# Object-Oriented Programming – Practical Exam

## Problem 1 – Cosmetics Shop

Enough with these silly games – StarCraft, MarCraft...! This ain’t nerd academy! Let’s do something for the girls! We need to create an online cosmetics shop! And by “we”, I mean “ you”! :D

In the shop there are currently two types of **products**: **shampoos** and **toothpastes**. Each **product** has **name**, **brand**, **price** and **gender** (men, women, unisex).Each **shampoo** has **quantity** (in milliliters) and **usage** (every day or medical). All shampoos’ price is per milliliter.Toothpastes have**ingredients**. There are **categories** of products. Each **category** has **name** and products can be **added** or **removed**. The same product can be added to a category more than once.There is also a **shopping cart**. Products can be **added** or **removed** from it. The same product can be added to the shopping cart more than once. The shopping cart can calculate the **total price** of all products in it.

### Design the Class Hierarchy

Your **task** is to **design an object-oriented class hierarchy** to model the cosmetics shop,**using the best practices for object-oriented design (OOD) and object-oriented programming (OOP)**. Avoid duplicated code though abstraction, inheritance, and polymorphism and encapsulate correctly all fields.

You are given few C# **interfaces** that you should **obligatory** implement and use as a basis of your code:

|  |
| --- |
| namespace Cosmetics.Contracts  {  publicinterfaceICategory  {  string Name { get; }  void AddCosmetics(IProduct cosmetics);  void RemoveCosmetics(IProduct cosmetics);  string Print();  }  publicinterfaceICosmeticsFactory  {  ICategory CreateCategory(string name);  IShampoo CreateShampoo(string name, string brand, decimal price, GenderType gender,  uint milliliters, UsageType usage);  IToothpaste CreateToothpaste(string name, string brand, decimal price,  GenderType gender, IList<string> ingredients);  IShoppingCart ShoppingCart();  }  publicinterfaceIProduct  {  string Name { get; }  string Brand { get; }  decimal Price { get; }  GenderType Gender { get; }  string Print();  }  publicinterfaceIShampoo : IProduct  {  uint Milliliters { get; }  UsageType Usage { get; }  }  publicinterfaceIToothpaste : IProduct  {  string Ingredients { get; }  }  publicinterfaceIShoppingCart  {  void AddProduct(IProduct product);  void RemoveProduct(IProduct product);  bool ContainsProduct(IProduct product);  decimal TotalPrice();  }  } |

Categories should implement**ICategory**. Adding the same product to one category more than once is allowed. Minimum category name’s length length is 2 symbols and maximum is 15 symbols. The error message should be "Category name must be between {min} and {max} symbols long!". Products in category should be sorted by brand in ascending order and then by price in descending order.When removing product from category, if the product is not found, the error message should be "Product {product name} does not exist in category {category name}!". Category’s print method should return text in the following format:

|  |
| --- |
| ***{category name} category – {number of products} products/product in total***  ***- {product brand} – {product name}:***  ***\* Price: ${product price}***  ***\* For gender: Men/Women/Unisex***  ***\* Ingredients: {product ingredients, separated by “, “}* (when applicable)**  ***- {product brand} – {product name}:***  ***\* Price: ${product price}***  ***\* For gender: {product gender}***  ***\* Quantity: {product quantity} ml*(when applicable)**  ***\* Usage: EveryDay/Medical* (when applicable)** |

All products should implement the **IProduct** interface.Minimum product name’s length is 3 symbols and maximum is 10 symbols. The error message should be "Product name must be between {min} and {max} symbols long!". Minimum brand name’s length is 2 symbols and maximum is 10 symbols. The error message should be "Product brand must be between {min} and {max} symbols long!".Gender type can be “Men”, “Women” or “Unisex”.

All shampoos should implement the **IShampoo** interface. Shampoo’s price is given per milliliter. Usage type can be “EveryDay” or “Medical”.

All toothpastes should implement the **IToothpaste** interface.Ingredients should be represented as text, joined in their order of addition, separated by “, “ (comma and space). Each ingredient name’s length should be between 4 and 12 symbols, inclusive. The error message should be "Each ingredientmust be between {min} and {max} symbols long!".

Shopping cart should implement the **IShoppingCart** interface. Adding the same product more than once is allowed. Do not check if the product exists, when removing it from the shopping cart.

Look into the example below to get better understanding of the printing format.

All number type fields should be printed “**as is**”, without any formatting or rounding.

All properties in the above interfaces are mandatory (cannot be null or empty).

If a null value is passed to some mandatory property, your program should throw a proper exception.

### Additional Notes

To simplify your work you are given an already built execution engine that executes a sequence of commands read from the console using the classes and interfaces in your project (see the Cosmetics-Skeletonfolder). Please, put your classes in namespace **Cosmetics.Products**. Implement the**CosmeticsFactory**class in the namespace **Cosmetics.Engine**.

