Loops

CMPT220L
Due on Feb 25, 2022 by 11:59PM
Points: 100

Problems

1. *(Geometry: area of a regular polygon)* A regular polygon is an n-sided polygon in which all sides are of the same length and all angles have the same degree (i.e., the polygon is both equilateral and equiangular). The formula for computing the area of a regular polygon is

$$Area = \frac{n \times s^2}{4 \times \tan\left(\frac{\pi}{n}\right)}$$

Here, s is the length of a side. Write a program that prompts the user to enter the number of sides and their length of a regular polygon and displays its area. Here is a sample run:

```
Enter the number of sides: 5
Enter the side: 6.5
The area of the polygon is 72.69017017488385
```

2. *(Corner point coordinates)* Suppose an n-sided regular polygon is centered at (0,0) with one point at the 3 o'clock position, as shown in Figure 1. Write a program that prompts the user to enter the number of the sides, the radius of the bounding circle of a polygon, and displays the coordinates of the corner points on the polygon.

Here is a sample run:

```
Enter the number of the sides: 6
Enter the radius of the bounding circle: 100
The coordinates of the points on the polygon are
(100.0, 0.0)
(50.0, 86.6)
(-50.0, 86.6)
(-100.0, 1.22)
(-50.0, -86.6)
(50, -86.60)
```

3. *(Bioinformatics: find genes)* Biologists use a sequence of the letters A, C, G, and T to model a genome. A gene is a substring of a genome that starts after a triplet ATG and ends before a triplet TAG, TAA, or TGA. Furthermore, the length of a gene string is a multiple of 3, and the gene does not contain any of the triplets ATG, TAG, TAA, or TGA. Write a program that prompts the user to enter a genome and displays all genes in the genome. If no gene is found in the input sequence, display "no gene is found".

Here are the sample runs:

```
Enter a genome string: TTATGTTTTAAGGATGGGGCGTTAGTT
TTT
```
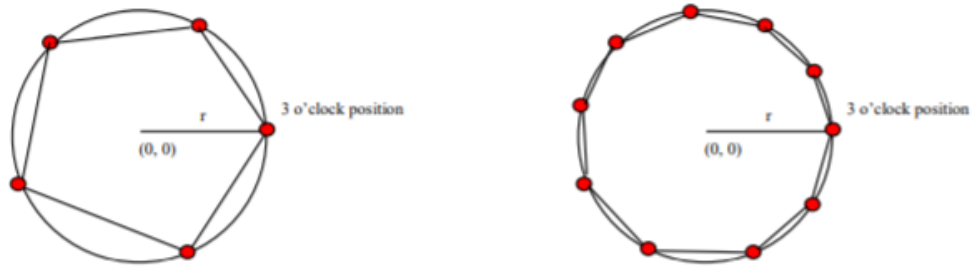
Figure 1: An n-sided polygon is centered at (0,0) with one point at the 3 o'clock position

```
GGGCGT

Enter a genome string: TGTGTGTATAT
no gene is found
```

4. *(Reduce square root)* Write a program that prompts the user to enter a positive integer and obtains its square root in simplest form. For example, the simplest form for $\sqrt{18}$ is $3\sqrt{2}$ is, for 28 is $2\sqrt{7}$, and for $3\sqrt{648}$ is $18\sqrt{2}$.

Here are some sample runs:

```
Enter a positive integer: 1300
sqrt(1300) is 10*sqrt(13)

Enter a positive integer: 31
sqrt(31) is sqrt(31)

Enter a positive integer: 64
sqrt(64) is 8
```

Submission

Make sure you create one Java file per project. Place your `.java` files under the corresponding folder in your local copy of the GitHub repository, commit and push it to the remote repository. Make sure that the professor has access to the repository (`jfac65-marist`).

```
cmpt220lastname\
   hw04\
      Problem1.java
      Problem2.java
      Problem3.java
      Problem4.java
```