**Summative practice questions:**

1. Calculate the cost of building a foundation for a house. The input, the length and width of the house, as well as the depth of the foundation, should be given in feet and the output should be given in CAD. Assume the price of $150 per a cubic meter of concrete.
2. The ratio between CAD and USD is 0.93 today. The ratio between EURO and CAD is 1.5 today. Please write a program that will convert CAD dollars to USD and CAD to EUROs.

**3.** Body Mass Index

The Body Mass Index (BMI) is one of the calculations used by doctors to assess an adult’s health.

The doctor measures the patient’s height (in metres) and weight (in kilograms), then calculates the BMI using the formula



Write a program which prompts for the patient’s height and weight, calculates the BMI, and displays the corresponding message from the table below.

|  |  |
| --- | --- |
| BMI Category | Message |
| More than 25 | Overweight |
| Between 18.5 and 25.0 (inclusive) | Normal weight |
| Less than 18.5 | Underweight |

Sample Input 1 (user input is in italics)

Enter weight: 69

Enter height: 1.73

Output for Sample Input 1

Normal weight

Explanation for Output in Sample Input 1

The BMI is 69=(1:73 \_ 1:73), which is approximately 23.0545. According to the table, this is a “Normal weight”.

Sample Input 2 (user input is in italics)

Enter weight: 84.5

Enter height: 1.8

Output for Sample Input 2

Overweight

Explanation for Output in Sample Input 2

The BMI is 84.5/(1.8 times 1:8), which is approximately 26.0802. According to the table, this is “Overweight”.

4. Leap year

Use nested If structure to write a program that determines whether a year entered is a leap year or not. The rule for determining a leap year is as follows: A year is a leap year if it is divisible by 4 and not by 100; and every fourth century year is a leap year (these are years that are divisible by 400).

For example: 1992 is a Leap Year (divisible by 4 and not by100)

1900 is not (divisible by 4 and 100, not by 400)

1993 is not (not divisible by 4)

2000 Leap Year (divisible by 400)

**Challenging:**

1. Divisibility by 3.

A number is divisible by 3 if the sum of its digits is divisible by 3. Write a program that checks if a four digit number entered by the user is divisible by 3 by finding the sum of its digits and then checking if the sum of the digits is divisible by 3.

2. Deficient, Perfect, and Abundant

Write a program that repeatedly reads a positive integer, determines if the integer is deficient, perfect, or abundant, and outputs the number along with its classification.

A positive integer, n, is said to be perfect if the sum of its proper divisors equals the number itself. (Proper divisors include 1 but not the number itself.) If this sum is less that n, the number is deficient, and if the sum is greater than n, the number is abundant.

3. A company wants to transmit data over the telephone, but they are concerned that their data are tapped. All of their data are transmitted as four-digit integers. They have asked you to write a program that encrypts their data so that it can be transmitted more securely. Your program should read a four digit integer and encrypt it as follows: Replace each digit by (the sum of that digit plus 7) modulus 10. Then, swap the first digit with the third, swap the second digit with the fourth and print the encrypted integer.

4. Who is in the middle?

In the story Goldilocks and the Three Bears, each bear had a bowl of porridge to eat while sitting at his/her favorite chair. What the story did not tell us is that Goldilocks moved the bowls around the table, so the bowls were not at the right seats anymore. The bowls can be sorted by weight with the lightest bowl being the Baby Bear’s bowl, the medium bowl being the Mama Bear’s bowl and the heaviest bowl being the Papa’s Bear bowl. Write a program that reads in three weights and prints out the weight of mama Bear’s bowl. You may assume that all weights are positive integers less than 100.

**Sample Input**

10

5

8

**Output for the Sample Input**

8

**More challenging questions:**

* 1. Censor

The Society for Prevention of Profanity on the Internet has observed a growing number of chat lines on the World Wide Web. A chat line allows a Web user to type lines of text which are transmitted to all other users. The Society is concerned about the number of four letter words being transmitted by these chat lines and has proposed the mandatory use of software to remove all four-letter words from every transmission. Your job is to write the software to do this removal.

The input to your program consists of an integer, *n*, on a line by itself, followed by *n* lines of text. Each line of text contains words separated by spaces. Each word consists of letters of the alphabet and exactly one space separates adjacent words. There are no spaces before the first word or after the last word on each line. Lines do not exceed 80 characters in length.

The output from your program should consist of the *n* lines of text, with each four-letter word replaced by four asterisks. The lines should be separated by one blank line.

**Sample input**

2

The quick brown fox jumps over the lazy dog

Now is the time for all good people to come to the aid of the party

**Sample output**

The quick brown fox jumps \*\*\*\* the \*\*\*\* dog

Now is the \*\*\*\* for all \*\*\*\* people to \*\*\*\* to the aid of the party

2. Cryptology is the study of secret messages. One of the earliest known cryptographic systems was used by Julius Ceasar. He made messages secret by shifting each letter three letters forward in the alphabet. For example, using the scheme the letter B is sent to E and the letter M is sent to P. Your task is to write two functions with the function prototypes as follows:

void encodeThis(string);

void decodeThis(string);

Write a program that allows to the user to enter a sentence, use the function encodeThis to encode the message, and print out the encrypted message.

Now, take the encrypted message and decrypt it by sending it to the function decodeThis and finally print out the original message.

For example, the message “meet you in the park” encrypted should produce “phhw brx lq wkh sdun”.

1. **Poetry**

A simple poem consists of one or more four-line verses. Each line consists of one or more words consisting of upper or lower case letters, or a combination of both upper and lower case letters.

Adjacent words on a line are separated by a single space.

We define the last syllable of a word to be the sequence of letters from the last vowel ("a", "e", "i", "o" or "u", but not "y") to the end of the word. If a word has no vowel, then the last syllable is the word itself. We say that two lines rhyme if their last syllables are the same, ignoring case.

You are to classify the form of rhyme in each verse. The form of rhyme can be *perfect, even, cross, shell*, or *free*:

perfect rhyme: the four lines in the verse all rhyme

even rhyme: the first two lines rhyme and the last two lines rhyme

cross rhyme: the first and third lines rhyme, as do the second and fourth

shell rhyme: the first and fourth lines rhyme, as do the second and third

free rhyme: any form that is not perfect, even, cross, or shell

The first line of the input file contains an integer *N*, the number of verses in the poem, 1 ! *N* ! 5.

The following 4*N* lines of the input file contain the lines of the poem. Each line contains at most 80 letters of the alphabet and spaces as described above.

The output should have *N* lines. For each verse of the poem there should a single line containing one of the words 'perfect', 'even', 'cross', 'shell' or 'free' describing the form of rhyme in that verse.

**Sample Input 1**

1

One plus one is small

one hundred plus one is not

you might be very tall

but summer is not

**Output for Sample Input 1**

cross

**Sample Input 2**

2

I say to you boo

You say boohoo

I cry too

It is too much foo

Your teacher has to mark

and mark and mark and teach

To do well on this contest you have to reach

for everything with a lark

**Output for Sample Input 2**

perfect

shell

**Sample Input 3**

2

It seems though

that without some dough

creating such a bash

is a weighty in terms of cash

But how I see

the problem so fair

is to write subtle verse

with hardly a rhyme

**Output for Sample Input 3**

even

free