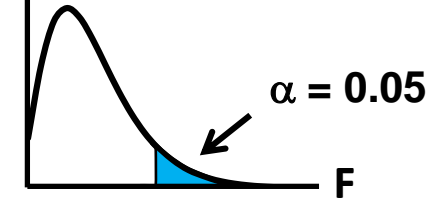


Table of critical F values for $\alpha = 0.05$.

The degrees of freedom of the numerator are listed horizontally.
 The degrees of freedom of the denominator are listed vertically.

This table is used for one-tailed F tests and ANOVA F tests.

www.statsexamples.com



| df for the denominator | df for the numerator | | | | | | | | | | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 22 | 24 | 26 | 28 | 30 | 35 | 40 | 45 | 50 | 60 | 70 | 80 | 100 | 200 | 500 | 1000 | >1000 | |
|------------------------|----------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|-------|------|
| 3 | 10.13 | 9.55 | 9.28 | 9.12 | 9.01 | 8.94 | 8.89 | 8.85 | 8.81 | 8.79 | 8.76 | 8.74 | 8.73 | 8.71 | 8.70 | 8.69 | 8.68 | 8.67 | 8.67 | 8.66 | 8.65 | 8.64 | 8.63 | 8.62 | 8.62 | 8.60 | 8.59 | 8.59 | 8.58 | 8.57 | 8.57 | 8.56 | 8.55 | 8.54 | 8.53 | 8.53 | 8.53 | |
| 4 | 7.71 | 6.94 | 6.58 | 6.39 | 6.26 | 6.16 | 6.09 | 6.04 | 6.00 | 5.96 | 5.94 | 5.91 | 5.89 | 5.87 | 5.86 | 5.84 | 5.83 | 5.82 | 5.81 | 5.80 | 5.79 | 5.77 | 5.76 | 5.75 | 5.75 | 5.73 | 5.72 | 5.71 | 5.70 | 5.69 | 5.68 | 5.67 | 5.66 | 5.65 | 5.64 | 5.63 | 5.63 | |
| 5 | 6.61 | 5.79 | 5.41 | 5.19 | 5.05 | 4.95 | 4.88 | 4.82 | 4.77 | 4.74 | 4.70 | 4.68 | 4.66 | 4.64 | 4.62 | 4.60 | 4.59 | 4.58 | 4.57 | 4.56 | 4.54 | 4.53 | 4.52 | 4.50 | 4.50 | 4.48 | 4.46 | 4.45 | 4.44 | 4.43 | 4.42 | 4.41 | 4.41 | 4.39 | 4.37 | 4.37 | 4.37 | |
| 6 | 5.99 | 5.14 | 4.76 | 4.53 | 4.39 | 4.28 | 4.21 | 4.15 | 4.10 | 4.06 | 4.03 | 4.00 | 3.98 | 3.96 | 3.94 | 3.92 | 3.91 | 3.90 | 3.88 | 3.87 | 3.86 | 3.84 | 3.83 | 3.82 | 3.81 | 3.79 | 3.77 | 3.76 | 3.75 | 3.74 | 3.73 | 3.72 | 3.71 | 3.69 | 3.68 | 3.67 | 3.67 | |
| 7 | 5.59 | 4.74 | 4.35 | 4.12 | 3.97 | 3.87 | 3.79 | 3.73 | 3.68 | 3.64 | 3.60 | 3.57 | 3.55 | 3.53 | 3.51 | 3.49 | 3.48 | 3.47 | 3.46 | 3.44 | 3.43 | 3.41 | 3.40 | 3.39 | 3.38 | 3.36 | 3.34 | 3.33 | 3.32 | 3.30 | 3.29 | 3.29 | 3.27 | 3.25 | 3.24 | 3.23 | 3.23 | |
