

This memo contains information to help **Berkeley-Haas EWMBA applicants** prepare for the prerequisite waiver exams in College-Level Mathematics and Statistics.

The examinations are intended to ensure that prospective students who are applying to the Evening & Weekend MBA Program have the prerequisite mathematical/statistical/analytical skills for the ensuing coursework.

**STATISTICS:**

You should demonstrate sufficient competence with such tasks as deriving probabilities, finding the mean, variance, and standard deviation for data sets and for a random variable, developing a confidence interval, determining sample size, conducting a hypothesis test, and evaluating a (linear) regression model. In problems where a specific knowledge of business or economics is needed, relevant information/clarification will be provided. Standard Normal,  $t$  and  $F$  Distribution tables will be provided.

**MATH:**

You should demonstrate sufficient competence with such tasks as solving “word problems,” solving systems of linear equations, solving non-linear equations (quadratic, logarithmic, exponential), interpreting graphs, and determining slope. In problems where a specific knowledge of business or economics is needed, the applicable formulae will be provided.

**PLEASE NOTE:**

1. The test is a two-hour long exam, with 30 multiple choice questions. Although the examination is in a multiple-choice format, those exams that fall short of passing will be carefully reviewed with respect to calculations you make on the exam sheets, so it is to your benefit to display your work/logic on the exam paper. Mistakes due to minor calculator/calculation errors will not be as detrimental as mistakes in concept or general execution of a problem. The test is closed book: no notes or formula are allowed in the exam.
2. On the day of the exam, please bring:
  - Photo ID: one valid form of photo identification with you (i.e. drivers license or passport).
  - Pencils: please bring at least one No. 2 pencil.
  - Calculator: a simple calculator may be used. We will not allow calculators that store formulae.
3. You may only take each subject exam once per year. If you take the exams and do not pass, you will have to fulfill the prerequisites by taking courses. If you intend to take coursework to fulfill the prerequisite requirements, please note that the courses must be completed and official transcripts received at our office with a grade of B or better by August 5, 2010 for fall 2010. Approved courses are listed here:  
<http://ewmba.haas.berkeley.edu/PrereqClassList.pdf>
4. If you do not fulfill the prerequisites through coursework or by waiver exam, you will not be able to enroll in the Evening & Weekend MBA Program, even if you have been offered admission.

For information on PARKING and DIRECTIONS, go to:  
<http://www.haas.berkeley.edu/haas/visiting.html>

**APPLICANTS TAKING THE WAIVER EXAMS SHOULD BE FAMILIAR WITH THE FOLLOWING TOPICS:**

**College-Level Mathematics**

- Working with exponents and logarithms
- Graphing a linear equation (including the concepts of slope and intercept)
- Graphing a set of linear inequalities
- Solving a system of simultaneous linear equations
- Strong skills in graphing functions and ability to understand graphical arguments
- Solving word problems (e.g., taking the words of a mixture, age, or work problem, translating them into a system of equations, and solving the system of equations)
- Basic calculus – the derivative and its application to finding slope and optima of (univariate) functions

**Statistics**

- Elementary rules of probability (including probabilities of compound events, joint probabilities and conditional probabilities)
- Discrete probability distributions (including the binomial)
- Continuous probability distributions (including the normal)
- A probability distribution's mean, variance, and standard deviation
- Techniques of data summarization (including mean, median, and mode; variance, standard deviation, mean absolute deviation, and range; histogram, pie chart, box plot, and Ogive; frequency, relative frequency, cumulative frequency, and relative cumulative frequency; empirical rule and Chebychev's inequality)
- Statistical estimation (including the Central Limit Theorem, t-distribution, confidence intervals for a population's mean, and hypothesis testing for a population's mean)
- Simple and multiple regression (including covariance and correlation; R-squared, F, and t-statistics; multicollinearity and serial correlation issues; confidence intervals in prediction)

## **REFERENCE GUIDES FOR STUDY**

The following is not a complete list of relevant texts. Any text having similar coverage should be helpful in your preparation for the waiver exams, but the texts below are typically management-oriented math and statistics texts.