You are only **allowed to write classes**. You are **not allowed to modify the existing interfaces and classes except the CosmeticsFactoryclass**.

Current implemented commands the engine supports are:

* **CreateCategory (name)** – adds a category with given name. Duplicate names are not allowed
* **AddToCategory (categoryName) (productName)** – adds a product to a category, if both are already created in the program
* **RemoveFromCategory (categoryName) (productName)** – removes a product from a category, if both are already created in the program
* **ShowCategory (categoryName)** – prints the category and all products in it
* **CreateShampoo (name) (brand) (price) (gender) (milliliters) (usage)** – parses the input and creates shampoo. Duplicate names are not allowed
* **CreateToothpaste (name) (brand) (price) (gender) (ingredients) –** parses the input and creates toothpaste. Ingredients are comma separated. Duplicate names are not allowed
* **AddToShoppingCart (productName) –** adds a product to the shopping cart, if the product is already created
* **RemoveFromShoppingCart (productName) –** removes a product from the shopping cart, if the product is created and is already in the shopping cart
* **TotalPrice –** return the total price of all products in the shopping cart

All commands return appropriate success messages. In case of invalid operation or error, the engine returns appropriate error messages.

### Sample Input

|  |
| --- |
| **CreateCategory ForMale**  **ShowCategory ForMale**  **CreateCategory a**  **CreateCategory qwertyuiopasdfghjklzxcvbnm**  **CreateCategory ForMale**  **CreateToothpaste White+ Colgate 15.50 men fluor,bqla,golqma**  **CreateToothpaste W Colgate 15.50 men fluor,bqla,golqma**  **CreateToothpaste White+White+White+White+White+ Colgate 15.50 men fluor,bqla,golqma**  **CreateToothpaste White+ Colgate 15.50 men fluor,bqla,golqma**  **CreateToothpaste White+++ C 15.50 men fluor,bqla,golqma**  **CreateToothpaste White++++ ColgateColgateColgateColgate 15.50 men fluor,bqla,golqma**  **CreateCategory ForMale**  **ShowCategory ForMale**  **CreateShampoo Cool Nivea 0.50 men 500 everyday**  **CreateToothpaste White+ Colgate 15.50 men fluor,bqla,golqma**  **AddToCategory ForMale Cool**  **ShowCategory ForMale**  **AddToCategory ForMale White+**  **ShowCategory ForMale**  **CreateToothpaste White- Colgate 19.50 men fluor,bqla,golqma**  **AddToCategory ForMale White-**  **ShowCategory ForMale**  **RemoveFromCategory ForMale Cool**  **ShowCategory ForMale**  **RemoveFromCategory ForMale White+**  **ShowCategory ForMale**  **CreateCategory ForMale**  **ShowCategory ForMale**  **CreateShampoo Cool Nivea 0.50 men 500 everyday**  **CreateToothpaste White+ Colgate 15.50 men fluor,bqla,golqma**  **AddToCategory ForMale Cool**  **ShowCategory ForMale**  **AddToCategory ForMale White+**  **ShowCategory ForMale**  **CreateToothpaste White- Colgate 19.50 men fluor,bqla,golqma**  **AddToCategory ForMale White-**  **ShowCategory ForMale**  **CreateToothpaste White+ Colgate 15.50 men fluor,bqla,golqma**  **AddToShoppingCart White+**  **CreateShampoo Cool Nivea 0.50 men 500 everyday**  **AddToShoppingCart Cool**  **CreateToothpaste White+ Colgate 15.50 men fluor,bqla,golqma**  **AddToShoppingCart White+**  **CreateShampoo Cool Nivea 0.50 men 500 everyday**  **RemoveFromShoppingCart Cool**  **RemoveFromShoppingCart White+**  **CreateToothpaste White+ Colgate 15.50 men fluor,bqla,golqma**  **AddToShoppingCart White+**  **CreateShampoo Cool Nivea 0.50 men 500 everyday**  **AddToShoppingCart Cool**  **TotalPrice** |

