

Qn 5 a.

$$\frac{5a^2b^3}{6a^7b^5} \div \frac{a^9b^4}{3ab^6}$$

$$\div \frac{a}{b} = \times \frac{b}{a}$$

$$= \frac{5a^2b^3}{6a^7b^5} \times \frac{3ab^6}{a^9b^4}$$

Divide terms $\left[\frac{a^m}{a^n} = a^{m-n} \right]$

$$= \frac{5}{6} \times a^{2-7} \times b^{3-5} \times 3 \times a^{1-9} \times b^{6-4}$$

Simplify powers.

$$= \frac{5}{6} \times a^{-5} \times b^{-2} \times 3 \times a^{-8} \times b^2$$

Multiply terms $\left[a^m \times a^n = a^{m+n} \right]$

$$= \frac{5}{26} \times 3 \times a^{-5+(-8)} \times b^{-2+2}$$

Simplify powers

$$= \frac{5}{2} \times a^{-13} \times b^0$$

Write as positive powers.

$$= \frac{5}{2} \times \frac{1}{a^{13}} \times 1$$

$$= \frac{5}{2a^{13}}$$

5 b)

$$\frac{7a^2b^4}{3a^6b^7} \div \left(\frac{3ab}{2a^6b^4}\right)^3$$

Indices $(a^m)^n = a^{m \cdot n}$

$$= \frac{7a^2b^4}{3a^6b^7} \div \frac{3^3a^3b^3}{2^3a^{18}b^{12}}$$

$\div \frac{a}{b} \Rightarrow \times \frac{b}{a}$

$$= \frac{7a^2b^4}{3a^6b^7} \times \frac{2^3a^{18}b^{12}}{3^3a^3b^3}$$

Divide

$$= \frac{7}{3} \times a^{2-6} \times b^{4-7} \times \frac{2^3}{3^3} \times a^{18-3} \times b^{12-3}$$

Simplify powers

$$= \frac{7}{3} \times a^{-4} \times b^{-3} \times \frac{2^3}{3^3} \times a^{15} \times b^9$$

Multiply $a^m \times a^n = a^m$

$$= \frac{7}{3} \times \frac{2^3}{3^3} \times a^{-4+15} \times b^{-3+9}$$

Simplify powers.

$$= \frac{56}{81} \times a^{11} \times b^6$$

$$= \frac{56a^{11}b^6}{81}$$

Qn 5 c)

$$\left(\frac{4a^9}{b^6}\right)^3 \div \left(\frac{3a^7}{2b^5}\right)^4$$

$$= \frac{4^3 a^{27}}{b^{18}} \div \frac{3^4 a^{28}}{2^4 b^{20}}$$

$$= \frac{4^3 a^{27}}{b^{18}} \times \frac{2^4 b^{20}}{3^4 a^{28}}$$

$$= \frac{4^3 \times 2^4 \times a^{27} \times b^{20}}{3^4 \times a^{28} \times b^{18}}$$

$$= \frac{64 \times 16}{81} \times a^{27-28} \times b^{20-18}$$

$$= \frac{1024}{81} \times a^{-1} \times b^2$$

$$= \frac{1024}{81} \times \frac{1}{a} \times b^2$$

$$= \frac{1024 b^2}{81 a}$$

Indices: $(a^m)^n = a^{mn}$

$$\div \frac{a}{b} \rightarrow \times \frac{b}{a}$$

Collect like terms.

Divide terms.

Simplify powers

Write with positive powers

Qn 5d)

$$\frac{5x^2y^6}{(2x^4y^5)^2} \div \frac{(4x^6y)^3}{10xy^3}$$

$$= \frac{5x^2y^6}{2^2x^8y^{10}} \div \frac{4^3x^{18}y^3}{10xy^3}$$

$$= \frac{5x^2y^6}{2^2x^8y^{10}} \times \frac{10xy^3}{4^3x^{18}y^3}$$

$$= \frac{5 \times 10 \times x^{2+1} \times y^{6+3}}{2^2 \times 4^3 \times x^{8+18} \times y^{10+3}}$$

$$= \frac{50}{4 \times 64} \times \frac{x^3}{x^{26}} \times \frac{y^9}{y^{13}}$$

$$= \frac{25}{126} \times x^{3-26} \times y^{9-13}$$

$$= \frac{25}{126} \times x^{-23} \times y^{-4}$$

$$= \frac{25}{126} \times \frac{1}{x^{23}} \times \frac{1}{y^4}$$

$$= \frac{25}{126x^{23}y^4}$$

Qn 5e).

