Answer on Question #63412 – Math – Discrete Mathematics

Suppose that you need to deliver the message "161803398" which is the pass key for a weapon activation to country X. Encrypt the message using Caesar cipher with the encryption key,

$$(n\ +\ 2^2)mod10$$

where $n = 0, 1, 2, \ldots, 9,$
without being intercepted and decrypted by other countries. Using number theory method:

Question

(a) State the decrypted message.

Solution

(a)
We shall encrypt the message "161803398" using Caesar cipher with the encryption key $(n\ +\ 2^2)mod10$:
$n = 1:\ y = (1 + 4)mod10 = 5,\ y\ is\ a\ symbol\ of\ the\ encrypted\ message;$

$n = 6:\ \ y = (6 + 4)mod10 = 0;$

$n = 1:\ y = (1 + 4)mod10 = 5;$

$n = 8:\ y = (8 + 4)mod10 = 2;$

$n = 0:\ y = (0 + 4)mod10 = 4;$

$n = 3:\ y = (3 + 4)mod10 = 7;$

$n = 3:\ y = (3 + 4)mod10 = 7;$

$n = 9:\ y = (9 + 4)mod10 = 3;$

$n = 8:\ y = (8 + 4)mod10 = 2.$

Answer:
Encrypted message is $505247732.$

Question

(b) Determine the decryption key.

Solution

(b)

Decryption key:

$x = (y - 4 + 10) mod 10;$

$x = (y + 6) mod 10, where\ \ x\ is\ a\ symbol\ of\ the\ original\ message.$

Answer: decryption key is $x = (y + 6) mod 10.$

Question

(c) Suggest an improvement to the encryption key to increase the encryption strength.

Solution

(c) Example of improvement to the encryption key:

$$(n + 30) mod\ 20$$

The encryption strength of this key is greater because every symbol of original message is encrypted with two symbols.

Answer: $(n + 30) mod 20.$