Problem of the Week

Problem A

Dated Messages

A *Caesar Cipher* is a way to create secret messages by shifting letters in text. For example, a Caesar Cipher of 3 shifts each letter in the text by 3. If you want to shift the letter **D** by 3, then you count three letters forward to arrive at the letter **G**. Similarly, if you want to shift the letter **E** by 3, then you count three letters forward to arrive at the letter **H**. So in a Caesar Cipher of 3, the letter **D** is encoded with the letter **G**, the letter **E** is encoded with the letter **H**, and so on. When shifting letters, if you reach the end of the alphabet, you continue counting at the letter **A**. For example, if you want to shift the letter **Y** by 3, then you count forward to **Z**, then to **A**, and end up at the letter **B**.

(a) Using a Caesar Cipher of 3, encode the message **FRACTIONS**.

(b) To decode a secret message you shift the letters in the opposite direction. For example, in a Caesar Cipher of 4 the letter **G** would be decoded as **C**. Decode the message **AEXIVPSS** using a Caesar Cipher of 4.

(c) A *Date Cipher* shifts the letters in a message by the corresponding digit of a date in the form *YYYYMMDD*. If the message is longer than the date, then we repeat the date as many times as necessary. In the table below, the message **FRACTIONS** has been encoded using the digits from the International Women's Day, 20240308.

Original Letter	F	R	A	C	T	I	O	N	S
Digit of Date	2	0	2	4	0	3	0	8	2
Encoded Letter	H	R	C	G	T	L	O	V	U

The secret message for **FRACTIONS** would be **HRCGTLOVU**.

A famous mathematician has the birthdate December 9, 1906 (19061209). Use the Date Cipher and this date to **decode** the message **HAAIFJOYQNR** to find the name of the famous mathematician.