8.1 Distributions of Random Variables

To graph a histogram:

STAT and choose 1: Edit
Enter the values of $X$ in L1 and the probabilities in L2.
2nd STAT PLOT and choose 1:Plot1
Press Enter to select On.
For Type, choose the last icon on the first row, Xlist: L1 and Freq: L2.
Set your window. For example:
- $X_{\text{min}} = -0.5$ (include the entire first rectangle of width 1, centered at 0)
- $X_{\text{max}} = 5$
- $X_{\text{scl}} = 1$
- $Y_{\text{min}} = 0$
- $Y_{\text{max}} = 1$ (heights are probabilities so 1 is plenty)
- $Y_{\text{scl}} = 0.1$
Press Graph.
(Hint: You may turn the StatPlot on and off at the top of the Y = screen once you have it set up.)

8.2 Expected Value

8.3 Variance and Standard Deviation

To calculate the mean, median, and standard deviation for a single list of data:

STAT and choose 1: Edit
Enter the data in a list.
STAT then right arrow to CALC and choose 1: 1-Var Stats
2nd and choose the appropriate list (above 1, 2, 3, ...).
On your homescreen: 1-Var Stats L1
Press Enter.

To calculate the mean, median, and standard deviation when given the probabilities or frequencies:

STAT and choose 1: Edit
Put the data in L1 and either the probabilities or the frequencies in L2
STAT then right arrow to CALC and choose 1: 1-Var Stats
2nd and choose the appropriate lists (above 1, 2, 3, ...).
On your homescreen: 1-Var Stats L1, L2
Press Enter.

To calculate the variance:

Follow the appropriate steps above to calculate the 1-Var Stats.
VARS and choose 5: Statistics… and then 4: $\sigma X$ which represents standard deviation.
Press $x^2$
On your homescreen: $\sigma X^2$
Press Enter.
8.4 The Binomial Distribution

To calculate a single binomial probability:

2nd and DISTR
Choose 0: binompdf
   Usage: binompdf (number of trials, probability of success, number of successes)
   Complete the appropriate values.
   For example: binompdf(4, 0.2, 3) means the experiment consists of 4 trials with probability of success 0.2, and you want to find the probability of exactly 3 successes.
   Press Enter.

To calculate several binomial probabilities:

2nd and DISTR
Choose A: binomcdf
   Usage: binomcdf (number of trials, probability of success, number of successes)
   Complete the appropriate values.
   For example: binomcdf(4, 0.2, 3) means the experiment consists of 4 trials with probability of success 0.2, and you want to find the probability of 3 or fewer successes.
   Press Enter.

You may need either binompdf or binomcdf depending upon the situation.

- binompdf
  - The probability density function (pdf) that computes the probability of a single trial
  - binompdf(number of trials, probability of success, r number of successes) will give you the probability \( P(X = r) \).
  - binompdf(number of trials, probability of success) will give you a list of the probabilities for all possible values of \( r \). You will have to use the right arrow key to see the whole list, starting with \( r = 0 \).
  - binompdf(number of trials, probability of success) STO→L1 will give you all the probabilities starting with \( r = 0 \) and will store them in L1 for easier viewing.

- binomcdf
  - The cumulative density function, i.e. it sums the probabilities.
  - binomcdf(number of trials, probability of success, r number of successes) will give the sum of the probabilities from 0 to \( r \).
  - binomcdf(number of trials, probability of success) will give a list of the probability sums from 0 to \( r \) for all possible values of \( r \). You will have to use the right arrow key to see the whole list, starting with \( r = 0 \).
  - binomcdf (number of trials, probability of success) STO→L1 will give a list of the probability sums from 0 to \( r \) for all possible values of \( r \) and will store them in L1 for easier viewing.
8.5 The Normal Distribution

To calculate standard normal probabilities ($\mu = 0$, $\sigma = 1$):

2\textsuperscript{nd} and DISTR
Choose 2: normalcdf

Usage: normalcdf (minimum value, maximum value)

Complete the appropriate values.

For example: normalcdf(-1, 1) gives the value of $P(-1 < Z < 1)$.

Press Enter.

To calculate non-standard normal probabilities:

2\textsuperscript{nd} and DISTR
Choose 2: normalcdf

Usage: normalcdf (minimum value, maximum value, $\mu$, $\sigma$)

Complete the appropriate values.

For example: normalcdf(1, 3, 2, 0.5) gives the value of $P(1 < X < 3)$ for the normal variable $X$ with $\mu = 2$ and $\sigma = 0.5$.

Press Enter.

To calculate the value of $X$ given the probability:

2\textsuperscript{nd} and DISTR
Choose 3: invNorm

Usage: invNorm(probability, $\mu$, $\sigma$)

Complete the appropriate values.

For example: invNorm(0.3, 2, 0.5) gives the value $a$ of the normal variable $X$ with $\mu = 2$ and $\sigma = 0.5$ for which $P(X < a) = 0.3$.

Press Enter.