| 8 | 5.32 | 4.46 | 4.07 | 3.84 | 3.69 | 3.58 | 3.50 | 3.44 | 3.39 | 3.35 | 3.31 | 3.28 | 3.26 | 3.24 | 3.22 | 3.20 | 3.19 | 3.17 | 3.16 | 3.15 | 3.13 | 3.12 | 3.10 | 3.09 | 3.08 | 3.06 | 3.04 | 3.03 | 3.02 | 3.01 | 2.99 | 2.99 | 2.97 | 2.95 | 2.94 | 2.93 | 2.93 | |
| 9 | 5.12 | 4.26 | 3.86 | 3.63 | 3.48 | 3.37 | 3.29 | 3.23 | 3.18 | 3.14 | 3.10 | 3.07 | 3.05 | 3.03 | 3.01 | 2.99 | 2.97 | 2.96 | 2.95 | 2.92 | 2.90 | 2.89 | 2.87 | 2.87 | 2.86 | 2.84 | 2.83 | 2.81 | 2.80 | 2.79 | 2.78 | 2.77 | 2.76 | 2.73 | 2.72 | 2.71 | 2.71 | |
| 10 | 4.96 | 4.10 | 3.71 | 3.48 | 3.33 | 3.22 | 3.14 | 3.07 | 3.02 | 2.98 | 2.94 | 2.91 | 2.89 | 2.86 | 2.85 | 2.83 | 2.81 | 2.80 | 2.79 | 2.77 | 2.75 | 2.74 | 2.72 | 2.71 | 2.70 | 2.68 | 2.66 | 2.65 | 2.64 | 2.62 | 2.61 | 2.60 | 2.59 | 2.56 | 2.55 | 2.54 | 2.54 | |
| 11 | 4.84 | 3.98 | 3.59 | 3.36 | 3.20 | 3.09 | 3.01 | 2.95 | 2.90 | 2.85 | 2.82 | 2.79 | 2.76 | 2.74 | 2.72 | 2.70 | 2.69 | 2.67 | 2.66 | 2.65 | 2.63 | 2.61 | 2.59 | 2.58 | 2.57 | 2.55 | 2.53 | 2.52 | 2.51 | 2.49 | 2.48 | 2.47 | 2.46 | 2.43 | 2.42 | 2.41 | 2.41 | |
| 12 | 4.75 | 3.89 | 3.49 | 3.26 | 3.11 | 3.00 | 2.91 | 2.85 | 2.80 | 2.75 | 2.72 | 2.69 | 2.66 | 2.64 | 2.62 | 2.60 | 2.59 | 2.57 | 2.56 | 2.54 | 2.52 | 2.51 | 2.49 | 2.48 | 2.47 | 2.45 | 2.44 | 2.43 | 2.41 | 2.40 | 2.38 | 2.37 | 2.36 | 2.35 | 2.32 | 2.31 | 2.30 | 2.30 |
| 13 | 4.67 | 3.81 | 3.41 | 3.18 | 3.03 | 2.92 | 2.83 | 2.77 | 2.71 | 2.67 | 2.63 | 2.60 | 2.58 | 2.55 | 2.53 | 2.51 | 2.50 | 2.48 | 2.47 | 2.46 | 2.44 | 2.42 | 2.41 | 2.39 | 2.38 | 2.36 | 2.34 | 2.33 | 2.31 | 2.30 | 2.28 | 2.27 | 2.26 | 2.23 | 2.22 | 2.21 | 2.21 | |
| 14 | 4.60 | 3.74 | 3.34 | 3.11 | 2.96 | 2.85 | 2.76 | 2.70 | 2.65 | 2.60 | 2.57 | 2.53 | 2.51 | 2.48 | 2.46 | 2.44 | 2.43 | 2.41 | 2.40 | 2.39 | 2.37 | 2.35 | 2.33 | 2.32 | 2.31 | 2.28 | 2.27 | 2.25 | 2.24 | 2.22 | 2.21 | 2.20 | 2.19 | 2.16 | 2.14 | 2.14 | 2.13 | |
