SURDS

Explain rational number, irrational number.

Explain surds.

eg. √2,√3,√5,√7,2√2,2√3,3√5…….etc

Conversion into simplest form

eg. $\sqrt{8} = \sqrt{2 \times 2 \times 2} = 2\sqrt{2}$

i. $\sqrt{8}$ ii.$\sqrt{32}$ iii.$\sqrt{27}$ iv.$\sqrt{12}$

v.$\sqrt{20}$ vi.$\sqrt{24}$ vii.$\sqrt{75}$ viii.$\sqrt{48}$

ix.$\sqrt{28}$ x.$\sqrt{44}$

Addition

1.$2\sqrt{3} + \sqrt{3} = 3\sqrt{3}$

2. $5\sqrt{7} + \sqrt{7} = 6\sqrt{7}$

Add the following:

i. $2\sqrt{3} + 5\sqrt{3}$ ii. $3\sqrt{2} + 4\sqrt{2}$ iii.$\sqrt{8} + \sqrt{2}$ iv.$4\sqrt{3} + \sqrt{75}$

v. $2\sqrt{3} + \sqrt{3} + 5\sqrt{3}$ vi. $4\sqrt{3} + 3\sqrt{2} + \sqrt{75}$

Subtraction

1. $4\sqrt{2} - 3\sqrt{2} = \sqrt{2}$

2. $7\sqrt{3} - 4\sqrt{3} = 3\sqrt{3}$

Subtract the following:

i. $4\sqrt{2} - \sqrt{2}$ ii. $4\sqrt{3} - 2\sqrt{3}$ iii. $3\sqrt{6} - \sqrt{6}$ iv. $5\sqrt{7} - 2\sqrt{7}$

v. $4\sqrt{5} - \sqrt{20}$ vi. $4\sqrt{3} - \sqrt{3} - \sqrt{12}$

Multiplication

1. $\sqrt{2} \times \sqrt{3} = \sqrt{6}$

2. $5\sqrt{2} \times 2\sqrt{3} = 10\sqrt{6}$

Multiply

i.$\sqrt{5} \times \sqrt{3}$ ii.$\sqrt{2} \times \sqrt{5}$ iii.$\sqrt{2} \times \sqrt{7}$ iv.$\sqrt{2} \times \sqrt{3}$

v.$\sqrt{3} \times \sqrt{3}$ vi.$\sqrt{6} \times \sqrt{3}$ vii.$\sqrt{2} \times \sqrt{3}$ viii.$\sqrt{10} \times \sqrt{2}$

ix.$5\sqrt{2} \times 2\sqrt{3}$ x.$\sqrt{3} \times 2\sqrt{8}$ xi. $3\sqrt{2} \times 2\sqrt{5}$ xii. $2\sqrt{2} \times \sqrt{3}$

xiii.$6\sqrt{2} \times 2\sqrt{3}$ xiv.$5\sqrt{5} \times 2\sqrt{3}$ xv.$\sqrt{7} \times 2\sqrt{3}$ xiv.$\sqrt{2} \times 2\sqrt{5}$

Simplify:

i. $2\sqrt{3} + \sqrt{12}$ ii. $2\sqrt{2} + \sqrt{50}$ iii. $5\sqrt{24} + 2\sqrt{6}$ iv. $3\sqrt{8} - \sqrt{32}$

v. $3\sqrt{8} - 2\sqrt{12} + \sqrt{20}$ vi. $3\sqrt{18} - 2\sqrt{27} + \sqrt{45}$

vii.$5\sqrt{3} - 2\sqrt{12} - \sqrt{32} + \sqrt{50}$ viii. $3\sqrt{6} - 2\sqrt{24} - \sqrt{54} + \sqrt{150}$

eg. $2\sqrt{3} + \sqrt{12} = 2\sqrt{3} + \sqrt{2 \times 2 \times 3}$

$=2\sqrt{3} + 2\sqrt{3}$

$=4\sqrt{3}$

RATIONALIZATION OF SURDS:

