In-Class Exercise:

Mortgage Processing During a Pandemic[1]

During the COVID-19 pandemic, banks saw an increase in mortgage applications from individuals and families looking to purchase larger homes to accommodate the new realities of working from home. One local bank in New Haven (Evans Bank) in particular, saw many applications from New Yorkers looking to purchase homes in Connecticut. Due to this increased volume and the standardized nature of their mortgage review process, they have decided to hire a group of MBA students to help with these virtually via Zoom. To determine which group of students to hire, the bank has created a virtual mortgage processing challenge upon which you are all about to embark.

You will be randomized into teams of 5 students using breakout rooms on Zoom. To begin, your team will be given 10 minutes to discuss how you will set up your mortgage review process, adhering to the approval and identity verification steps shown below. Then, your team will be given exactly 15 minutes to work on a fresh stack of 50 mortgage applications.

Underwriting Standards

Mortgage processing at Evans Bank follows a very structured process. The bank has decided to accept mortgage applications if and only if:

- **The loan-to-value ratio (LTV) is less than 85% or**
- **The loan-to-value ratio (LTV) is between 85% and 100% and the front ratio is less than 25% and the back ratio is less than 35%**
  (The formulas for these ratios are described below in Section 1.)

In addition to calculating this financial eligibility criteria, the mortgage processing division has to perform some simple identity verification task, which is explained in Section 2 below.

SECTION 1 - Financial Eligibility: Definitions and Example

The three previously used mortgage processing terms are defined as follows:

LTV Ratio = Loan Amount / Minimum {Purchase price and Appraisal Value}

The Loan Amount is not directly given in the interview notes but can easily be calculated by looking at the purchase price (you find the purchase price in the second line of the interview note "…in purchasing a house valued \$x ") and the percentage of the down payment.

> For example, in the case of interview note #1 (Exhibit 1), the loan amount is
> Loan Amount = \$207,000 * (100% - 13%) = \$180,090
>
> Since the purchasing price is \$207,000 and the appraisal value is \$178,236, you find the LTV as:
> LTV   = \$180,090 / Minimum {\$207,000 and \$178,236}
>   = \$180,090 / \$178,236 = 1.010

Next, the front ratio is defined as:

Front Ratio = Yearly mortgage payment / (yearly income + additional income)

> For example, in the case of interview note #1, this ratio is
> Front = \$13,493 / (\$34,755 + \$10,339) = 0.299

The back ratio also considers other payment obligations of the buyer and is computed as follows:

Back Ratio = (Debt payment + property taxes + yearly mortgage payment) /
(yearly income + additional income)

> For interview note #1, this ratio computes as:
> Back   = (\$1,546 + \$2,467 + \$13,493) / (\$34,755 + \$10,339)
>   = 0.388

Based on the three ratios
       LTV   = 1.010
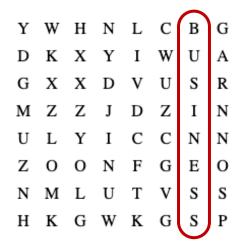   Front = 0.299
       Back   = 0.388
this mortgage application should *NOT* be approved (see criteria on previous page).

SECTION 2 - Verification of Personal Identity

In addition to considering the three ratios discussed on the previous page, the underwriting process also needs to confirm the correctness of all information provided by the applicant as well as verify the personal identity of the applicant. To do this, you will need to complete either a word search puzzle or a sudoku puzzle. These appear on each mortgage application, and the output from this will be a single number.

Word Search Instructions

How many words from "BUSINESS, FUTURE, HOME, MONEY, LOAN" do you find below?

```
Y  W  H  N  L  C  B  G
D  K  X  Y  I  W  U  A
G  X  X  D  V  U  S  R
M  Z  Z  J  D  Z  I  N
U  L  Y  I  C  C  N  N
Z  O  O  N  F  G  E  O
N  M  L  U  T  V  S  S
H  K  G  W  K  G  S  P
```

In this word search, only "BUSINESS" can be found (out of the 5 words).

So, the answer to this puzzle is:

1.

Sudoku Instructions

Solve the sudoku puzzle – which number should go in the red circle? (4x4 puzzles only use numbers 1 to 4, 6x6 use 1 to 6, 9x9 use 1 to 9)

4	3	1	2
1	2	4	3
3	1	2	4
2	4	3	1

In Sudoku, each number can only appear once in each bold-outlined box, each full row and each full column. Filling in the numbers, we can find that the answer to this puzzle (the number that should go into the box with the red circle), is:

1.

SECTION 3 - Output of the Process

The correct outcome of the mortgage processing of interview note #1 and the puzzles above is thus:

"REJECT, 1"

Each mortgage must produce BOTH components. You must get the accept/reject decision AND the puzzle solution correct in order to have processed the mortgage correctly. Every other outcome of the process is deemed a defect.

Your Task

Preparation
Your group will be given 10 minutes to organize your work. There are many different ways in which you can organize yourselves. For example, you could divide up the applications and then have each student process an application from beginning to end. Or, you could have one student compute the loan amount, one student compute the LTV, one student compute the front ratio, one student compute the back ratio, and one student do the verification task. This is fully under the discretion of the team.

As part of the preparation, you will also have to set up a way to communicate with each other. Please set up a Google Spreadsheet that all of you can access. An outline of a sample sheet is shown in Exhibit 2. During the processing, each team member can then update information in the google doc. **Assign one student as the senior underwriter. This student is in charge for collecting all data and communicating information to the rest of the class.**

Processing
All groups will be given 15 minutes during which they try to process as many mortgages as they can handle using the process that they previously designed. If the team members choose to do so, they can stay in contact via chat, video call, or any other media. **Groups should work independently from each other.**

Discussion
After the processing phase, we will have a quick discussion of the following questions:
- How many applications did the various groups process?
- In what ways did groups organize their work?

During that discussion time, the senior underwriter compiles the information needed for the audit phase (see below).

Audit

At the end of the exercise, the senior underwriter is evaluating the performance of the team by determining two metrics:

1. the total number of applications that were processed (regardless of accuracy)
2. the percentage of applications that were processed correctly, i.e. consistent with the solution that will be shared with all students at the end of the exercise during class.

#1 Interview Notes

These notes reflect the initial discussion between the mortgage broker and the mortgage applicant. The mortgage applicant is interested in purchasing a house valued at $207,000. The down payment will be 13%. The house is in reasonably good condition. Its appraisal value is $178,236. Based on the current rates that our company offers in that market segment, the yearly mortgage payments would be $13,493.

The mortgage applicant has a yearly income of $34,755 according to last year's tax document. In addition, the household also has additional income of $10,339 either through the work of other members of the household or through financial investments.

The credit history of the mortgage applicant is good. Other yearly debt expenses going forward are estimated to be $1,546. Estimated school and property taxes related to the property are $2,467.

Exhibit 1: Example of the interview component of the mortgage note. Each mortgage interview note will be coupled with either a word search puzzle or a sudoku puzzle for identity verification.

Mortgage #	Loan Amt	LTV	Front	Back	Accept?	Puzzle Result
1	180090	1.01	0.299	0.388	NO	1
2						
3						
4						
5						
6						
...						

Exhibit 2: Example of a Google Sheet set-up that might be helpful for your team. You are welcome to do what you think is best!