# More Exercises: Data Types and Variables

Problems for exercises and homework for the [“Programming Fundamentals” course @ SoftUni](https://softuni.bg/courses/programming-fundamentals).

# Numeral Types and Type Conversion

## Type Boundaries

Write a program which receives a **number type** (**as a string**) and prints the **maximum** and the **minimum value** of that type. You can receive one of the following types: “int”, “uint”, “long”, “byte” and “sbyte”.

*Note: For this example, the Java’s byte corresponds to the C#’s sbyte.*

### Examples

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Input** | **Output** |  | **Input** | **Output** |
| int | 2147483647  -2147483648 | byte | 255  0 |

### Hints

* Follow the idea in the code below:  
  
* For Java: you can import com.sun.jmx.snmp.SnmpUnsignedInt for printing the **uint** values.

## Number Checker

Write a program, which checks if a **number** is an **integer** or a **floating-point** number and **prints** either “**floating-point**” or “**integer**”, depending on the case. You will **only** receive **numbers**.

### Constraints

* **Integer numbers** will be in the interval **[-9223372036854775808…9223372036854775807]**

### Examples

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Input** | **Output** |  | **Input** | **Output** |
| 3 | integer | 2.31 | floating-point |

## Water Overflow

You have a **water** **tank** with capacity of **255 liters**. On the next **n** lines, you will receive **liters of water**, which you have to **pour** in your **tank**. If the **capacity** is **not enough**, print “Insufficient capacity!” and **continue reading** the next line. On the last line, print the **liters** in the **tank**.

### Input

The **input** will be on two lines:

* On the **first** **line**, you will receive **n** – the number of **lines**, which will **follow**
* On the next **n lines** – you receive **quantities** of water, which you have to **pour** in the **tank**

### Output

Every time you do not have **enough** **capacity** in the tank to pour the given liters, **print**:

Insufficient capacity!

On the last line, **print** only the **liters** in the **tank**.

### Constraints

* **n** will be in the interval **[1…20]**
* **liters** will be in the interval **[1…1000]**

### Examples

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Input** | **Output** |  | **Input** | **Output** |
| **5**  20  100  100  100  20 | Insufficient capacity!  240 | **1**  1000 | Insufficient capacity!  0 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Input** | **Output** |  | **Input** | **Output** |
| **7**  10  20  30  10  5  10  20 | 105 | **4**  250  10  20  40 | Insufficient capacity!  Insufficient capacity!  Insufficient capacity!  250 |

## Tourist Information

Write a program, which helps tourists **convert** **imperial** **units** of measurement to **metric units**. Your program needs to support the **following conversions**: **miles** to **kilometers**, **inches** to **centimeters**, **feet** to **centimeters**, **yards** to **meters** and **gallons** to **liters**. The **conversion** **table** looks like this:

|  |  |  |
| --- | --- | --- |
| **If you receive:** | **Multiply by:** | **To get:** |
| miles | 1.6 | kilometers |
| inches | 2.54 | centimeters |
| feet | 30 | centimeters |
| yards | 0.91 | meters |
| gallons | 3.8 | liters |

### Input

The **input** will be on **two lines**:

* On the **first** **line**, you will receive the **imperial** **unit**, which you need to convert
* On the **second line**,you will receive the **value**, which you need to **convert**

### Output

Print the answer in the following format:

{initial value} {initial imperial unit} = {converted value} {metric unit}

**Format** the **converted** **value** to the **2nd decimal place**.

Print the **initial** **value** as it is **given**.

### Constraints

* The **value**, which needs to be **converted** will be in the interval [±1.5×10-45… ±3.4×1038]**.**

### Examples

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Input** | **Output** |  | **Input** | **Output** |
| miles  12.313 | 12.313 miles = 19.70 kilometers |  | gallons  12 | 12 gallons = 45.60 liters |

## Weather Forecast

You invented a new groundbreaking technology to **predict the weather**, using **numerology**. You will be given a **number** from the **console** and with it, you can predict **tomorrow’s weather**. Your system works in the following way:

* If the number can fit in **sbyte** (for C#)or **byte** (for Java) – the weather will be­**­ “Sunny**”
* If the numbers can fit in **int** – the weather will be “**Cloudy**”
* If the number fits in **long** – the weather will be “**Windy**”
* If it is **floating point** number – the weather will be “**Rainy**”

**Always** **print** the **smallest** **possible** option.

### Input

* On the first line, you will receive a **number**.

