Exercise 2B

Q1. Express the result in power notation

a. $\left(\frac{4}{5}\right)^5 \times \left(\frac{4}{5}\right)^4 = \left(\frac{4}{5}\right)^{5+4} = \left(\frac{4}{5}\right)^9$

b. $\left(\frac{3}{4}\right)^{-6} \times \left(\frac{3}{4}\right)^{-4} = \left(\frac{3}{4}\right)^{-6-4} = \left(\frac{3}{4}\right)^{-10}$

c. $\left(\frac{-2}{3}\right)^7 \times \left(\frac{-2}{3}\right)^{-4} = \left(\frac{-2}{3}\right)^{7+(-4)} = \left(\frac{-2}{3}\right)^{7-4} = \left(\frac{-2}{3}\right)^3$

d. $\left(\frac{7}{8}\right)^{-3} \times \left(\frac{7}{8}\right)^{-4} = \left(\frac{7}{8}\right)^{-3-4} = \left(\frac{7}{8}\right)^{-7}$

e. $\left(\frac{3}{7}\right)^6 \div \left(\frac{3}{7}\right)^5 = \left(\frac{3}{7}\right)^{6-5} = \left(\frac{3}{7}\right)^1$

f. $\left(\frac{-3}{4}\right)^{-3} \div \left(\frac{-3}{4}\right)^{-3} = \left(\frac{-3}{4}\right)^{-3-(-3)} = \left(\frac{-3}{4}\right)^{-3+3} = \left(\frac{-3}{4}\right)^0 = 1$

g. $\left(\frac{-7}{10}\right)^9 \div \left(\frac{-7}{10}\right)^7 = \left(\frac{-7}{10}\right)^{9-7} = \left(\frac{-7}{10}\right)^2$

h. $\left(\frac{8}{9}\right)^6 \div \left(\frac{8}{9}\right)^{-3} = \left(\frac{8}{9}\right)^{6-(-3)} = \left(\frac{8}{9}\right)^{6+3} = \left(\frac{8}{9}\right)^9$

i. $\left[\left(\frac{3}{2}\right)^2\right]^7 = \left(\frac{3}{2}\right)^{14}$

j. $\left[\left(\frac{5}{6}\right)^3\right]^{-2} = \left(\frac{5}{6}\right)^{-6}$

k. $\left[\left(\frac{7}{10}\right)^{-2}\right]^3 = \left(\frac{7}{10}\right)^{-6}$

l. $\left[\left(\frac{4}{5}\right)^{-3}\right]^{-3} = \left(\frac{4}{5}\right)^{-9}$

Q2. Simplify

a. $\left(\frac{3}{8}\right)^3 \times \left(\frac{4}{9}\right)^3 = \left(\frac{\overset{1}{\cancel{3}}}{\underset{2}{\cancel{8}}} \times \frac{\overset{1}{\cancel{4}}}{\underset{3}{\cancel{9}}}\right)^3 = \left(\frac{1}{6}\right)^3 = \frac{1}{216}$

b. $\left(\frac{20}{27}\right)^4 \times \left(\frac{9}{10}\right)^4 \times \left(\frac{2}{3}\right)^4 = \left(\frac{\overset{2}{\cancel{20}}}{\underset{3}{\cancel{27}}} \times \frac{\overset{1}{\cancel{9}}}{\underset{1}{\cancel{10}}} \times \frac{2}{3}\right)^4 = \left(\frac{4}{9}\right)^4 = \frac{256}{6561}$

c. $\left(\dfrac{-4}{3}\right)^3 \div \left(\dfrac{8}{9}\right)^3 = \left(\dfrac{-\overset{1}{\cancel{4}}}{\cancel{3}} \times \dfrac{\overset{3}{\cancel{9}}}{\cancel{8}_2}\right)^3 = \left(\dfrac{-3}{2}\right)^3 = \dfrac{-27}{8}$

