WISSENAIRE (Maths Olympiad)

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① Given, $(\sqrt{8}+i)^{50} = 3^{49}(a+ib)$

Taking modulus on both sides,

$$(\sqrt{8+1})^{50} = 3^{49}(\sqrt{a^2+b^2})$$

Squaring on both sides.

$$9^{50} = (3^{49})^2(a^2+b^2)$$

$$\boxed{a^2+b^2=9}$$

$\therefore$ Required answer: $a^2+b^2=9$.