$$\left(\frac{x^5 y^{-3}}{2xy^5}\right)^{-4} \div \frac{4x^6 y^{-10}}{(3x^{-2}y^2)^{-3}}$$

Indices $(a^m)^n = a^{mn}$

$$= \frac{x^{-20} y^{12}}{2^{-4} x^{-4} y^{-20}} \div \frac{4x^6 y^{-10}}{3^{-3} x^6 y^{-6}}$$

$\div \frac{a}{b} \Rightarrow \times \frac{b}{a}$

$$= \frac{x^{-20} y^{12}}{2^{-4} x^{-4} y^{-20}} \times \frac{3^{-3} x^6 y^{-6}}{4x^6 y^{-10}}$$

Collect like terms
Multiply $a^m \times a^n = a^{m+n}$

$$= \frac{1}{2^{-4}} \times \frac{3^{-3}}{4} \times \frac{x^{-20+6}}{x^{-4+6}} \times \frac{y^{12+(-6)}}{y^{-20+(-10)}}$$

Simplify powers.

$$= (2^{-4})^{-1} \times 3^{-3} \times \frac{1}{2^2} \times \frac{x^{-14}}{x^2} \times \frac{y^6}{y^{-30}}$$

Divide terms $\frac{a^m}{a^n} = a^{m-n}$

$$= 2^4 \times \frac{1}{3^3} \times \frac{1}{2^2} \times x^{-14-2} \times y^{6-(-30)}$$

Simplify powers.

$$= 2^{4-2} \times \frac{1}{3^3} \times x^{-16} \times y^{36}$$

Write with positive powers

$$= 2^2 \times \frac{1}{3^3} \times \frac{1}{x^{16}} \times y^{36}$$

$$= \frac{4y^{36}}{27x^{16}}$$

Qn 5 f). $\frac{3m^3 n^4}{2m^{-6} n^{-5}} \div \left(\frac{2m^4 n^6}{m^{-1} n} \right)^{-2}$

$$= \frac{3}{2} \times m^{3-(-6)} n^{4-(-5)} \div \left(2m^{4-(-1)} n^{6-1} \right)^{-2}$$

$$= \frac{3}{2} \times m^9 \times n^9 \div \frac{1}{(2m^5 n^5)^2}$$

$$= \frac{3}{2} \times m^9 \times n^9 \times \frac{(2m^5 n^5)^2}{1}$$

$$= \frac{3}{2} \times m^9 \times n^9 \times 2^2 m^{10} n^{10}$$

$$= \frac{3}{2} \times 4^2 \times m^{9+10} \times n^{9+10}$$

$$= 6 \times m^{19} \times n^{19}$$

$$= 6m^{19} n^{19}$$

Bracket needs simplifying.

$$a^{-2} = \frac{1}{a^2}$$

$$\div \frac{a}{b} \Rightarrow \left(\times \frac{b}{a} \right)$$

Indices: $(a^m)^n = a^{mn}$

Multiply $a^m \times a^n \times a^{mn}$

simplify fraction.

Qn 5g)

$$4m^{\frac{1}{2}}n^{\frac{3}{4}} \div \frac{6m^{\frac{1}{4}}n^{\frac{1}{4}}}{8m^{\frac{3}{4}}n^{\frac{1}{2}}}$$

$$\div \frac{a}{b} \Rightarrow \times \frac{b}{a}$$

$$= 4m^{\frac{1}{2}}n^{\frac{3}{4}} \times \frac{8m^{\frac{3}{4}}n^{\frac{1}{2}}}{6m^{\frac{1}{4}}n^{\frac{1}{4}}}$$

Divide $\frac{a^m}{a^n} = a^{m-n}$

$$= 4m^{\frac{1}{2}}n^{\frac{3}{4}} \times \frac{8}{6} \times m^{\frac{3}{4}-\frac{1}{4}} \times n^{\frac{1}{2}-\frac{1}{4}}$$