### Sample Output

|  |
| --- |
| **Category with name ForMale was created!**  **ForMale category - 0 products in total**  **Category name must be between 2 and 15 symbols long!**  **Category name must be between 2 and 15 symbols long!**  **Category with name ForMale already exists!**  **Toothpaste with name White+ was created!**  **Product name must be between 3 and 10 symbols long!**  **Product name must be between 3 and 10 symbols long!**  **Toothpaste with name White+ already exists!**  **Product brand must be between 2 and 10 symbols long!**  **Product brand must be between 2 and 10 symbols long!**  **Category with name ForMale already exists!**  **ForMale category - 0 products in total**  **Shampoo with name Cool was created!**  **Toothpaste with name White+ already exists!**  **Product Cool added to category ForMale!**  **ForMale category - 1 product in total**  **- Nivea - Cool:**  **\* Price: $250.00**  **\* For gender: Men**  **\* Quantity: 500 ml**  **\* Usage: EveryDay**  **Product White+ added to category ForMale!**  **ForMale category - 2 products in total**  **- Colgate - White+:**  **\* Price: $15.50**  **\* For gender: Men**  **\* Ingredients: fluor, bqla, golqma**  **- Nivea - Cool:**  **\* Price: $250.00**  **\* For gender: Men**  **\* Quantity: 500 ml**  **\* Usage: EveryDay**  **Toothpaste with name White- was created!**  **Product White- added to category ForMale!**  **ForMale category - 3 products in total**  **- Colgate - White-:**  **\* Price: $19.50**  **\* For gender: Men**  **\* Ingredients: fluor, bqla, golqma**  **- Colgate - White+:**  **\* Price: $15.50**  **\* For gender: Men**  **\* Ingredients: fluor, bqla, golqma**  **- Nivea - Cool:**  **\* Price: $250.00**  **\* For gender: Men**  **\* Quantity: 500 ml**  **\* Usage: EveryDay**  **Product Cool removed from category ForMale!**  **ForMale category - 2 products in total**  **- Colgate - White-:**  **\* Price: $19.50**  **\* For gender: Men**  **\* Ingredients: fluor, bqla, golqma**  **- Colgate - White+:**  **\* Price: $15.50**  **\* For gender: Men**  **\* Ingredients: fluor, bqla, golqma**  **Product White+ removed from category ForMale!**  **ForMale category - 1 product in total**  **- Colgate - White-:**  **\* Price: $19.50**  **\* For gender: Men**  **\* Ingredients: fluor, bqla, golqma**  **Category with name ForMale already exists!**  **ForMale category - 1 product in total**  **- Colgate - White-:**  **\* Price: $19.50**  **\* For gender: Men**  **\* Ingredients: fluor, bqla, golqma**  **Shampoo with name Cool already exists!**  **Toothpaste with name White+ already exists!**  **Product Cool added to category ForMale!**  **ForMale category - 2 products in total**  **- Colgate - White-:**  **\* Price: $19.50**  **\* For gender: Men**  **\* Ingredients: fluor, bqla, golqma**  **- Nivea - Cool:**  **\* Price: $250.00**  **\* For gender: Men**  **\* Quantity: 500 ml**  **\* Usage: EveryDay**  **Product White+ added to category ForMale!**  **ForMale category - 3 products in total**  **- Colgate - White-:**  **\* Price: $19.50**  **\* For gender: Men**  **\* Ingredients: fluor, bqla, golqma**  **- Colgate - White+:**  **\* Price: $15.50**  **\* For gender: Men**  **\* Ingredients: fluor, bqla, golqma**  **- Nivea - Cool:**  **\* Price: $250.00**  **\* For gender: Men**  **\* Quantity: 500 ml**  **\* Usage: EveryDay**  **Toothpaste with name White- already exists!**  **Product White- added to category ForMale!**  **ForMale category - 4 products in total**  **- Colgate - White-:**  **\* Price: $19.50**  **\* For gender: Men**  **\* Ingredients: fluor, bqla, golqma**  **- Colgate - White-:**  **\* Price: $19.50**  **\* For gender: Men**  **\* Ingredients: fluor, bqla, golqma**  **- Colgate - White+:**  **\* Price: $15.50**  **\* For gender: Men**  **\* Ingredients: fluor, bqla, golqma**  **- Nivea - Cool:**  **\* Price: $250.00**  **\* For gender: Men**  **\* Quantity: 500 ml**  **\* Usage: EveryDay**  **Toothpaste with name White+ already exists!**  **Product White+ was added to the shopping cart!**  **Shampoo with name Cool already exists!**  **Product Cool was added to the shopping cart!**  **Toothpaste with name White+ already exists!**  **Product White+ was added to the shopping cart!**  **Shampoo with name Cool already exists!**  **Product Cool was removed from the shopping cart!**  **Product White+ was removed from the shopping cart!**  **Toothpaste with name White+ already exists!**  **Product White+ was added to the shopping cart!**  **Shampoo with name Cool already exists!**  **Product Cool was added to the shopping cart!**  **$546.50 total price currently in the shopping cart!** |

## Problem 2 – Army of Creatures

Few**armies** are fighting with their ancient mythology creatures.

* Each **creature** has properties:**attack**, **defense**, **health points**, **damage** and **list of specialties**.
* Each **specialty** can apply special rules (changing creatures properties) during the battle.
* The battle consists of turns. Each turn can be one of 3 possible actions:
  + **Adding** new creatures to one of the armies
  + **Attacking** one creature from one armytoother creature from another army
  + **Skipping** turn. In this action the creature does not attack, but can receive some bonuses to its properties

You are given anobject-oriented implementation of the creatures, specialties and battles between the armies.

