Class Practice on Equations with Radicals

1. Solve the equation: \( \sqrt{x} = 4 \)

2. Solve the equation: \( \sqrt{2x - 6} = 4 \)

3. Solve the equation: \( \sqrt{2x - 6} = 4 \)
4. Solve the equation: \( \sqrt{2x + 3} = x \)

5. Solve the equation: \( \sqrt{2x + 3} + 1 = 0 \)

6. Solve the equation: \( \sqrt[3]{3x - 3} = 3 \)
1. Solve the equation:

\[ \sqrt{x} = 4 \]  Begin by squaring both sides of the equation.

\[ (\sqrt{x})^2 = 4^2 \]
\[ x = 16 \]

Check:
\[ \sqrt{16} = 4 \]
\[ \sqrt{16} = 4? \]
\[ 4 = 4 \quad \text{This is true, so} \; x = 16 \; \text{is the answer.} \]

2. Solve the equation:

\[ \sqrt{2x-6} = 4 \]  Begin by squaring both sides of the equation.

\[ (\sqrt{2x-6})^2 = 4^2 \]
\[ 2x - 6 = 16 \]
\[ 2x = 22 \]
\[ x = 11 \]

Check:
\[ \sqrt{2(11)-6} = 4 \]
\[ \sqrt{2(11)-6} = 4? \]
\[ \sqrt{22-6} = 4? \]
\[ \sqrt{16} = 4? \]
\[ 4 = 4 \quad \text{This is true, so} \; x = 11 \; \text{is the answer.} \]
3. Solve the equation:

\[ \sqrt{2x - 6} = 4 \]

Begin by isolating the radical.

\[ \sqrt{2x} = 10 \]

Now we square both sides of the equation.

\[ (\sqrt{2x})^2 = 10^2 \]
\[ 2x = 100 \]
\[ x = 50 \]

Check:

\[ \sqrt{2x - 6} = 4 \]
\[ \sqrt{2(50) - 6} = 4? \]
\[ \sqrt{100 - 6} = 4? \]
\[ 10 - 6 = 4? \]
\[ 4 = 4 \] ← This is true, so \( x = 50 \) is the answer.

4. Solve the equation: \( \sqrt{2x + 3} = x \)

\[ \sqrt{2x + 3} = x \]

Begin by cubing both sides of the equation.

\[ (\sqrt{2x + 3})^2 = x^2 \]
\[ 2x + 3 = x^2 \]

Rewrite with all terms on the same side of the equal sign.

\[ x^2 - 2x - 3 = 0 \]

Factor the left-hand side.

\[ (x - 3)(x + 1) = 0 \]
\[ x = 3 \text{ or } x = -1 \]

Check for \( x = 3 \):

\[ \sqrt{2x + 3} = x \]
\[ \sqrt{2(3) + 3} = 3? \]
\[ \sqrt{9} = 3? \]
\[ 3 = 3 \] ← This is true, so \( x = 3 \) is an answer.

Check for \( x = -1 \):

\[ \sqrt{2x + 3} = x \]
\[ \sqrt{2(-1) + 3} = -1? \]
\[ \sqrt{1} = -1? \] ← This is NOT true, so \( x = -1 \) is an NOT an answer (it is an extraneous solution).

So, in summary, the only solution to the original equation is \( x = 3 \).
5. Solve the equation:

\[ \sqrt{2x+3} + 1 = 0 \]

Begin by isolating the radical.

\[ \sqrt{2x+3} = -1 \]

Now we square both sides of the equation.

\[ \left( \sqrt{2x+3} \right)^2 = (-1)^2 \]

\[ 2x + 3 = 1 \]

\[ 2x = -2 \]

\[ x = -1 \]

Check:

\[ \sqrt{2x+3} + 1 = 0 \]

\[ \sqrt{2(-1)+3} + 1 = 0? \]

\[ \sqrt{1} + 1 = 0? \]

\[ 2 = 0? \leftarrow \text{This is NOT true, so } x = -1 \text{ is NOT an answer (it is an extraneous solution).} \]

This equation has no solution.

6. Solve the equation:

\[ \sqrt[3]{3x-3} = 3 \]

Begin by cubing both sides of the equation.

\[ \left( \sqrt[3]{3x-3} \right)^3 = 3^3 \]

\[ 3x - 3 = 27 \]

\[ 3x = 30 \]

\[ x = 10 \]

Check:

\[ \sqrt[3]{3x-3} = 3 \]

\[ \sqrt[3]{3(10)-3} = 3? \]

\[ \sqrt[3]{27} = 3? \]

\[ 3 = 3 \leftarrow \text{This is true, so } x = 10 \text{ is the answer.} \]