# Complex Numbers and Quadratic Equations

## Assertion Reason Questions

**Direction: In the following questions, a statement of Assertion (A) is followed by a statement of Reason (R).**
**Choose the correct answer out of the following choices.**

(a) Both (A) and (R) are true and (R) is the correct explanation of (A).
(b) Both (A) and (R) are true but (R) is not the correct explanation of (A).
(c) (A) is true but (R) is false.
(d) (A) is false but (R) is true.

**1. Assertion (A):** Simplest form of $i^{35}$ is - i.
**Reason (R):** Additive inverse of (1 - i) is equal to - 1 + i.

**Ans.** (A) is false but (R) is true.

**Explanation:** $i^{35} = \frac{1}{i^{-35}} = \frac{1}{(i^2)^{17} i}$

$$= \frac{1}{-i} \times \frac{i}{i} = \frac{i}{-i^2} = i$$

$\therefore$ Additive inverse of $z$ is $-z$.
So, additive inverse of $(1 - i)$ is $-1 + i$.

**2. Assertion (A):** If $z_1 = 2 + 3i$ and $z_2 = 3 - 2i$ then
$z_1 - z_2 = -1+5i$.
**Reason(R):** If $z_1 = (a + ib)$ and $z_2 = (c + id)$
then $z_1 - z_2 = (a - c) + i\,(b-d)$.

**Ans.** (a) Both (A) and (R) are true and (R) is the correct explanation of (A).
Explanation: Given $z_1 = 2 + 3\,i$ and $z_2 = 3 - 2i$
then
We know that, if $z_1 = (a + ib)$ and $z_2 = (c + id)$,
then,
$Z_1 - Z_2 = (ac) + i(b-d)$
$Z_1 - Z_2 = (2+3i)-(3-21)$

$Z_1$-$Z_2$=2+3i-3 + 2i
$Z_1$-$Z_2$ = -1+5i

On comparing it with a + ib, we get
b = -8
Given,
$(1-1)^3 = 1^3-i^3 - 3 \times 1 \times_{i}(1-i)$
$= 1-i^2 xi- 3i+ 3i^2$
=1+i-3i-3
=-2-2i
z=-2-2i
On comparing it with a + ib, we get
a = -2 and b = -2

**3. Assertion (A):** Multiplicative inverse of 2 - 3i is 2 + 3i.
**Reason (R):** If z = 3 + 4i then z = 3-4i.

**Ans.** (A) is false but (R) is true.
Explanation: Multiplicative inverse of z = $z^{-1}$

Multiplicative inverse of $z = \frac{1}{z}$

Putting $z = 2 - 3i$

Multiplicative inverse of $2 - 3i = \frac{1}{2-3i}$

$$= \frac{1}{(2-3i)} \times \frac{(2+3i)}{(2+3i)}$$

$$= \frac{2+3i}{(2-3i)(2+3i)}$$

[Using $(a + b)(a - b) = a^2 - b^2$]

$$= \frac{2+3i}{2^2-(3i)^2}$$

$$= \frac{2+3i}{4-9i^2}$$

Putting $i^2 = -1$

$$= \frac{2+3i}{4-9\times-1}$$

$$= \frac{2+3i}{4+9}$$

$$= \frac{2+3i}{13}$$

$$= \frac{2}{13}+\frac{3i}{13}$$

Hence, Multiplicative inverse = $\frac{2}{13}+\frac{3i}{13}$.

$$z = a + ib$$

$$\bar{z} = a - ib$$

$$z = 3 + 4i$$

then $\bar{z} = 3 - 4i$