

# APMA 1650 Midterm 2 Checklist

Here is a checklist of topics to help you review for the second midterm. It is meant to serve as a guide to help with studying for the exam.

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## Continuous and mixed random variables

1. Probability density function, cumulative distribution functions. Know the properties and how to relate them.
2. Expected value, LOTUS and variance. Properties and how to calculate.
3. Uniform distribution, exponential distribution, normal distribution, Gamma distribution.
4. What happens to a probability distribution of an RV when you apply a function to it?
5. Mixed RVs and generalized PDFs.

## Multivariate Distributions

1. Multivariate PMFs, PDFs, CDFs, how to compute probabilities and integrate over 2D regions in rectangular and polar coordinates.
2. Marginals, conditional PDFs and PMFs, independent random variables.
3. Law of total probability, discrete and continuous cases.
4. Conditional expectation and conditional variance. How to use them to compute unconditional variance and expectation. Law of iterated expectation and law of total variance.
5. Covariance and correlation. Relation to independence. Can two random variables have no correlation, but be dependent?
6. Calculating distributions for sums of independent random variables.

## Probability bounds

1. Markov and Chebyshev inequalities. How to estimate certain probabilities when you don't know the distribution.
2. Estimating probabilities of sums of independent random variables.