A) (a) Solve the eq^n $x^3 = 1$

Sol^n $x^3 = 1$

$x^3 - 1 = 0$

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

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

If $x^2+x+1 = 0$, we have in the usual way

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

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

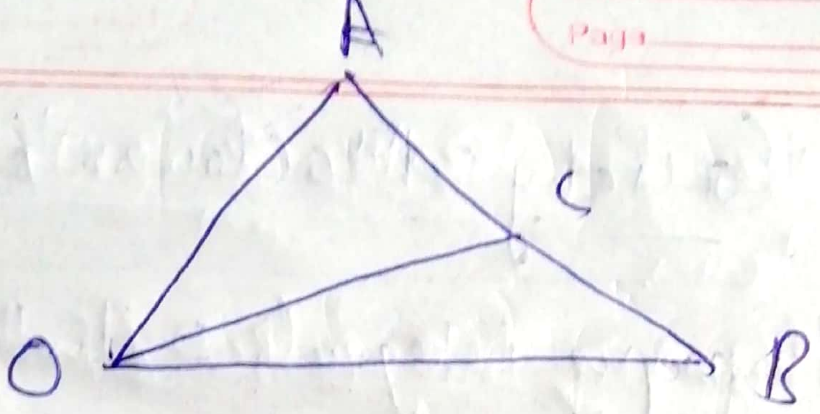
Hence, $1, \frac{1}{2}(-1 \pm \sqrt{3}\,i)$ are called the three roots of unity.

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

Ans Let A, B be the points which represent a, b. Bisect AB at C then,

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

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



therefore, $a+b$ & $a-b$ are represented by $2\overline{OC}$ & $2\overline{CA}$;
hence $|a+b| = 2OC$, $|a-b| = 2CA$

Now since C is the midpoint of base AB

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

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

Hence proved.