7. Let \( \psi : \mathbb{C} \rightarrow \mathbb{R} \) be an isomorphism, then
\[
\psi(i^2) = \psi(i)^2 = \psi(-1) = -1
\]
so \( \psi(i)^2 = -1 \) which is impossible in \( \mathbb{R} \).

8. Let \( \psi : \mathbb{Q}(\sqrt{2}) \rightarrow \mathbb{Q}(\sqrt{3}) \) be an isomorphism.
Then \( \psi((\sqrt{2})^2) = \psi(\sqrt{2})^2 = \psi(2) = \psi(i) + \psi(i) \)
so \( \psi(\sqrt{2})^2 = 2 \) which is impossible in \( \mathbb{Q}(\sqrt{3}) \).

18. (a) If \( x, y \) are in \( \phi(R) \) we can find \( a, b \) in \( R \) such that
\( \phi(a) = x \), \( \phi(b) = y \), but then
\[
\phi(ab) = xy = \phi(ba) = yx,
\]
so \( xy = yx \) and \( \phi(R) \) is commutative.

(b) \[
\phi(a + 0) = \phi(a) + \phi(0) \quad \phi(a - a) = \phi(a) - \phi(a) = 0
\]
so \( \phi(0) = 0 \).

(c) For any \( s \) in \( S \), since \( \phi \) is onto we have \( x \) in \( R \)
such that \( \phi(x) = s \), but then \( \phi(1_R xx) = \phi(x) = s \)
so \( s = \phi(1_R) \cdot s \) for any \( s \) in \( S \).
\[
\phi(1_R) x \phi(x) = \phi(1_R) \cdot s
\]
and thus \( \phi(1_R) = 1_S \).
i) It is a subgroup: take \(a, b\) nilpotents, so \(\exists n, m\) such that \(a^n = 0\) \(\Rightarrow \) \(b^m = 0\).

Show \((a - b)\) is nilpotent.

Newton's Binomial Thm for commutative rings: for \(s \geq 1\)

\[
(a - b)^s = \sum_{k=0}^{s} \binom{s}{k} a^k b^{s-k}
\]

Taking \(s = m + n\), we see that for any \(k \in \mathbb{N}, m+n\)
we have \(a^k b^{m+n-k} = 0\) because either \(k \leq m\), and then \(m+n-k \geq m\) so \(b = 0\)
on \(k > n\) and then \(a = 0\).

So \((a - b)\) is nilpotent.

ii) For a nilpotent \(a\) and \(b\) in \(R\), we have

\[(ab)^k = a^k b^k\] because \(R\) is commutative,
so taking \(k\) large enough we have \(a^k = 0\) and thus \((ab)^k = 0\).

33) \(\Delta\) it is not the center in the group theory sense.

A subgroup? \(a, b\) in \(Z(R)\), \(z\) in \(R\)

\[(a - b)z = az - bz = za - zb = z(a - b)\]

So \(a - b \in Z(R)\)

Moreover, if \(a, b \in Z(R)\) then \((ab)z = (az)b = (zab)\)

for all \(z\) so \(ab \in Z(R)\)

Commutativity is clear.
Note: the question is a bit strange. They mean "is a ring with the usual operations on fractions", or "is a subring of $\mathbb{Q}$".

\[
\frac{a}{b} - \frac{c}{d} = \frac{ad - bc}{bd} \quad \text{gcd}(b, p) = 1 \quad \text{gcd}(d, p) = \pm
\]

\[
\frac{a}{b} \cdot \frac{c}{d} = \frac{ac}{bd} \quad \text{gcd}(bd, p) = \pm
\]

\[
\frac{a}{b} \cdot \frac{c}{d} = \frac{ac}{bd} \quad \text{gcd}(bd, p) = \pm
\]

\[
\frac{a}{b} \cdot \frac{c}{d} = \frac{ac}{bd} \quad \text{idem}.
\]