

```
#include <stdio.h>
```

```
#include <stdlib.h>
```

```
// Function to print an element in tuple form
```

```
void print_tuple(int num, int q, int p) {
```

```
    int tuple[p];
```

```
    for (int i = 0; i < p; i++) {
```

```
        tuple[i] = num % q;
```

```
        num /= q;
```

```
    }
```

```
    printf("(");
```

```
    for (int i = p - 1; i >= 0; i--) {
```

```
        printf("%d", tuple[i]);
```

```
        if (i > 0) printf(", ");
```

```
    }
```

```
    printf(")");
```

```
}
```

```
// Function to print polynomial representation
```

```
void print_polynomial(int num, int p) {
```

```
    int first = 1;
```

```
    for (int i = p - 1; i >= 0; i--) {
```

```
        if ((num / (1 << i)) % 2) { // Extract coefficient
```

```
            if (!first) printf(" + ");
```

```
            if (i == 0) printf("1");
```

```
            else if (i == 1) printf("x");
```

```
            else printf("x^%d", i);
```

```
            first = 0;
```

```
        }
```

```
    }
```

```
    if (first) printf("0");
```

```
}
```

```
int main() {
```

```
    int q, p;
```

```
    printf("Enter base field size q: ");
```

```
    scanf("%d", &q);
```

```
    printf("Enter extension degree p: ");
```

```
    scanf("%d", &p);
```

```
    if (q < 2 || p < 1) {
```

```
        printf("Invalid input. q must be >= 2 and p >= 1.\n");
```

```
        return 1;
```

```
    }
```

```
    int total_elements = 1;
```

```
    for (int i = 0; i < p; i++) {
```

```
        total_elements *= q;
```

```
    }
```

```
    printf("\nElements of GF(%d^%d):\n", q, p);
```

```
    printf("-----\n");
```

```
    printf(" | Decimal | Tuple Form | Polynomial Form      |\n");
```

```
    printf("-----\n");
```

```
    for (int num = 0; num < total_elements; num++) {
```

```
        printf(" | %7d | ", num);
```

```
        print_tuple(num, q, p);
```

```
        printf(" | ");
```

```
        print_polynomial(num, p);
```

```
        printf(" |\n");
```

```
    }
```

```
    printf("-----\n");
```

```
return 0;
```

```
}
```