| 15 | 4.54 | 3.68 | 3.29 | 3.06 | 2.90 | 2.79 | 2.71 | 2.64 | 2.59 | 2.54 | 2.51 | 2.48 | 2.45 | 2.42 | 2.40 | 2.38 | 2.37 | 2.35 | 2.34 | 2.33 | 2.31 | 2.29 | 2.27 | 2.26 | 2.25 | 2.22 | 2.20 | 2.19 | 2.18 | 2.16 | 2.15 | 2.14 | 2.12 | 2.10 | 2.08 | 2.07 | 2.07 | |
| 16 | 4.49 | 3.63 | 3.24 | 3.01 | 2.85 | 2.74 | 2.66 | 2.59 | 2.54 | 2.49 | 2.46 | 2.42 | 2.40 | 2.37 | 2.35 | 2.33 | 2.32 | 2.30 | 2.29 | 2.28 | 2.25 | 2.24 | 2.22 | 2.21 | 2.19 | 2.17 | 2.15 | 2.14 | 2.12 | 2.11 | 2.09 | 2.08 | 2.06 | 2.05 | 2.03 | 2.02 | 2.01 | |
| 17 | 4.45 | 3.59 | 3.20 | 2.96 | 2.81 | 2.70 | 2.61 | 2.55 | 2.49 | 2.45 | 2.41 | 2.38 | 2.35 | 2.33 | 2.31 | 2.29 | 2.27 | 2.26 | 2.24 | 2.23 | 2.21 | 2.19 | 2.17 | 2.16 | 2.15 | 2.12 | 2.10 | 2.09 | 2.08 | 2.06 | 2.05 | 2.03 | 2.02 | 1.99 | 1.97 | 1.96 | 1.96 | |
| 18 | 4.41 | 3.55 | 3.16 | 2.93 | 2.77 | 2.66 | 2.58 | 2.51 | 2.46 | 2.41 | 2.37 | 2.34 | 2.31 | 2.29 | 2.27 | 2.25 | 2.23 | 2.22 | 2.20 | 2.19 | 2.17 | 2.15 | 2.13 | 2.12 | 2.11 | 2.08 | 2.06 | 2.05 | 2.04 | 2.02 | 2.00 | 1.99 | 1.98 | 1.95 | 1.94 | 1.92 | 1.92 | |
| 19 | 4.38 | 3.52 | 3.13 | 2.90 | 2.74 | 2.63 | 2.54 | 2.48 | 2.42 | 2.38 | 2.34 | 2.31 | 2.28 | 2.26 | 2.23 | 2.21 | 2.20 | 2.18 | 2.17 | 2.16 | 2.13 | 2.11 | 2.10 | 2.08 | 2.07 | 2.05 | 2.03 | 2.01 | 2.00 | 1.98 | 1.97 | 1.96 | 1.94 | 1.91 | 1.89 | 1.88 | 1.88 | |
| 20 | 4.35 | 3.49 | 3.10 | 2.87 | 2.71 | 2.60 | 2.51 | 2.45 | 2.39 | 2.35 | 2.31 | 2.28 | 2.25 | 2.22 | 2.20 | 2.18 | 2.17 | 2.15 | 2.14 | 2.12 | 2.10 | 2.08 | 2.07 | 2.05 | 2.04 | 2.01 | 1.99 | 1.98 | 1.97 | 1.95 | 1.93 | 1.92 | 1.91 | 1.88 | 1.86 | 1.85 | 1.84 | |
| 21 | 4.32 | 3.47 | 3.07 | 2.84 | 2.68 | 2.57 | 2.49 | 2.42 | 2.37 | 2.32 | 2.28 | 2.25 | 2.22 | 2.20 | 2.18 | 2.16 | 2.14 | 2.12 | 2.11 | 2.10 | 2.07 | 2.05 | 2.04 | 2.02 | 2.01 | 1.98 | 1.96 | 1.95 | 1.94 | 1.92 | 1.90 | 1.89 | 1.88 | 1.84 | 1.83 | 1.82 | 1.81 | |
| 22 | 4.30 | 3.44 | 3.05 | 2.82 | 2.66 | 2.55 | 2.46 | 2.40 | 2.34 | 2.30 | 2.26 | 2.23 | 2.20 | 2.17 | 2.15 | 2.13 | 2.11 | 2.10 | 2.08 | 2.07 | 2.05 | 2.03 | 2.01 | 2.00 | 1.98 | 1.96 | 1.94 | 1.92 | 1.91 | 1.89 | 1.88 | 1.86 | 1.85 | 1.82 | 1.80 | 1.79 | 1.78 | |