d. $\left(\dfrac{6}{25}\right)^3 \times \left(\dfrac{5}{3}\right)^3 \div \left(\dfrac{2}{5}\right)^3 = \left(\dfrac{6}{25} \times \dfrac{5}{3} \div \dfrac{2}{5}\right)^3 = \left(\dfrac{6}{25} \times \dfrac{5}{3} \times \dfrac{5}{2}\right)^3$

$$= \left(\dfrac{\cancel{6}}{\cancel{25}} \times \dfrac{\cancel{25}}{\cancel{6}}\right)^3 = 1$$

e. $\left(\dfrac{2}{5}\right)^3 \times \left(\dfrac{2}{5}\right)^5 \div \left(\dfrac{2}{5}\right)^7 = \left(\dfrac{2}{5}\right)^3 \times \left(\dfrac{2}{5}\right)^{5-7} = \left(\dfrac{2}{5}\right)^3 \times \left(\dfrac{2}{5}\right)^{-3}$

$$= \left(\dfrac{2}{5}\right)^{3-3} = \left(\dfrac{2}{5}\right)^0 = 1$$

f. $\left(\dfrac{1}{3}\right)^5 \div \left(\dfrac{1}{3}\right) \times \left(\dfrac{1}{3}\right)^{-4} = \left(\dfrac{1}{3}\right)^{5-1} \times \left(\dfrac{1}{3}\right)^{-4} = \left(\dfrac{1}{3}\right)^4 \times \left(\dfrac{1}{3}\right)^{-4} =$

$$= \left(\dfrac{1}{3}\right)^{4-4} = \left(\dfrac{1}{3}\right)^0 = 1$$

g. $\left[\left(\dfrac{-3}{4}\right)^4 \times \left(\dfrac{-3}{4}\right)^2\right] \div \left[\left(\dfrac{-3}{4}\right)^2\right]^3$

$\left(\dfrac{-3}{4}\right)^{4+2} \div \left(\dfrac{-3}{4}\right)^6 = \left(\dfrac{-3}{4}\right)^6 \div \left(\dfrac{-3}{4}\right)^6 = \left(\dfrac{-3}{4}\right)^{6-6} = \left(\dfrac{-3}{4}\right)^0 = 1$

Q3. Fill in the blanks

a. $\left(2^{-1} \times 3^{-1}\right)^2 \times \left(\dfrac{-3}{8}\right)^{-1}$

$\left(\dfrac{1}{2} \times \dfrac{1}{3}\right)^2 \times \left(\dfrac{-8}{3}\right)$

$\left(\dfrac{1}{6}\right)^2 \times \dfrac{-8}{3} = \dfrac{1}{\cancel{36}_{9}} \times \dfrac{\overset{2}{\cancel{-8}}}{3} = \dfrac{-2}{27}$

b. $\left(4^{-1} \times 3^{-1}\right) \div 12^{-1}$

$\dfrac{1}{4} \times \dfrac{1}{3} \div \dfrac{1}{12} = \dfrac{1}{12} \times \dfrac{12}{1} = 1$

c. $(2^5 \div 2^8) \div 2^{-7} = 2^{5-8} \div 2^{-7}$

$$= 2^{-3} \div 2^{-7}$$

$$= 2^{-3-(-7)} = 2^{-3+7} = 2^4 = 16$$

Q4. Find value of n

a. $(\frac{4}{5})^3 \times (\frac{4}{5})^{-6} = (\frac{4}{5})^{2n-1}$

$(\frac{4}{5})^{3-6} = (\frac{4}{5})^{2n-1}$

$(\frac{4}{5})^{-3} = (\frac{4}{5})^{2n-1}$

Taking powers:

