1. By ‘brute force’, Find the set of quadratic residues, and the set of quadratic non-residues of \( p = 13 \).

**Sol. to 1:**

\[
QR(13) = \{0^2, 1^2, 2^2, 3^2, 4^2, 5^2, 6^2\} \mod 13
\]
\[
= \{0, 1, 4, 9, 16, 25, 36\} \mod 13
\]
\[
= \{0, 1, 4, 9, 3, 12, 10\}
\]
\[
= \{0, 1, 3, 4, 9, 10, 12\}.
\]

**Ans. to 1:** The set of quadratic residues modulo 13 is \( \{0, 1, 3, 4, 9, 10, 12\} \).

2. Using the Quadratic Reciprocity Law and Rules 1-3, find (no credit for other methods)

\[
\left( \frac{7}{17} \right)
\]

**Sol. to 2:** By Rule 4 the Quadratic Reciprocity Law

\[
\left( \frac{7}{17} \right) \left( \frac{17}{7} \right) = (-1)^{(7-1)(17-1)/4} = (-1)^{(6)(16)/4} = (-1)^{24} = 1
\]

so

\[
\left( \frac{7}{17} \right) = \left( \frac{17}{7} \right) = \left( \frac{3}{7} \right)
\]

since \( 17 \mod 7 = 3 \).

Moving right along, using Rule 4 (QRL) once again

\[
\left( \frac{3}{7} \right) \left( \frac{7}{3} \right) = (-1)^{(3-1)(7-1)/4} = (-1)^{(2)(6)/4} = (-1)^{3} = -1
\]

So

\[
\left( \frac{3}{7} \right) = - \left( \frac{7}{3} \right)
\]

But since \( 7 \mod 3 = 1 \),

\[
\left( \frac{7}{3} \right) = \left( \frac{1}{3} \right) = 1
\]

(Of course \( \left( \frac{1}{p} \right) \) is always 1, since \( 1^2 = 1 \).

Going back we have,

\[
\left( \frac{3}{7} \right) = -1
\]

and finally,

\[
\left( \frac{7}{17} \right) = -1
\]

**Ans. to 2:** \( \left( \frac{7}{17} \right) = -1 \), in other words 7 is a quadratic NON-residue of 17.