Atomic Energy Education Society – Distance Learning Programme

Class – **VIII** Subject – **Mathematics**

Chapter – **7**: **CUBES AND CUBE ROOTS**

**Hand-out (Module 1/3)**

***Introduction***

There is an interesting story about Srinivasa Ramanujan, India’s great mathematical genius and his famous mathematician friend Prof. G H Hardy. One day Prof. Hardy visited Ramanujan in a taxi whose number was 1729. Hardy described 1729 as a *dull number* to Ramanujan. To this, the great Ramanujan quickly interjected and said that 1729 is the smallest number that can be expressed as a sum of two cubes in two different ways. Indeed an interesting number.

***Hardy – Ramanujan Number***

According to Ramanujan, the number 1729 is the smallest number that can be expressed as a sum of two cubes in two different ways:

**1729 = 1728 + 1 = 12 3 + 1 3**

**1729 = 1000 + 729 = 10 3 + 9 3**

1729 has since been known as the Hardy – Ramanujan Number.

1729 is the smallest Hardy– Ramanujan Number.

There are an infinitely many such numbers, such as …

 4104 = 2 3 + 16 3 and 4104 = 9 3 + 15 3

13832 = 18 3 + 20 3 and 13832 = 2 3 + 24 3

***Cubes***

The word ‘cube’ is used in geometry.

A cube is a solid figure which has all its sides equal.

8 cubes of side 1 cm will make a cube of side 2 cm.

27 cubes of side 1 cm will make a cube of side 3 cm.

64 cubes of side 1 cm will make a cube of side 4 cm.

The numbers 1, 8, 27, 64 … are called **perfect cubes** or **cube numbers**.

A perfect cube or a cube number is obtained when a number is multiplied by taking it three times.

1 x 1 x 1 = 1 3 = **1**

2 x 2 x 2 = 2 3 = **8**

***There are only ten perfect cubes from 1 to 1000.***

3 x 3 x 3 = 3 3 = **27**

4 x 4 x 4 = 4 3 = **64**

5 x 5 x 5 = 5 3 = **125**

6 x 6 x 6 = 6 3 = **216**

7 x 7 x 7 = 7 3 = **343**

8 x 8 x 8 = 8 3 = **512**

9 x 9 x 9 = 9 3 = **729**

10 x 10 x 10 = 10 3 = **1000**

***Some properties of cube numbers/perfect cubes***

1. Cubes of even numbers are always even.

Example: 2 3 = 8

 4 3 = 64

 6 3 = 216,

 12 3 = 1728 etc.

1. Cubes of odd numbers are always odd.

 Example: 1 3 = 1

 3 3 = 27

 5 3 = 125

 11 3 = 1331 etc.

1. The cube of a negative number is always negative.

Example: (– 3)3 = (– 27)

 (– 9)3 = (–729)

 (– 14)3 = (– 2744)

1. (a) If the one’s digit of a number is **1**, then the one’s digit of its cube is
 also **1**.

 Example: 1**1** 3 = 133**1**

(b) If the one’s digit of a number is **2**, then the one’s digit of its cube is **8**.

 Example: 1**2** 3 = 172**8**

(c) If the one’s digit of a number is **3**, then the one’s digit of its cube is **7**.

 Example: 2**3** 3 = 1216**7**

(d) If the one’s digit of a number is **4**, then the one’s digit of its cube is
 also **4**.

 Example: 1**4** 3 = 274**4**

(e) If the one’s digit of a number is **5**, then the one’s digit of its cube is
 also **5**.

 Example: 2**5** 3 = 1562**5**

(f) If the one’s digit of a number is **6**, then the one’s digit of its cube is
 also **6**.

 Example: 1**6** 3 = 409**6**

(g) If the one’s digit of a number is **7**, then the one’s digit of its cube is **3**.

 Example: 1**7** 3 = 491**3**

(h) If the one’s digit of a number is **8**, then the one’s digit of its cube is **2**.

 Example: 1**8** 3 = 583**2**

(i) If the one’s digit of a number is **9**, then the one’s digit of its cube is
 also **9**.

 Example: 1**9** 3 = 685**9**

1. The number of zeroes at the end of a perfect cube is always a multiple of 3.

So the number of zeroes at the end of a perfect cube can be 3, 6, 9, 12 ….

Example: 1000, 8000, 27000000, 1728000, 64000000000 etc. are all perfect cubes.

 ^\*^\*^\*^\*^\*^\*^\*^\*^\*