```
        ┌─────────────┐
        │    Start    │
        └─────────────┘
               │
               ▼
        ╱───────────────╲
        │  Prepare data  │
        │ and Scanner in │
        │  Global scope  │
        ╲───────────────╱
               │
               ▼
    ┌───────────────────────────┐
    │                           │
    │ credential[0][0] = "admin"│
    │ credential[0][0] = "admin"│
    │                           │
    └───────────────────────────┘
               │
               ▼
    ┌─┬───────────────────┬─┐
    │ │                   │ │
    │ │   loginMenu()     │ │
    │ │                   │ │
    └─┴───────────────────┴─┘
               │
               ▼
        ┌─────────────┐
        │     End     │
        └─────────────┘
```

```
usernameCheck()
```

True

prompt error

False

userInput → String[] strings : credential

True

strings[0] is null

True → continue

False → strings[0] is (userInput)

True → return userInput

False → userInput is "register"

True → return userInput

False → userInput is "quit"

True → return userInput

```
                        ┌─────────────────────┐
                        │   passwordCheck()   │
                        └──────────┬──────────┘
                                   │
                                   ▼
                        ┌─────────────────────┐
                        │        limit        │
                        └──────────┬──────────┘
                                   │
                                   ▼
                              ◇ limit < 3 ◇
         False  ←───────────────            ────────────────◄─── limit++ ───◄───────────────┐
   ┌──────────────┐                                                                          │
   │ return false │                    │ True                                                │
   └──────────────┘                    ▼                                                     │
                              ┌─────────────────┐         ┌──────────┐      ┌──────────────┐ │
                              │    userInput    │         │ warning  │      │ last attempt │ │
                              └────────┬────────┘         └────┬─────┘      │   warning    │ │
                                       │                       │ True       └──────┬───────┘ │
                                       ▼                       │ True              │ True    │
                              ◇ String[] strings :     False   ◇ limit < 1  False  ◇ limit == 1  False
                                credential ◇ ───────────►          ──────────►              ─────────┘
                                       │ True
                                       ▼
                              ◇ strings[0] is    True   ◇ strings[1] is   True   ┌─────────────┐
                                username ◇ ──────────►    userInput ◇ ─────────► │ return true │
                                                                                 └─────────────┘
                                  False                     False
```

```
attemptLogin()
        │
        ▼
┌─────────────────────┐
│ username =          │
│ usernameCheck()     │
└─────────────────────┘
        │
        ▼
     ◇ username is not ────False────▶ ( return true )
       "register" or "quit"
        │
        ▼
┌─────────────────────┐
│ boolean password =  │          ┌──────────────┐
│ passwordCheck()     │          │  mainMenu()  │
└─────────────────────┘          └──────────────┘
        │                              ▲
        ▼                              │ False
     ◇ password ──True──▶ ◇ profile ──True──▶ ┌──────────────┐
        │                  [getUserID()] [0]   │ setProfile() │
        │ False            == null             └──────────────┘
        ▼
     ◇ attemptLogin() ──False──▶ ( return false )
        │                              ▲
        │ True                         │ False
        ▼                              │
     ◇ username is ──False──▶ ◇ username is ──True──▶ ┌────────────┐
       "register"              "quit"                  │ quitMenu() │
        │                                              └────────────┘
        │ True
        ▼
┌────────────────┐
│ registerMenu() │
└────────────────┘
```

```
printHeading(prompt)
```

Heading, bar
side = "||"

prompt.length() is
divisable by 2

True

heading = 64
bar = "=" 64 in length

False

heading = 65
bar = "=" 65 in length

gap = ((heading -
(side.length() * 2) -
prompt.length()) / 2)

title = String.format("%s%" + gap +
"s%s%" + gap + "s%s\n", side, " ",
prompt, " ", side)

```
newStringArray(String[][]
data)
```

```
String[][] old = data;
data = new
String[old.length + 1]
[old[0].length]
```

```
row = 0
```

```
End
```

```
row < old.length
```

False

True

```
col = 0
```

```
col++
```

```
col < old[row].length
```

False

```
row++
```

True

```
data[row][col] =
old[row][col]
```

```
newDoubleArray(double[][]
         data)
```

```
double[][] old = data;
    data = new
double[data.length + 1]
    [data[0].length]
```

```
row = 0
```

```
End
```

```
row < old.length
```

False

True

```
col = 0
```

```
col < old[row].length
```

```
col++
```

```
row++
```