### Output

**Print** your prediction for the **weather**.

### Constraints

* Any whole **numbers** will be in the interval **[-9223372036854775808…9223372036854775807]**.

### Examples

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Input** | **Output** |  | **Input** | **Output** |
| 120 | Sunny |  | -1.31 | Rainy |

## Catch the Thief

In the future, a very dangerous thief has escaped. Your mission is to catch him, but the only thing you know is the **numeral type**, which is his **id**.

On the **first line,** you will receive the **numeral type** of **thief’s id**. On the **second line,** you will receive **n** – the number of ids you will receive. The person who has an id **closest** to the **maximum value** of the givennumeral type **without** **overflowing it** is the **thief’s id**.

### Input

* On the first line, you will receive the thief’s id **numeral type**. The type will **always** be one of the following: “**sbyte**”, “**int**” or “**long**”.
* On the second line, you will receive **n** – the **count** of **ids** you are going to receive. **Each** will be on a **new** **line**.

### Output

Print the **id** of the **thief**.

### Constraints

* The type will **always** be one of the following: “**sbyte**”, “**int**” or “**long**”
* The **sbyte** interval will be **[-128…127]**
* The number **n** will be in the interval **[1…20]**.
* The **ids** will be integers in the interval **[-9223372036854775808…9223372036854775807]**

### Examples

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Input** | **Output** |  | **Input** | **Output** |
| **sbyte**  **5**  1  126  128  1000  1241 | 126 |  | **long**  **4**  1  6  3  2 | 6 |

## \* Sentence the Thief

In the last task, you caught the thief, but in the future, everyone is multitasking and you need to **calculate** his **sentence** as well.

His sentence equals to the **times** his **id** **overflows** the numerical type sbyte. Round the years to the **nearest larger integer value** (5.01 🡺 6).

Example: If the thief’s id is **5251**, that means the sentence will equal: **5251 / 127 = 41.35** years. Rounded to the **next** **integer** **value**, the final sentence would be **42 years**.

Notice that the **id** might be **negative** and can **overflow** the **negative** boundary of **sbyte**.

### Input

* On the first line, you will receive the thief’s id **numeral type**. The type will **always** be one of the following: “**sbyte**”, “**int**” or “**long**”.
* On the second line, you will receive **n** – the **count** of **ids** you are going to receive. **Each** will be on a **new** **line**.

### Output

If the **years** of the sentence are more than **1** print them in the following format:

Prisoner with id {id of the thief} is sentenced to {duration of the sentence} years

Otherwise use this format:

Prisoner with id {id of the thief} is sentenced to {duration of the sentence} year

### Constraints

* The type will **always** be one of the following: “**sbyte**”, “**int**” or “**long**”
* We will use for **sbyte** the interval **[-128…127]**
* **n** will be in the interval **[1…20]**
* The **ids** will be integers in the interval **[-9223372036854775808…9223372036854775807]**
* The **id** will **never** be **0**.

### Examples

|  |  |  |
| --- | --- | --- |
| **Input** | **Output** | **Comments** |
| **int**  **4**  -2561  -3412  -5999  -2641 | Prisoner with id -2561 is sentenced to 21 years | The biggest int, which is the **closest** to **long’s** max value is **-2560**, and this is the thief’s id. Their sentence will equal to:  **-2561 / -128 = 20.01**. After rounding that equals **21 years**. |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Input** | **Output** |  | **Input** | **Output** |
| **sbyte**  **5**  1  126  128  1000  1241 | Prisoner with id 126 is sentenced to 1 year |  | **long**  **5**  1  56  100  -42  -2411 | Prisoner with id 100 is sentenced to 1 year |

## House Builder

You are a house builder and you need to buy the materials for one of your clients. This is quite a special house and it needs special materials. The house needs **4** sbyte variables and **10** int variables. A rough design of the house can be seen below:



You will receive **two** numbers from the console, which will be the prices of the **materials**. **One** will be an **integer** and the **other** will be sbyte, but you do not know the order in which they will be given. The intnumber will be the **price** of the int **materials** and the sbytenumberwill be the **price** of the sbyte **materials**.

Calculate the **total** **price of the materials** and print them on the console.

### Input

* You will receive **two lines** of input, containing different **numbers** from **different numeral types**.

### Output

Print the **total** price for the **materials**.

### Constraints

* The sbyte **price** will be integers in the interval **[0…127]**
* The int **price** will be integer in the interval **[128…2147483647]**

### Examples

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Input** | **Output** |  | **Input** | **Output** |
| 100  2000 | 20400 |  | 2147483647  127 | 21474836978 |

# Text and Other Types

## Make a Word

Write a program, which combines **n** characters and prints on a single line the **combinations** of these characters.

