Octal Numbers

- **Octal number system**: number system based on number 8
    - Has **8** digits: 0, 1, 2, 3, 4, 5, 6, 7
    - Value of digits increase by **8** for each position

  ```
  Example:

     153(8) = 1 x 8^2 + 5 x 8^1 + 3 x 8^0
            = 64 + 40 + 3 = 107
  ```

- Finding the representation of a value in the octal number system:
    - Divide the value repeated by 8
    - Collect the remainders in the reverse order

  (The procedure is exactly the same as the one to find the representation for a value in the binary number system, except you need to divide by 8 instead of 2)

  ```
  Example:

      value = 23

  Find the representation in the octal number system:

         23
     8 ------ 7
          2
     8 ------ 2
          0

     representation is ----> 27(8)
  ```

- Octal numbers are mainly used to show binary code because octal number can be converted easily to binary numbers and vice versa.

- **Converting octal numbers to binary numbers:**
    - Convert each octal digit to 3 binary digits using:

  ```
            Octal digit       Binary digits
            -----------       -------------
                 0       -->       000
                 1       -->       001
                 2       -->       010
                 3       -->       011
                 4       -->       100
                 5       -->       101
                 6       -->       110
                 7       -->       111
  ```

```
Example:

   153(8)  =  01101011(2)
```

- **Converting binary numbers to octal numbers:**
  - Convert (starting from the right) each **group** of **3 binary digits** into **one octal digit** using:

```
Binary digits      Octal digit
-------------      -----------
    000        -->      0
    001        -->      1
    010        -->      2
    011        -->      3
    100        -->      4
    101        -->      5
    110        -->      6
    111        -->      7
```

```
Example:

   11111101(2)  =  375(8)
```
