

Qn 3a)

$$\frac{2a^2b \times 3a^3b^4}{4a^3b^5}$$

$$= \frac{2^1 \times 3 \times a^2 \times a^3 \times b \times b^4}{4^1 \times a^3 \times b^5}$$

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

$$= \frac{3}{2} \times a^2 \times b^0$$

$$= \frac{3}{2} \times a^2 \times 1$$

$$= \frac{3a^2}{2}$$

No Brackets  
No Indices

since it is all multiplied  
you can rearrange  
the order to  
"collect like terms".

Index laws to  
multiply and divide  
(can do these separately)

Simplify powers

$b^0 = 1$

b) 
$$\frac{4m^6n^3 \times 12mn^5}{6m^7n^6}$$

$$= \frac{4 \times 12^2 \times m^6 \times m \times n^3 \times n^5}{6 \times m^7 \times n^6}$$

$$= 8 \times m^{6+1-7} \times n^{3+5-6}$$

$$= 8 \times m^0 \times n^2$$

$m^0 = 1$

$$= 8n^2$$

collect terms.

Multiply and Divide  
using index laws

Qn 3 c)

$$\frac{10m^6n^5 \times 2m^2n^3}{12m^4n \times 5m^2n^3}$$

$$= \frac{10 \times 2 \times m^6 \times m^2 \times n^5 \times n^3}{6 \times 2 \times 5 \times m^4 \times m^2 \times n \times n^3}$$

$$= \frac{2}{6} \times \frac{m^{6+2}}{m^{4+2}} \times \frac{n^{5+3}}{n^{1+3}}$$

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

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

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

$$= \frac{m^2n^4}{3}$$

Collect like terms.

Multiply terms  $\left\{ \begin{array}{l} \text{in top} \\ \text{in bottom} \end{array} \right.$   
 $a^m \times a^n = a^{m+n}$

Simplify powers.

Divide terms

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

d)  $\frac{6x^3y^2 \times 4x^6y}{9xy^5 \times 2x^3y^6}$

$$= \frac{6 \times 4 \times x^3 \times x^6 \times y^2 \times y}{9 \times 2 \times x \times x^3 \times y^5 \times y^6}$$

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

$$= \frac{4}{3} \times \frac{x^9}{x^6} \times \frac{y^3}{y^8}$$

$$= \frac{4}{3} \times x^3 \times \frac{1}{y^5}$$

$$= \frac{4x^3}{3y^5}$$

Collect like terms

Multiply terms in numerator  
" " " denominator

Simplify

Divide terms.

Qn 3e)

$$\frac{(6x^3y^2)^4}{9x^5y^2 \times 4xy^7}$$

$$= \frac{6^4 x^{12} y^8}{9x^5y^2 \times 4xy^7}$$

$$= \frac{6^4 \times x^{12} \times y^8}{9 \times 4 \times x^5 \times x \times y^2 \times y^7}$$

$$= \frac{6^4}{36} \times \frac{x^{12}}{x^{5+1}} \times \frac{y^8}{y^{2+7}}$$

$$6^4 = (6^2)^2 = (36)^2$$

$$= \frac{(36)^2}{36} \times \frac{x^{12}}{x^6} \times \frac{y^8}{y^9}$$

$$= (36)^{2-1} \times x^{12-6} \times y^{8-9}$$

$$= (36)^1 \times x^6 \times y^{-1}$$

$$= 36 \times x^6 \times \frac{1}{y}$$

$$= \frac{36x^6}{y}$$

Brackets simplified

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

collect like terms

multiply terms (in numerator)

Simplify powers.