### Input

* On the **first** **line**, you will receive **n** – the number of **lines**, which will **follow**
* On the next **n lines** – you will receive **lower** and **uppercase** characters from the **English** alphabet

### Output

**Print** the **word** in the format:

The word is: {word}

### Constraints

* **n** will be in the interval **[1…20]**.
* The **characters** will always be either **uppercase** or **lowercase** letters from the **English alphabet**
* You will receive **one** **letter** per **line**, **without** **empty** spaces.

### Examples

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Input** | **Output** |  | **Input** | **Output** |
| **5**  A  b  C  d  E | The word is: AbCdE |  | **12**  S  o  f  t  U  n  i  R  u  l  z  z | The word is: SoftUniRulzz |

## Sum of Chars

Write a program, which sums the ASCII codes of **n** characters and prints the **sum** on the console.

### Input

* On the **first** **line**, you will receive **n** – the number of **lines**, which will **follow**
* On the next **n lines** – you will receive letters from the **Latin** alphabet

### Output

Print the **total** **sum** in the following format:

The sum equals: {totalSum}

### Constraints

* **n** will be in the interval **[1…20]**.
* The **characters** will always be either **upper** or **lower**-case letters from the **English alphabet**
* You will always receive **one** **letter** per **line**

### Examples

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Input** | **Output** |  | **Input** | **Output** |
| **5**  A  b  C  d  E | The sum equals: 399 |  | **12**  S  o  f  t  U  n  i  R  u  l  z  z | The sum equals: 1263 |

## String Concatenation

Write a program, which reads **three** lines from the console. On the **first** line, there will be **delimiter** (**char**) – you have to **separate** the **strings** by this delimiter. The **second** line will be either “**even**” or “**odd**”. If you receive “**odd**”, you have to take every odd string and vice versa if you receive “**even**”. The last line will be the number of lines – **n** which you will receive. The **first** iteration of the **loop** starts from **1**.

Print the newly created string on a **new line**.

### Constraints

* **n** will be in the interval **[1…20]**.
* The strings will be at most **30** characters long

### Examples

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Input** | **Output** |  | **Input** | **Output** |
| -  **even**  **5**  One  Two  Three  Four  Five | Two-Four |  | **&**  **odd**  **4**  Pesho  Stefan  Maria  Gergana | Pesho&Maria |

### Hints

* In C#, you can use [String.Remove(…)](https://msdn.microsoft.com/en-us/library/d8d7z2kk(v=vs.110).aspx) to remove the last delimiter.
* In Java, you can use [String.substring(…)](https://www.javatpoint.com/java-string-substring) for the same operation.

## Beer Kegs

Write a program, which calculates the volume of **n** beer kegs. You will receive in total **3 \* n** lines. **Each three lines** will hold **information** for a **single** keg. First up is the **model** of the keg, after that is the **radius** of the keg, and lastly is the **height** of the keg.

Calculate the volume using the following formula: π \* r^2 \* h.

At the end, print the **model** of the **biggest** keg.

### Input

You will receive **3 \* n** lines. Each group of lines will be on a new line:

* First – **model** – **string**.
* Second –**radius** – **floating-point** number
* Third **height** – **integer** number

### Output

Print the **model** of the **biggest** keg.

### Constraints

* **n** will be in the interval **[1…10]**
* The **radius** will be a **floating-point number** in the interval **[1…3.402823E+38]**
* The **height** will be an **integer** in the interval **[1…2147483647]**

### Examples

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Input** | **Output** |  | **Input** | **Output** |
| **3**  Keg 1  10  10  Keg 2  20  20  Keg 3  10  30 | Keg 2 |  | **2**  Smaller Keg  2.41  10  Bigger Keg  5.12  20 | Bigger Keg |

## Decrypting Messages

You will receive a **key** (**integer**) and **n** characters afterward. Add the key to each of the characters and append them to **message**. At the end print the message, which you decrypted.

### Input

* On the **first line**, you will receive the **key**
* On the **second line**, you will receive **n** – the number of **lines**, which will **follow**
* On the next **n lines** – you will receive **lower** and **uppercase** characters from the **Latin** alphabet

### Output

Print the **decrypted message**.

