



Langage C

Calcul de la factorielle d'un nombre (TP01 exercice 3.d)

Nombre donné

```
#define NBRE 5
```

```
int main() {
```

```
    if (NBRE == 0) {
```

```
        printf ("0! = 1\n ");
```

```
        exit(0);
```

```
    }
```

```
    int fact = 1;
```

```
    for (int i=1; i<=NBRE; i++)
```

```
        fact *= i;
```

```
    printf("%d! = %d\n", NBRE, fact);
```

```
    exit(0);
```

```
}
```

Nombre donné

```
#define NBRE 5
```

```
int main() {
```

```
    if (NBRE == 0) {  
        printf ("0! = 1\n ");  
        exit(0);  
    }
```

Inutile!

```
    int fact = 1;
```

```
    for (int i=1; i<=NBRE; i++)
```

```
        fact *= i;
```

```
    printf("%d! = %d\n", NBRE, fact);
```

```
    exit(0);
```

```
}
```

Limites

- $12! = 479\,001\,600$
- $13! = 6\,227\,020\,800$
- $\text{INT_MAX} = 2^{31}-1 = 2\,147\,483\,647$
pour un codage sur 4 bytes (cf. *limits.h*)

$13! > \text{INT_MAX} \Rightarrow \text{OVERFLOW !}$

Amélioration

```
#define NBRE 5
```

```
int main() {  
    int fact = 1;  
    for (int i=1; i<=NBRE; i++) {  
        if (fact > INT_MAX/i) {  
            printf("Error: integer overflow\n");  
            exit(1);  
        }  
        fact *= i;  
    }  
    printf("%d! = %d\n", NBRE, fact);  
    exit(0);  
}
```

Amélioration

```
#define NBRE 5
```

```
int main() {
```

```
    int fact = 1;
```

```
    for (int i=1; i<=NBRE; i++) {
```

```
        if (fact > INT_MAX/i) {
```

```
            printf("Error: integer overflow\n");
```

```
            exit(1);
```

```
        }
```

```
        fact *= i;
```

```
    }
```

```
    printf("%d! = %d\n", NBRE, fact);
```

```
    exit(0);
```

```
}
```



**Détection de l'overflow
avant qu'il ne survienne!**