You task is to**extend the existing code** following all the requirements described in this document.

Examine the existing code for hints and to better understand how the code works. Pay special attention to where the specialty methods are called (**ApplyWhenAttacking**, **ApplyWhenDefending**, **ApplyAfterDefending**, **ChangeDamageWhenAttacking**, **ApplyOnSkip**).

To give you an overview of the code:There are **3 folders**in the given project:

* Some of the code is already implemented in ArmyOfCreatures.Logicnamespace (/**Logic/ folder**). **You are not allowed to change, add or remove code in this folder**. The important classes in this folder are:
  + The **BattleManager** class which is responsible for simulating a battle between two armies of creatures. It contains the logic of the **Add**, **Attack** and **Skip** actions during a battle.
  + The**CreaturesInBattle** contains the current properties for one type of creatures in the battle. It has 3 important methods: **DealDamage**, **Skip** and **StartNewTurn**.
  + The abstract class **Creature** and few creature implementations
  + The abstract class **Specialty** and few specialty implementations
  + The **CreaturesFactory** class is responsible for creating creatures from given type name as string.
* There is ArmyOfCreatures.Consolenamespace (**/Console/ folder**)which is responsible for reading and writing to the console and command parser for the 4 commands controlling the battles between the armies.
  + **You are not allowed to change, add or remove code from this folder, too.**
    - The only methods**you are allowedto change** in ArmyOfCreatures.Consolenamespace are:
      * The static method **GetCreaturesFactory** in the **Program** class.
      * The static method **GetBattleManager** in the **Program** class.
  + You should not concern yourself with handling input and output data – the engine does it for you.
* There is an empty namespaceArmyOfCreatures.Extended(/Extended/ folder) in which you should put all of your code.
  + In the folder named Creatures in the Extendedfolderput your implementations of the Creature class
  + In the folder Specialties put your implementations of the Specialty class
  + All other code files put directly in the folder Extended
  + You can safely delete the DeleteMe.cs file

### Commands

There are 4 commands that the applicationsupports:

* add command – adds *Count* number of *CreatureType*creatures to one of the two armies (with number *ArmyId*)
  + Syntax: add *Count CreatureType(ArmyId)*
  + Example: add 10 Archangel(2)–adds 10archangels to the second army
  + Note: no two creatures with both the same creature type and army id will be added
* attack command – executes an attack between creature with type *AttackerType* from army with number *AttackerArmyId* and creature with type *DefenderType* from army with number *DefenderArmyId*
  + Syntax:attack *AttackerType*(*AttackerArmyId*) *DefenderType*(*DefenderArmyId*)
  + Example: attack Angel(2) Goblin(1) – the angels from the second army attack the goblins from the first army
* skip command – skips the turn of the given *CreatureType* from the given *ArmyId*
  + Syntax: skip*CreatureType(ArmyId)*
  + Example: skip Griffin(2) – skips the turn of the griffins from the second army
* exit command – Immediately exits the console application
  + Syntax: exit