### Constraints

* The **key** will be in the interval **[0…20]**
* **n** will be in the interval **[1…20]**
* The **characters** will always be **upper** or **lower**-case letters from the **English alphabet**
* You will receive **one** **letter** per **line**

### Examples

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Input** | **Output** |  | **Input** | **Output** |
| **3**  **7**  P  l  c  q  R  k  f | SoftUni |  | **1**  **7**  C  d  b  q  x  o  s | Decrypt |

## \* Boat Simulator

You have the task to write a simulator of a boat race. You will receive **two** characters, which will **represent** the two **boats**.

After that you will receive **n** random strings. Each string on an **odd** line represents the **speed** of the **first** **boat** and on an **even** line – the **speed** of the **second** **boat**. The boat **moves** with the count of the tiles, equal to the **length** of the given **string**. The **first** **boat**, which reaches **50** **tiles** is the **winner**.

Our boats can be **upgradable**, which means when we receive the string “**UPGRADE**” we **add** **3** to the **ASCII** codes of **both** of the boats characters and after that, we use those **characters** to represent the boats. If you receive “**UPGRADE**”, you should **not** **move** the boats.

If one of the boats **reaches 50** moves – printthe character of the **winner** and **stop** taking any **input**. If **neither** of the boats reach **50** moves – print the boat, which reached the **most** **moves**.

### Input

* On the **first line**, you will receive the **character** of the **first** boat
* On the **second line**, you will receive the **character** of the **second** boat
* On the **third line,** you will receive **n** – the number of lines, which will follow

### Output

Print only the **character representation** of the **winning boat**.

### Constraints

* **n** will be in the interval **[1…20]**
* The length of the stings will be between **[1…100]** characters
* At the **end,** the boats will **not** have **equal** **moves**

### Examples

|  |  |  |
| --- | --- | --- |
| **Input** | **Output** | **Comments** |
| **!**  **(**  **7**  move  need for speed  go  fast and furious  UPGRADE  stopTheBoat  UPGRADE | . | First boat 🡺 ‘!’, second boat 🡺 ‘(’  “**move**” 🡺 **4 letters long** 🡺 **first** **boat (odd row)** moves **4 tiles**  “**need for speed**” 🡺 14 letters long 🡺 **second boat (even row)** moves **14** tiles.  “**go**” 🡺 2 letters long 🡺 **first boat** **(odd row)** moves **2** tiles.  “**fast and furious**” 🡺 16 letters long 🡺 **second boat** moves **16** tiles.  “**UPGRADE**” 🡺 add 3 to‘!’ 🡺 upgrades to **‘**$**’**, add 3 to **‘**(**‘** 🡺 upgrades to **‘**+**’**.  “**stopTheBoat**” 🡺 11 letters long 🡺 **second boat** moves **11** tiles.  “**UPGRADE**”🡺 add 3 to ‘$’ 🡺 upgrades to **‘**'**’**, add 3 to **‘**+**‘** 🡺 upgrades to **‘**.**’**.  **Winner – second boat 🡺 41 moves >** **6 moves** 🡺 **second boat wins** |

|  |  |  |
| --- | --- | --- |
| **Input** | **Output** | **Comments** |
| **E**  **A**  **10**  UPGRADE  start  driveWithTheSpeedOfLight  go  driveWithTheSpeedOfLightOrFaster  Should not be read  a  Should not be read  b  Should not be read | H | We start with an **UPGRADE** and the first boat is represented by ‘**H**’ and the second by ‘**D**’  After the **5th** line of input the **first** boat has made **50** moves and you should **not** take as an input the **other lines**. |

## \* Balanced Brackets

You will receive **n** lines. On **those** **lines**, you will receive **one** of the following:

* Opening bracket – “(“,
* Closing bracket – “)” or
* **Random string**

Your task is to find out if the **brackets** are **balanced**. That means after every **closing** bracket should follow an **opening** one. Nested parentheses are **not valid**, and if **two** **consecutive opening brackets** exist, the expression should be marked as **unbalanced**.

### Input

* On the **first line**, you will receive **n** – the number of lines, which will follow
* On the next **n** lines, you will receive “(”, “)” or **another** string

### Output

You have to print “BALANCED”, if the parentheses are balanced and “UNBALANCED” otherwise.

### Constraints

* **n** will be in the interval **[1…20]**
* The length of the stings will be between **[1…100]** characters

### Examples

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Input** | **Output** |  | **Input** | **Output** |
| **8**  (  5 + 10  )  \* 2 +  (  5  )  -12 | BALANCED |  | **6**  12 \*  )  10 + 2 -  (  5 + 10  ) | UNBALANCED |