

Exercise 1: I/O Exceptions (Input Validation):

Write a Java program to calculate and display a customer water bill. Water costs more per gallon as use increases. Follow the following rules in the table for calculating the water bill.

Single-family and Duplex Water Rates

Single-family and duplex water rates have a base charge and three tiers.

Water		Single-Family	Duplex
Base Charge		\$13.21	\$15.51
Tier	Volume Charge per 1,000 Gallons		
1	0–7,000 Gallons	\$2.04	
	0–9,000 Gallons		\$1.97
2	7,001–13,000 Gallons	\$2.35	
	9,001–13,000 Gallons		\$2.26
3	Over 13,000 Gallons	\$2.70	\$2.60
Charges rounded to the nearest cent. Actual costs vary due to rounding.			

Note: Even though water rates are given as a rate per 1,000 gallons, the actual rates are still calculated on a per gallon rate. (i.e. for tier 1 the rate is \$.00204 per gallon)

Use **JOptionPane** for all input and output.

Let's do some examples:

Single family, 9000 gallons

$$\begin{aligned}\text{Water Bill} &= \text{Base charge} + 7000 * 2.04 / 1000.0 + (9000 - 7000) * 2.35 / 1000.0 \\ &= 13.21 + 7000 * 0.00204 + 2000 * 0.00235 \\ &= 13.21 + 14.28 + 4.70 \\ &= 32.19\end{aligned}$$

Duplex, 15000 gallons

$$\begin{aligned}\text{Water Bill} &= \text{Base charge} + 9000 * 0.00197 + 4000 * 0.00226 + (15000 - 13000) * 0.00260 \\ &= 15.51 + 9000 * 0.00197 + 4000 * 0.00226 + 2000 * 0.00260 \\ &= 15.51 + 17.73 + 9.04 + 5.20 \\ &= 47.48\end{aligned}$$

Program Data:

Customer Rate (1-Single-family, 2-Duplex): 1

Customer number: 223344 (required input from a user and must be 6 digits)

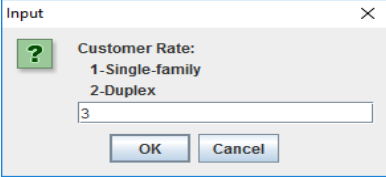
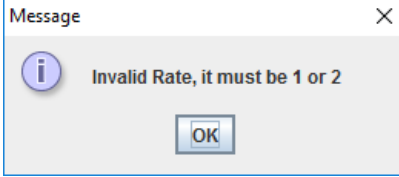
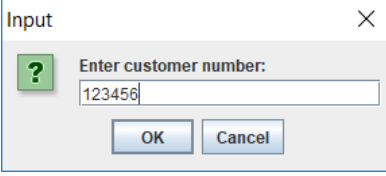

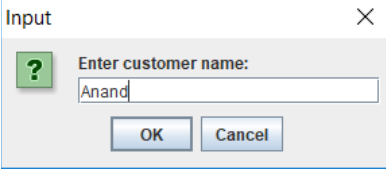
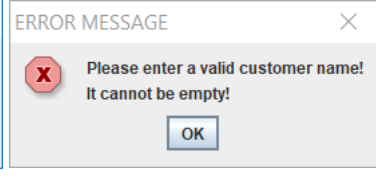
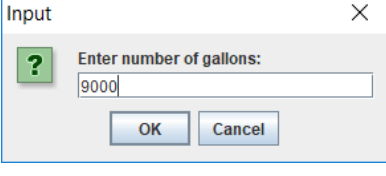
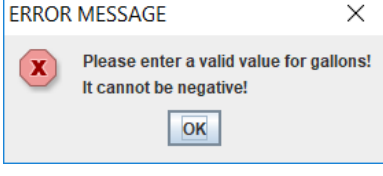
Customer Name: Michael Wells (required input from a user, validation is required)

Base charge: 16.33 (Must be a constant)

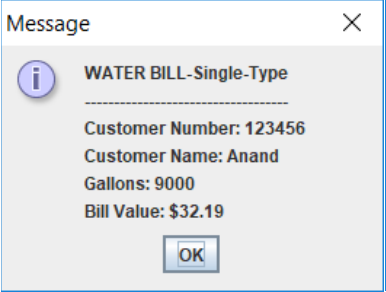
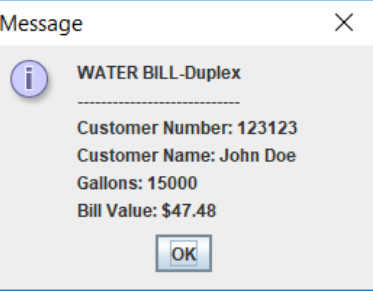
Volume charge, per 1,000 Gallons: 0.00253 (part of program data, can be a constant)

Number of gallons: 7000 (required input from the user and must not be a negative)

Program input sample: ERROR MESSAGES(as required)

 <p>Input dialog box titled "Input" with a question mark icon. It contains a label "Customer Rate:" with a list: "1-Single-family" and "2-Duplex". Below the list is a text field containing the number "3". At the bottom are "OK" and "Cancel" buttons.</p>	 <p>Message dialog box titled "Message" with an information icon. It contains the text "Invalid Rate, it must be 1 or 2". At the bottom is an "OK" button.</p>
 <p>Input dialog box titled "Input" with a question mark icon. It contains a label "Enter customer number:" and a text field containing "123456". At the bottom are "OK" and "Cancel" buttons.</p>	 <p>ERROR MESSAGE dialog box titled "ERROR MESSAGE" with an error icon. It contains the text "Please enter a valid 6-digit customer number!". At the bottom is an "OK" button.</p>
 <p>Input dialog box titled "Input" with a question mark icon. It contains a label "Enter customer name:" and a text field containing "Anand". At the bottom are "OK" and "Cancel" buttons.</p>	 <p>ERROR MESSAGE dialog box titled "ERROR MESSAGE" with an error icon. It contains the text "Please enter a valid customer name! It cannot be empty!". At the bottom is an "OK" button.</p>
 <p>Input dialog box titled "Input" with a question mark icon. It contains a label "Enter number of gallons:" and a text field containing "9000". At the bottom are "OK" and "Cancel" buttons.</p>	 <p>ERROR MESSAGE dialog box titled "ERROR MESSAGE" with an error icon. It contains the text "Please enter a valid value for gallons! It cannot be negative!". At the bottom is an "OK" button.</p>

Program output sample:

 <p>Message dialog box titled "Message" with an information icon. It contains the text "WATER BILL-Single-Type" followed by a dashed line and the following details: "Customer Number: 123456", "Customer Name: Anand", "Gallons: 9000", and "Bill Value: \$32.19". At the bottom is an "OK" button.</p>	 <p>Message dialog box titled "Message" with an information icon. It contains the text "WATER BILL-Duplex" followed by a dashed line and the following details: "Customer Number: 123123", "Customer Name: John Doe", "Gallons: 15000", and "Bill Value: \$47.48". At the bottom is an "OK" button.</p>
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Instructions: Use the JOptionPane class for the program input and output, and if you need to format the program output

Use Try{} Catch {} for input validation. For some input validations, you can also use if-statement. No need to use loop statements for users to re-enter a correct data format. The floating-point numbers must be rounded to 2 decimal places.