### **Math texts:**

R. A. Barnett, M. R. Ziegler, Applied Mathematics for Business, Economics, Life Sciences, and Social Sciences (Dellan & Macmillan Publishers)

R. J. HarshBarger, J. J. Reynolds, Mathematical Applications for the Management, Life, and Social Sciences (D.C. Heath Publishers)

E. F. Haeussler, R. S. Paul, Introductory Mathematical Analysis for Business, Economics, and the Life and Social Sciences (Prentice Hall Publishers)

### **Statistics texts:**

D. Anderson, D. Sweeney, T. Williams, Statistics for Business and Economics (South-Western Publishers)

K. Black, Business Statistics: Contemporary Decision Making (South-Western Publishers)

M. Hamburg, P. Young, Statistical Analysis for Decision Making (Dryden Press)

L. Kazmier, Business Statistics (McGraw-Hill, Schaum Series Outline)

D. Levine, M. Berenson, D. Stephan, Statistics for Managers Using Microsoft Excel (Prentice-Hall Publishers)

E. Mansfield, Statistics for Business and Economics (Norton Publishers)

W. Mendenhall, J. Reinmuth, R. Beaver, D. Duhan, Statistics for Management and Economics (Duxbury Press)

E. Minieka, Z. Kurzeja, Statistics for Business with Computer Applications (South-Western Publishers)



## t DISTRIBUTION

Column Headings : Area in Upper Tail:  $P(T \geq t)$

| d.f.     | 0.200     | 0.100    | 0.050    | 0.025    | 0.010    | 0.005    |
|----------|-----------|----------|----------|----------|----------|----------|
| 1        | 1.3763819 | 3.077684 | 6.313752 | 12.7062  | 31.82052 | 63.65674 |
| 2        | 1.0606602 | 1.885618 | 2.919986 | 4.302653 | 6.964557 | 9.924843 |
| 3        | 0.9784723 | 1.637744 | 2.353363 | 3.182446 | 4.540703 | 5.840909 |
| 4        | 0.9409646 | 1.533206 | 2.131847 | 2.776445 | 3.746947 | 4.604095 |
| 5        | 0.9195438 | 1.475884 | 2.015048 | 2.570582 | 3.36493  | 4.032143 |
| 6        | 0.9057033 | 1.439756 | 1.94318  | 2.446912 | 3.142668 | 3.707428 |
| 7        | 0.8960296 | 1.414924 | 1.894579 | 2.364624 | 2.997952 | 3.499483 |
| 8        | 0.8888895 | 1.396815 | 1.859548 | 2.306004 | 2.896459 | 3.355387 |
| 9        | 0.8834039 | 1.383029 | 1.833113 | 2.262157 | 2.821438 | 3.249836 |
| 10       | 0.8790578 | 1.372184 | 1.812461 | 2.228139 | 2.763769 | 3.169273 |
| 11       | 0.87553   | 1.36343  | 1.795885 | 2.200985 | 2.718079 | 3.105807 |
| 12       | 0.8726093 | 1.356217 | 1.782288 | 2.178813 | 2.680998 | 3.05454  |
| 13       | 0.8701515 | 1.350171 | 1.770933 | 2.160369 | 2.650309 | 3.012276 |
| 14       | 0.8680548 | 1.34503  | 1.76131  | 2.144787 | 2.624494 | 2.976843 |
| 15       | 0.866245  | 1.340606 | 1.75305  | 2.13145  | 2.60248  | 2.946713 |
| 16       | 0.864667  | 1.336757 | 1.745884 | 2.119905 | 2.583487 | 2.920782 |
| 17       | 0.863279  | 1.333379 | 1.739607 | 2.109816 | 2.566934 | 2.898231 |
| 18       | 0.8620487 | 1.330391 | 1.734064 | 2.100922 | 2.55238  | 2.87844  |
| 19       | 0.8609506 | 1.327728 | 1.729133 | 2.093024 | 2.539483 | 2.860935 |
| 20       | 0.8599644 | 1.325341 | 1.724718 | 2.085963 | 2.527977 | 2.84534  |
| 21       | 0.859074  | 1.323188 | 1.720743 | 2.079614 | 2.517648 | 2.83136  |
| 22       | 0.8582661 | 1.321237 | 1.717144 | 2.073873 | 2.508325 | 2.818756 |
| 23       | 0.8575296 | 1.31946  | 1.713872 | 2.068658 | 2.499867 | 2.807336 |
| 24       | 0.8568555 | 1.317836 | 1.710882 | 2.063899 | 2.492159 | 2.796939 |
| 25       | 0.8562362 | 1.316345 | 1.708141 | 2.059539 | 2.485107 | 2.787436 |
| 26       | 0.8556652 | 1.314972 | 1.705618 | 2.055529 | 2.47863  | 2.778715 |
| 27       | 0.8551372 | 1.313703 | 1.703288 | 2.05183  | 2.47266  | 2.770683 |
| 28       | 0.8546475 | 1.312527 | 1.701131 | 2.048407 | 2.46714  | 2.763262 |
| 29       | 0.854192  | 1.311434 | 1.699127 | 2.04523  | 2.462021 | 2.756386 |
| 30       | 0.8537673 | 1.310415 | 1.697261 | 2.042272 | 2.457262 | 2.749996 |
| 35       | 0.8520119 | 1.306212 | 1.689572 | 2.030108 | 2.437723 | 2.723806 |
| 40       | 0.8506998 | 1.303077 | 1.683851 | 2.021075 | 2.423257 | 2.704459 |
| 45       | 0.8496819 | 1.300649 | 1.679427 | 2.014103 | 2.412116 | 2.689585 |
| 50       | 0.8488692 | 1.298714 | 1.675905 | 2.008559 | 2.403272 | 2.677793 |
| 100      | 0.8452304 | 1.290075 | 1.660234 | 1.983971 | 2.364217 | 2.625891 |
| 1000     | 0.8419808 | 1.282399 | 1.646379 | 1.962339 | 2.330083 | 2.580755 |
| Infinity | 0.8416212 | 1.281552 | 1.644854 | 1.959964 | 2.326348 | 2.575829 |