### Tasks

* Add class **Goblin**. The **Goblin** is a creature with attack **4**, defence **2**, health points **5** and damage **1.5** and has**no specialties**.
  + *Hint: Examine other successors of the* ***Creature*** *class*
* Add class **AncientBehemoth**. The **AncientBehemoth** is a creature with attack **19**, defense **19**, damage **40**, health points **300** and has the following specialties:
  + **ReduceEnemyDefenseByPercentage** specialty with 80% damage reduction
  + **DoubleDefenseWhenDefending** specialty for 5 rounds
  + *Hint: The class* ***AncientBehemoth*** *is similar to* ***Behemoth****creature class.*
* Add class **DoubleDamage**. The **DoubleDamage** is a specialty that **doubles the current damage** during battle.
  + The **DoubleDamage**class shouldhave only one**constructor** that accepts one argument – the number of rounds for the specialty to has effect. After these rounds (attacks) the effect of this specialty stops.
    - The number of rounds in the constructor should be greater than 0
    - The number of rounds in the constructor should be less than or equal to 10
  + Override the default **ToString()** implementation to return the name of the specialty with the number of rounds remaning in parentesis. Example: “**DoubleDamage(7)**”
  + *Hint: The class* ***Hate*** *(specialty) also changes the damage during the battle.*
  + *Hint: The class* ***DoubleDefenseWhenDefending*** *also has fixed rounds of effectiveness.*
* Add class **WolfRaider**. The **WolfRaider** is a creature with attack **8**, defense **5**, health points **10**, damage **3.5** and:
  + **DoubleDamage** specialty for 7 rounds
* Add class **Griffin.** The **Griffin** is a creature with attack **8**, defense **8**, damage **4.5** and health points **25**. It also has the following specialties:
  + **DoubleDefenseWhenDefending** for 5 rounds
  + **AddDefenseWhenSkip** with 3 defense points
  + **Hate** specialtyto**WolfRaider** creatures
    - *Hint: The* ***Angel****,* ***Archangel****,* ***Devil*** *and* ***ArchDevil****creatures also have* ***Hate*** *specialty.*
* Add class **AddAttackWhenSkip.** The **AddAttackWhenSkip** is a specialty that **adds attack points** to the permanent attack points of the creature and is applied **when creature skips** its turn.
  + The class should have only one**constructor** which accepts integer argument (between 1 and 10, inclusive) – the value to add to the permanent attack of the creature during skip action in battle.
  + Override the default **ToString()** implementation to return the name of the specialty with the number of attack to add in parentesis. Example: “**AddAttackWhenSkip(3)**”
  + *Hint: The class* ***AddAttackWhenSkip*** *is similar to* ***AddDefenseWhenSkip****.*
* Add class **DoubleAttackWhenAttacking**. The **DoubleAttackWhenAttacking** is a specialty. It doubles the current attack when creature is attacking.
  + The class should have only one**constructor** that accepts one argument – the number of rounds for the specialty to has effect. After these rounds the effect of this specialty stops.
    - The number of rounds in the constructor should be greater than 0
  + Override the default **ToString()** implementation to return the name of the specialty with the number of rounds left in parentesis. Example: “**DoubleAttackWhenAttacking(4)**”
* Add class **CyclopsKing**. The **CyclopsKing** is a creature with attack **17**, defense **13**, damage **18**, health points **70** and the following specialties:
  + **AddAttackWhenSkip**with 3 attack points for each skip action.
  + **DoubleAttackWhenAttacking** for 4 rounds
  + **DoubleDamage** for 1 round
* **Implementsupport for working with3 armies (instead of only 2 in the current implementation)**
  + The console application should be able to process commands where the *ArmyId* is equal to 3
    - **add 10 ArchDevil(3)** should be valid command
    - **attack Angel(1) ArchDevil(3)** should also be a valid command
    - See the **second example** below
  + Remember: You are NOT allowed to edit the **BattleManager** class neither the commands classes in the **Console**folder.

### Additional Requirements

As you know **100 of the points** for this task are given by <http://bgcoder.com>and the other 100 points will be awarded after we manuallytest your code.Each of these requirements will affect your final exam points:

* Name all classes exactly as explained above
  + For example the class containing **AddAttackWhenSkip** speciallity should be called exactly **AddAttackWhenSkip**
* All reference arguments that are passed to externally visible methods **should be checked againstnull**.
  + Throw an**ArgumentNullException** when the argument is **null**.
* Implement all described data validations
  + For example: As described above **AddAttackWhenSkip** constructor should accept only positive values between 1 and 10, inclusive.
* Your code should compile without any warnings.
* Do not hide existing methods with the **new** keyword.
* Follow all the described rules and DO NOT change the existing code as described above.
* etc.

