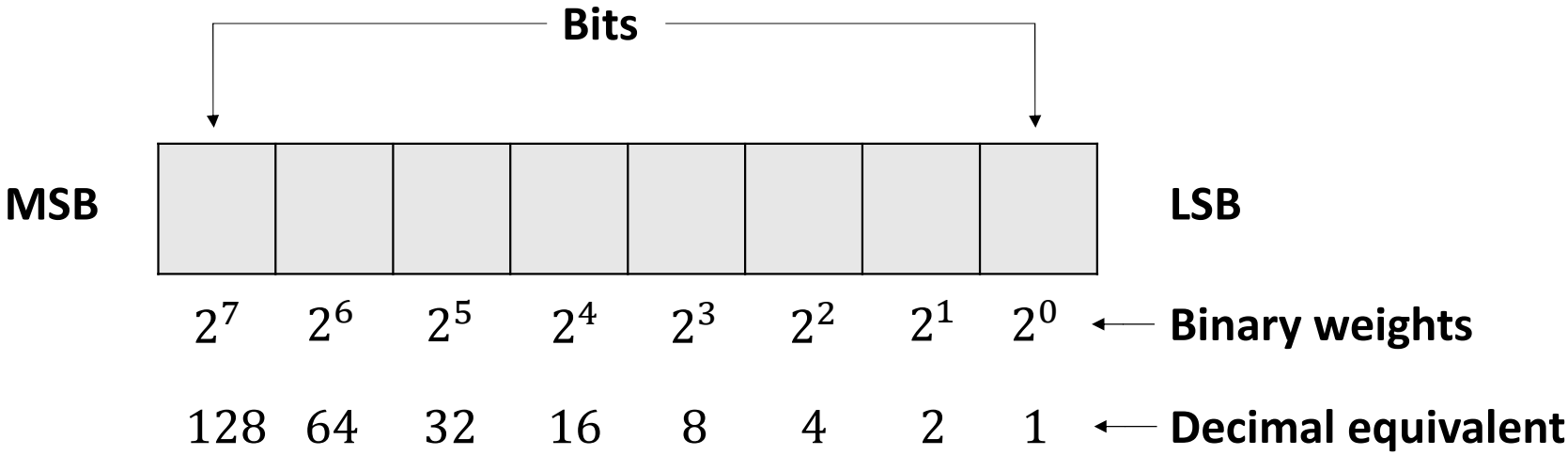
○ Bitwise Operators:

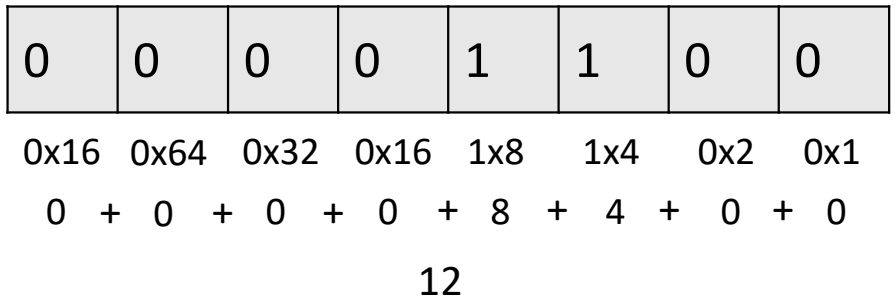
Bitwise operators are used to perform operation directly on the individual bits of integers. They treat integers as sequence of 1's and 0's and manipulate them on low-level.

Operators	Example	Description
& (Bitwise AND)	12 & 13	1100 & 1101 = 1100 (decimal 12)
| (Bitwise OR)	12 | 13	1100 | 1101 = 1101 (decimal 13)
~ (Bitwise NOT)	~12	Equivalent to –(x+1)
^ (Bitwise XOR)	12 ^ 13	1100 ^ 1101 = 0001 (decimal 1)
<< (left shift)	5 << 2	0101 << 2 = 10100 (decimal 20)
>> (Right shift)	20 >> 2	10100 >> 2 = 00101 (decimal 5)

Binary Number System



Binary representation of 12



Operators Precedence and Associativity:

Operator	Type	Precedence	Associativity
()	Parentheses	Highest	Left to right
**	Exponentiation	High	Right to left
* / % //	Multiplication, division, modulus, floor division	Medium	Left to right
+ -	Addition, subtraction	Medium	Left to right
< <= > >=	Comparison	Low	Left to right
== !=	Equality	Low	Left to right
not	Logical NOT	Low	Right to left
and	Logical AND	Lowest	Left to right
or	Logical OR	Lowest	Left to right

