Part 3: Program (96 points)

1. (18 points) Write an App for the point and line operations. Consider the following classes for a point and a line equation $ax + by = c$.

```java
class Point {
    double x, y;
}

class LineEquation {
    double a, b, c;
}
```

(a) (8 points) Create an interface (layout XML) that allows the user to enter the line equation and a point.

(b) (3 points) Write a function that takes a line and returns the area formed by the line, x-axis, and y-axis.

(c) (4 points) Write a function that takes a point and a line and returns the distance from the point to the line.

   Hint: $distance((x_0, y_0), ax + by = c) = \frac{|ax_0 + by_0 - c|}{\sqrt{a^2 + b^2}}$.

(d) (3 points) Write the main activity to use above functions.

A possible run may look like:

Enter $ax + by = c$ and a point $(d, e)$: 3 4 12 0 0
The area formed by $3.00x + 4.00y = 12$, x-axis, and y-axis is 6.
The distance between $(0.00, 0.00)$ and $3.00x + 4.00y = 12$ is 2.40.

2. (30 points) Create an App for a Bingo game.

(a) (10 points) Create an interface (layout XML) that allows the user to enter $n$ and $n$ numbers between 1 and 25.

(b) (7 points) Write a function that randomly fills a board of 5 by 5 with numbers from 1 to 25.

(c) (9 points) Write a function that takes the board, an array of numbers, marks the selected number, and calculates how many lines can be formed.

(d) (4 points) The player selects $n$ numbers and uses the above function to check how many lines can be formed.

A possible run may look like:

Enter $n$: 12
Enter 12 numbers between 1 and 25: 2 5 6 7 8 9 10 13 15 17 21 22
The randomly generated 5 by 5 board is:
3 6 1 25 11
19 22 8 14 17
2 9 21 10 5
20 15 18 4 12
13 7 23 24 16
The result is:
3 * 1 25 11
19 * * 14 *
* * * * *
20 * 18 4 12
* * 23 24 16
Two lines are formed.

3. (46 points) Create an Android application of the product information.

(a) (12 points) Create an interface (layout XML) which allows a user to enter the product ID, the name, the price, and the quantity of a product. There are five buttons: insert, search, update, delete, and list.

(b) (8 points) Create a database to store the information of products.

(c) (26 points) There are five operations:

   i. (5 points) Inserting the information of a product into the database.
   ii. (6 points) Searching a product by her or his name.
   iii. (5 points) Updating a product information.
   iv. (5 points) Deleting a product by the product name.
   v. (5 points) List all products.