| 23 | 4.28 | 3.42 | 3.03 | 2.80 | 2.64 | 2.53 | 2.44 | 2.37 | 2.32 | 2.27 | 2.24 | 2.20 | 2.18 | 2.15 | 2.13 | 2.11 | 2.09 | 2.08 | 2.06 | 2.05 | 2.02 | 2.01 | 1.99 | 1.97 | 1.96 | 1.93 | 1.91 | 1.90 | 1.88 | 1.86 | 1.85 | 1.84 | 1.82 | 1.79 | 1.77 | 1.76 | 1.76 | |
| 24 | 4.26 | 3.40 | 3.01 | 2.78 | 2.62 | 2.51 | 2.42 | 2.35 | 2.30 | 2.25 | 2.22 | 2.18 | 2.15 | 2.13 | 2.11 | 2.09 | 2.07 | 2.06 | 2.04 | 2.03 | 2.00 | 1.99 | 1.97 | 1.95 | 1.94 | 1.91 | 1.89 | 1.88 | 1.86 | 1.84 | 1.83 | 1.82 | 1.80 | 1.77 | 1.75 | 1.74 | 1.73 | |
| 25 | 4.24 | 3.39 | 2.99 | 2.76 | 2.60 | 2.49 | 2.40 | 2.33 | 2.28 | 2.24 | 2.20 | 2.16 | 2.14 | 2.11 | 2.09 | 2.07 | 2.05 | 2.04 | 2.02 | 2.01 | 1.98 | 1.96 | 1.95 | 1.93 | 1.92 | 1.89 | 1.87 | 1.86 | 1.84 | 1.82 | 1.81 | 1.80 | 1.78 | 1.75 | 1.73 | 1.72 | 1.71 | |
| 26 | 4.23 | 3.37 | 2.98 | 2.74 | 2.59 | 2.47 | 2.39 | 2.32 | 2.27 | 2.22 | 2.18 | 2.15 | 2.12 | 2.09 | 2.07 | 2.05 | 2.03 | 2.02 | 2.00 | 1.99 | 1.97 | 1.95 | 1.93 | 1.91 | 1.90 | 1.87 | 1.85 | 1.84 | 1.82 | 1.80 | 1.79 | 1.78 | 1.76 | 1.73 | 1.71 | 1.70 | 1.69 | |
| 27 | 4.21 | 3.35 | 2.96 | 2.73 | 2.57 | 2.46 | 2.37 | 2.31 | 2.25 | 2.20 | 2.17 | 2.13 | 2.10 | 2.08 | 2.06 | 2.04 | 2.02 | 2.00 | 1.99 | 1.97 | 1.95 | 1.93 | 1.91 | 1.90 | 1.88 | 1.86 | 1.84 | 1.82 | 1.81 | 1.79 | 1.77 | 1.76 | 1.74 | 1.71 | 1.69 | 1.68 | 1.67 | |
| 28 | 4.20 | 3.34 | 2.95 | 2.71 | 2.56 | 2.45 | 2.36 | 2.29 | 2.24 | 2.19 | 2.15 | 2.12 | 2.09 | 2.06 | 2.04 | 2.02 | 2.00 | 1.99 | 1.97 | 1.96 | 1.93 | 1.91 | 1.90 | 1.88 | 1.87 | 1.84 | 1.82 | 1.80 | 1.79 | 1.77 | 1.75 | 1.74 | 1.73 | 1.69 | 1.67 | 1.66 | 1.65 | |
| 29 | 4.18 | 3.33 | 2.93 | 2.70 | 2.55 | 2.43 | 2.35 | 2.28 | 2.22 | 2.18 | 2.14 | 2.10 | 2.08 | 2.05 | 2.03 | 2.01 | 1.99 | 1.97 | 1.96 | 1.94 | 1.92 | 1.90 | 1.88 | 1.87 | 1.85 | 1.83 | 1.81 | 1.79 | 1.77 | 1.75 | 1.74 | 1.73 | 1.71 | 1.67 | 1.65 | 1.64 | 1.64 | |