# F Distribution

$\alpha = 0.05$

Table of  $F_{.05}$

| $d.f.d.$ → | $d.f.n.$ → | 1        | 2        | 3        | 4         | 5        | 6        | 7        | 8        | 9        |
|------------|------------|----------|----------|----------|-----------|----------|----------|----------|----------|----------|
| 1          |            | 161.4476 | 199.5    | 215.7073 | 224.58324 | 230.1619 | 233.986  | 236.7684 | 238.8827 | 240.5433 |
| 2          |            | 18.51282 | 19       | 19.16429 | 19.246794 | 19.29641 | 19.32953 | 19.35322 | 19.37099 | 19.38483 |
| 3          |            | 10.12796 | 9.552094 | 9.276628 | 9.1171823 | 9.013455 | 8.940645 | 8.886743 | 8.845238 | 8.8123   |
| 4          |            | 7.708647 | 6.944272 | 6.591382 | 6.3882329 | 6.256057 | 6.163132 | 6.094211 | 6.041044 | 5.998779 |
| 5          |            | 6.607891 | 5.786135 | 5.409451 | 5.1921678 | 5.050329 | 4.950288 | 4.875872 | 4.81832  | 4.772466 |
| 6          |            | 5.987378 | 5.143253 | 4.757063 | 4.533677  | 4.387374 | 4.283866 | 4.206658 | 4.146804 | 4.099016 |
| 7          |            | 5.591448 | 4.737414 | 4.346831 | 4.1203117 | 3.971523 | 3.865969 | 3.787044 | 3.725725 | 3.676675 |
| 8          |            | 5.317655 | 4.45897  | 4.066181 | 3.8378534 | 3.687499 | 3.58058  | 3.500464 | 3.438101 | 3.38813  |
| 9          |            | 5.117355 | 4.256495 | 3.862548 | 3.6330885 | 3.481659 | 3.373754 | 3.292746 | 3.229583 | 3.178893 |
| 10         |            | 4.964603 | 4.102821 | 3.708265 | 3.4780497 | 3.325835 | 3.217175 | 3.135465 | 3.071658 | 3.020383 |
| 11         |            | 4.844336 | 3.982298 | 3.587434 | 3.35669   | 3.203874 | 3.094613 | 3.01233  | 2.94799  | 2.896223 |
| 12         |            | 4.747225 | 3.885294 | 3.490295 | 3.2591667 | 3.105875 | 2.99612  | 2.913358 | 2.848565 | 2.796375 |
| 13         |            | 4.667193 | 3.805565 | 3.410534 | 3.1791171 | 3.025438 | 2.915269 | 2.832098 | 2.766913 | 2.714356 |
| 14         |            | 4.60011  | 3.738892 | 3.343889 | 3.1122498 | 2.958249 | 2.847726 | 2.764199 | 2.698672 | 2.645791 |
| 15         |            | 4.543077 | 3.68232  | 3.287382 | 3.0555683 | 2.901295 | 2.790465 | 2.706627 | 2.640797 | 2.587626 |
| 16         |            | 4.493998 | 3.633723 | 3.238872 | 3.0069173 | 2.852409 | 2.741311 | 2.657197 | 2.591096 | 2.537667 |
| 17         |            | 4.451322 | 3.591531 | 3.196777 | 2.9647081 | 2.809996 | 2.69866  | 2.614299 | 2.547955 | 2.494291 |