False

True

```
data[row][col] =
    old[row][col]
```

```
newString(String[]
data)
```

```
String[] old = data;
data = new
String[data.length + 1]
```

```
i = 0
```

```
i < old.length
```

False

End

True

```
data[i] = old[i]
i++
```

```
powerDouble(double base,
int exponent)
```

```
exponent == 0
```

False

```
return 1
```

True

```
return base *
powerDouble(base,
exponent - 1)
```

```
        ┌─────────────┐
        │  confirm()  │
        └──────┬──────┘
               │
               ▼
          ◇ True ◇ ◄──────────────────┐
               │                        │
               ▼                        │
        ╱ userInput ╱                   │
               │                        │
               ▼                        │
    ◇ username is "y" ◇ ──True──► ( return true )
               │                        │
             False                      │
               ▼                        │
    ◇ username is "n" ◇ ──True──► ( return false )
               │                        │
             False                      │
               ▼                        │
        ╱ prompt error ╱ ───────────────┘
```

```
        ( getUserID() )
             |
             v
        /          \
       <    i = 0    >
        \          /
             |
             v
          /     \
         /       \       False
        < credential[i][0] is not >--------->  ( return i )
        <      username      >                      ^
         \       /                                  |
          \     /                                   |
             |                                      |
           True                                     |
             |                                      |
    +------->|                                      |
    |        v                                      |
    |   +---------+                                 |
    |   |  i++    |                                 |
    |   +---------+                                 |
    |        |                                      |
    |        v                                      |
    |      /     \                                  |
    |     /       \                                 |
    | True<  credential[i][0] is not  > False ------+
    +----<         username          >
          \       /
           \     /
```

```
insertMortgageDetail(String s)
```

s

creditMortgageDetail[getUserID()] += s + "\n"

End

```
                    validatePhoneNumber(String
                            numbers)
                               |
                               v
   length =                length is less than 11 or        True        return false
numbers.length()     -->    bigger than 13            -->

                                    |
                                  False
                                    |
                                    v
return true                      i = 0

         False
           ^
           |
        i < length            <--              i = 0

           |
         True
           |
           v
current = the integer form of String        i is 0 and         True      return false
   form of numbers.charAt(i)          -->    current is not 0   -->

                                                  |
                                                False
                                                  |
                                                  v
                    False                      i is 1 and        True     return false
         i++              <--                  current is not 8  -->
```

```
validateIDCardNumber(String
numbers)
```

length =
numbers.length()

length != 16 —— True —→ return false

False

i = 0

i < length —— False —→ return true

i < length —— True

switch
numbers.charAt(i) —→ case
number —— False —→ return false

case number —— True —→ i++

i++ —→ i < length

```
debtReadjustment(double installmentMin, double
inverseReturnOfPoweredInterest, double interestInMonth,
int downPayment, int downPaymentPercentage)
```

```
boolean repeat = true;
double creditLimit;
double debtMax;
int debt;
int[] out = new int[2];
```

```
creditLimit = installmentMin *
(inverseReturnOfPoweredInterest / interestInMonth);
debtMax = creditLimit + downPayment;
```

debt

debt > debtMax — True → prompt invalid

False

repeat = false

repeat — True / False

downPayment is less than the minimum down payment — False →
```
out[0] = debt;
out[1] = downPayment;
```

True

prompt the minimum down payment → repeat = true

downPayment

downPayment is less than the minimum down payment — True → prompt invalid

False

repeat = false

repeat — True / False

```
out = debtReadjustment(installmentMin,
inverseReturnOfPoweredInterest,
interestInMonth,
downPayment,downPaymentPercentage)
```

True

downPayment is more than the minimum down payment — False / True

```
          ┌─────────────┐
         (  loginMenu()  )
          └──────┬──────┘
                 │
                 ▼
        ╱──────────────╲
       │  prompt login  │
       │    heading     │
       │ and login guide │
        ╲──────────────╱
                 │
                 ▼
          ◇ attemptLogin() ◇ ──True──▶ ◇ username is "register" ◇ ──True──▶ ║ registerMenu() ║
                 │                              │
               False                          False
                 │                              ▼
                 ▼                    ◇ username is "quit" ◇
               ( End ) ◀──False───────────────┤
                                               │
                                             True
                                               ▼
                                         ║ quitMenu() ║
```

loginMenu()

prompt login heading and login guide

attemptLogin()

True

username is "register"

True

registerMenu()

False

False

username is "quit"

