#include

#include

int val[40];

int s[100010];

int exp[100010];

int main()

{

char ch;

int b, m, n, v, l, i;

scanf("%d%d", &b, &m);

getchar();

ch = getchar();

for (n = 0; ch != '\n'; ch = getchar())

if (ch == ' ')

n++;

else

if (ch == 'x')

exp[n] = -4;

else

if (ch == '+')

exp[n] = -1;

else

if (ch == '-')

exp[n] = -2;

else

if (ch == '\*')

exp[n] = -3;

else

if ('0' <= ch && ch <= '9')

exp[n] = ch-'0';

else

exp[n] = 10+ch-'A';

for (v = 0; v < b; v++)

{

l = 0;

for (i = 0; i <= n; i++)

if (exp[i] >= 0)

s[l++] = exp[i];

else

if (exp[i] == -1)

s[l-2] = (s[l-2]+s[l-1])%b, l--;

else

if (exp[i] == -2)

s[l-2] = (s[l-2]-s[l-1]+b)%b, l--;

else

if (exp[i] == -3)

s[l-2] = (s[l-2]\*s[l-1])%b, l--;

else

s[l++] = v;

val[v] = s[0];

}

while (m--)

{

ch = getchar();

for (v = 0; ch != '\n'; ch = getchar())

if ('0' <= ch && ch <= '9')

v = ch-'0';

else

v = 10+ch-'A';

if (0 <= val[v] && val[v] <= 9)

printf("%c\n", val[v]+'0');

else

printf("%c\n", val[v]-10+'A');

}

return 0;

}