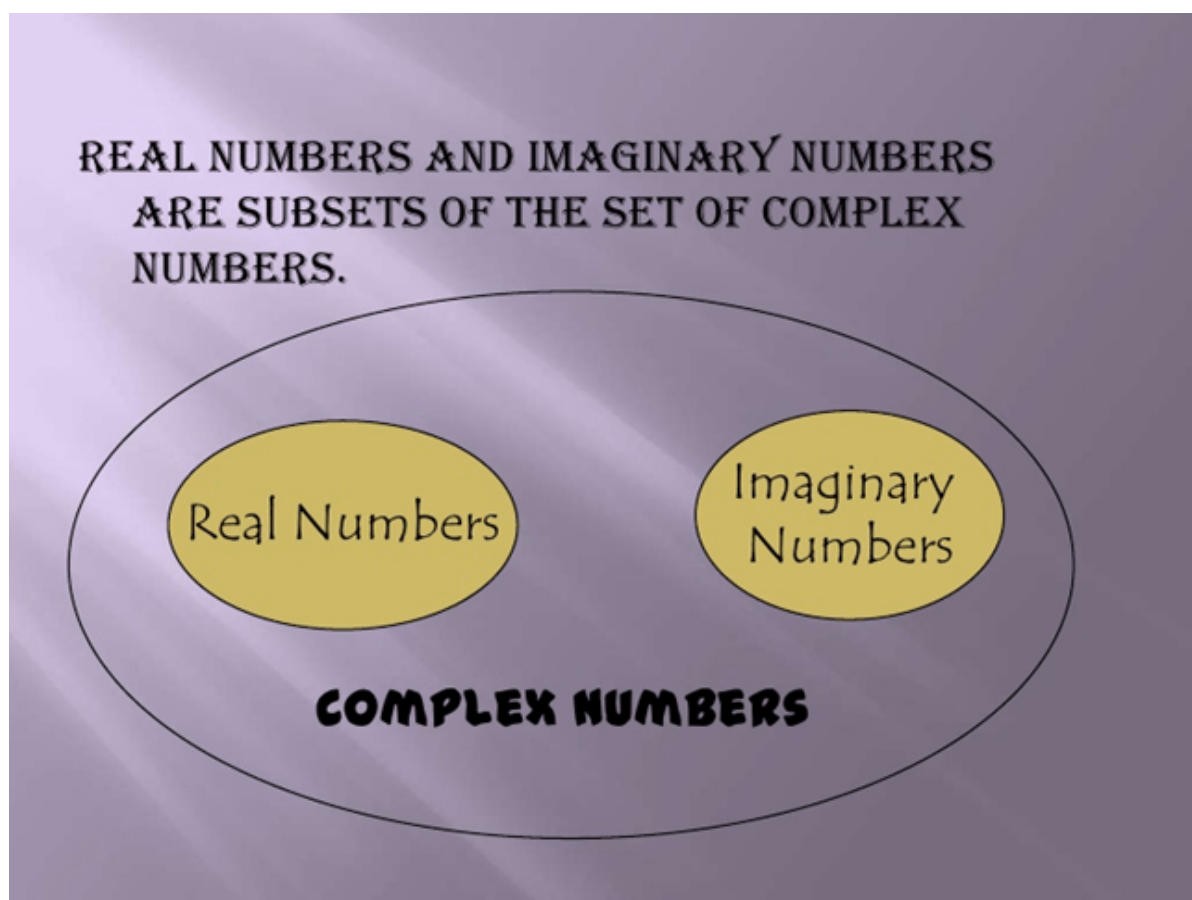


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## NCERT Class 11 Mathematics Solutions: Chapter 5 – Complex Number and Quadratic Equations Miscellaneous Exercise Part 1

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

Answer:

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

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

Answer:

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

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

So, proved.