False

End

True

quitMenu()

```
registerMenu()  →  prompt register
                    heading
                         │
                         ▼
                    newStringArray(credential);
                    newStringArray(profile);
                    newDoubleArray(creditMortgage);
                    newString(creditMortgageDetail);
                         │
                         ▼
creditMortgageDetail
[creditMortgageDetail.length - 1]
        = "";

        credential
[credential.length - 1][0] =
    promptedTextInput(
"Enter your username: ");
        credential

[credential.length - 1][1] =
    promptedTextInput(
"Enter your password: ");
        │
        ▼
loginMenu()  →  End
```

```
setProfile() → id = getUserID()
               i = true
```

```
name
```

```
phoneNumber
```

```
validatePhoneNumber
(phoneNumber) ──False──→ prompt invalid
```

```
(True)
i = false
```

```
i ──True── 
  └──False──→ prompt format
              guide
```

```
i = false
```

```
phoneNumber
```

```
phoneNumber
```

```
validatePhoneNumber
(phoneNumber) ──False──→ prompt invalid
```

```
(True)
i = false
```

```
i ──True──
  └──False──→ salary
```

```
confirm() ──False──→ setProfile() → End
  └──True──→
```

```
profile[id][0] = name
profile[id][1] = phoneNumber
profile[id][2] = IDCardNumber
profile[id][3] = salary
```

```
profile[id][0]
profile[id][1]
profile[id][2]
profile[id][3]
→ End
```

```
              mainMenu()  ──────▶  prompt          ──────▶  menu
                                   menu heading
                                   and menu
                                                              │
                                                              ▼
                                                         switch (menu)

                                                              │
                                                              ▼
  False          False              False
  ┌──── case ◀──────── case ◀──────── case
  │     "3"             "2"            "1"
  │      │               │             │
  │    True            True          True
  │      ▼               ▼             ▼
  │  accountInfo     loanMenu()    creditCard
  │   Menu()                        Menu()
  │
  │
  │
  │
  └──▶ case ──────▶ case ──────▶ End
       "4"   False  "5"   False
        │             │
      True          True
        ▼             ▼
    loginMenu()   quitMenu()
```

```
creditCardMenu() → prompt menu heading and menu → menu
                                                    ↓
                                              switch (menu)
                                                    ↓
                                                case "1"
   False ←  case "3"  ← False ←  case "2"  ← False ← case "1"
      ↓        ↓ True              ↓ True              ↓ True
     End    account            loanMenu()         creditCard
            InfoMenu()                             Menu()
```

creditCardMenu()

prompt menu heading and menu

menu

switch (menu)

case "1"

case "2"

case "3"

False

False

False

True

True

True

account InfoMenu()

loanMenu()

creditCard Menu()

