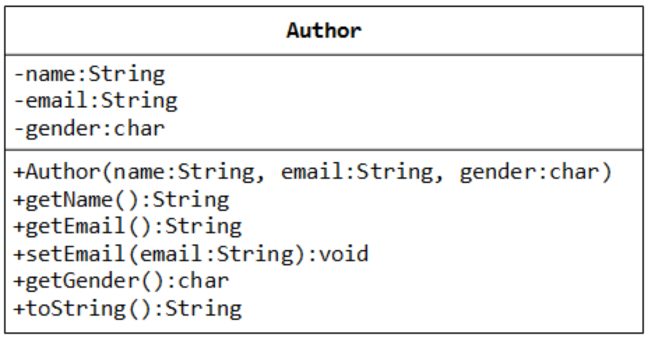
Week 2

Exercise 2.1: The Author and Book Classes



```
Author
-name:String
-email:String
-gender:char
+Author(name:String, email:String, gender:char)
+getName():String
+getEmail():String
+setEmail(email:String):void
+getGender():char
+toString():String
```

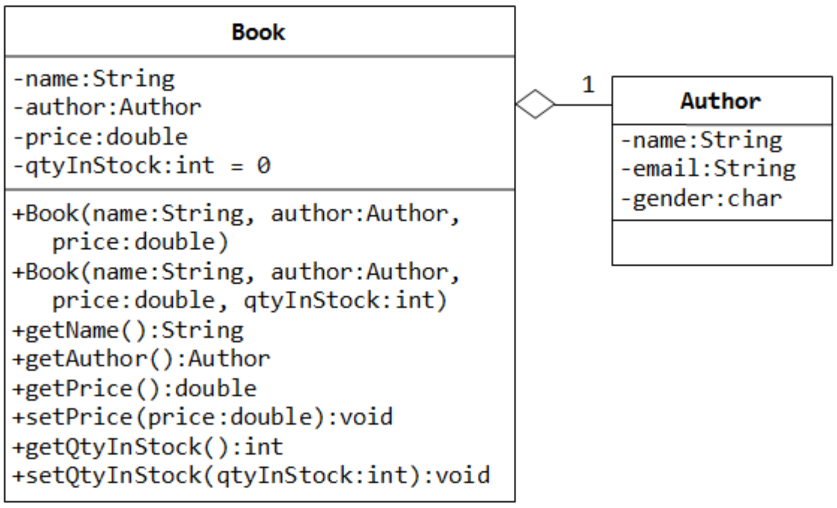
A class called Author is designed as shown in the class diagram. It contains:

- Three private instance variables: name (String), email (String), and gender (char of either 'm'or 'f');
- One constructor to initialize the name, email and gender with the given values;

```
public Author (String name, String email, char gender) {......}
```

  (There is no default constructor for Author, as there are no defaults for name, email and gender.)
- public getters/setters: getName(), getEmail(), setEmail(), and getGender();
  (There are no setters for name and gender, as these attributes cannot be changed.)
- A toString() method that returns "*author-name (gender) at email*", e.g., "Tan Ah Teck (m) at ahTeck@somewhere.com".

A class called Book is designed as shown in the class diagram.



```
Book
-name:String
-author:Author
-price:double
-qtyInStock:int = 0
+Book(name:String, author:Author,
   price:double)
+Book(name:String, author:Author,
   price:double, qtyInStock:int)
+getName():String
+getAuthor():Author
+getPrice():double
+setPrice(price:double):void
+getQtyInStock():int
+setQtyInStock(qtyInStock:int):void
```

The class Book contains:

- Four private instance variables: name (String), author (of the class Author you have just created, assume that each book has one and only one author), price(double), and qtyInStock (int);

- Two constructors:

```
public Book (String name, Author author, double price) {...}
public Book (String name, Author author, double price, int qtyInStock) {...}
```

- public methods `getName()`, `getAuthor()`, `getPrice()`, `setPrice()`, `getQtyInStock()`, `setQtyInStock()`.
- `toString()` that returns "*'book-name' by author-name (gender) at email*".
  (Take note that the `Author`'s `toString()` method returns "*author-name (gender) at email*".)

