | 30.856 | 32.345 | 47.269 | 51.805 | 55.758 | 59.342 | 60.436 | 63.69 |
| 50 | | 29.707 | 31.664 | 32.357 | 34.764 | 37.689 | 39.754 | 41.449 | 58.164 | 63.167 | 67.505 | 71.420 | 72.613 | 76.15 |
| 60 | | 37.485 | 39.699 | 40.482 | 43.188 | 46.459 | 48.759 | 50.641 | 68.972 | 74.397 | 79.082 | 83.298 | 84.580 | 88.38 |
| 80 | | 53.540 | 56.213 | 57.153 | 60.391 | 64.278 | 66.994 | 69.207 | 90.405 | 96.578 | 101.88 | 106.63 | 108.07 | 112.33 |

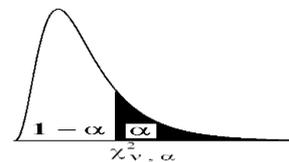
Exemple : $v = 10$ d.d.l. $P = P(\chi^2_{10} \leq F_P) = 0.95 \Rightarrow F_P = 18.307$

Approximation : Pour $v > 100$ d.l.l. $\chi^2(v) \cong N(v; \sqrt{2v})$ ou $\sqrt{2}\chi^2 - \sqrt{2v-1} \cong N(0,1)$

جدول (3): توزيع كاي مربع (χ^2)