Multiply $a^m \times a^n = a^{m+n}$

$$= 4^2 \times \frac{8}{6^3} \times m^{\frac{1}{2}+(\frac{3}{4}-\frac{1}{4})} \times n^{\frac{3}{4}+(\frac{1}{2}-\frac{1}{4})}$$

Simplify powers by adding fractions

$$= \frac{16}{3} \times m^{\frac{6}{12}+\frac{9}{12}-\frac{4}{12}} \times n^{\frac{3}{4}+\frac{2}{4}-\frac{1}{4}}$$

$$= \frac{16}{3} \times m^{\frac{11}{12}} \times n^{\frac{4}{4}}$$

$$n^{\frac{4}{4}} = n$$

$$= \frac{16m^{\frac{11}{12}}n}{3}$$

Qn 5 h) $\left(\frac{4b^3c^{\frac{1}{3}}}{6c^{\frac{1}{5}}b}\right)^{\frac{1}{2}} \div (2b^3c^{-\frac{1}{5}})^{-\frac{3}{2}}$

Indices $(a^m)^n = a^{mn}$

$$a^{-m} = \frac{1}{a^m}$$

$$= \frac{4^{\frac{1}{2}} b^{\frac{3}{2}} c^{\frac{1}{3} \times \frac{1}{2}}}{6^{\frac{1}{2}} c^{\frac{1}{10}} b^{\frac{1}{2}}} \div \frac{1}{(2b^3c^{-\frac{1}{5}})^{\frac{3}{2}}}$$

$$\therefore \frac{1}{a} \rightarrow \frac{a}{1}$$

$$= \frac{4^{\frac{1}{2}}}{6^{\frac{1}{2}}} \times b^{\frac{3}{2} - \frac{1}{2}} \times c^{\frac{1}{6} - \frac{1}{10}} \times (2b^3c^{-\frac{1}{5}})^{\frac{3}{2}}$$

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

$$= \frac{(2^2)^{\frac{1}{2}}}{6^{\frac{1}{2}}} \times b^{\frac{2}{2}} \times c^{\frac{5}{30} - \frac{3}{30}} \times 2^{\frac{3}{2}} \times b^{3 \times \frac{3}{2}} \times c^{-\frac{1}{5} \times \frac{3}{2}}$$

Simplify powers.

$$= \frac{2}{6^{\frac{1}{2}}} \times b \times c^{\frac{2}{30}} \times 2^{\frac{3}{2}} \times b^{\frac{9}{2}} \times c^{-\frac{3}{10}}$$

Multiply $a^m \times a^n = a^{m+n}$

$$= \frac{1}{6^{\frac{1}{2}}} \times 2^{1 + \frac{3}{2}} \times b^{1 + \frac{9}{2}} \times c^{\frac{2}{30} + (-\frac{3}{10})}$$

$$= \frac{2^{\frac{5}{2}}}{6^{\frac{1}{2}}} \times b^{\frac{11}{2}} \times c^{\frac{2}{30} - \frac{9}{30}}$$

$$\left(\frac{2^5}{6}\right)^{\frac{1}{2}} = \frac{2^{\frac{5}{2}}}{6^{\frac{1}{2}}}$$

$$= \left(\frac{2^5}{6}\right)^{\frac{1}{2}} \times b^{\frac{11}{2}} \times c^{-\frac{7}{30}}$$

$$= \left(\frac{2^1 \times 2^4}{6 \cdot 3}\right)^{\frac{1}{2}} \times b^{\frac{11}{2}} \times \frac{1}{c^{\frac{7}{30}}}$$

$$= \frac{(2^4)^{\frac{1}{2}}}{3^{\frac{1}{2}}} \times b^{\frac{11}{2}} \times \frac{1}{c^{\frac{7}{30}}}$$

$$= \frac{2^2}{3^{\frac{1}{2}}} \times b^{\frac{11}{2}} \times \frac{1}{c^{\frac{7}{30}}}$$

$$= \frac{4 b^{\frac{11}{2}}}{3^{\frac{1}{2}} c^{\frac{7}{30}}}$$