Question #9107

Given z1 = 3(cos 14° + i sin 14°) and z2 = 2(cos 121° + i sin 121°), find the product z1.z2

Solution

$$z_1 = r_1(\cos\alpha_1 + i\sin\alpha_1)$$

$$z_2 = r_2(\cos\alpha_2 + i\sin\alpha_2)$$

$$z_1 z_2 = r_1 r_2(\cos\alpha_1\cos\alpha_2 + i\cos\alpha_1\sin\alpha_2 + i\sin\alpha_1\cos\alpha_2 + i^2\sin\alpha_1\sin\alpha_2) =$$
$$= r_1 r_2((\cos\alpha_1\cos\alpha_2 - \sin\alpha_1\sin\alpha_2) +) + i(\sin\alpha_1\cos\alpha_2 + \cos\alpha_1\sin\alpha_2) =$$
$$= r_1 r_2(\cos(\alpha_1 + \alpha_2) + i\sin(\alpha_1 + \alpha_2))$$

$$z_1 \cdot z_2 = 2\cdot 3(\cos(14^0 + 121^0) + i\sin(14^0 + 121^0)) = 6(\cos(135^0) + i\sin(135^0))$$

Answer: $z_1 \cdot z_2 = 6(\cos(135^0) + i\sin(135^0))$