$2n - 1 = -3$

$2n = -3 + 1$

$2n = -2$

$n = \frac{-2}{2}$, $n = -1$

b. $n(3^{-5}) = 3$

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

$n = 3 \times 3^5$

$= 3 \times 3 \times 3 \times 3 \times 3 \times 3 = 729$

c. $n(-5)^4 \div n^2 = 5$

$n \times (-5)^4 \times \dfrac{1}{n \times n} = 5$

$\dfrac{(-5) \times (-5) \times (-5) \times (-5)}{n} = 5$ (by cross multiply)

$$n = \frac{(-5) \text{ x } (-5) \text{x } (-5) \text{ x}(-5)}{5}$$

n = 125

Q5 Find The Reciprocal

a. $\left(\frac{4}{5}\right)^{2n-1}$ $= \left(\frac{5}{4}\right)^{2n-1}$

b. $\left(\frac{2}{5}\right)^{-3}$ x $\left(\frac{5}{4}\right)^{-2}$

$\left(\frac{2}{5}\right)^{3}$ x $\left(\frac{5}{4}\right)^{2}$

$\frac{2}{5}$ x $\frac{2}{5}$ x $\frac{2}{5}$ x$\frac{5}{4}$ x$\frac{5}{4}$ $= \frac{1}{10}$

$\quad\quad\quad\quad\quad 2 \quad\quad 2 \atop 1$

Q6. Express the following in negative exponents

a. $\left(\frac{2}{3}\right)^{2}$ $= \left(\frac{3}{2}\right)^{-2}$

b. $(2^{-3})^{2}$ $= (2)^{-6}$

c. 5^{2} x 5^{3} $= 5^{2+3} = 5^{5}$ $= \left(\frac{1}{5}\right)^{-5}$

d. $\left[\left(-\frac{2}{5}\right)^{-1}\right]^{-2}$ $= \left(-\frac{2}{5}\right)^{2}$ $= \left(-\frac{5}{2}\right)^{-2}$

Q7. Find the value of n

a. $5^{10} \div 5^{8} = \left(\frac{1}{5}\right)^{n}$

$5^{10-8} = \left(\frac{1}{5}\right)^{n}$

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

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

n = - 2

b. $(\frac{-2}{3})^4 \div (\frac{-2}{3})^3 = (\frac{-3}{2})^n$

$(\frac{-2}{3})^{4-3} = (\frac{-3}{2})^n$

$(\frac{-2}{3})^1 = (\frac{-3}{2})^n$

$(\frac{-3}{2})^{-1} = (\frac{-3}{2})^n$

n = -1

c. $(-5)^4 \div (-5)^2 = 5^n$

$(-5)^{4-2} = 5^n$

$5^2 = 5^n$

n= 2

Q8. Simplify

a. $(a^8 \times a^{-5})^0$

$(a^{8-5})^0 = (a^3)^0 = $ 1

b. $(b^2)^4 \times b^0$

$b^8 \times 1 = $ b^8

(c)

$$- \frac{a^{-3} b^{10} c^8 \times b\, c^8}{(b^{-10} \times c^6)^4}$$

$$- \left[\frac{a^{-3} b^{10} c^8 \times b\, c^8}{b^{-40} \times c^{24}} \right]$$

$$- \left[\frac{b^{10} \times b^{40} \times c^8 \times b \times c^8}{a^3 \times c^{24}} \right]$$

$$- \left[\frac{b^{51} \times c^{16}}{a^3 \times c^{24}} \right]$$

$$- \left[\frac{b^{51} \times c^{16-24}}{a^3} \right] \quad = \quad - \frac{b^{51} \times c^{-8}}{a^3}$$

$$= \quad - \frac{b^{51}}{a^3 c^8}.$$

(d)

$$\left[\frac{- a^{-5}}{- a^{10} b^{-9} c^{-7} \times (a^{-15} \times c^0)} \right]^2$$

$$\frac{- a^{-10}}{- a^{20} b^{-18} c^{-14} \times a^{-30} \times 1}$$

$$\frac{a^{-10}}{a^{20} b^{-18} c^{-14} \times a^{-30}}$$

$$\frac{a^{-10}}{a^{20-30} b^{-18} c^{-14}}$$

$$\frac{a^{-10}}{a^{-10} b^{-18} c^{-14}} \quad = \quad \boxed{b^{18} c^{14}.}$$