Cubing Numbers

A. Formula method

* cube of any number can be found out using the formula.

$$(a+b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$$

$$(a-b)^3 = a^3 - 3a^2b + 3ab^2 - b^3.$$

Eg 1: Find the cube of 102

$$(100+2)^3 = (100)^3 + 3(100)^2 \times 2 + 3(100) \times 2^2 + 2^3.$$

$$= 1000000 + 3(10000) \times 2 + 300 \times 4 + 8$$

$$= 1000000 + 60000 + 1200 + 8.$$

$$= 1061208$$

Eg 2: Find the cube of 97.

$$(100-3)^3 = (100)^3 - 3(100)^2 \times 3 + 3(100) \times 3^2 - 3^3.$$

$$= 1000000 - 9(10000) + 2700 - 27$$

$$= 1000000 - 90000 + 2700 - 27$$

$$= 910000 + 2673$$

$$= 912673$$

Eg 3: Find the cube of 93.

Eg 4: Find the cube of 105

Eg 5: Find the cube of 91.

Eg 6: Find the cube of 108

B. Anurupya Sutra

Eqn: $a^3 + 3a^2b + 3ab^2 + b^3$.

$\Rightarrow a^3 + a^2b + ab^2 + b^3$ — ①

$2a^2b + 2ab^2$ — ②

$= a^3 + 3a^2b + 3ab^2 + b^3$.

From Eqn. ①; we see the pattern below.

1st term — a^3.

2nd term — $a^3 \times \frac{b}{a} = a^2b$.

3rd term — $a^2b \times \frac{b}{a} = ab^2$.

4th term — $ab^2 \times \frac{b}{a} = b^3$.

Hence each term 'x' by $\frac{b}{a}$ — gives next term.

For Eqn. ② 'x' the term twice (from 2, 3 rd terms).

- Add them up. (1) & (2).

Q. Find the cube of 52 : (50+2).

$a = 5 \quad b = 2$

1st term $= a^3 = 5^3 = 125$

1st Row

2nd term $= 125 \times \frac{2}{50} = 50$ ✓

3rd term $= 50 \times \frac{2}{5} = 20$ ✓

4th term $= 2^3 = 8$.

2nd Row

$50 \times 2 + 20 \times 2$

$= 100 + 40$.

125	50	20	8
	100	40	
125	150	60	8

Step 3: add '3' zeros to 125 (append) = 125000
'2' zeros to 150 = 15000
'1' zero to 60 = 600
'0' zeros to 8 = 8
= 140608

Q. Find the cube of 12 a=1 b=2

I
$1^3 = 1$.
$1 \times \frac{2}{1} = 2$.
$2 \times \frac{2}{1} = 4$
$2^3 = 8$

II
$2 \times 2 = 4$
$2 \times 4 = 8$

1	2	4	8
	4	8	
1	6	12	8

1000
600
120
8
= 1728

Q. Find the cube of 31 a=3 b=1

I
$3^3 = 9$
$9 \times \frac{1}{3} = 3$
$3 \times \frac{1}{3} = 1$
$1^3 = 1$.

II
$2 \times 3 = 6$
$2 \times 1 = 1$.

9	3	1	1
	6	1	
9	9	2	1

9000
900
20
1
= 9921

I

$3^3 = 27$.

$27 \times \frac{1}{3} = 9$.

$9 \times \frac{1}{3} = 3$.

$1^3 = 1$

II

$2 \times 9 = 18$.

$3 \times 2 = 6$.

27	9	3	1
	18	6	
27	27	9	1

27 000
2700
990
1
29791

Q. Find the cube of 13

I

$1^3 = 1$

$1 \times \frac{3}{1} = 3$.

$3 \times \frac{3}{1} = 9$

$3^3 = 27$

II

$3 \times 2 = 6$

$9 \times 2 = 18$.

1	3	9	27
	6	18	
1	9	27	27

1000
900
270
27
2197

Q. Find the cubes of.

a. 14
b. 22
c. 24
d. 33
e. 42
f. 51
g. 62

h. Find the cube of 102 $\overset{a}{(10)}\ \overset{b}{(2)}$

$10^3 = 1000$.

I $1000 \times \frac{2}{10} = 200$

$200 \times \frac{2}{10} = 40$.

$2^3 = 8$

II $2 \times 200 = 400$.

$2 \times 40 = 80$

1000	200	40	8.
	400	80	
1000	600	120	8

1000000.
60000.
1200
8
1061208.

* Note the above Rule is applicable to only till 999 (3, 2, 1, NO zeros appended).

From 1000 onwards, we put 6, 4, 2 & no zeros.

Eg: Find the cube of 1001. $\overset{a}{10}/\overset{b}{01}$

$10^3 = 1000$.

I $1000 \times \frac{01}{10} = 100$.

$100 \times \frac{1}{10} = 10$.

$1^3 = 1$.

II $2 \times 100 = 200$.

$2 \times 10 = 20$.

1000	100	10	1
	200	20.	
1000	300	30	1

1000 000000.
3 000000
3000
1
1003003001.

* Very rarely we need to find the nos. more than 1000.

Note: Observe the digits in the question.
& Select the method appropriately.
(the one which can give answer Instantly)
- Number made of 1's, 2's, 3's. or Similar digits - Anurupya Sutra.
- Number is closer to the bases - formula method.

EXERCISE

Q (1). Find the cube of following Nos. using the formula $(a+b)^3$.

(1) 105

(2) 41

(3) 54

(4) 23

Q (2). Find the cube of following Nos. using Anurupya Rule.

(1) 66

(2) 77

(3) 91

(4) 19

Q (3). Find the cube of following Nos. using formula $(a-b)^3$.

(1) 49

(2) 90

(3) 199

(4) 96.

Q.(4) Find the cube of the following Nos. using Anurupya Rule.

(1) 43

(2) 72

(3) 103.