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

Simplify

Write with positive powers

$$f) \frac{5x^2y^3 \times 2xy^5}{10x^3y^4 \times x^4y^2} = \frac{10x^{2+1}y^{3+5}}{10x^{3+4}y^{4+2}} = \frac{10x^3y^8}{10x^7y^6}$$

$$= \frac{10}{10} \times x^{3-7} \times y^{8-6}$$

$$= 1 \times x^{-4} \times y^2$$

$$= \frac{1}{x^4} \times y^2$$

Qn 3 g)

$$\frac{a^3 b^2 \times 2(ab^5)^3}{6(a^2 b^3)^3 \times a^4 b}$$

Brackets simplified

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

$$= \frac{a^3 b^2 \times 2 \times a^3 b^{15}}{6 \times a^6 b^9 \times a^4 b}$$

Multiply terms in numerator  
" " " denominator

$$= \frac{2 \times a^{3+3} \times b^{2+15}}{6 \times a^{6+4} \times b^{9+1}}$$

$$= \frac{2 \times a^6 \times b^{17}}{36 \times a^{10} \times b^{10}}$$

Simplify

$$= \frac{1}{3} \times a^{6-10} \times b^{17-10}$$

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

$$= \frac{1}{3} \times a^{-4} \times b^7$$

Simplify

$$= \frac{1}{3} \times \frac{1}{a^4} \times b^7$$

Write with positive powers.

$$= \frac{b^7}{3a^4}$$

Qn 3h)

$$\frac{(p^6 q^2)^{-3} \times 3pq}{2p^{-4} q^{-2} \times (5pq^4)^{-2}}$$

$$= \frac{p^{-18} q^{-6} \times 3pq}{2p^{-4} q^{-2} \times 5^{-2} p^{-2} q^{-8}}$$

$$= \frac{3 \times p^{-18} \times p \times q^{-6} \times q}{2 \times 5^{-2} \times p^{-4} \times p^{-2} \times q^{-2} \times q^{-8}}$$

$$= \frac{3}{2} \times \frac{1}{5^2} \times \frac{p^{-18+1}}{p^{-4+(-2)}} \times \frac{q^{-6+1}}{q^{-2+(-8)}}$$

$$= \frac{3}{2} \times (5^2)^{-1} \times \frac{p^{-17}}{p^{-6}} \times \frac{q^{-5}}{q^{-10}}$$

$$= \frac{3}{2} \times 5^2 \times p^{-17-(-6)} \times q^{-5-(-10)}$$

$$= \frac{75}{2} \times p^{-11} \times q^5$$

$$= \frac{75}{2} \times \frac{1}{p^{11}} \times q^5$$

$$= \frac{75q^5}{p^{11}}$$

Brackets simplified

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

Collect like terms.

Multiply a numerator  
" " denominator

Simplify powers

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

Simplify

write with positive powers.

Qn 3i)

$$\frac{6x^{\frac{3}{2}}y^{\frac{1}{2}} \times x^{\frac{4}{5}}y^{\frac{3}{5}}}{2(x^{\frac{1}{2}}y)^{\frac{1}{5}} \times 3x^{\frac{1}{2}}y^{\frac{1}{5}}}$$

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

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

Collect like terms.

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

Multiply in numerator  
" " denominator  
 $[a^m \times a^n = a^{m+n}]$

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

$\frac{3}{2} + \frac{4}{5} = \frac{15}{10} + \frac{8}{10} = \frac{23}{10}$   
 $\frac{1}{2} + \frac{3}{5} = \frac{5}{10} + \frac{6}{10} = \frac{11}{10}$   
 $\frac{1}{5} + \frac{1}{2} = \frac{2}{10} + \frac{4}{10} = \frac{6}{10}$   
 $\frac{1}{5} + \frac{1}{5} = \frac{2}{10}$

Write fractions with same denominator

$$= \frac{x^{\frac{23}{10}} \times y^{\frac{11}{10}}}{x^{\frac{6}{10}} \times y^{\frac{2}{10}}}$$

Simplify power

$$= \frac{x^{\frac{23}{10}} \times y^{\frac{11}{10}}}{x^{\frac{6}{10}} \times y^{\frac{2}{10}}}$$

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

$$= x^{\frac{23}{10} - \frac{6}{10}} \times y^{\frac{11}{10} - \frac{2}{10}}$$

Write fractions with same denominator

$$= x^{\frac{17}{10}} \times y^{\frac{9}{10}}$$

Simplify power

$$= x^{\frac{17}{10}} \times y^{\frac{9}{10}}$$

$$= x^{\frac{17}{10}} y^{\frac{9}{10}}$$