Section-1

Ans-1

(a.) $x^3 = 1$

$x^3 - 1 = 0$

$(x-1)(x^2+x+1) = 0$

giving $x = 1$ or $x^2+x+1=0$

if $x^2+x+1=0$,

$$x = \frac{1}{2}(-1 \pm \sqrt{-3})$$

$$= \frac{1}{2}(-1 \pm i\sqrt{3})$$

Hence the number 1, $\frac{1}{2}(-1 \pm i\sqrt{3})$ are called cubic roots of unity.

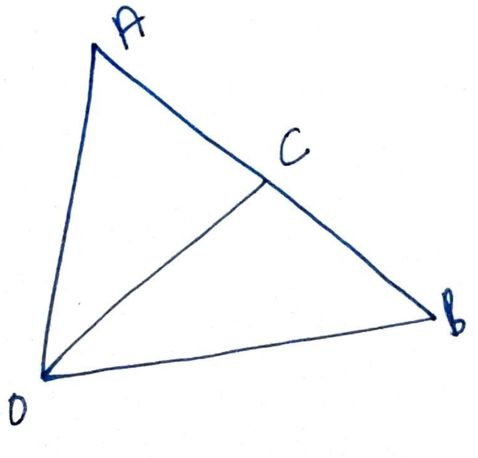
(b.). $|a+b|^2 + |a-b|^2 = 2|a|^2 + 2|b|^2$

Let A, B, be the point which represent a, b.

Bisect AB at C, then

$$\vec{OA} + \vec{OB} = 2\vec{OC}$$

& $\vec{OA} - \vec{OB} = \vec{BA} = 2\vec{CA}$



Therefore $a+b$ and $a-b$ represented by $2\vec{OC}$ and $2\vec{CA}$ hence,

$$|a+b| = 2OC, \quad |a-b| = 2CA$$

Now, since C is the midpoint of base AB

$$OA^2 + OB^2 = 2OC^2 + 2CA^2$$

$$\therefore 2|a|^2 + 2|b|^2 = |a+b|^2 + |a-b|^2.$$