Explain rationalization of surds:

eg. The rationalization of $2+\sqrt{3}$ is

$$\begin{aligned}(2+\sqrt{3})(2-\sqrt{3}) &= (2)^2-(\sqrt{3})^2\\ &= 4-3\\ &= 1\end{aligned}$$

Rationalize the following:

i. $2+\sqrt{3}$	ii. $3+\sqrt{7}$	iii. $3+\sqrt{5}$	iv. $5+\sqrt{21}$
v. $\sqrt{6}+\sqrt{3}$	vi. $\sqrt{3}+\sqrt{2}$	vii. $\sqrt{2}+1$	viii $\sqrt{6}+\sqrt{5}$
ix. $2\sqrt{2}+\sqrt{3}$	x. $2\sqrt{3}+\sqrt{5}$	xi. $2\sqrt{3}+\sqrt{10}$	xii. $\sqrt{3}-\sqrt{2}$
xiii. $\sqrt{75}-\sqrt{50}$	xiv. $2\sqrt{7}-5$	xv. $4-2\sqrt{3}$	xvi. $5\sqrt{3}-3\sqrt{6}$

Simplification: Eg. $\frac{\sqrt{5}}{\sqrt{3}-\sqrt{2}}$

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

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

$=\frac{\sqrt{15}+\sqrt{10}}{(\sqrt{3})^2-(\sqrt{2})^2}$

$=\frac{\sqrt{15}+\sqrt{10}}{3-2}$

$=\sqrt{15}+\sqrt{10}$

Simplify:

i. $\frac{3}{\sqrt{3}-\sqrt{2}}$ ii. $\frac{3}{\sqrt{6}-\sqrt{3}}$ iii. $\frac{3\sqrt{3}}{\sqrt{5}-\sqrt{2}}$ iv. $\frac{2\sqrt{2}}{\sqrt{5}+\sqrt{3}}$

v. $\frac{2}{\sqrt{7}-\sqrt{3}}$ vi. $\frac{\sqrt{7}+\sqrt{3}}{5+\sqrt{21}}$ vii. $\frac{\sqrt{5}}{\sqrt{3}-\sqrt{2}}-\frac{3\sqrt{3}}{\sqrt{5}-\sqrt{2}}-\frac{2\sqrt{2}}{\sqrt{5}+\sqrt{3}}$

viii. $\frac{3\sqrt{7}}{\sqrt{5}+\sqrt{2}}-\frac{5\sqrt{5}}{\sqrt{7}+\sqrt{2}}+\frac{2\sqrt{2}}{\sqrt{7}+\sqrt{5}}$ ix. $\frac{3\sqrt{2}}{\sqrt{6}-\sqrt{3}}-\frac{4\sqrt{3}}{\sqrt{6}-\sqrt{2}}+\frac{2\sqrt{3}}{\sqrt{6}+\sqrt{2}}$

x. $\frac{3\sqrt{7}}{\sqrt{5}+\sqrt{2}}-\frac{5\sqrt{5}}{\sqrt{2}+\sqrt{7}}+\frac{2\sqrt{2}}{\sqrt{7}+\sqrt{5}}$ xi. $\frac{\sqrt{2}}{\sqrt{3}}\left(\frac{2+\sqrt{3}}{\sqrt{3}+1}\right)-\frac{\sqrt{2}}{\sqrt{3}}\left(\frac{2-\sqrt{3}}{\sqrt{3}-1}\right)$

Some extra questions

1. If $x=\sqrt{\frac{\sqrt{5}+1}{\sqrt{5}-1}}$, prove that $x^2-x=1$

2. If $x=\frac{\sqrt{3}+\sqrt{2}}{\sqrt{3}-\sqrt{2}}\ \&\ xy=1$, then find the value of $7x^2-5xy+7x^2$.