Operators Precedence and Associativity:

Sample Expression

Expression 1

*=> 10 + 3 * 2 **3 – (6 // 2 + 1) * 3 % 4*

*=> 10 + 3 * 2 **3 – (3 +1) * 3 % 4*

*=> 10 + 3 * 2**3 – 4 * 3 % 4*

*=> 10 + 3 * 8 – 4 * 3 %4*

=> 10 + 24 – 12 % 4

=> 10 + 24 – 0

=> 34 – 0

=> 34

Expression 2

*⇒10 / 2 + 3 * 2 ** 3 – (6//2 + 1) * 3 % 4*

*⇒10/2 + 3 * 2 ** 3 – (3 + 1) * 3 % 4*

*⇒10/2 + 3 * 2 ** 3 – 4 * 3 % 4*

*⇒10/2 + 3 * 8 -4 * 3 % 4*

*⇒5 + 3 * 8 -4 * 3 %4*

*⇒5 + 24 – 4 * 3 % 4*

⇒5 + 24 – 12 % 4

⇒5 + 24 – 0

⇒29 – 0

⇒29

Expression 3

=> 10 * 2 + 3 * 2 ** 3 - (6//2 +1)/3 % 4

=> 10 * 2 +3* 2**3 -(3+1)/3 % 4

=> 10 * 2 +3* 2**3 -4/3 % 4

=> 10 * 2 +3* 8 -4/3 % 4

=> 10 * 2 +3* 8 -4/3 % 4

=> 20 + 3 *8 - 4/3 % 4

=> 20 + 24 - 4/3 % 4

=> 20 + 24 - 1.3333 % 4

=> 20 + 24 - 1.3333

$\Rightarrow$ 44 - 1.3333

$\Rightarrow$ 42.66

Expressions:

```
>>> x =  10
>>> result = x * 5 + 2       # Arithmetic expression
>>> print(result)
52
>>>
>>> # Boolean expression
>>> age = 23
>>> is_adult = age >= 18
>>> print(is_adult)
True
>>> young_adult = age >= 18 and age <= 39
>>> print(young_adult)
True
>>>
>>> # String expression
>>> full_name = "John" + " " + "Doe"
>>> print(full_name)
John Doe
>>>
>>> # function call expression
>>> length = len("example")
>>> print(length)
7
>>>
>>> # literal expression
>>> number = 123
>>> print(number)
123
```

Basic Python Tasks:

1. Write Python program to take radius of circle as input and computes the area of circle $(\boldsymbol{A = \pi r^2})$. Let $\pi = 3.14$
2. Write Python program to compute area of triangle $(\frac{\mathbf{1}}{\mathbf{2}} \times \boldsymbol{b} \times \boldsymbol{h})$
3. Write Python program to solve *(x + y) x (x + y)*. Let x =4 and y = 3
4. Write Python program to find distance between two points (x1, y1) and (x2, y2). Points coordinates are input by user.

$$\boldsymbol{d = \sqrt{(x1 - x2)^2 + (y1 - y2)^2}}$$

Control Flow:

- Decision Making Structures: (If-else)

General structure:

```
if test1:
    statement1
elif test2:
    statement2
else:
    statement3
```

```
a = int(input("Enter first number: "))
Enter first number: 5
b = int(input("Enter second number: "))
Enter second number: 6

if b > a:
    print("b is greater than a")
elif b < a:
    print("b is less than a")
else:
    print("b is equals to a")


b is greater than a
```

```
a = int(input("Enter first number: "))
Enter first number: 8
b = int(input("Enter second number: "))
Enter second number: 6
c = int(input("Enter third number: "))
Enter third number: 4

if a>b and b>c:
    print("both conditions are true")
else:
    print("conditions are false")


both conditions are true
```

If-else conditional statement Tasks:

- Write program to check of the given number is positive, negative or zero.
- Ask the user for a grade percentage and display the corresponding letter grade (A, B, C, D, F)

  A-Grade Range (80(inclusive) - 100(inclusive))
  B-Grade Range (70(inclusive) - 80(exclusive))
  C-Grade Range (60(inclusive) - 70(exclusive))
  D-Grade Range (50(inclusive) - 60(exclusive))
  Below 50 Fail

- Write program that displays: Kamran Akmal on output, if score > 30, Shoaib Akhtar, if 20<score<30 and Shahid Afridi, if 10<score<20.

If else conditional statements Task:

- Write a program that takes positive integer as input from user and checks whether the number is even or odd and display the appropriate message on screen.