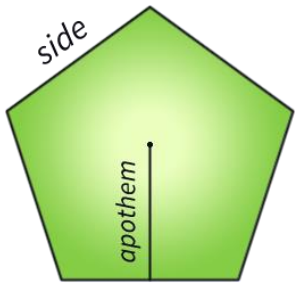
COMP 1600 Fall 2025

Project 1: Purchasing Polygonal Properties



Due by: Friday, September 12, 2025 at 11:59 p.m.

All of the plots of land on the Greek island of Polygos are shaped like **regular polygons**. A regular polygon is one whose sides are all the same length and whose angles are all the same as well, such as a square or an equilateral triangle.

Your program will help people calculate how much a given property would cost to buy. Cost is based on area because of the price of land as well as perimeter because of the cost of the fencing which must be put around all properties on Polygos.

Specification

Your program must first read in six pieces of data: two `String` values, an `int` value, and three `double` values.

1. First name
2. Last name
3. Sides the property has
4. Side length in meters
5. Property cost per square meter
6. Fence cost per meter

From this data, you must compute the following seven values:

1. Total **area**: the area covered by the polygon
2. Total **perimeter**: the distance around the edge of the polygon in meters
3. Length of **apothem**: the distance from the center of the polygon to the middle of a side
4. **Interior angle**: the interior angle at which sides of the polygon meet
5. Cost of land: the property cost per square meter multiplied by the total area
6. Cost of fencing: the fence cost per square meter multiplied by the total perimeter
7. Total cost: the cost of land plus the cost of fencing

Then, your program must read in two additional pieces of data, a `double` value and an `int` value. These pieces of data assume that the user is taking out a loan for the total cost at a fixed interest rate over a set number of years.

1. Annual interest rate
2. Length of loan in years

Finally, your program must compute the following value:

- Total cost with interest: the total cost including loan interest

Once these values have been computed, they must be presented with formatting that **exactly** matches the sample output below.

Sample Execution

Below is sample output from the execution of the program. The user is prompted for his or her first name, last name, sides the property has, side length in meters, property cost per square meter, and fence cost per meter. User input is marked in **green**, just as it is in IntelliJ. Note that this is only a **sample**. Users must be able to enter any name and any values for the property dimensions and costs.

After these values are read in, an appropriately named title for the table of property information, using the first initial and the last name of the user, is printed, followed by 64 asterisks on the next line. Then, the seven computed values of property information are printed on separate lines.

Then, the words `Loan Information` are printed on a separate line, followed by 64 asterisks on the next line. The user is prompted for the annual interest rate and the length of the loan in years.

After these values are read in, the computed value of the total cost with interest is printed on a separate line.

Note: Your output must match **exactly, to the character,** to get full credit.

```
Welcome to the Polygonal Land Plot Calculator!

Enter your first name:                David
Enter your last name:                 Stucki
Enter the sides the property has:     7
Enter side length in meters:          10.4
Enter property cost per square meter: $3.50
Enter fence cost per meter:           $6.75

Property Information for D. Stucki
****************************************************************
Total area:                           393.044 square meters
Total perimeter:                      72.800 meters
Length of apothem:                    10.798 meters
Interior angle:                       128.571 degrees
Cost of land:                         $1375.65
Cost of fencing:                      $491.40
Total cost:                           $1867.05

Loan Information
****************************************************************
Enter annual interest rate:           .05
Enter length of loan in years:        10
Total cost with interest:             $3041.23
```

Equations

In order to compute the correct geometric values, there are several formulas you may find useful. In these equations the variable *sides* refers to the number of sides of the polygon, *length* refers to the length of a side, *apothem* is the length of the apothem, *area* is the total area of the polygon, *perimeter* is the perimeter of the polygon, and *angle* is the interior angle of the polygon.

- $apothem = \frac{1}{2}\ length \cdot \cot(180° / sides)$
- $area = \frac{1}{2}\ sides \cdot length \cdot apothem$
- $perimeter = sides \cdot length$
- $angle = 180° \cdot (sides - 2)/sides$

To compute the total cost with interest you will only need one equation. For this equation, *cost* is the total amount of money including interest, *principal* is the initial amount of money borrowed, *rate* is the annual interest rate, and *years* is the length of the loan in years.

- $cost = principal \cdot (1 + rate)^{years}$

These formulas use mathematical notation. Remember that steps must be taken to convert mathematical notation into equivalent Java syntax. In particular, dividing integers in mathematics can produce rational numbers. In Java, dividing two integers will always make another integer. Also, all trigonometric methods in the Java `Math` class use radians as angle units, although the equations above all use degrees. You will need to convert the degrees to radians before using the `Math.tan()` method.

Hints

Tabs

You might notice that the values all line up in a column. This occurs because tabs are being used for spacing. You can use the escape sequence `\t` inside of a `String` literal to print a tab. Most entries will require three tabs, but the two longest entries will only require one.

Decimals

All computed geometric values show exactly three places after the decimal point. All costs show exactly two places after the decimal point to represent cents. To get full points, your output must match. Use the `System.out.format()` method to accomplish this formatting.

Turn In

Your IntelliJ project should be called `Project1`, but the class you create inside should be called `Polygon`. Upload the `Polygon.java` file from the `Project1\src` folder wherever you created your project to **Brightspace**.

All work must be submitted before Friday, September 12, 2025 at 11:59 p.m. unless you are going to use a grace day.

All work must be done individually. You may discuss general concepts with your classmates, but it is never acceptable for you to look at someone else's code. Please refer to the course policies if you have any questions about academic integrity. If you have trouble with the assignment, I am always available for assistance.

Grading

Your grade will be determined by the following categories, based largely on correctly computing four geometric values and four costs:

Category	Weight
Computing total area	10%
Computing total perimeter	10%
Computing length of apothem	10%
Computing interior angle	10%
Computing cost of land	10%
Computing cost of fencing	10%
Computing total cost	10%
Computing total costs with interest	10%
Matching output formatting exactly	10%
Coding style and comments	10%

Under no circumstances should any student look at the code written by another student. Tools will be used to detect code similarity automatically.

Code that does not compile will automatically score zero points.