

Problem V

Did you Pay Your Taxes?

Problem ID: taxes

Your solution to this problem must implement an object-oriented approach that uses inheritance. Any other solution will receive zero points, even if the testing system judges it correctly.

In the fictional country of Freedonia, citizens and people who work need to pay taxes on their annual income. To calculate a tax bill, the Freedonia government uses a progressive tax system, where higher income earners are taxed at higher rates. The government groups citizens into a default set of tax brackets based on their income. Specifically, the government uses the following chart to group citizens into five tax brackets:

Tax rate	Income bracket	Taxes owed
5%	\$0 to \$10,000	5% of taxable income
10%	\$10,001 to \$30,000	\$500 plus 10% of the amount over \$10,000
15%	\$30,001 to \$50,000	\$2,500 plus 15% of the amount over \$30,000
20%	\$50,001 to \$100,000	\$5,500 plus 20% of the amount over \$50,000
25%	\$100,001 or more	\$15,500 plus 25% of the amount over \$100,000

Let's look at an example that calculates one citizen's tax bill. If the citizen earns \$40,000 then they fall into the 15% tax bracket because their income is within the range for that bracket. The citizen pays 5% on that first \$10,000 and 10% on the chunk of income between \$10,001 and \$30,000. They then pay 15% on the rest, because some of their \$40,000 income falls into the 15% tax bracket. This means the citizen's tax bill is \$4,000, the breakdown for which is illustrated in the chart below.

Dollars	Amount Subject to Tax	Tax Rate	Tax at Each Rate
\$0-\$10,000	$(\$10,000 - 0) = \$10,000$	5%	$(\$10,000 * .05) = \500
\$10,000-\$30,00	$(\$30,000 - \$10,000) = \$20,000$	10%	$(\$20,000 * .10) = \$2,000$
\$30,000-\$50,000	$(\$40,000 - \$30,000) = \$10,000$	15%	$(\$10,000 * .15) = \$1,500$
Total	\$40,000	-	\$4,000 tax bill

Citizens must *file* their taxes, which means they tell the government the amount of taxes they owe using the process explained above. However, there are different types of filers depending on where a citizen lives. The process of calculating taxes owed will be the same regardless of how a citizen files their taxes; however, citizens living in *urban* (an area surrounding a city) and *rural* (an area that is located outside towns and cities) areas use different income ranges for their tax brackets. For this problem, we will call all citizens living outside of urban and rural areas as *F* filers, urban citizens as *U* filers, and rural citizens as *R* filers. *F* filers use the default tax brackets and income ranges as shown above. For *U* and *R* filers, the income ranges in the above chart change slightly:

- *U* filers - uses the same bracket as *F* filers with the exception that the ranges are doubled. For example, the 5% bracket has a range from \$0 to \$20,000 ($10,000 * 2$). The 10% bracket range is \$20,001 to \$60,000 ($30,000 * 2$). The 15% bracket range is \$60,001 to \$100,000 ($50,000 * 2$) and so on.

- R filers - the brackets are the same as the F brackets with the exception of the last two tax brackets have the following ranges:

Tax rate	Income bracket	Taxes owed
20%	\$50,0001 to \$200,000	\$5,500 plus 20% of the amount over \$200,000
25%	\$200,001 or more	\$35,500 plus 25% of the amount over \$200,000

Your task for this problem is to design and implement classes that use **inheritance** to represent the various filers: F , U , and R . Specifically, you must define three classes: a `Filer` class, a `UrbanFiler` class, and a `RuralFiler` class. Think closely about your inheritance hierarchy, to ensure there is little repeated code between the classes. Similarly, if the Freedonian government decided to add more types of filers with different tax brackets, it should be possible to do so by adding more classes and reusing (via inheritance) much of the code you'll implement.

As a reminder, your solution to this problem must implement an object-oriented approach that uses inheritance. Any other solution will receive zero points, even if the testing system judges it correctly.

Input

The input contains information pertaining to a single Freedonian citizen.

The first line of the input is a string that represents the way the citizen files based on where they live. The value "**F**" means the citizen is a F filer. The value "**U**" means the citizen is a U filer and "**R**" means the citizen is a R filer.

The second line of the input is a floating point value I ($0 \leq I \leq 1e6$) that represents the total income for the citizen.

Output

The output is a single floating point number that represents the total taxes owed for the citizen.

Sample Input 1

F 40000.00	400.00
---------------	--------

Sample Output 1

Sample Input 2

U 100000.00	11000.00
----------------	----------

Sample Output 2

Sample Input 3

R 150000.50	25500.10
----------------	----------

Sample Output 3