① Magic number

n = 64 →

① 6 4

② 6+4 == 1

10 == 1 ✗

1 + 0 == 1 ✓ magic number

② Happy Number:

n = 19

① split into digits i.e.

1 9

② square the digits i.e. 1^2 9^2

③ Add the square together & compare with == 1.

n = 19

$1^2 + 9^2 = 82 == 1$ ✗

n = 82

$8^2 + 2^2 = 68 == 1$ ✗

$6^2 + 8^2 = 100 == 1$ ✗

$1^2 + 0^2 + 0^2 == 1$ ✓

last digit (4) (1) →

4 16

$1^2 + 6^2$

1 + 36 = 37

9 + 49

③ Prime Number

→ number divisible by itself & 1.

2, 5, 7, 11, 13, 17, 19, 23, 29, 31...

④ Kreparkar's Number

n = 45 →

① Do the square of n.

2025

② count no. of digits. = 4

③ 2 + 025 = 27 == 45

20 + 25 = 45 == n ✓

15231

1+5231

15+231

152+31

1523+1

$(45)^2$

$(78)^2$

⑤ Automorphic number.

n = 5

① sq. of n = 25

② n = 25 → $(25)^2$ = 625

⑥ Neon Number

n = 9

① sq. of n. 81

8+1 == n

⑦ Catlan Number → IBM (Tech Interview)

$C_{(n)} = \frac{(2*n)!}{(n+1)! * n!}$ || $C_{(n)} = \sum_{i=0}^{n} C_{(i)} * C_{(n-1-i)}$

1 1

0 1

1 1 2 5 14 42 ----

① $C_{(0)} = \frac{(2*0)!}{(0+1)! * 0!} = \frac{1}{1} = 1$

② $C_{(1)} = \frac{(2*1)!}{(1+1)! * 1!} = \frac{2!}{2! * 1!} = 1$

③ $C_{(2)} = \frac{(2*2)!}{(2+1)! * 2!} = \frac{4!}{3! * 2!} = \frac{4*3!}{3! * 2 * 1} = 2$

④ $C_{(3)} = \frac{(2*3)!}{(3+1)! * 3!} = \frac{6!}{4! * 3!} = \frac{6*5*4!}{4! * 3*2*1} = 5$

Pattern Printing:

① n = 5

```
for(i=1; i<=n; i++){
  for(j=1; j<=i; j++){
    printf("*");
  }
  printf("\n");
```

1 2 3 4 5

1 - *

2 - * *

3 - * * *

4 - * * * *

5 - * * * * *

Zig-zag Pattern r = 3, c = 9

```
for(r=1; r<=3; r++){
  for(c=1; c<=9; c++){
    if( (r==1 && c%4==3) ||
        (r==2 && (c%2==0)) ||
        (r==3 && (c%4==1)) ){
      printf("*");
    }
    else {
      printf(" ");
    }
  }
  printf("\n");
}
return 0;
```

```
for(i=0;i<6;i++){
    for(j=0;j<7;j++){
        if((i==0 && j%3!=0)||
        (i==1 && j%3==0)|| (i-j==2)||(i+j==8))
            printf("*");
        else
            printf(" ");
    }
    printf("\n");
```

i = 0

j = 0 1 2 3 4 5 6 7

for(i=0; i<6; i++){

for(j=0; j<7; j++){

if(i==0 && 0%3 != 0)

1%3 != 0 ✓

r=0 - * * - * * -

r=1