| 18         |            | 4.413873 | 3.554557 | 3.159908 | 2.9277442 | 2.772853 | 2.661305 | 2.576722 | 2.510158 | 2.456281 |
| 19         |            | 4.38075  | 3.521893 | 3.12735  | 2.8951073 | 2.740058 | 2.628318 | 2.543534 | 2.47677  | 2.422699 |
| 20         |            | 4.351243 | 3.492828 | 3.098391 | 2.8660814 | 2.71089  | 2.598978 | 2.514011 | 2.447064 | 2.392814 |
| 21         |            | 4.324794 | 3.4668   | 3.072467 | 2.8400998 | 2.684781 | 2.572712 | 2.487578 | 2.420462 | 2.366048 |
| 22         |            | 4.300949 | 3.443357 | 3.049125 | 2.8167083 | 2.661274 | 2.549061 | 2.463774 | 2.396503 | 2.341937 |
| 23         |            | 4.279344 | 3.422132 | 3.027998 | 2.7955387 | 2.639999 | 2.527655 | 2.442226 | 2.374812 | 2.320105 |
| 24         |            | 4.259677 | 3.402826 | 3.008787 | 2.7762893 | 2.620654 | 2.508189 | 2.422629 | 2.355081 | 2.300244 |
| 25         |            | 4.241699 | 3.38519  | 2.991241 | 2.7587105 | 2.602987 | 2.49041  | 2.404728 | 2.337057 | 2.282097 |
| 26         |            | 4.225201 | 3.369016 | 2.975154 | 2.7425941 | 2.58679  | 2.474109 | 2.388314 | 2.320527 | 2.265453 |
| 27         |            | 4.210008 | 3.354131 | 2.960351 | 2.7277653 | 2.571886 | 2.459108 | 2.373208 | 2.305313 | 2.250131 |
| 28         |            | 4.195972 | 3.340386 | 2.946685 | 2.7140758 | 2.558127 | 2.445259 | 2.35926  | 2.291264 | 2.235982 |
| 29         |            | 4.182964 | 3.327654 | 2.93403  | 2.7013993 | 2.545386 | 2.432434 | 2.346342 | 2.278251 | 2.222874 |
| 30         |            | 4.170877 | 3.31583  | 2.922277 | 2.6896276 | 2.533555 | 2.420523 | 2.334344 | 2.266163 | 2.210697 |
| 40         |            | 4.084746 | 3.231727 | 2.838745 | 2.6059749 | 2.449466 | 2.335852 | 2.249024 | 2.18017  | 2.124029 |
| 50         |            | 4.03431  | 3.18261  | 2.790008 | 2.5571792 | 2.400409 | 2.286436 | 2.199202 | 2.129923 | 2.073351 |
| 60         |            | 4.001191 | 3.150411 | 2.758078 | 2.5252151 | 2.36827  | 2.254053 | 2.166541 | 2.096968 | 2.040098 |
| 70         |            | 3.977779 | 3.127676 | 2.735541 | 2.5026565 | 2.345586 | 2.231192 | 2.143478 | 2.07369  | 2.016601 |
| 80         |            | 3.960352 | 3.110766 | 2.718785 | 2.4858849 | 2.328721 | 2.214193 | 2.126324 | 2.056373 | 1.999115 |
| 90         |            | 3.946876 | 3.097698 | 2.705838 | 2.472927  | 2.315689 | 2.201056 | 2.113067 | 2.042986 | 1.985595 |
| 100        |            | 3.936143 | 3.087296 | 2.695534 | 2.4626149 | 2.305318 | 2.190601 | 2.102513 | 2.032328 | 1.974829 |