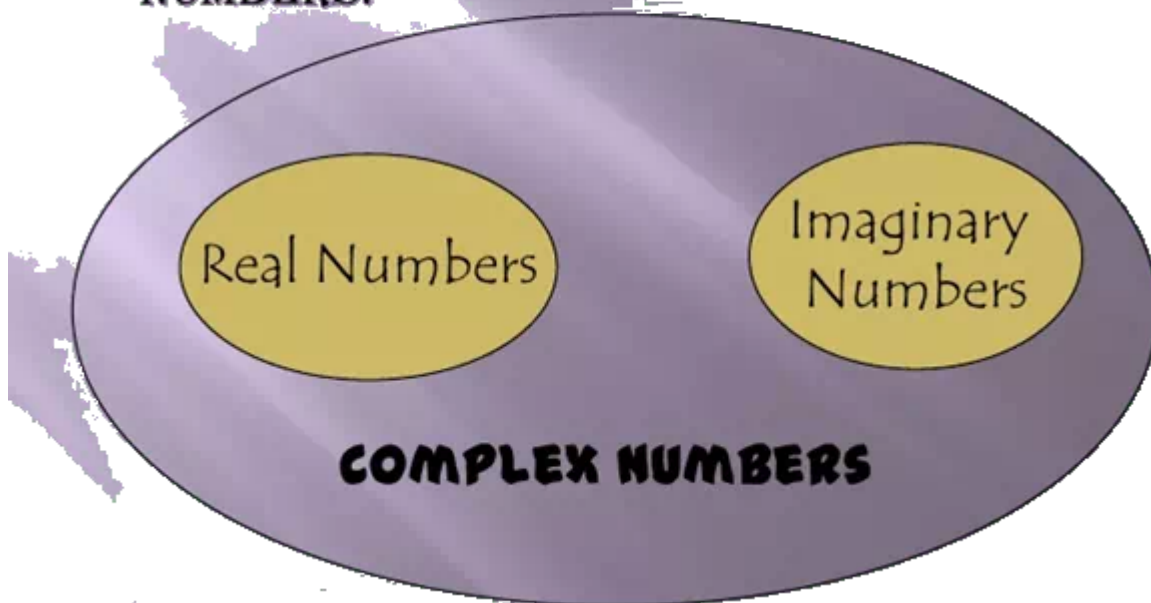


## NCERT Class 11 Mathematics Solutions: Chapter 5 –Complex Number and Quadratic Equations Miscellaneous Exercise Part 1

**REAL NUMBERS AND IMAGINARY NUMBERS  
ARE SUBSETS OF THE SET OF COMPLEX  
NUMBERS.**



*Understanding of Complex Number*

1. Evaluate  $\left[ i^{18} + \left( \frac{1}{i} \right)^{25} \right]^3$

Answer:

$$\begin{aligned} \left[ i^{18} + \left( \frac{1}{i} \right)^{25} \right]^3 &= \left[ i^{4 \times 4 + 2} + \frac{1}{i^{4 \times 6 + 1}} \right]^3 \\ &= \left[ (i^4)^4 \cdot i^2 + \frac{1}{(i^4)^6 \cdot i} \right]^3 \\ &= \left[ i^2 + \frac{1}{i} \right]^3 \quad [\because i^4 = 1] \\ &= \left[ -1 + \frac{1}{i} \times \frac{i}{i} \right]^3 \quad [\because i^2 = -1] \\ &= \left[ -1 + \frac{i}{i^2} \right]^3 \end{aligned}$$

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$$\begin{aligned} &= [-1 - i]^3 \\ &= (-1)^3 [1 + i]^3 \\ &= - [1^3 + i^3 + 3 \cdot 1 \cdot i(1 + i)] \\ &= - [1 + i^3 + 3i + 3i^2] \\ &= - [1 - i + 3i - 3] \\ &= -[-2 + 2i] \\ &= 2 - 2i \end{aligned}$$

2. For any two complex numbers  $z_1$  and  $z_2$ , prove that  $Re (z_1 z_2) = Re z_1 Re z_2 - Im z_1 Im z_2$

Answer:

Let  $z_1 = x_1 + iy_1$  and  $z_2 = x_2 + iy_2$

$$\begin{aligned} \therefore z_1 z_2 &= (x_1 + iy_1) (x_2 + iy_2) \\ &= x_1 (x_2 + iy_2) + iy_1 (x_2 + iy_2) \\ &= x_1 x_2 + ix_1 y_2 + iy_1 x_2 + i^2 y_1 y_2 \\ &= x_1 x_2 + ix_1 y_2 + iy_1 x_2 - y_1 y_2 [i^2 = -1] \\ &= (x_1 x_2 - y_1 y_2) + i (x_1 y_2 + y_1 x_2) \\ &\rightarrow Re (z_1 z_2) = x_1 x_2 - y_1 y_2 \\ &\rightarrow Re (z_1 z_2) = Re z_1 Re z_2 - Im z_1 Im z_2 \end{aligned}$$

So, proved.