### Example Input and Output

**In the given skeleton you will find the input and output files for the two examples given bellow.**

**If you pass only the first example test you are most likely to have 70 points in the judge system (bgcoder.com).**

|  |  |
| --- | --- |
| **Sample Input** | **Sample Output** |
| **add 10 AncientBehemoth(1)**  **add 100 WolfRaider(1)**  **add 100 Goblin(1)**  **add 10 CyclopsKing(2)**  **add 50 Griffin(2)**  **add 10 Archangel(2)**  **attack Archangel(2) Goblin(1)**  **attack AncientBehemoth(1) Archangel(2)**  **attack Griffin(2) WolfRaider(1)**  **attack WolfRaider(1) Griffin(2)**  **skip CyclopsKing(2)**  **attack Archangel(2) WolfRaider(1)**  **attack AncientBehemoth(1) Archangel(2)**  **attack Griffin(2) AncientBehemoth(1)**  **attack CyclopsKing(2) AncientBehemoth(1)**  **attack Archangel(2) AncientBehemoth(1)**  **attack AncientBehemoth(1) CyclopsKing(2)**  **attack Griffin(2) AncientBehemoth(1)**  **attack CyclopsKing(2) AncientBehemoth(1)**  **attack Archangel(2) AncientBehemoth(1)**  **attack AncientBehemoth(1) CyclopsKing(2)**  **exit** | **--- Creature added to army 1 - AncientBehemoth (ATT:19; DEF:19; HP:300; DMG:40) [ReduceEnemyDefenseByPercentage(80),DoubleDefenseWhenDefending(5)]**  **--- Creature added to army 1 - WolfRaider (ATT:8; DEF:5; HP:10; DMG:3.5) [DoubleDamage(7)]**  **--- Creature added to army 1 - Goblin (ATT:4; DEF:2; HP:5; DMG:1.5) []**  **--- Creature added to army 2 - CyclopsKing (ATT:17; DEF:13; HP:70; DMG:18) [AddAttackWhenSkip(3),DoubleAttackWhenAttacking(4),DoubleDamage(1)]**  **--- Creature added to army 2 - Griffin (ATT:8; DEF:8; HP:25; DMG:4.5) [DoubleDefenseWhenDefending(5),AddDefenseWhenSkip(3),Hate(WolfRaider)]**  **--- Creature added to army 2 - Archangel (ATT:30; DEF:30; HP:250; DMG:50) [Hate(Devil),Hate(ArchDevil),Resurrection]**  **--- Attacker before - 10 Archangel (ATT:30; DEF:30; THP:2500; LDMG:0)**  **--- Defender before - 100 Goblin (ATT:4; DEF:2; THP:500; LDMG:0)**  **--- Attacker after - 10 Archangel (ATT:30; DEF:30; THP:2500; LDMG:1200)**  **--- Defender after - 0 Goblin (ATT:4; DEF:2; THP:0; LDMG:0)**  **--- Attacker before - 10 AncientBehemoth (ATT:19; DEF:19; THP:3000; LDMG:0)**  **--- Defender before - 10 Archangel (ATT:30; DEF:30; THP:2500; LDMG:0)**  **--- Attacker after - 10 AncientBehemoth (ATT:19; DEF:19; THP:3000; LDMG:660)**  **--- Defender after - 8 Archangel (ATT:30; DEF:6; THP:2000; LDMG:0)**  **--- Attacker before - 50 Griffin (ATT:8; DEF:8; THP:1250; LDMG:0)**  **--- Defender before - 100 WolfRaider (ATT:8; DEF:5; THP:1000; LDMG:0)**  **--- Attacker after - 50 Griffin (ATT:8; DEF:8; THP:1250; LDMG:388.125)**  **--- Defender after - 62 WolfRaider (ATT:8; DEF:5; THP:612; LDMG:0)**  **--- Attacker before - 62 WolfRaider (ATT:8; DEF:5; THP:612; LDMG:0)**  **--- Defender before - 50 Griffin (ATT:8; DEF:8; THP:1250; LDMG:0)**  **--- Attacker after - 62 WolfRaider (ATT:8; DEF:5; THP:612; LDMG:347.2)**  **--- Defender after - 37 Griffin (ATT:8; DEF:16; THP:903; LDMG:0)**  **--- Before skip - 10 CyclopsKing (ATT:17; DEF:13; THP:700; LDMG:0)**  **--- After skip - 10 CyclopsKing (ATT:20; DEF:16; THP:700; LDMG:0)**  **--- Attacker before - 8 Archangel (ATT:30; DEF:30; THP:2000; LDMG:0)**  **--- Defender before - 62 WolfRaider (ATT:8; DEF:5; THP:612; LDMG:0)**  **--- Attacker after - 8 Archangel (ATT:30; DEF:30; THP:2000; LDMG:900)**  **--- Defender after - 0 WolfRaider (ATT:8; DEF:5; THP:0; LDMG:0)**  **--- Attacker before - 10 AncientBehemoth (ATT:19; DEF:19; THP:3000; LDMG:0)**  **--- Defender before - 8 Archangel (ATT:30; DEF:30; THP:2000; LDMG:0)**  **--- Attacker after - 10 AncientBehemoth (ATT:19; DEF:19; THP:3000; LDMG:660)**  **--- Defender