Write the class Book (which uses the `Author` class written earlier). Also write a test program called `TestBook` to test the constructor and `public` methods in the class Book. Take Note that you have to construct an instance of `Author` before you can construct an instance of Book *e.g.*,

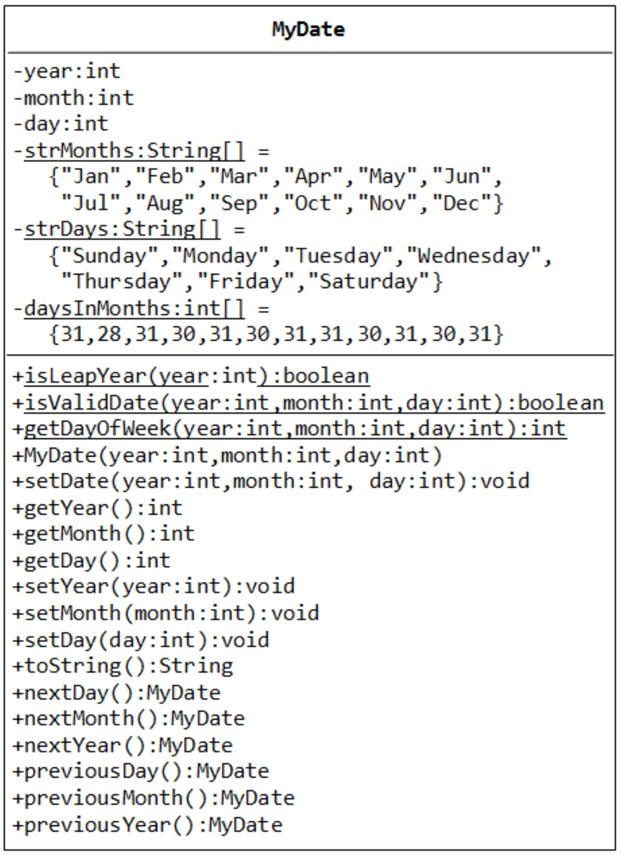
```
Author anAuthor = new Author(......);
Book aBook = new Book("Java for dummy", anAuthor, 19.95, 1000);
// Use an anonymous instance of Author
Book anotherBook = new Book("More Java for dummy",
                         new Author(......),
                         29.95, 888);
```

TRY:

1. Printing the name and `email` of the author from a Book instance.
2. Introduce new methods called `getAuthorName()`, `getAuthorEmail()`, `getAuthorGender()` in the Book class to return the `name`, `email` and `gender` of the author of the book. For example,

```
public String getAuthorName() { ...... }
```

Exercise 2.2: The `MyDate` Class



```
MyDate
-year:int
-month:int
-day:int
-strMonths:String[] =
   {"Jan","Feb","Mar","Apr","May","Jun",
    "Jul","Aug","Sep","Oct","Nov","Dec"}
-strDays:String[] =
   {"Sunday","Monday","Tuesday","Wednesday",
    "Thursday","Friday","Saturday"}
-daysInMonths:int[] =
   {31,28,31,30,31,30,31,31,30,31,30,31}
+isLeapYear(year:int):boolean
+isValidDate(year:int,month:int,day:int):boolean
+getDayOfWeek(year:int,month:int,day:int):int
+MyDate(year:int,month:int,day:int)
+setDate(year:int,month:int, day:int):void
+getYear():int
+getMonth():int
+getDay():int
+setYear(year:int):void
+setMonth(month:int):void
+setDay(day:int):void
+toString():String
+nextDay():MyDate
+nextMonth():MyDate
+nextYear():MyDate
+previousDay():MyDate
+previousMonth():MyDate
+previousYear():MyDate
```

A class called `MyDate`, which models a date instance, is defined as shown in the class diagram.
The `MyDate` class contains the following `private` instance variables:

- `year` (`int`): Between 1 to 9999.
- `month` (`int`): Between 1 (Jan) to 12 (Dec).
- `day` (`int`): Between 1 to `28|29|30|31`, where the last day depends on the month and whether it is a leap year for Feb (`28|29`).

It also contains the following `private static` variables (drawn with underlined in the class diagram):

- `strMonths` (`String[]`), `strDays` (`String[]`), and `dayInMonths` (`int[]`): `static` variables, initialized as shown, which are used in the methods.

