CORE MATHS 1

Note Title 08/09/2011

Indices and Surds

Rules of Indices

$$x^m \times x^n = x^{m+n}$$

$$\frac{x^m}{x^n} = x^{m-n}$$

$$(x^m)^n = x^{mn}$$

$$x^{-n} = \frac{1}{x^n}$$

$$x^{1/n} = \sqrt[n]{x}$$

$$x^0 = 1$$

Examples

① $2^{-3} = \frac{1}{2^3} = \frac{1}{8}$

② $\left(\frac{3}{4}\right)^{-2} = \frac{1}{\left(\frac{3}{4}\right)^2} = \frac{1}{\frac{9}{16}} = 1 \div \frac{9}{16}$

$= 1 \times \frac{16}{9}$

$= \frac{16}{9}$

③ $\left(\frac{2}{3}\right)^{-2} = \frac{9}{4}$

④ $64^{1/2} = \sqrt{64} = 8$

⑤ $64^{1/3} = \sqrt[3]{64} = 4$

⑥ $8^{-1/3} = \frac{1}{\sqrt[3]{8}} = \frac{1}{2}$

⑦ $9^{3/2} = 9^{1/2 \times 3}$

$= (9^{1/2})^3$

$= 3^3$

$= \underline{27}$

⑧ $\left(\frac{1}{8}\right)^{-2/3} = \left(\frac{8}{1}\right)^{2/3} = 8^{1/3 \times 2}$

$= (8^{1/3})^2$

$= 2^2$

$= \underline{4}$

⑨ $\frac{x^{-2} \times \sqrt{x^{10}}}{x^3} = \frac{x^{-2} \times (x^{10})^{1/2}}{x^3}$

$= \frac{x^{-2} \times x^5}{x^3}$

$= \frac{x^3}{x^3}$

$= x^0$

$= \underline{1}$

p 8 Ex 1F (all)

Rules of Surds

$\sqrt{xy} = \sqrt{x} \times \sqrt{y}$

$\sqrt{\frac{x}{y}} = \frac{\sqrt{x}}{\sqrt{y}}$

BUT $\sqrt{x+y} \neq \sqrt{x} + \sqrt{y}$ (eg $\sqrt{9+4} \neq \sqrt{9}+\sqrt{4}$)

$\sqrt{13} \neq 3+2$

Examples

① $\sqrt{12} \times \sqrt{3} = \sqrt{12 \times 3}$

$= \sqrt{36}$

$= \underline{6}$

② Simplify $\sqrt{48}$

$= \sqrt{16 \times 3}$

$= \sqrt{16} \times \sqrt{3}$

$= \underline{4\sqrt{3}}$

look for the largest square number which is a factor of 48

③ $\sqrt{48} + \sqrt{75}$

$= 4\sqrt{3} + \sqrt{25 \times 3}$

$= 4\sqrt{3} + 5\sqrt{3}$

$= \underline{9\sqrt{3}}$

④ $\dfrac{\sqrt{72}}{2\sqrt{3}} = \dfrac{\sqrt{36 \times 2}}{2\sqrt{3}}$

$= \dfrac{6\sqrt{2}}{2\sqrt{3}}$

$= \dfrac{3\sqrt{2}}{\sqrt{3}} \times \dfrac{\sqrt{3}}{\sqrt{3}}$

$= \dfrac{3\sqrt{6}}{3}$

$= \underline{\sqrt{6}}$

HWK: Finish IF if not done so

p10 16 Q 1 - 12 BY MONDAY

④ (alternative method)

$$\frac{\sqrt{72}}{2\sqrt{3}} = \frac{\sqrt{72}}{\sqrt{4}\times\sqrt{3}}$$

$$= \frac{\sqrt{72}}{\sqrt{4\times 3}}$$

$$= \frac{\sqrt{72}}{\sqrt{12}}$$

$$= \sqrt{\frac{72}{12}}$$

$$= \sqrt{6}$$

⑤ Rationalize the denominator of

$$\frac{8\sqrt{5}}{\sqrt{2}}$$

To do this we multiply top and bottom by $\sqrt{2}$ which doesn't change the value of the expression but gets rid of the surd in the denominator.

$$\frac{8\sqrt{5}}{\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}}$$

$$= \frac{8\sqrt{10}}{2}$$

$$= 4\sqrt{10}$$

⑥ Rationalize the denominator of

$$\frac{3-\sqrt{5}}{2+\sqrt{5}}$$

We multiply top and bottom by $2-\sqrt{5}$

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

$$= \frac{6 - 3\sqrt{5} - 2\sqrt{5} + 5}{4 - 5}$$

$$= \frac{11 - 5\sqrt{5}}{-1} \quad \times \frac{-1}{-1}$$

$$= 5\sqrt{5} - 11$$

p 11 Ex 1H odd nos.

p 6 Ex 1E all