

Let $d(n)$ be defined as the sum of proper divisors of n (numbers less than n which divide evenly into n).

If $d(a) = b$ and $d(b) = a$, where $a \neq b$, then a and b are an amicable pair and each of a and b are called amicable numbers.

For example, the proper divisors of 220 are 1, 2, 4, 5, 10, 11, 20, 22, 44, 55 and 110; therefore $d(220) = 284$.

The proper divisors of 284 are 1, 2, 4, 71 and 142; so $d(284) = 220$.

Therefore, amicable numbers are a pair of numbers, each of which is the sum of the factors of the other.

Write a multithreaded client-server application whereby a client must accept two numbers as input from the user and then pass them to a server application. The server must then determine if the two numbers are amicable or not and communicate this to the client. The client application must then display a message to the end user indicating if the original input represented an amicable pair. Two sample runs of the program are illustrated below.

The responsibilities of the **client** are as follows:

1. Accept two (numeric) values from the user.
2. These numbers must be passed to the server as two **int** values.
3. Receive a **boolean** value from the server.
4. If the **boolean** value returned from server is **false**, the client must display a message indicating that the original input did not represent an amicable pair.
5. If the **boolean** value returned from server is **true**, the client must display a message indicating that the original input represented an amicable pair.

The responsibilities of the **server** are as follows:

1. Accept two (numeric) values from the client.
2. Determine if the two numbers represent an amicable pair.
3. Return a **boolean** value to the client.

4. The server must return a value of **false** if the numbers passed from the client application do not represent an amicable pair.
5. The server must return a value of **true** if the numbers passed from the client application represent an amicable pair.

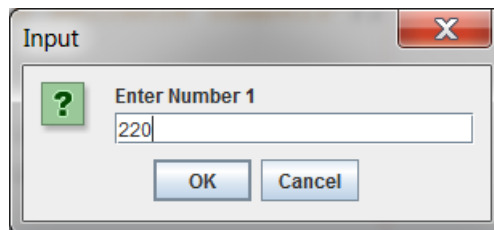
Note 1: *The server must be multi-threaded.*

Note 2: *All necessary exceptions must be caught and declared.*

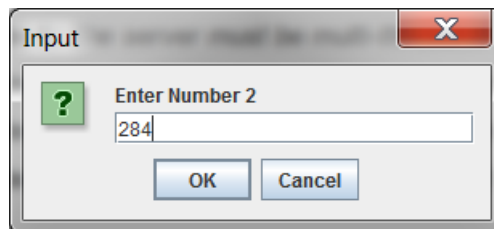
Note 3: *There is no input/output from/to the user in the server.*

Note 4: *The server must continually accept input from the same client.*

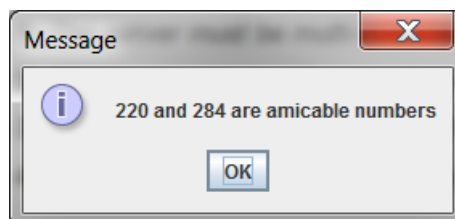
Sample Run 1



A Java-style input dialog box titled "Input" with a red close button (X) in the top right corner. On the left is a green square icon with a white question mark. To the right of the icon is the text "Enter Number 1". Below this text is a text input field containing the number "220". At the bottom of the dialog are two buttons: "OK" and "Cancel".

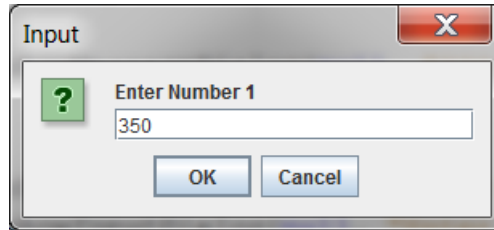


A Java-style input dialog box titled "Input" with a red close button (X) in the top right corner. On the left is a green square icon with a white question mark. To the right of the icon is the text "Enter Number 2". Below this text is a text input field containing the number "284". At the bottom of the dialog are two buttons: "OK" and "Cancel".



A Java-style message dialog box titled "Message" with a red close button (X) in the top right corner. On the left is a blue circular icon with a white lowercase 'i'. To the right of the icon is the text "220 and 284 are amicable numbers". At the bottom of the dialog is a single button: "OK".

Sample Run 2



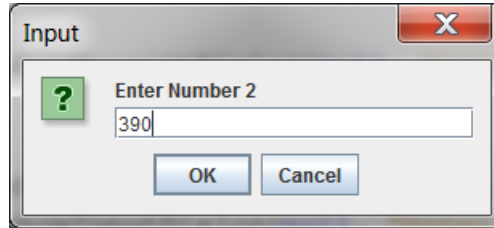
Input

Enter Number 1

350

OK Cancel

This is an input dialog box with a title bar containing the word "Input" and a close button (X). The main area contains a green question mark icon, the text "Enter Number 1", a text input field containing the number "350", and two buttons labeled "OK" and "Cancel".



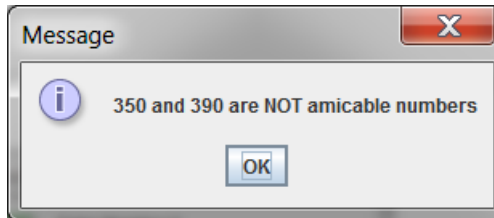
Input

Enter Number 2

390

OK Cancel

This is an input dialog box with a title bar containing the word "Input" and a close button (X). The main area contains a green question mark icon, the text "Enter Number 2", a text input field containing the number "390", and two buttons labeled "OK" and "Cancel".



Message

350 and 390 are NOT amicable numbers

OK

This is a message dialog box with a title bar containing the word "Message" and a close button (X). The main area contains a blue information icon (i), the text "350 and 390 are NOT amicable numbers", and a single button labeled "OK".