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Practice exercise: how to solve?

Try to solve this exercise yourself. Think of the structure: what part is same for different loan systems and what part is different? Avoid duplication! Do it step-by-step and start with base class. Write tests for every method to see if they work properly. Think of at least 2 customers and write down (on paper) the expected values for each step for finding the loan (loan duration, monthly payment etc)! This makes it easier to understand the task and easier to test. DO NOT start immediately writing the code.

If you have mistakes/problems then use [debugging](#) or `Console.WriteLine()` to print out the values of your variables to find the problematic place.

If you have done your own version then check the uploaded solution. Yours does not have to look the same but should follow the same principles. Uploaded solution does not have a class for Loan with unfixed interest and is missing tests. Add them, refactor your code (if necessary) and submit the solution as your 15th homework.

NB! PLEASE do not check the solution before you have done your own version.

If you have questions and/or are stuck then come to the lesson on Thursday (09:40 – 12:00), 13th of December or Friday (11:00-13:30), 14th of December.

Task:

We are creating a loan system which takes customer's data as a parameter and finds:

- Loan duration
- Maximum loan amount
- Monthly payments amount

We have (classes):

1. Customer: person who wants to get a loan.
 - Every customer has public properties for Age, MonthlyIncome, MonthlyObligations and Assets.
 - Monthly income : net salary that customer receives on account every month
 - Monthly obligations : mandatory amount that customer pays monthly for other expenses (other loans etc)
 - Assets : value of the assets that can be used to guarantee the loan, for example an existing apartment.
 - Customer has a constructor which takes name as a parameter and sets its value. Based on the name it also generates customerCode. Name has to be at least 5 characters long and

consist of first and last name. If invalid name is entered then a warning is displayed and name is set to „Jhon Doe“.

- Customer code is generated based on the first names first letter and from last name where every letter is replaced by its alphabetical position: A=1, B=2, C=3 etc. If customer has multiple last names then we only use one last name. If customer has multiple first names, then we only use the first one.

Example: „Antti Aabel“: code is generated from AAabel-> ""1 1 1 2 5 12 " -> "1112512 "

2. Loan systems: there are multiple loan systems which have different conditions for loans. They calculate maximum loan amount and monthly loan payments based on the customer's data.

All loan systems:

- Assume that customer wants to take the loan for as long time as possible (based on their age).
- Maximum time for a loan is 30 years.
- Have a public method GetLoan(Customer customer) which takes customer as a parameter and:
 1. Prints out customer data
 2. Prints loan data

- A. **Standard Loan system:** calculates the maximum available loan and monthly payment for a customer based on different conditions. Maximum loan amount depends on multiple conditions (in order of importance):

- Customer's age: maximum age for paying back the loan is 65. (Person older than 35 cannot take loan for 30 years)
- Customer's monthly income: monthly loan payment can be max 27% from monthly income. If customer has monthly obligations then they should be deducted (*lahutatud*) from monthly income before calculating the maximum.

*Example: monthly income is 1500 and obligations 200. Maximum monthly payment is $(1500-200) * 0.27 = 351$*

- Customer has to have at least 300 euros on their account after monthly loan payment. (If customer's account balance after paying for loan and other payments is less or equal to 300 then customer cannot get a loan).

- B. **Loan with insurance:** similar to Standard loan but here a loan insurance is added to the loan. This means that customer pays more but can also get a bigger loan.

- Loan payment can be up to 45% from monthly income.
- Monthly loan payment has to include insurance payment. Insurance is 4% from maximum loan amount.
- Maximum age can be up to 75.
- Print how much is insurance payment.

- C. **Loan with unfixed interest:** similar to standard loan but:

- This loan has interest rate which is not fixed and might be different for every customer. Interest rate can be between 0.5 and 3%. Interest rate changes (randomly) after every

3rd customer. (First 3 customers getting a loan have the same interest rate, 4-6 customers have a different one etc).

Interest rate payment has to be included in the maximum monthly payment (not added to it).

- Customer's assets : having assets increases the maximum available loan by 30% from their price. If customer has assets worth more than 10000 then minimum income requirement (of 300 euros) is not required.
*Example: assets are 5000. $5000 * 0.3 = 1500$. This amount is added to maximum loan amount.*
- If customer is too old for a loan then he/she can get a loan for 2 years and max amount is half of the assets worth.
Example: customer is 90 and his assets are 5000. Max loan amount is $5000 / 2 = 2500$.
- Print also how much is paid for interest.

Requirements and tips:

- Create 4 different customers and try getting a loan with every system in main method. Test different conditions!
- Add tests for every (sub)method that does a calculation/changes values and is important in your opinion!
- Write all steps for finding a loan as submethods; do not make a long complicated method. Method should not be longer than 20-30 lines.
- Testing: a method that is being tested should have a return value (or give value to a property that is being tested). Private methods cannot be tested. Private methods can be tested if you make test class to inherit from the class that you are testing. Internal methods can be tested (if you need to test a non-private method then make it internal or make an internal method for getting their values).
- After finishing refactor your code: make methods smaller if necessary, delete unused variables and empty lines. Make the code look good. [Resharper](#) will help you in this (free for students).
- Put all classes/interfaces to a separate file.
- Good! You have managed to read the task until here. Solution file is protected by a psw which is: „studyhard. You need to enter the password to unpack it.
- For creating customer code you can:
 1. Use an array or dictionary or list and use indexes
 2. Use [ASCII](#) table: check the decimal values for every capital letter (under „ASCII printable characters“). Do you see a pattern? Getting decimal value from character:
`int number = (int)characterExample:`

NB! 'A' and 'a' both have to have a value of 1. Custom letters (öäüõ) can be ignored.

Example:

```
Customer aAabel = new Customer("Anti Aabel");  
aAabel.Age = 60;
```

```

aAabel.MonthlyIncome = 2000;

Customer mMaasikas = new Customer("Mari Maarikas");
mMaasikas.Age = 25;
mMaasikas.MonthlyIncome = 4000;
mMaasikas.MonthlyPayments = 1000;

StandardLoan standardLoanSystem = new StandardLoan();
standardLoanSystem.GiveLoan(aAabel);
standardLoanSystem.GiveLoan(mMaasikas);

InsuranceLoan insuranceLoanSystem = new InsuranceLoan();
insuranceLoanSystem.GiveLoan(aAabel);
insuranceLoanSystem.GiveLoan(mMaasikas);

```

```

--Customer with name Anti Aabel and code 1112512
Finding rates for loan : Standard
- - - - -
Your maximum loan duration is : 5
Your maximum monthly payment is : 540
Your maximum loan amount is : 16200

--Customer with name Mari Maarikas and code 13131118911119
Finding rates for loan : Standard
- - - - -
Your maximum loan duration is : 30
Your maximum monthly payment is : 810
Your maximum loan amount is : 24300

--Customer with name Anti Aabel and code 1112512
Finding rates for loan : Insurance
- - - - -
Your maximum loan duration is : 15
Your maximum monthly payment is : 900
Your maximum loan amount is : 25920
Insurance is : 1080 and total payment 27000

--Customer with name Mari Maarikas and code 13131118911119
Finding rates for loan : Insurance
- - - - -
Your maximum loan duration is : 30
Your maximum monthly payment is : 1350
Your maximum loan amount is : 38880
Insurance is : 1620 and total payment 40500

```