Academic Preparation – list of free online resources

Where to begin: Please review each section and complete those areas with which you are not currently comfortable. Most tutorials include quizzes and practice tests, so completing these is a good way to quickly review if you are comfortable with the content.

Concepts that past students have indicated are critical have been highlighted in red. If you have only a small amount of time to devote to the academic prep, please focus on the highlighted sections first.

If you would like to track your learning progress you can sign up for a user account with Khan Academy, but this is not required.

Completion times: We have estimated the times to complete each section based on the length of videos and allocating time for the practice questions. It may take you a longer or shorter time than we have indicated, and after a few sections you will begin to get an idea of your speed compared to our estimates.

Disclaimer: These tutorials have not been vetted in-depth. They have been selected based on the concepts included and tutorial descriptions. Students are encouraged to explore the content and cover concepts with which they are unfamiliar. The aim is to ensure that you have foundational proficiency in these topics, but not all concepts may apply directly to course work.

All resources below are from Khan Academy, unless otherwise indicated.

Quantitative Methods

Reminder: each of you comes to the program with a different background - please review each section and complete those areas with which you are not currently comfortable.

Arithmetic
2 hours approximate study time. Relevant for Statistics, Operations, Finance, Economics.

The Basic Order of Operations (PEMDAS)
- Order of Operations (20 mins)

Fractions (approx. 1 hour 15 mins total)
- Introduction to Fractions (15 mins)
- Equivalent Fractions (40 mins)
- Simplifying Tricky Fractions (20 mins)

Averages
- Averages (9 mins)

Linear Equations & Functions – relevant for Economics
- Modeling with linear equations (10 mins)

Algebra
19 hours approximate study time. Relevant for Statistics, Operations, Finance, Economics.

Functions (approx. 1 hour 20 mins total) (Relevant for Economics)
- Maximum and minimum points (15 mins)
- Average rate of change (30 mins)
- Average rate of change word problems (35 mins)

Logarithms (approx. 45 mins total) (Relevant for Economics & Finance)
- Introduction to Logarithms (45 mins)

Introduction to algebra (approx. 3 hours 20 mins total) (Relevant for Statistics/Operations)
- Introduction to variables (25 mins)
- Substitution and evaluating expressions (15 mins)
- Evaluating expressions word problems (15 mins)
- Writing algebraic expressions introduction (23 mins)
- Dependent & independent variables (10 mins)
- Combining like terms (32 mins)
- Introduction to equivalent algebraic expressions (7 mins)
- Interpreting linear expressions (10 minss)
- Division by zero (15 mins)
- Practice test (25 mins)

One-variable linear equations (approx. 5 hours total) (Relevant for Statistics/Operations)

- Algebraic equations basics (23 mins)
- Why we do the same thing to both sides of an equation (15 mins)
- One-step addition & subtraction equations (25 mins)
- One-step multiplication & division equations (40 mins)
- Two-steps equations intro (20 mins)
- Two-step equation word problems (20 mins)
- Linear equations with variables on both sides (35 mins)
- Linear equations with parentheses (20 mins)
- Analyzing the number of solutions to linear equations (18 mins)
- Linear equations word problems (25 mins)
- Linear equations with unknown coefficients (10 mins)
- Practice test (25 mins)

One-variable linear inequalities (approx. 1 hour 10 mins total) (Relevant for Statistics/Operations) (only sections indicated below)
- Introduction to inequalities with variables (40 mins)
- One-step inequalities (20 mins)
- Quiz (10 mins)

Two-variable linear equations (approx. 6 hours 50 mins) (Relevant for Statistics/Operations/Economics)
- Two-variable linear equations intro (30 mins)
- x-intercepts and y-intercepts (40 mins)
- Slope (50 mins)
- Horizontal & vertical lines (20 mins)
- Intro to slope-intercept form (30 mins)
- Graphing slope-intercept equations (25 mins)
- Writing slope-intercept equations (50 mins)
- Point-slope form (30 mins)
- Standard form (35 mins)
- Summary: Forms of two-variable linear equations (35 mins)
- Practice test (30 mins)

Excel, Plagiarism & Citation

Reminder: each of you comes to the program with a different background - please review each section and complete those areas with which you are not currently comfortable.

Excel
1 hour to 4 hours approximate study time, depending on previous skill level. Relevant for Statistics, Operations, Finance.

You will use Excel frequently in various courses during your program – make sure you have the basic skills in advance.