Percentage Points of the χ^2 Distribution $\chi^2_{v,\alpha}$

$$P(\chi^2 > \chi^2_{v,\alpha}) = \alpha$$



| v | α | | | | | | | | | | | | | | |
|-----|----------|--------|--------|--------|--------|--------|--------|-------|-------|-------|-------|-------|-------|-------|-------|
| | 0.001 | 0.005 | 0.010 | 0.025 | 0.050 | 0.100 | 0.250 | 0.500 | 0.750 | 0.900 | 0.950 | 0.975 | 0.990 | 0.995 | 0.999 |
| 1 | 10.83 | 7.88 | 6.63 | 5.02 | 3.84 | 2.71 | 1.32 | 0.45 | 0.10 | 0.02 | | | | | |
| 2 | 13.82 | 10.60 | 9.21 | 7.38 | 5.99 | 4.61 | 2.77 | 1.39 | 0.58 | 0.21 | 0.10 | 0.05 | 0.02 | 0.01 | |
| 3 | 16.27 | 12.84 | 11.34 | 9.35 | 7.81 | 6.25 | 4.11 | 2.37 | 1.21 | 0.58 | 0.35 | 0.22 | 0.11 | 0.07 | 0.02 |
| 4 | 18.47 | 14.86 | 13.28 | 11.14 | 9.49 | 7.78 | 5.39 | 3.36 | 1.92 | 1.06 | 0.71 | 0.48 | 0.30 | 0.21 | 0.09 |
| 5 | 20.52 | 16.75 | 15.09 | 12.83 | 11.07 | 9.24 | 6.63 | 4.35 | 2.67 | 1.61 | 1.15 | 0.83 | 0.55 | 0.41 | 0.21 |
| 6 | 22.46 | 18.55 | 16.81 | 14.45 | 12.59 | 10.64 | 7.84 | 5.35 | 3.45 | 2.20 | 1.64 | 1.24 | 0.87 | 0.68 | 0.38 |
| 7 | 24.32 | 20.28 | 18.48 | 16.01 | 14.07 | 12.02 | 9.04 | 6.35 | 4.25 | 2.83 | 2.17 | 1.69 | 1.24 | 0.99 | 0.60 |
| 8 | 26.12 | 21.95 | 20.09 | 17.53 | 15.51 | 13.36 | 10.22 | 7.34 | 5.07 | 3.49 | 2.73 | 2.18 | 1.65 | 1.34 | 0.86 |
| 9 | 27.88 | 23.59 | 21.67 | 19.02 | 16.92 | 14.68 | 11.39 | 8.34 | 5.90 | 4.17 | 3.33 | 2.70 | 2.09 | 1.73 | 1.15 |
| 10 | 29.59 | 25.19 | 23.21 | 20.48 | 18.31 | 15.99 | 12.55 | 9.34 | 6.74 | 4.87 | 3.94 | 3.25 | 2.56 | 2.16 | 1.48 |
| 11 | 31.26 | 26.76 | 24.72 | 21.92 | 19.68 | 17.28 | 13.70 | 10.34 | 7.58 | 5.58 | 4.57 | 3.82 | 3.05 | 2.60 | 1.83 |
| 12 | 32.91 | 28.30 | 26.22 | 23.34 | 21.03 | 18.55 | 14.85 | 11.34 | 8.44 | 6.30 | 5.23 | 4.40 | 3.57 | 3.07 | 2.21 |
| 13 | 34.53 | 29.82 | 27.69 | 24.74 | 22.36 | 19.81 | 15.98 | 12.34 | 9.30 | 7.04 | 5.89 | 5.01 | 4.11 | 3.57 | 2.62 |
| 14 | 36.12 | 31.32 | 29.14 | 26.12 | 23.68 | 21.06 | 17.12 | 13.34 | 10.17 | 7.79 | 6.57 | 5.63 | 4.66 | 4.07 | 3.04 |
| 15 | 37.70 | 32.80 | 30.58 | 27.49 | 25.00 | 22.31 | 18.25 | 14.34 | 11.04 | 8.55 | 7.26 | 6.26 | 5.23 | 4.60 | 3.48 |
| 16 | 39.25 | 34.27 | 32.00 | 28.85 | 26.30 | 23.54 | 19.37 | 15.34 | 11.91 | 9.31 | 7.96 | 6.91 | 5.81 | 5.14 | 3.94 |
| 17 | 40.79 | 35.72 | 33.41 | 30.19 | 27.59 | 24.77 | 20.49 | 16.34 | 12.79 | 10.09 | 8.67 | 7.56 | 6.41 | 5.70 | 4.42 |
| 18 | 42.31 | 37.16 | 34.81 | 31.53 | 28.87 | 25.99 | 21.60 | 17.34 | 13.68 | 10.86 | 9.39 | 8.23 | 7.01 | 6.26 | 4.90 |
| 19 | 43.82 | 38.58 | 36.19 | 32.85 | 30.14 | 27.20 | 22.72 | 18.34 | 14.56 | 11.65 | 10.12 | 8.91 | 7.63 | 6.84 | 5.41 |
| 20 | 45.31 | 40.00 | 37.57 | 34.17 | 31.41 | 28.41 | 23.83 | 19.34 | 15.45 | 12.44 | 10.85 | 9.59 | 8.26 | 7.43 | 5.92 |
| 21 | 46.80 | 41.40 | 38.93 | 35.48 | 32.67 | 29.62 | 24.93 | 20.34 | 16.34 | 13.24 | 11.59 | 10.28 | 8.90 | 8.03 | 6.45 |
| 22 | 48.27 | 42.80 | 40.29 | 36.78 | 33.92 | 30.81 | 26.04 | 21.34 | 17.24 | 14.04 | 12.34 | 10.98 | 9.54 | 8.64 | 6.98 |
| 23 | 49.73 | 44.18 | 41.64 | 38.08 | 35.17 | 32.01 | 27.14 | 22.34 | 18.14 | 14.85 | 13.09 | 11.69 | 10.20 | 9.26 | 7.53 |
| 24 | 51.18 | 45.56 | 42.98 | 39.36 | 36.42 | 33.20 | 28.24 | 23.34 | 19.04 | 15.66 | 13.85 | 12.40 | 10.86 | 9.89 | 8.08 |
| 25 | 52.62 | 46.93 | 44.31 | 40.65 | 37.65 | 34.38 | 29.34 | 24.34 | 19.94 | 16.47 | 14.61 | 13.12 | 11.52 | 10.52 | 8.65 |
| 30 | 59.70 | 53.67 | 50.89 | 46.98 | 43.77 | 40.26 | 34.80 | 29.34 | 24.48 | 20.60 | 18.49 | 16.79 | 14.95 | 13.79 | 11.59 |
| 40 | 73.40 | 66.77 | 63.69 | 59.34 | 55.76 | 51.81 | 45.62 | 39.34 | 33.66 | 29.05 | 26.51 | 24.43 | 22.16 | 20.71 | 17.92 |
| 50 | 86.66 | 79.49 | 76.15 | 71.42 | 67.50 | 63.17 | 56.33 | 49.33 | 42.94 | 37.69 | 34.76 | 32.36 | 29.71 | 27.99 | 24.67 |
| 60 | 99.61 | 91.95 | 88.38 | 83.30 | 79.08 | 74.40 | 66.98 | 59.33 | 52.29 | 46.46 | 43.19 | 40.48 | 37.48 | 35.53 | 31.74 |
| 70 | 112.32 | 104.21 | 100.43 | 95.02 | 90.53 | 85.53 | 77.58 | 69.33 | 61.70 | 55.33 | 51.74 | 48.76 | 45.44 | 43.28 | 39.04 |
| 80 | 124.84 | 116.32 | 112.33 | 106.63 | 101.88 | 96.58 | 88.13 | 79.33 | 71.14 | 64.28 | 60.39 | 57.15 | 53.54 | 51.17 | 46.52 |
| 90 | 137.21 | 128.30 | 124.12 | 118.14 | 113.15 | 107.57 | 98.65 | 89.33 | 80.62 | 73.29 | 69.13 | 65.65 | 61.75 | 59.20 | 54.16 |
| 100 | 149.45 | 140.17 | 135.81 | 129.56 | 124.34 | 118.50 | 109.14 | 99.33 | 90.13 | 82.36 | 77.93 | 74.22 | 70.06 | 67.33 | 61.92 |