LAB3 - Object

COMP-2021: Object-Oriented Programming

Objective

- To learn more about Java basics
  - Type conversion and casting
  - Control structures
- To practice using object and differentiate Class and Object
  - Create a class (includes fields, constructors and methods)
  - Instantiate objects and access members

Hero's Greeting

Create 3 heroes and let them greet each other.

- Define a class `Hero`, which contains the following fields (choose the proper type for each field)
  - `name`, `age` and `gender`
  - the `superPower`, which is determined by fields `age` and `gender`

    ```
    Male with age smaller than 40: "_TimeTravel_".
    Male with age larger than or equal to 40: "_Invulnerability_".
    Female with age smaller than 40: "_Precognition_".
    Female with age larger than or equal to 40: "_Healing_".
    ```

  - `greetingCount` counts the number of greeting made by a hero

Hero's Greeting (cont'd)

- Add a constructor with three arguments to the class.
  - accepts values of `name`, `age` and `gender`
  - assigns values to corresponding fields
  - inits the `superPower` field according to its rules
- Add a no-arg constructor which randomly initializes a new `Hero` object in the following way
  - `name`: consist of two random upper letters, i.e. A-Z
  - `age`: set to a random number in range [5,90)
  - `gender`: randomly set to male or female
  - `superPower`: set according to its rules

- Create a method called `greeting` for Hero
  - Parameter: another `Hero`
  - Behavior: printing a greeting message in the following format to the other Hero:
    (doing nothing if the other Hero is itself or null)
    - Greeting- `greetingCount` from Hero- `name` : Hi Hero- `anotherHero.name` , I'm `name` , my super power is `superPower` .
    - Output example:

```
Greeting-0 from Hero-SV: Hi Hero-UI, I'm SV, my super power is Healing.
Greeting-1 from Hero-SV: Hi Hero-XV, I'm SV, my super power is Healing.
Greeting-1 from Hero-UI: Hi Hero-XV, I'm UI, my super power is TimeTravel.
Greeting-2 from Hero-UI: Hi Hero-ZY, I'm UI, my super power is TimeTravel.
```

Hero's Greeting (cont'd)

- Use debugger to examine the initialization of fields
    i. Set a breakpoint at the first statement of a Constructor;
    ii. Debug the program and `step over` the constructor to monitor the initial value of each variable.
- Use debugger to View how methods get pushed onto or popped from the call stack
    i. Set a breakpoint at a statement that contains a method call;
    ii. Debug the program and `step into` the method call to examine the stack frame in the debug panel. Find out all variables and their values for each frame in the stack.

Practice

- We can also define `superPower` as a method and compute a hero's superpower every time the method is invoked.
- Change your program and implement this idea.
- Discuss the advantages and disadvantages of the two approaches.

Tips

- Generate a random integer within range [0,n).

```
Random random = new Random();
// `import java.util.Random;` is required
int age = random.nextInt(n);
```

- Generate a random character and convert it to String

```
String name = ((char) (random.nextInt(26) + 'A')) + "";
```

Tips (cont'd)

- A char variable contains an unsigned 16-bit integer value (e.g., `'A'` holds the int value `65`).
- `random.nextInt(26) + 'A'` is an infix expression of two integers; The result has a random value in range [65,90]. (The ASCII value of character A~Z is [65,90])
- `(char) (random.nextInt(26) + 'A')` explicitly casts the random number from type `int` to `char`.
- If one operand of `+` is of type `String` (e.g., `+ ""`)
  1. the other operand will be converted to a `String`,
  2. then the two strings are concatenated.

ACSII

- ASCII stands for American Standard Code for Information Interchange.
- ASCII is a very small character set, a char value in Java represents a character in UTF-16 encoding, and UTF-16 character set is a super set of ASCII character set.

```
Dec  = Decimal Value
Char = Character
```

Dec	Char	Dec	Char	Dec	Char	De	Cha	Dec	Char
48	0	64	@	80	P	96	`	112	p
49	1	65	A	81	Q	97	a	113	q
50	2	66	B	82	R	98	b	114	r
51	3	67	C	83	S	99	c	115	s
52	4	68	D	84	T	100	d	116	t
53	5	69	E	85	U	101	e	117	u
54	6	70	F	86	V	102	f	118	v
55	7	71	G	87	W	103	g	119	w
56	8	72	H	88	X	104	h	120	x
57	9	73	I	89	Y	105	i	121	y
58	:	74	J	90	Z	106	j	122	z
59	;	75	K	91	[	107	k	123	{
60	<	76	L	92	\	108	l	124	|
61	=	77	M	93	]	109	m	125	}
62	>	78	N	94	^	110	n	126	~
63	?	79	O	95	_	111	o	127	DEL

- Reference: http://www.asciitable.com/