| 30 | 4.17 | 3.32 | 2.92 | 2.69 | 2.53 | 2.42 | 2.33 | 2.27 | 2.21 | 2.16 | 2.13 | 2.09 | 2.06 | 2.04 | 2.01 | 1.99 | 1.98 | 1.96 | 1.95 | 1.93 | 1.91 | 1.89 | 1.87 | 1.85 | 1.84 | 1.81 | 1.79 | 1.77 | 1.76 | 1.74 | 1.72 | 1.71 | 1.70 | 1.66 | 1.64 | 1.63 | 1.62 | |
| 32 | 4.15 | 3.29 | 2.90 | 2.67 | 2.51 | 2.40 | 2.31 | 2.24 | 2.19 | 2.14 | 2.10 | 2.07 | 2.04 | 2.01 | 1.99 | 1.97 | 1.95 | 1.94 | 1.92 | 1.91 | 1.88 | 1.86 | 1.85 | 1.83 | 1.82 | 1.79 | 1.77 | 1.75 | 1.74 | 1.71 | 1.70 | 1.69 | 1.67 | 1.63 | 1.61 | 1.60 | 1.60 | |
| 34 | 4.13 | 3.28 | 2.88 | 2.65 | 2.49 | 2.38 | 2.29 | 2.23 | 2.17 | 2.12 | 2.08 | 2.05 | 2.02 | 1.99 | 1.97 | 1.95 | 1.93 | 1.92 | 1.90 | 1.89 | 1.86 | 1.84 | 1.82 | 1.81 | 1.80 | 1.77 | 1.75 | 1.73 | 1.71 | 1.70 | 1.69 | 1.68 | 1.66 | 1.62 | 1.60 | 1.59 | 1.58 | |
| 36 | 4.11 | 3.26 | 2.87 | 2.63 | 2.48 | 2.36 | 2.28 | 2.21 | 2.15 | 2.11 | 2.07 | 2.03 | 2.00 | 1.98 | 1.95 | 1.93 | 1.92 | 1.90 | 1.88 | 1.87 | 1.85 | 1.82 | 1.81 | 1.79 | 1.78 | 1.75 | 1.73 | 1.71 | 1.69 | 1.67 | 1.66 | 1.64 | 1.62 | 1.59 | 1.56 | 1.55 | 1.55 | |
| 38 | 4.10 | 3.24 | 2.85 | 2.62 | 2.46 | 2.35 | 2.26 | 2.19 | 2.14 | 2.09 | 2.05 | 2.02 | 1.99 | 1.96 | 1.94 | 1.92 | 1.90 | 1.88 | 1.87 | 1.85 | 1.83 | 1.81 | 1.79 | 1.77 | 1.76 | 1.73 | 1.71 | 1.69 | 1.68 | 1.65 | 1.64 | 1.62 | 1.61 | 1.57 | 1.54 | 1.54 | 1.53 | |
| 40 | 4.08 | 3.23 | 2.84 | 2.61 | 2.45 | 2.34 | 2.25 | 2.18 | 2.12 | 2.08 | 2.04 | 2.00 | 1.97 | 1.95 | 1.92 | 1.90 | 1.89 | 1.87 | 1.85 | 1.84 | 1.81 | 1.79 | 1.77 | 1.76 | 1.74 | 1.72 | 1.69 | 1.67 | 1.66 | 1.64 | 1.62 | 1.61 | 1.59 | 1.55 | 1.53 | 1.52 | 1.51 | |
| 42 | 4.07 | 3.22 | 2.83 | 2.59 | 2.44 | 2.32 | 2.24 | 2.17 | 2.11 | 2.06 | 2.02 | 1.99 | 1.96 | 1.94 | 1.91 | 1.89 | 1.87 | 1.86 | 1.84 | 1.83 | 1.80 | 1.78 | 1.76 | 1.75 | 1.73 | 1.70 | 1.68 | 1.66 | 1.65 | 1.62 | 1.61 | 1.59 | 1.57 | 1.53 | 1.51 | 1.50 | 1.49 | |
| 44 | 4.06 | 3.21 | 2.82 | 2.58 | 2.43 | 2.3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |