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These are four important built-in functions in GCC compiler:

1. **\_\_builtin\_popcount(x)**: This function is used to count the number of one's (set bits) in an integer.

### Example:

```
if x = 4
binary value of 4 is 100
Output: No of ones is 1.
```

```
// C program to illustrate __builtin_popcount(x)

#include <stdio.h>
int main()
{
    int n = 5;

    printf("Count of 1s in binary of %d is %d ",
           n, __builtin_popcount(n));
    return 0;
}
```

### Output:

```
Count of 1s in binary of 5 is 2
```

**Note:** Similarly you can use `__builtin_popcountl(x)` & `__builtin_popcountll(x)` for long and long long data types.

2. **\_\_builtin\_parity(x)**: This function is used to check the [parity](#) of a number. This function returns true(1) if the number has odd parity else it returns false(0) for even

parity.

### Example:

```
if x = 7
```

7 has odd no. of 1's in its binary(111).

Output: Parity of 7 is 1

```
// C program to illustrate __builtin_parity(x)
```

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

```
int main()
```

```
{
```

```
    int n = 7;
```

```
    printf("Parity of %d is %d ",  
           n, __builtin_parity(n));
```

```
    return 0;
```

```
}
```

### Output:

```
Parity of 7 is 1
```

**Note:** Similarly you can use `__builtin_parityl(x)` & `__builtin_parityll(x)` for long and long long data types.

3. **\_\_builtin\_clz(x):** This function is used to count the leading zeros of the integer. Note : clz = count leading zero's

**Example:** It counts number of zeros before the first occurrence of one(set bit).

```
a = 16
Binary form of 16 is 00000000 00000000 00000000 00010000
Output: 27
```

```
// C program to illustrate __builtin_clz(x)
#include <stdio.h>
int main()
{
    int n = 16;

    printf("Count of leading zeros before 1 in %d is %d",
           n, __builtin_clz(n));
    return 0;
}
```

### Output:

Count of leading zeros before 1 in 16 is 27

**Note:** `__builtin_clz(x)` This function only accept unsigned values

**Note:** Similarly you can use `__builtin_clzl(x)` & `__builtin_clzll(x)` for long and long long data types.

4. **`__builtin_ctz(x)`:** This function is used to count the trailing zeros of the given integer.

Note : ctz = count trailing zeros.

**Example:** Count no of zeros from last to first occurrence of one(set bit).

```
a = 16
Binary form of 16 is 00000000 00000000 00000000 00010000
Output: ctz = 4
```

```
// C program to illustrate __builtin_ctz(x)
#include <stdio.h>
int main()
{
    int n = 16;

    printf("Count of zeros from last to first "
           "occurrence of one is %d",
           __builtin_ctz(n));
    return 0;
}
```

## Output:

Count of zeros from last to first occurrence of one is 4

**Note:** Similarly you can use `__builtin_ctzl(x)` & `__builtin_ctzll(x)` for long and long long data types.

```
// C program to illustrate builtin functions of
// GCC compiler
#include <stdio.h>
#include <stdlib.h>

int main()
{
    int num = 4;
    int clz = 0;
    int ctz = 0;
    int pop = 0;
    int parity = 0;

    pop = __builtin_popcount(num);
    printf("Number of one's in %d is %d\n", num, pop);

    parity = __builtin_parity(num);
    printf("Parity of %d is %d\n", num, parity);

    clz = __builtin_clz(num);
    printf("Number of leading zero's in %d is %d\n", num, clz);

    // It only works for unsigned values
    clz = __builtin_clz(-num);
    printf("Number of leading zero's in %d is %d\n", -num, clz);

    ctz = __builtin_ctz(num);
    printf("Number of trailing zero's in %d is %d\n", num, ctz);

    return 0;
}
```

## Output:

```
Number of one's in 4 is 1
Parity of 4 is 1
Number of leading zero's in 4 is 29
Number of leading zero's in -4 is 0
Number of trailing zero's in 4 is 2
```

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