1. **MAROONANDGOLD**

**Explanation**: Both the rows and column contains A-Z alphabets. Now, to decrypt a message which is encrypted using Vigenere cipher, we will see the rows that contain the key and search for the cipher text in the row and the column corresponding to alphabet will be our plaintext.

For example:

**Cipher Text**: eprfylscdxyjveprfylscdxyjv

**Key**: SPARKY

Now we will look for ‘e’ in the row of ‘S’ and the result which we get is ‘M’.

So ‘M’ will be our plain text for the corresponding cipher text, i.e. ‘e’. Now these steps will be repeated to get the plain text.

1. **The sun devil colors of maroon and gold look great**

**Explanation**: Alphabets from A-Z are assigned numbers from 0-25. We will be provided with the value of a & b. Now, to decrypt a message encrypted in affine cipher we will find a-1 by the equation **aa-1 = 1(mod n).** After calculating a-1, we will use the equation **D(y) = a-1(x-b) mod n** to find the plain text from the encrypted text.

For example:

**Cipher Text**: Uqp Lds Gpmza xbabcl By jfcbbs fsg hbag abbr hcpfu

**a = 9**

**b = 5**

**n = 26** // Number of alphabets are 26

First of all we will calculate the value of a-1from the equation **aa-1 = 1(mod n)** and will find its value **a-1** = **3.** Nowfor first alphabet ‘U’, its value is 20, i.e. x=20 and now we will use the equation **D(y) = a-1(x-b) mod n** to calculate D(y) which will come as 19 which is equal to **‘T’.** So the plain text for the first encrypted alphabet will be ‘T’. In the same way we will decrypt the entire plain text from the cipher text encrypted using affine cipher.

1. **The key for breaking your next cipher is right under your nose.**

**Explanation**: In Caesar cipher, we shift the alphabets to the left or right by some number of positions which is known as shift variable. If we want to shift the alphabets by 3, then the new or encrypted value of ‘a’ will be ‘d’, ‘b’ will be ‘e’ and so on.

Now, for the given question, cipher text is “**Jxu auo veh rhuqaydw oekh dunj syfxuh yi hywxj kdtuh oekh deiu”** shift variable is unknown. We have to find the shift variable and the original plain text from the encrypted text. Now considering the value of n=1, we will apply Caesar cipher on the text, but we won’t find any meaningful text. So we will consider n=2, and applying it on Caesar cipher. Still we will not find any meaning full text. So continuing the same process, at n=10 where ‘a’ will be equal to ‘k’, ‘b’ will be equal to ‘l’, ‘j’ will be equal to ‘t’ and so on up to ‘z’ is equal to ‘j’, we will find the meaningful plain text which is **the key for breaking your next cipher is right under your nose.**

1. **Key**: qwertyuiopasdfghjklzxcvbnm

The first computer terminals such as the teletype were typewriters that could produce and be controlled by various computer codes. These used the qwerty layouts and added keys such as escape esc which had special meanings to computers. Later keyboards added function keys and arrow keys. Since the standardization of pc compatible computers and windows, most full sized computer keyboards have followed this standard. This layout has a separate numeric keypad for data entry. At the right, function keys across the top and a cursor section to the right and center with keys for insert, delete, home, end, page up and page down with cursor arrows in an inverted t-shape. Even the keyboard you are using to decrypt this message should be a variant of qwerty unless you have built your own qwerty is the new abcd.

**Explanation**: On analysis the given text, first of all applied Caesar cipher, we will apply n=1, and rotate the text to right side from one position. On rotating, we will get a meaningless text. Now, on applying n=2 and rotating the text to right side by two positions, we will again get some meaningless text. Repeating this thing upto n=26, will not give us any meaning full text.

So, now we have to use an alternative approach for that. In the new approach, we will calculate the number of frequency of each alphabet in the given text, i.e. by applying substitution cipher technique. So, on calculating the frequency of the alphabets in the text, we will see that the most frequently used alphabet is ‘T’ which is used 82 times in the text, second largest frequent used alphabet is ‘Z’ which is used 61 times in the text. After this, ‘Q’ is used 54 times, ‘L’ is used 51 times and so on.

On carefully analyzing the frequency of alphabets, and making level-headed guesses it can be clearly shown that the key is nothing but itself the qwerty keypad. It can also be verified that the first letter in the encrypted text is “Z” and on applying the key its corresponding plain text will be “T” and similarly for the next two alphabets, i.e. ‘I’ and ‘T’ out of which ‘T’ which is the most frequent alphabet when replaced with the corresponding word, i.e. ‘E’ and ‘I’ by ‘H’, we will get the word ‘THE’, this ensures that the key will be qwerty keypad. So applying the key on the complete cipher text and providing necessary spaces and punctuations, above plain text message is recovered.