- Excel training (delivered by Microsoft)
- Advanced Formulas & Functions (delivered by In Learning)
  - Intro (1 min)
  - Section 1: Formula & Function Tips & Shortcuts (50 mins)
  - Section 2: Formula & Function Tools (45 mins)
  - Section 3: IF and Related Functions (25 mins)
  - Section 4: Lookup and Reference Functions (only VLOOKUP) (25 mins)
  - Section 6: Statistical Functions (only MEDIAN, MODE, COUNT) (15 mins)
  - Section 7: Math Functions (only ROUND, ROUNDUP, ROUNDDOWN, RAND, RANDBETWEEN) (10 mins)
  - Section 11: Text Functions (only CONCATENATE)

Plagiarism & Citation
1 hour approximate study time. Critical skills for all of your courses - make sure you know how to cite your work, and understand what your responsibilities are with regards to academic integrity.

- Avoiding Plagiarism (UBC Commons resource)
- How to cite (UBC Library resource)
- Getting started with APA Citation style (UBC Library resource)

Finance & Capital Markets

1 hour 45 mins approximate study time. Relevant for Finance.

Reminder: each of you comes to the program with a different background - please review each section and complete those areas with which you are not currently comfortable.

Ratio, Proportion and Percent
- Introduction to Ratios (30 mins)
- Solving Percent Problems (10 mins)

Interest & Debt
- Compound interest basics (17 mins)
- Present value (45 mins)

Statistics

11 hours 40 mins approximate study time. Relevant for Statistics/Operations/Economics.

Reminder: each of you comes to the program with a different background – please review each section and complete those areas with which you are not currently comfortable.

Displaying & Describing Data (approx. 6 hours 50 mins total) (only sections indicated below)
- About (1 min)
- Statistics overview (20 mins)
- Categorical data displays (20 mins)
- Two-way tables for categorical data (35 mins)
- Histograms (15 mins)
- Line graphs – 6 mins
- Mean and median: The basics (45 mins)
- Range, Interquartile range (IQR) - just Range & IQR (no MAD) (15 mins)
  - Range and mid-range
  - Interquartile range (IQR)
  - Practice
  - Comparing range and interquartile range (IQR)
  - Interquartile range review
- Population variance and standard deviation (1 hour 15 mins)
- Sample variance and standard deviation (1 hour 45 mins)
- Practice test (30 mins)

Modelling Distributions of Data (approx. 2 hours 40 mins total)
- About – 1 min
- Describing location in a distribution (28 mins)
- Normal distributions (2 hours 10 mins)

Probability (approx. 1 hour 25 mins total) (only sections below)
- About – 1 min
- Basic theoretical probability – 50 mins
- Probability using sample spaces – 20 mins
- Quiz #1 – 15 mins

Probability Distributions
- Constructing a Probability Distribution – 7 mins

Sample Means (approx. 35 mins total) (only sections below)
- Central limit theorem – 10 mins
- Sampling distribution of the sample mean – 11 mins
- Sampling distribution of the sample mean 2 – 14 mins

Economics

10 hours approximate study time. Relevant for Economics.

We will take for granted knowledge of **basic algebraic manipulations**, including **simplifying single equations** for the value of a variable in terms of other parameters and **solving two-equation, two-variable problems**. We will also assume students are familiar with moving between **algebraic and graphical representations of functions** of two variables (most importantly, straight lines). **Differential calculus** will be used in some optimization problems, and students should be familiar with techniques of **differentiation for polynomials and exponential functions**, in particular. Parts of our course deal with situations of **uncertainty**, and for this reason it is helpful for students to be familiar with the basics of **probability theory**, and the concepts of **expected value** and **variance**, in particular.

Economics-specific concepts to know include the following: opportunity cost; marginal cost and marginal revenue; elasticity; demand curve; (industry) supply curve; Nash equilibrium

Introduction to Economics
- Intro to Economics: Crash Course Econ #1 (13 mins)

Average costs (ATC, MC) and marginal revenue (MR)
- Marginal cost and average total cost (7 mins)
- Marginal revenue and marginal cost (6 mins)
- Marginal revenue below average total cost (6 mins)

Derivative introduction (approx. 3 hours 45 mins total)
- Introduction to differential calculus (35 mins)
- Derivative as slope of tangent line (15 mins)
- Derivative as instantaneous rate of change (20 mins)
- Secant lines (45 mins)
- Derivative as a limit (25 mins)
- Formal definition of derivative (20 mins)
- Differentiability (27 mins)
- Derivative as a function (25 mins)
- Review: Derivative basics (15 mins)

Basic differentiation (approx. 2 hours 15 mins total)
- Basic differentiation rules (40 mins)
  - Power rule (23 mins)
  - Polynomial functions differentiation (45 mins)
- Review: Basic differentiation (30 mins)

Product, quotient & chain rules (approx. 1 hour 35 mins total)
- Product rule (45 mins)
- Chain rule (50 mins)

Derivative applications (approx. 1 hour 40 mins total) (only section below)
- Optimization (1 hr 40 mins)

Game theory and Nash Equilibrium (approx. 17 mins total)
- Prisoner's dilemma and the Nash equilibrium (10 mins)
- More on Nash equilibrium (7 mins)