after - 6 Archangel (ATT:30; DEF:6; THP:1500; LDMG:0)**  **--- Attacker before - 37 Griffin (ATT:8; DEF:8; THP:903; LDMG:0)**  **--- Defender before - 10 AncientBehemoth (ATT:19; DEF:19; THP:3000; LDMG:0)**  **--- Attacker after - 37 Griffin (ATT:8; DEF:8; THP:903; LDMG:49.95)**  **--- Defender after - 10 AncientBehemoth (ATT:19; DEF:38; THP:2951; LDMG:0)**  **--- Attacker before - 10 CyclopsKing (ATT:20; DEF:16; THP:700; LDMG:0)**  **--- Defender before - 10 AncientBehemoth (ATT:19; DEF:19; THP:2951; LDMG:0)**  **--- Attacker after - 10 CyclopsKing (ATT:40; DEF:16; THP:700; LDMG:396)**  **--- Defender after - 9 AncientBehemoth (ATT:19; DEF:38; THP:2555; LDMG:0)**  **--- Attacker before - 6 Archangel (ATT:30; DEF:30; THP:1500; LDMG:0)**  **--- Defender before - 9 AncientBehemoth (ATT:19; DEF:19; THP:2555; LDMG:0)**  **--- Attacker after - 6 Archangel (ATT:30; DEF:30; THP:1500; LDMG:240)**  **--- Defender after - 8 AncientBehemoth (ATT:19; DEF:38; THP:2315; LDMG:0)**  **--- Attacker before - 8 AncientBehemoth (ATT:19; DEF:19; THP:2315; LDMG:0)**  **--- Defender before - 10 CyclopsKing (ATT:20; DEF:16; THP:700; LDMG:0)**  **--- Attacker after - 8 AncientBehemoth (ATT:19; DEF:19; THP:2315; LDMG:560)**  **--- Defender after - 2 CyclopsKing (ATT:20; DEF:4; THP:140; LDMG:0)**  **--- Attacker before - 37 Griffin (ATT:8; DEF:8; THP:903; LDMG:0)**  **--- Defender before - 8 AncientBehemoth (ATT:19; DEF:19; THP:2315; LDMG:0)**  **--- Attacker after - 37 Griffin (ATT:8; DEF:8; THP:903; LDMG:49.95)**  **--- Defender after - 8 AncientBehemoth (ATT:19; DEF:38; THP:2266; LDMG:0)**  **--- Attacker before - 2 CyclopsKing (ATT:20; DEF:16; THP:140; LDMG:0)**  **--- Defender before - 8 AncientBehemoth (ATT:19; DEF:19; THP:2266; LDMG:0)**  **--- Attacker after - 2 CyclopsKing (ATT:40; DEF:16; THP:140; LDMG:39.6)**  **--- Defender after - 8 AncientBehemoth (ATT:19; DEF:38; THP:2227; LDMG:0)**  **--- Attacker before - 6 Archangel (ATT:30; DEF:30; THP:1500; LDMG:0)**  **--- Defender before - 8 AncientBehemoth (ATT:19; DEF:19; THP:2227; LDMG:0)**  **--- Attacker after - 6 Archangel (ATT:30; DEF:30; THP:1500; LDMG:465)**  **--- Defender after - 6 AncientBehemoth (ATT:19; DEF:19; THP:1762; LDMG:0)**  **--- Attacker before - 6 AncientBehemoth (ATT:19; DEF:19; THP:1762; LDMG:0)**  **--- Defender before - 2 CyclopsKing (ATT:20; DEF:16; THP:140; LDMG:0)**  **--- Attacker after - 6 AncientBehemoth (ATT:19; DEF:19; THP:1762; LDMG:420)**  **--- Defender after - 0 CyclopsKing (ATT:20; DEF:4; THP:0; LDMG:0)** |
| **add 10 Angel(1)**  **add 10 Devil(1)**  **add 10 Archangel(2)**  **add 10 ArchDevil(3)**  **attack Archangel(2) Devil(1)**  **attack ArchDevil(3) Angel(1)**  **attack Angel(1) ArchDevil(3)**  **attack Devil(1) Archangel(2)**  **attack Archangel(2) Devil(1)**  **attack ArchDevil(3) Angel(1)**  **attack Archangel(2) ArchDevil(3)**  **attack ArchDevil(3) Archangel(2)**  **attack Archangel(2) ArchDevil(3)**  **attack ArchDevil(3) Archangel(2)**  **attack Archangel(2) ArchDevil(3)**  **attack ArchDevil(3) Archangel(2)**  **attack Archangel(2) ArchDevil(3)**  **exit** | **--- Creature added to army 1 - Angel (ATT:20; DEF:20; HP:200; DMG:50) [Hate(Devil),Hate(ArchDevil)]**  **--- Creature added to army 1 - Devil (ATT:19; DEF:26; HP:160; DMG:35) [Hate(Angel),Hate(Archangel),ReduceEnemyDefenseByPercentage(100)]**  **--- Creature added to army 2 - Archangel (ATT:30; DEF:30; HP:250; DMG:50) [Hate(Devil),Hate(ArchDevil),Resurrection]**  **--- Creature added to army 3 - ArchDevil (ATT:21; DEF:28; HP:200; DMG:35) [Hate(Angel),Hate(Archangel),ReduceEnemyDefenseByPercentage(100)]**  **--- Attacker before - 10 Archangel (ATT:30; DEF:30; THP:2500; LDMG:0)**  **--- Defender before - 10 Devil (ATT:19; DEF:26; THP:1600; LDMG:0)**  **--- Attacker after - 10 Archangel (ATT:30; DEF:30; THP:2500; LDMG:900)**  **--- Defender after - 5 Devil (ATT:19; DEF:26; THP:700; LDMG:0)**  **--- Attacker before - 10 ArchDevil (ATT:21; DEF:28; THP:2000; LDMG:0)**  **--- Defender before - 10 Angel (ATT:20; DEF:20; THP:2000; LDMG:0)**  **--- Attacker after - 10 ArchDevil (ATT:21; DEF:28; THP:2000; LDMG:1076.25)**  **--- Defender after - 5 Angel (ATT:20; DEF:0; THP:924; LDMG:0)**  **--- Attacker before - 5 Angel (ATT:20; DEF:20; THP:924; LDMG:0)**  **--- Defender before - 10 ArchDevil (ATT:21; DEF:28; THP:2000; LDMG:0)**  **--- Attacker after - 5 Angel (ATT:20; DEF:20; THP:924; LDMG:300)**  **--- Defender after - 9 ArchDevil (ATT:21; DEF:28; THP:1700; LDMG:0)**  **--- Attacker before - 5 Devil (ATT:19; DEF:26; THP:700; LDMG:0)**  **--- Defender before - 10 Archangel (ATT:30; DEF:30; THP:2500; LDMG:0)**  **--- Attacker after - 5 Devil (ATT:19; DEF:26; THP:700; LDMG:511.875)**  **--- Defender after - 8 Archangel (ATT:30; DEF:0; THP:2000; LDMG:0)**  **--- Attacker before - 8 Archangel (ATT:30; DEF:30; THP:2000; LDMG:0)**  **--- Defender before - 5 Devil (ATT:19; DEF:26; THP:700; LDMG:0)**  **--- Attacker after - 8 Archangel (ATT:30; DEF:30; THP:2000; LDMG:720)**  **--- Defender after - 0 Devil (ATT:19; DEF:26; THP:0; LDMG:0)**  **--- Attacker before - 9 ArchDevil (ATT:21; DEF:28; THP:1700; LDMG:0)**  **--- Defender before - 5 Angel (ATT:20; DEF:20; THP:924; LDMG:0)**  **--- Attacker after - 9 ArchDevil (ATT:21; DEF:28; THP:1700; LDMG:968.625)**  **--- Defender after - 0 Angel (ATT:20; DEF:0; THP:0; LDMG:0)**  **--- Attacker before - 8 Archangel (ATT:30; DEF:30; THP:2000; LDMG:0)**  **--- Defender before - 9 ArchDevil (ATT:21; DEF:28; THP:1700; LDMG:0)**  **--- Attacker after - 8 Archangel (ATT:30; DEF:30; THP:2000; LDMG:660)**  **--- Defender after - 6 ArchDevil (ATT:21; DEF:28; THP:1040; LDMG:0)**  **--- Attacker before - 6 ArchDevil (ATT:21; DEF:28; THP:1040; LDMG:0)**  **--- Defender before - 8 Archangel (ATT:30; DEF:30; THP:2000; LDMG:0)**  **--- Attacker after - 6 ArchDevil (ATT:21; DEF:28; THP:1040; LDMG:645.75)**  **--- Defender after - 6 Archangel (ATT:30; DEF:0; THP:1500; LDMG:0)**  **--- Attacker before - 6 Archangel (ATT:30; DEF:30; THP:1500; LDMG:0)**  **--- Defender before - 6 ArchDevil (ATT:21; DEF:28; THP:1040; LDMG:0)**  **--- Attacker after - 6 Archangel (ATT:30; DEF:30; THP:1500; LDMG:495)**  **--- Defender after - 3 ArchDevil (ATT:21; DEF:28; THP:545; LDMG:0)**  **--- Attacker before - 3 ArchDevil (ATT:21; DEF:28; THP:545; LDMG:0)**  **--- Defender before - 6 Archangel (ATT:30; DEF:30; THP:1500; LDMG:0)**  **--- Attacker after - 3 ArchDevil (ATT:21; DEF:28; THP:545; LDMG:322.875)**  **--- Defender after - 5 Archangel (ATT:30; DEF:0; THP:1250; LDMG:0)**  **--- Attacker before - 5 Archangel (ATT:30; DEF:30; THP:1250; LDMG:0)**  **--- Defender before - 3 ArchDevil (ATT:21; DEF:28; THP:545; LDMG:0)**  **--- Attacker after - 5 Archangel (ATT:30; DEF:30; THP:1250; LDMG:412.5)**  **--- Defender after - 1 ArchDevil (ATT:21; DEF:28; THP:133; LDMG:0)**  **--- Attacker before - 1 ArchDevil (ATT:21; DEF:28; THP:133; LDMG:0)**  **--- Defender before - 5 Archangel (ATT:30; DEF:30; THP:1250; LDMG:0)**  **--- Attacker after - 1 ArchDevil (ATT:21; DEF:28; THP:133; LDMG:107.625)**  **--- Defender after - 5 Archangel (ATT:30; DEF:0; THP:1250; LDMG:0)**  **--- Attacker before - 5 Archangel (ATT:30; DEF:30; THP:1250; LDMG:0)**  **--- Defender before - 1 ArchDevil (ATT:21; DEF:28; THP:133; LDMG:0)**  **--- Attacker after - 5 Archangel (ATT:30; DEF:30; THP:1250; LDMG:412.5)**  **--- Defender after - 0 ArchDevil (ATT:21; DEF:28; THP:0; LDMG:0)** |