



## AP Computer Science AB 2000 Student Samples

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- (a) Write member function `GetCoordinates`, as started below. `GetCoordinates` takes a given letter or digit and returns its row and column in the 2-dimensional array. Assume that the parameter `ch` is a capital letter in the range 'A' through 'Z' or a digit in the range '0' through '9'.

The following example shows the point locations of character `ch` in the given matrix.

<u>Encryptor.myMat</u>						<u>ch</u>	<u>Point coordinates</u>
S	T	U	V	W	X	P	row = 5 col = 3
Y	Z	0	1	2	3	8	row = 2 col = 4
4	5	6	7	8	9	M	row = 5 col = 0
A	B	C	D	E	F		
G	H	I	J	K	L		
M	N	O	P	Q	R		

Complete function `GetCoordinates` below.

```
Point Encryptor::GetCoordinates(char ch) const
// precondition: 'A' ≤ ch ≤ 'Z' or '0' ≤ ch ≤ '9'
// postcondition: returns the row and column number of the
//                location of ch in myMat
```

```
{
    Point next;
    for(int i=0; i < myMat.NumRows(); i++)
    {
        for(int z=0; z < myMat.NumCols(); z++)
        {
            if(myMat[i][z] == ch)
            {
                next.row = i;
                next.col = z;
            }
        }
    }
    return next;
}
```

Part (b) begins on page 6.

Complete function EncryptTwo below.

```
apstring Encryptor::EncryptTwo(const apstring & pair) const
// precondition: pair.length() is 2
// postcondition: returns an encoded two-character string
```

```
{
    apstring next = " ";
    Point p = GetCoordinates(pair[0]);
    Point p1 = GetCoordinates(pair[1]);
    if ((p.row == p1.row) || (p.col == p1.col))
    {
        next += pair[1];
        next += pair[0];
    }
    else
    {
        next += myMat[p.row][p1.col];
        next += myMat[p1.row][p.col];
    }
    return next;
}
```

Part (c) begins on page 8.

Complete function EncryptWord below.

```
apstring Encryptor::EncryptWord(const apstring & word) const
// precondition: word contains only capital letters 'A' through 'Z'
//               and digits '0' through '9'.
// postcondition: returns an encrypted version of word, in which every
//               two letters have been examined and encrypted by
//               replacing the original letters with those located
//               in the opposite corners of the rectangle formed by
//               the two letters. If the original word contains an odd
//               number of letters, the last letter is left unchanged.
```

```
{
```

```
    apstring next = "";
```

```
    for(int i=0; i < word.length(); i+=2)
```

```
{
```

```
        if(i+1 < word.length())
```

```
{
```

```
            next += EncryptTwo(word.substr(i,2));
```

```
}
```

```
        else
```

```
            next += word[i];
```

```
}
```

```
    return next;
```

```
}
```

- (a) Write member function `GetCoordinates`, as started below. `GetCoordinates` takes a given letter or digit and returns its row and column in the 2-dimensional array. Assume that the parameter `ch` is a capital letter in the range 'A' through 'Z' or a digit in the range '0' through '9'.

The following example shows the point locations of character `ch` in the given matrix.

<u>Encryptor.myMat</u>						<u>ch</u>	<u>Point coordinates</u>
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4	5	6	7	8	9	M	row = 5    col = 0
A	B	C	D	E	F		
G	H	I	J	K	L		
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Complete function `GetCoordinates` below.

```

Point Encryptor::GetCoordinates(char ch) const
// precondition: 'A' ≤ ch ≤ 'Z' or '0' ≤ ch ≤ '9'
// postcondition: returns the row and column number of the
//                location of ch in myMat
{
    for(int r=0; r<5; r++)
        for(int c=0; c<5; c++)
            if(myMat[c][r]==ch)
            {
                Point result(c,r);
                return result;
            }
}

```

Part (b) begins on page 16.

Complete function EncryptTwo below.

```

apstring Encryptor::EncryptTwo(const apstring & pair) const
// precondition: pair.length() is 2
// postcondition: returns an encoded two-character string
{
    Point a, b;
    apstring result;
    char c1, c2;
    c1 = pair[0];
    c2 = pair[1];
    a = Encryptor.GetCoordinates(c1);
    b = Encryptor.GetCoordinates(c2);
    if((a.row == b.row) || (a.col == b.col))
    {
        result[0] = pair[1];
        result[1] = pair[0];
    }
    else
    {
        result[0] = myMat[b.col][b.row];
        result[1] = myMat[a.col][a.row];
    }
    return result;
}

```

Part (c) begins on page 18.

Complete function EncryptWord below.

```
apstring Encryptor::EncryptWord(const apstring & word) const
// precondition: word contains only capital letters 'A' through 'Z'
//               and digits '0' through '9'.
// postcondition: returns an encrypted version of word, in which every
//               two letters have been examined and encrypted by
//               replacing the original letters with those located
//               in the opposite corners of the rectangle formed by
//               the two letters. If the original word contains an odd
//               number of letters, the last letter is left unchanged.
```

```
{
    int len, k=0;
    apstring temp, encTemp, result;
    len = word.length();
    if (len % 2 != 0)
        len--;
    while (k < len)
    {
        temp = word.substr(k, 2);
        encTemp = Encryptor::EncryptTwo(temp);
        result += encTemp;
        k = k + 2;
    }
    if (len % 2 != 0)
        result += word[len];
    return result;
}
```

- (a) Write member function `GetCoordinates`, as started below. `GetCoordinates` takes a given letter or digit and returns its row and column in the 2-dimensional array. Assume that the parameter `ch` is a capital letter in the range 'A' through 'Z' or a digit in the range '0' through '9'.

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Complete function `GetCoordinates` below.

```
Point Encryptor::GetCoordinates(char ch) const
// precondition: 'A' ≤ ch ≤ 'Z' or '0' ≤ ch ≤ '9'
// postcondition: returns the row and column number of the
//                location of ch in myMat
```

```
{
    int i, j;
    for (i=0; i < 6; i++)
        for (j=0; j < 6; j++)
            if (myMat[i][j] == ch)
                return (GetCoordinates(ch));
}
```

Part (b) begins on page 16.

A4/AB1

C

Complete function EncryptTwo below.

```
apstring Encryptor::EncryptTwo(const apstring & pair) const  
// precondition: pair.length() is 2  
// postcondition: returns an encoded two-character string
```

```
{  
    int i;  
    Point pos1 = GetCoordinates(pair[0]);  
    Point pos2 = GetCoordinates(pair[1]);  
    if ((pos1[0] == pos2[0]) || (pos1[1] == pos2[1]))  
    {  
        pos1 = pos2;  
        pos2 = GetCoordinates(pair[0]);  
        return (pair[1] + pair[0]);  
    }  
}
```

Part (c) begins on page 18.

GO ON TO THE NEXT PAGE.

Complete function EncryptWord below.

```
apstring Encryptor::EncryptWord(const apstring & word) const
// precondition: word contains only capital letters 'A' through 'Z'
//               and digits '0' through '9'.
// postcondition: returns an encrypted version of word, in which every
//               two letters have been examined and encrypted by
//               replacing the original letters with those located
//               in the opposite corners of the rectangle formed by
//               the two letters. If the original word contains an odd
//               number of letters, the last letter is left unchanged.
```

```
{
```

```
    int i;
    apstring temp, newword = "";
```

```
    for (i=0; i < word.length(); i++)
```

```
    {
```

```
        temp = word[i] + word[i+1];
```

```
        newword += temp;
```

```
        temp = EncryptTwo(temp);
```

```
        newword += temp;
    }
```

```
    return (newword);
```

```
}
```