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The University of Jordan

Faculty of Engineering and Technology

Department of Computer Engineering

Object-Oriented Problem Solving: CPE 342

Part-I: Implement the following Polygon class:

Polygon
color: String filled: boolean sidesLengths: double []

Polygon()
Polygon(c: String, f:boolean, number: int)
Polygon(c: String, f: boolean, values: double[])
isEquilateral(): boolean
getPerimeter(): double
convert(): void

The Polygon class contains the following data fields:

- A *String* that represents the polygon *color*. The default color is "*Black*".

- A *boolean* data field called *filled* which determines whether the polygon is filled or not. The default filled value is *true*.

- An array of double values called (*sidesLengths*) that represent the lengths (in cm) of the polygon sides. The length of this array equals the number of sides of the polygon. The default number of sides of the polygon is 4 with each side having a value of 1.

The Polygon class contains the following constructors:

- A *no-arg* constructor that creates a polygon by reading its data fields values from the user.

  - It must read the *color* by prompting the user with the message "*What is the polygon color?*".
  - It must read whether the polygon is *filled* or not with the prompting message "*Is the polygon filled (Y/N)?*". The user must answer with either Y/y or N/n. If the user enters any other input, the program must keep on asking the user to answer either with Y/y or N/n.
  - It must read the number of sides of the polygon which represents the array *sidesLengths* size. The entered value must be between 3 (included) and 10 (excluded). If the user inputs a wrong value, the program must keep on prompting him to enter a correct value as required.
  - The constructor must then read the sides lengths (array elements) from the user. The entered values must be positive non-zero values. For each size length, if the user inputs a wrong value, the program must keep on prompting him to enter a correct value as required.

- A constructor that initializes the color and filled fields with the passed c and f parameters, respectively. The constructor must also create a polygon with the specified number of sides (passed as the *number* parameter). The passed number of sides must be greater than or equal to 3 and less than 10, if not the array must be assigned the default size. The constructor must then initialize the sides' lengths to 1s.

- A constructor that initializes the color and filled fields with the passed c and f parameters, respectively. The constructor must also create a polygon with sides' lengths copied from the passed array of double values. Note that the *sidesLengths* array should be initialized by creating a copy of the passed array. The passed array size must be greater than or equal to 3 and less than 10. If not, the array must be initialized with the default size of 3 and sides lengths of 2.

The Polygon class contains the following methods:

- A method named *isEquilateral* that returns true if all the polygon’s sides are of the same length and false otherwise.

- A method named *getPerimeter* that returns the perimeter of the polygon.

- A method named *convert* that modifies the polygon by changing the number of its sides either by adding sides or removing sides. This is performed by asking the user about the number of sides to convert the polygon to have.

  - If the user enters a number of sides that is greater than the polygon’s current number of sides, the required number of sides must be added to the array *sideslengths* and values of the added sides must be read from the user. For example, if the polygon’s current number of sides is 4 and the user enters that it is to be converted to have 6 sides, then two sides must be added by adding two elements to the array *sidesLengths*.
  - If the user enters a number of sides that is less than the polygon’s current number of sides, the required number of sides must be removed from the end of the array *sideslengths*. For example, if the polygon’s current number of sides is 6 and the user enters that it is to be converted to have 3 sides, then three sides must be removed by removing three elements from the end of the array *sidesLengths*.
  - If the user enters a “number of sides” that is the same as the polygon’s current number of sides, the following message must be printed “*No change on number of sides: polygon already has requested number of sides!*”.
  - If the user enters a “number of sides” that is less than 3 or more than 9, the following message must be printed “*No change on number of sides: invalid requested number of sides*”.

<u>Part-II: In your main class:</u>

- Declare and create 3 polygon objects:

1) The first polygon using the no-arg constructor,
2) The second polygon using the second constructor: with 4 sides. The color of the polygon is “Red” and it is filled.
3) The third polygon using the third constructor: with 5 sides and the following lengths: 1, 2, 2, 4 and 4 cm. The color of the polygon is “Blue” and it is filled.

- Convert the second polygon to have 7 sides, values of the three added sides are: 4, 5, 6.
- Convert the third polygon to have 3 sides.

- Print the following table which contains info of the three polygons:
Note that either “yes” or “no” should be printed in the *Filled* and *Equilateral* fields.
Note that columns of your table must <u>be aligned and left justified</u>.

Polygon#	# of sides	sides-lengths	Color	Filled	Equilateral?	Perimeter
1	….	…..				
2	…..	…..				
3	….	…..				