QUADRATIC SURD

1. If $x = 3 + 2\sqrt{2}$, then find $x + \frac{1}{x}$.

Ans. $x = 3 + 2\sqrt{2}$

or, $\frac{1}{x} = \frac{1}{3 + 2\sqrt{2}}$

$= \frac{1.(3 - 2\sqrt{2})}{(3 + 2\sqrt{2})(3 - 2\sqrt{2})}$

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

$= \frac{3 - 2\sqrt{2}}{9 - 4.2}$

$= \frac{3 - 2\sqrt{2}}{9 - 8}$

$= 3 - 2\sqrt{2}$

$\therefore x + \frac{1}{x} = (3 + 2\sqrt{2}) + (3 - 2\sqrt{2}) = 6$

2. Simplify : $\frac{3\sqrt{20} + 2\sqrt{28} + \sqrt{12}}{5\sqrt{45} + 2\sqrt{175} + \sqrt{75}}$

Ans. $\frac{3\sqrt{20} + 2\sqrt{28} + \sqrt{12}}{5\sqrt{45} + 2\sqrt{175} + \sqrt{75}}$

$= \frac{3\sqrt{2^2 \times 5} + 2\sqrt{2^2 \times 7} + \sqrt{2^2 \times 3}}{5\sqrt{3^2 \times 5} + 2\sqrt{5^2 \times 7} + \sqrt{5^2 \times 3}}$

$= \frac{6\sqrt{5} + 4\sqrt{7} + 2\sqrt{3}}{15\sqrt{5} + 10\sqrt{7} + 5\sqrt{3}}$

$= \frac{2(3\sqrt{5} + 2\sqrt{7} + \sqrt{3})}{5(3\sqrt{5} + 2\sqrt{7} + \sqrt{3})} = \frac{2}{5}$

3. Show that why is $(-5+\sqrt{2})$ not the conjugate surd of the mixed quadratic surd $(5+\sqrt{2})$.

Ans. $(-5+\sqrt{2})$ is not the conjugate surd of the mixed quadratic surd $(5+\sqrt{2})$ because,

$(5+\sqrt{2})+(-5+\sqrt{2})=\cancel{5}+\sqrt{2}-\cancel{5}+\sqrt{2}=2\sqrt{2}$, which is not a rational number. (Here condition is that sum and product both are rational numbers.)

4. Subtract $(5+\sqrt{2}+\sqrt{7})$ from the sum of $(-5+\sqrt{7})$ and $(\sqrt{7}+\sqrt{2})$ and find the value of subtraction.

Ans. $\{(-5+\sqrt{7})+(\sqrt{7}+\sqrt{2})\}-(5+\sqrt{2}+\sqrt{7})$

$=-5+\sqrt{7}+\sqrt{7}+\sqrt{2}-5-\sqrt{2}-\sqrt{7}$

$=-10+\sqrt{7}$ or, $\sqrt{7}-10$