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# Yannique Hecht
# Harvardx: PH125.3 - (3) Data Science: Probability
# SECTION 4: THE BIG SHORT
# ASSESSMENTS


# # # ASSESSMENT 4.1: THE BIG SHORT - DATA CAMP

# # EXERCISE 1 - Bank earnings
# Assign the number of loans to the variable `n`
██████████

# Assign the loss per foreclosure to the variable
 `loss_per_foreclosure`
████████████████████████████████

# Assign the probability of default to the variable `p_default`
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# Use the `set.seed` function to make sure your answer matches the
 expected result after random sampling
███████████

# Generate a vector called `defaults` that contains the default
 outcomes of `n` loans
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# Generate `S`, the total amount of money lost across all
 foreclosures. Print the value to the console.
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# # EXERCISE 2 - Bank earnings Monte Carlo
# Assign the number of loans to the variable `n`
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# Assign the loss per foreclosure to the variable
 `loss_per_foreclosure`
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# Assign the probability of default to the variable `p_default`
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# Use the `set.seed` function to make sure your answer matches the
 expected result after random sampling
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# The variable `B` specifies the number of times we want the
 simulation to run
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# Generate a list of summed losses 'S'. Replicate the code from the
 previous exercise over 'B' iterations to generate a list of summed
 losses for 'n' loans. Ignore any warnings for now.
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# Plot a histogram of 'S'. Ignore any warnings for now.
hist(S)

# # EXERCISE 3 - Bank earnings expected value
# Assign the number of loans to the variable `n`
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# Assign the loss per foreclosure to the variable
 `loss_per_foreclosure`
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# Assign the probability of default to the variable `p_default`
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# Calculate the expected loss due to default out of 10,000 loans
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# # EXERCISE 4 - Bank earnings standard error
# Assign the number of loans to the variable `n`
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# Assign the loss per foreclosure to the variable
 `loss_per_foreclosure`
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# Assign the probability of default to the variable `p_default`
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# Compute the standard error of the sum of 10,000 loans
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# # EXERCISE 5 - Bank earnings interest rate - 1
# Assign the loss per foreclosure to the variable
 `loss_per_foreclosure`
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# Assign the probability of default to the variable `p_default`
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# Assign a variable `x` as the total amount necessary to have an
 expected outcome of $0
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# # EXERCISE 6 - Bank earnings interest rate - 2
# Assign the number of loans to the variable `n`
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# Assign the loss per foreclosure to the variable
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# Assign the probability of default to the variable `p_default`
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# Generate a variable `z` using the `qnorm` function
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# Generate a variable `x` using `z`, `p_default`,
 `loss_per_foreclosure`, and `n`
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# Convert `x` to an interest rate, given that the loan amount is
 $180,000. Print this value to the console.
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# # EXERCISE 7 - Bank earnings - minimize money loss



# # # ASSESSMENT 4.2: THE BIG SHORT - Questions 1 and 2: Insurance
 rates, part 1

# Run the code below to set up your environment and load the
 libraries you will need for the following exercises:
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# examine the data from dslabs:
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# # Q1a
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# # Q1b
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Q1c

Q1d

Q1e

Q1f

Q2a

Q2b

Q2c

Q2d

ASSESSMENT 4.2: THE BIG SHORT - Questions 3 and 4: insurance rates, part 2

Q3a

Q3b

Q3c

Q3d

Q3e

                    # loss per claim
              # premium - profit when no claim

Q3f

Q4a

Q4b

ASSESSMENT 4.2: THE BIG SHORT - Questions 3 and 4: insurance rates, part 2

Q5b

Q5c

Q5d

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Q6a
n, p, l and x as defined in the problem information
████████████   # in R 3.6, set.seed(29, sample.kind="Rounding")

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Q6b
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Q6c
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