

INDEX NOTATION

Q1 a) Evaluate $\left(\frac{5}{3}\right)^{-2}$

b) simplify $\left(\frac{9}{t^6}\right)^{\frac{1}{2}}$

c) simplify $\frac{2x^3y}{6xy^2}$

solution

a) $\left(\frac{5}{3}\right)^{-2} = \left(\frac{3}{5}\right)^2 = \frac{9}{25}$

b) $\left(\frac{9}{t^6}\right)^{\frac{1}{2}} = \left[\frac{(3)^2}{(t^3)^2}\right]^{\frac{1}{2}} = \left[\left(\frac{3}{t^3}\right)^2\right]^{\frac{1}{2}} = \frac{3}{t^3}$

c) $\frac{2x^3y}{6xy^2} = \frac{2x^{3-1}}{3y^{2-1}} = \frac{x^2}{3y}$

Q2 a) Evaluate 4^{-2}

b) Simplify $\left[\frac{9xy^6}{x^3y^2}\right]^{\frac{1}{2}}$

solution

a) $4^{-2} = \frac{1}{4^2} = \frac{1}{16}$

b) $\left[\frac{9xy^6}{x^3y^2}\right]^{\frac{1}{2}} = \left[\frac{9y^4}{x^2}\right]^{\frac{1}{2}} = \left[\left(\frac{3y^2}{x}\right)^2\right]^{\frac{1}{2}} = \frac{3y^2}{x}$

Q3 Work out the value of

a) 3^0

b) 5^{-1}

c) 6^{-2}

d) $\left(\frac{2}{5}\right)^{-2}$

solutions

a) $3^0 = 1$

b) $5^{-1} = \frac{1}{5}$

c) $6^{-2} = \frac{1}{6^2} = \frac{1}{36}$

d) $\left(\frac{2}{5}\right)^{-2} = \left(\frac{5}{2}\right)^2 = \frac{25}{4}$

Q4 a) Evaluate $5^0 - 5^{-1}$

b) Simplify $(5x^3)^2$

c) Simplify $\left[\frac{16}{n^{16}}\right]^{\frac{1}{2}}$

Solution

a) $5^0 - 5^{-1} = 1 - \frac{1}{5} = \frac{4}{5}$

b) $(5x^3)^2 = 25x^6$

c) $\left[\frac{16}{n^{16}}\right]^{\frac{1}{2}} = \left(\frac{4}{n^8}\right)^2 \frac{1}{2} = \frac{4}{n^8}$

Q5a) The population of a country is 3.2×10^6 . There are 8×10^5 children. What fraction of the whole population are children? Give your answer in its simplest form

b) Simplify $25x^2 \div 5x^{-4}$

solution

a) $\frac{8 \times 10^5}{3.2 \times 10^6} = \frac{8 \times 10^5}{32 \times 10^5} = \frac{8}{32} = \frac{1}{4}$

b) $25x^2 \div 5x^{-4} = 5x^{2-(-4)} = 5x^6$

Q6 Evaluate

a) 17^0

b) $4^{\frac{5}{2}}$

c) $(0.2)^{-2}$

solution

a) $17^0 = 1$

b) $4^{\frac{5}{2}} = (2^2)^{\frac{5}{2}} = (2)^5 = 32$

c) $(0.2)^{-2} = \left(\frac{2}{10}\right)^{-2} = \left(\frac{10}{2}\right)^2 = (5)^2 = 25$

Q7 a) Evaluate $\left(\frac{1}{4}\right)^{-2}$

b) Simplify $64^{\frac{2}{3}}$

c) Simplify $\left[\frac{4x^2y^9}{x^4y}\right]^{\frac{1}{2}}$

solution

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

b) $64^{\frac{2}{3}} = (4^3)^{\frac{2}{3}} = 4^2 = 16$

c) $\left[\frac{4x^2y^9}{x^4y}\right]^{\frac{1}{2}} = \left[\frac{4y^8}{x^2}\right]^{\frac{1}{2}} = \frac{4^{\frac{1}{2}}y^{8 \times \frac{1}{2}}}{x^{2 \times \frac{1}{2}}} = \frac{2y^4}{x}$

Q8 a) simplify $p^2(p^3 - 3p^{-2})$

b) simplify $(27x^6)^{\frac{1}{3}}$

solution

a) $p^2(p^3 - 3p^{-2}) = p^{2+3} - 3p^{-2+2} = p^5 - 3$

b) $(27x^6)^{\frac{1}{3}} = [3^3(x^2)^3]^{\frac{1}{3}} = [(3x^2)^3]^{\frac{1}{3}} = 3x^2$

Q9 a) Find the value of a when $3^a \div 3^4 = 3^2$

b) Find the value of b when $8^b = 2$

solution

$$3^a \div 3^4 = 3^2$$

$$3^a = 3^4 \times 3^2$$

$$\therefore a = 2 + 4 = 6$$

b) $8^b = 2$

$$(2)^{3b} = (2)^1 \therefore 3b = 1 \quad b = \frac{1}{3}$$

Q10

Calculate, leaving your answers as fractions:

(a) 3^{-2}

(b) $2^{-1} - 4^{-1}$

(c) 5^{-3}

Solution

$$\begin{aligned} \text{(a)} \quad 3^{-2} &= \frac{1}{3^2} \\ &= \frac{1}{9} \end{aligned}$$

$$\begin{aligned} \text{(b)} \quad 2^{-1} - 4^{-1} &= \frac{1}{2} - \frac{1}{4} \\ &= \frac{1}{4} \end{aligned}$$

$$\begin{aligned} \text{(c)} \quad 5^{-3} &= \frac{1}{5^3} \\ &= \frac{1}{125} \end{aligned}$$

Q 11

Simplify each of the following expressions so that it is in the form a^n , where n is a number:

(a) $a^6 \times a^7$

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

(c) $(a^4)^3$

Solution

$$\begin{aligned} \text{(a)} \quad a^6 \times a^7 &= a^{6+7} \\ &= a^{13} \end{aligned}$$

$$\begin{aligned} \text{(b)} \quad \frac{a^4 \times a^2}{a^3} &= \frac{a^{4+2}}{a^3} \\ &= \frac{a^6}{a^3} \\ &= a^{6-3} \\ &= a^3 \end{aligned}$$

$$\begin{aligned} \text{(c)} \quad (a^4)^3 &= a^{4 \times 3} \\ &= a^{12} \end{aligned}$$

PRACTICE QUESTIONS:

(1) EVALUATE $4^2 + 4^1 + 4^0$.

(2) **(a)** Find the value of $2^n - n^2$.

(i) when $n = 0$,

(ii) when $n = 3$.

(b) Find the value of $\left(\frac{1}{3}\right)^{-2}$

(3) Find a , b and c when

(a) $3^a \div 3^5 = 27$,

(b) $125^b = 5$,

(c) $10^c = 0.001$.

ANSWERS:

(1) 21

(2) (a) (i) 1 (ii) -1
 (b) 9

(3) (a) 8

 (b) $\frac{1}{3}$

 (c) -3

Type equation here.