End

```
newCreditCard()  →  prompt menu heading and menu  →  menu
                                                        │
                                                        ▼
                                                  switch (menu)
                                                        │
                                                        ▼
False ← case "3" ← False ← case "2" ← False ← case "1"
  │         │                  │                  │
  │       True               True               True
  │         ▼                  ▼                  ▼
  │   lifestyle          travel             general
  │   CreditCard         CreditCard         Purpose
  │   Application()      Application()       CreditCard
  │                                          Application()
  │
  ▼
case "4"  → False →  case "5"  → False →  End
  │                     │
True                  True
  ▼                     ▼
priority            creditCardMenu()
CreditCard
Application()
```

```
loanMenu()  →  prompt
               menu heading  →  menu  →  switch (menu)
               and menu

                                                    │
                                                    ▼

         newLoanMenu()  ◄──True──  case
                                   "1"

                                    │ False
                                    ▼

      accountLoanInfo()  ◄──True──  case
                                    "2"

                                     │ False
                                     ▼

          mainMenu()  ◄──True──  case
                                 "3"

                                  │ False
                                  ▼

                                 End
```

```
newLoanMenu()  →  prompt menu heading and menu  →  menu
                                                     │
                                                     ▼
                                              switch (menu)
                                                     │
                                                     ▼
```

```
                 False          False          case
case "3"  ←────  case "2"  ←────  "1"
   │                │              │
   │ False          │ True         │ True
   ▼                ▼              ▼
                  ┌─────────┐    ┌─────────┐    ┌─────────┐
                  │ mortgage│    │  auto   │    │ personal│
                  │  Loan   │    │  Loan   │    │  Loan   │
                  │Application()│ │Application()│ │Application()│
                  └─────────┘    └─────────┘    └─────────┘
```

```
         False            False
case  ────────→  case  ────────→  End
 "4"              "5"
  │ True           │ True
  ▼                ▼
┌─────────┐      ┌─────────┐
│refinancing│    │loanMenu()│
│  Loan    │     │          │
│Application()│  └─────────┘
└─────────┘
```

```
mortgageLoan
Application()  ──▶  preparing variables
                           │
                           ▼
                   prompt menu
                   and select menu
                           │
                           ▼
         True          ◇ buying house? ◇
  prompt menu  ◀────────
  and select menu                     False
        │                              │
        ▼                              │
    input                             │
  buildingArea  ───────────────────────▶
                                   creditFacilities
                                        │
                                        ▼
                         ◇ creditFacilities < 1 ◇
                     True                    False
```

```
                                creditLimit calculation
                                        │
tenor ◀── True ── ◇ tenor < 1 || tenor > 20 ◇ ── False
                                        │
                                        ▼
                                      debt
                                        │
                                        ▼
                              ◇ debt > debtMax ◇
                        True                    False
```

```
End  ◀──  ‖ newLoanMenu() ‖
                   ▲
                 False
                   │
creditMortgage[id][0]
   = debt
creditMortgage[id][1]
   = tenor          True
creditMortgage[id][2] ◀──── ◇ confirm() ◇ ◀── print content ◀── content padding
   = downPayment                                                    adjustment
creditMortgage[id][3]                                                  ▲
   = installment                                                       │
                                                            print heading
                                                            part of the table
                                                                       ▲
                                                                       │
                                                            preparing table
                                                               variables
                                                                       ▲
                                                                 True  │
                                                      debt and downPayment
                                                       output from
                                                       debtReadjustment
```

```
downPayment
     │
     ▼
◇ downPayment is        False      ◇ downPayment is      False
  less than minimum down ──────────▶  more than minimum down ──
  payment ◇                            payment ◇
   True                                  True
```

```
          ┌─────────────────┐
          │ not found function │
          └─────────────────┘
                   │
                   ▼
          ╱─────────────────╲
         ╱  prompt title      ╲
        ╱  of function and     ╲
        ╲  not found           ╱
         ╲───────────────────╱
                   │
                   ▼
          ┌─┬───────────────┬─┐
          │ │ parent menu   │ │
          │ │ function      │ │
          └─┴───────────────┴─┘
                   │
                   ▼
            ╭─────────────╮
            │    End      │
            ╰─────────────╯
```

not found function
generalPurposeCreditCardApplication()
travelCreditCardApplication()
lifestyleCreditCardApplication()
priorityCreditCardApplication()
ownedCreditCard()
personalLoanApplication()
autoLoanApplication()
refinancingLoanApplication()

```
  accountLoanInfo()  ──────▶  Loan Status
                              heading
                                  │
                                  ▼
                        creditMortgage          True
                        [getUserID()][0] == 0  ──────▶   notFound()
                                  │                          │
                              False                          │
                                  ▼                          │
                             credit        ◀─────────────────┘
                             Mortgage
                             Detail
                             [getUserID()]
                                  │
                                  ▼
              False          confirm()         True
       ◀──────────────                  ──────────────▶
        │                                              │
        ▼                                              ▼
   accountLoan   ─────▶    End    ◀─────    loanMenu()
   Info()
```

```
                          ┌─────────────────┐
                          │ accountInfoMenu()│
                          └─────────────────┘
                                   │
                                   ▼
         True                  ◇ profile[id][0] != null ◇         False
    ┌──────────────┐  ◄────                                 ────►  ┌──────────────┐
    │ preparing table│                                             │ print not    │
    │ variables      │                                             │ found menu   │
    └──────────────┘                                               └──────────────┘
           │
           ▼
    ┌──────────────┐
    │ print heading │
    │ part of the table│
    └──────────────┘
           │
           ▼
    ┌──────────────┐
    │ content padding│
    │ adjustment     │
    └──────────────┘
           │
           ▼
    ┌──────────────┐        ◇ confirm() ◇    True    ┌──────────────┐
    │ print content │ ────►                   ────►  │ mainMenu()   │
    └──────────────┘                                 └──────────────┘
                              │ False                        │
                              ▼                              ▼
                        ┌──────────────┐            ┌──────────┐
                        │ accountInfo   │ ────►      │   End    │
                        │ Menu()        │            └──────────┘
                        └──────────────┘
```