The `MyDate` class has the following `public static` methods (drawn with underlined in the class diagram):

- `isLeapYear(int year)`: returns `true` if the given `year` is a leap year. A year is a leap year if it is divisible by 4 but not by 100, or it is divisible by 400.
- `isValidDate(int year, int month, int day)`: returns `true` if the given `year`, `month`, and `day`constitute a valid date. Assume that `year` is between 1 and 9999, `month` is between 1 (Jan) to 12 (Dec) and `day` shall be between 1 and `28|29|30|31` depending on the `month` and whether it is a leap year on Feb.
- `getDayOfWeek(int year, int month, int day)`: returns the day of the week, where `0` for Sun, `1`for Mon, ..., `6` for Sat, for the given date. Assume that the date is valid. You can look up from Wiki on "Determination of the day of the week".

The `MyDate` class has one constructor, which takes 3 parameters: `year`, `month` and `day`. It shall invoke `setDate()` method (to be described later) to set the instance variables.

The `MyDate` class has the following `public` methods:

- `setDate(int year, int month, int day)`: It shall invoke
  the `static` method `isValidDate()`to verify that the given `year`, `month` and `day` constitute a valid date.
  (Advanced: Otherwise, it shall throw an `IllegalArgumentException` with the message "Invalid year, month, or day!".)
- `setYear(int year)`: It shall verify that the given `year` is between 1 and 9999.
  (Advanced: Otherwise, it shall throw an `IllegalArgumentException` with the message "Invalid year!".)
- `setMonth(int month)`: It shall verify that the given `month` is between 1 and 12.
  (Advanced: Otherwise, it shall throw an `IllegalArgumentException` with the message "Invalid month!".)
- `setDay(int day)`: It shall verify that the given `day` is between `1` and `dayMax`,
  where `dayMax` depends on the `month` and whether it is a leap year for Feb.
  (Advanced: Otherwise, it shall throw an `IllegalArgumentException` with the message "Invalid month!".)
- `getYear()`, `getMonth()`, `getDay()`: return the value for the `year`, `month` and `day`, respectively.
- `toString()`: returns a date string in the format "`xxxday d mmm yyyy`", e.g., "Tuesday 14 Feb 2012".
- `nextDay()`: update `this` instance to the next day and return `this` instance. Take note that `nextDay()` for `31 Dec 2000` shall be `1 Jan 2001`.
- `nextMonth()`: update `this` instance to the next month and return `this` instance. Take note that `nextMonth()` for `31 Oct 2012` shall be `30 Nov 2012`.
- `nextYear()`: update `this` instance to the next year and return `this` instance. Take note that `nextYear()` for `29 Feb 2012` shall be `28 Feb 2013`.
  (Advanced: throw an `IllegalStateException` with the message "Year out of range!" if year > 9999.)
- `previousDay()`, `previousMonth()`, `previousYear()`: similar to the above.

Write the code for the `MyDate` class.

Use the following test statements to test the `MyDate` class:

```
MyDate d1 = new MyDate(2012, 2, 28);

System.out.println(d1);              // Tuesday 28 Feb 2012
System.out.println(d1.nextDay());    // Wednesday 29 Feb 2012
System.out.println(d1.nextDay());    // Thursday 1 Mar 2012
System.out.println(d1.nextMonth());  // Sunday 1 Apr 2012
System.out.println(d1.nextYear());   // Monday 1 Apr 2013

MyDate d2 = new MyDate(2012, 1, 2);
System.out.println(d2);                  // Monday 2 Jan 2012
System.out.println(d2.previousDay());    // Sunday 1 Jan 2012
System.out.println(d2.previousDay());    // Saturday 31 Dec 2011
System.out.println(d2.previousMonth());  // Wednesday 30 Nov 2011
System.out.println(d2.previousYear());   // Tuesday 30 Nov 2010

MyDate d3 = new MyDate(2012, 2, 29);
System.out.println(d3.previousYear());   // Monday 28 Feb 2011

// MyDate d4 = new MyDate(2099, 11, 31); // Invalid year, month, or day!
// MyDate d5 = new MyDate(2011, 2, 29);  // Invalid year, month, or day!
```