VIII Test-14 Exponents and Powers

Note: Write the laws of exponents used

1) Find the multiplicative inverse of (i) 3^{-3} (ii) 10^{10}

2) Find the value of x for which $2^x \div 2^{-4} = 4^5$

3) Express 0.00000000837 in Standard form.

4) Write 3.61492×10^6 in usual form.

5) Calculate the missing value of x in the following expression: $\left(\frac{11}{9}\right)^3 \times \left(\frac{9}{11}\right)^6 = \left(\frac{11}{9}\right)^{2x-1}$

6) Simplify and write in exponential form:

(i) $(-5)^2 \times (-5)^{-3}$ (ii) $\left(\frac{1}{2}\right)^{-3} \times \left(\frac{1}{2}\right)^{-2}$

7) Simplify the following and write in exponential form:

(i) $2^3 \times 3^3$ (ii) $\left(\frac{4}{5}\right)^5 \times \left(\frac{5}{6}\right)^5$

8) Express 8^{-4} as a power with the base 2.

9) Simplify the following and write in exponential form:

(i) $\left(3^6 \div 3^8\right)^4 \times 3^{-4}$ (ii) $\frac{1}{27} \times 3^{-3}$

10) Find the value of k if $(-2)^{k+1} \times (-2)^3 = (-2)^7$

11) Simplify (i) $\left[\left(\frac{1}{4}\right)^{-3} - \left(\frac{1}{3}\right)^{-3}\right] \div \left(\frac{1}{4}\right)^{-2}$

(ii) $\left(\frac{2}{3}\right)^{-6} \times \left(\frac{3}{2}\right)^{-4}$

12) Find the value of $\left[\left(-\frac{3}{4}\right)^{-2}\right]^2$

13) Solve for x: $(81)^{-4} \div (729)^{2-x} = 9^{4x}$

VIII **Test-14** (Answers)

1) (i) 3^3
(ii) 10^{-10}

2) $2^x \div \frac{1}{2^4} = 4^5$

$\Rightarrow 2^x \times 2^4 = (2^2)^5$

$\Rightarrow 2^{x+4} = 2^{10}$ $[a^m \times a^n = a^{m+n}]$

$\therefore x+4 = 10$

$x = 10-4 = 6$

3) $0.00000000837 = 8.37 \times 10^{-9}$

4) $3.61492 \times 10^6 = 3614920$

5) $\left(\frac{11}{9}\right)^3 \times \left(\frac{11}{9}\right)^{-6} = \left(\frac{11}{9}\right)^{2x-1}$

$\Rightarrow \left(\frac{11}{9}\right)^{3-6} = \left(\frac{11}{9}\right)^{2x-1}$ $[a^m \times a^n = a^{m+n}]$

$\Rightarrow \left(\frac{11}{9}\right)^{-3} = \left(\frac{11}{9}\right)^{2x-1}$

$\therefore 2x-1 = -3$

$2x = -3+1 = -2$

$x = -1$

6) (i) $(-5)^2 \times (-5)^{-3} = (-5)^{2-3} = (-5)^{-1} = \left(-\frac{1}{5}\right)^1$

(ii) $\left(\frac{1}{2}\right)^{-3} \times \left(\frac{1}{2}\right)^{-2} = \left(\frac{1}{2}\right)^{-3-2} = \left(\frac{1}{2}\right)^{-5} = 2^5$

$[a^m \times a^n = a^{m+n}]$

7) (i) $2^3 \times 3^3 = (2\times3)^3 = 6^3$ $[\because a^m \times b^m = (a\times b)^m$

(ii) $\left(\frac{4}{5}\right)^5 \times \left(\frac{5}{6}\right)^5 = \left(\frac{\cancel{4}^{2}}{\cancel{5}} \times \frac{\cancel{5}}{\cancel{6}_{3}}\right)^5 = \left(\frac{2}{3}\right)^5$

8) $8^{-4} = (2^3)^{-4} = 2^{-12}$ $[(a^m)^n = a^{mn}]$

9) (i) $(3^6 \div 3^8)^4 \times 3^{-4} = (3^{6-8})^4 \times 3^{-4} = (3^{-2})^4 \times 3^{-4}$

$= 3^{-8} \times 3^{-4} = 3^{-8-4} = 3^{-12}$

(ii) $\frac{1}{27} \times 3^{-3} = \frac{1}{3^3} \times 3^{-3} = 3^{-3} \times 3^{-3} = 3^{-3-3} = 3^{-6}$ $[a^m \times a^n = a^{m+n}]$

10) $(-2)^{k+1} \times (-2)^3 = (-2)^7$

$\Rightarrow (-2)^{k+1+3} = (-2)^7$ $[\because a^m \times a^n = a^{m+n}]$

$\Rightarrow (-2)^{k+4} = (-2)^7$

$\therefore k+4 = 7$

$k = 7-4 = 3$ //

11) (i) $\left[\left(\frac{1}{4}\right)^{-3} - \left(\frac{1}{3}\right)^{-3}\right] \div \left(\frac{1}{4}\right)^{-2}$

$= (4^3 - 3^3) \div 4^2 = \frac{64-27}{16} = \underline{\underline{\frac{37}{16}}}$

(ii) $\left(\frac{2}{3}\right)^{-6} \times \left(\frac{3}{2}\right)^{-4}$

$= \left(\frac{3}{2}\right)^6 \times \left(\frac{3}{2}\right)^{-4} = \left(\frac{3}{2}\right)^{6-4} = \left(\frac{3}{2}\right)^2 = \underline{\underline{\frac{9}{4}}}$ $[a^m \times a^n = a^{m+n}]$

12) $\left[\left(-\frac{3}{4}\right)^{-2}\right]^2 = \left(-\frac{3}{4}\right)^{-4} = \left(\frac{4}{3}\right)^4 = \underline{\underline{\frac{256}{81}}}$ $[\because (a^m)^n = a^{mn}]$

13) $(81)^{-4} \div (729)^{2-x} = 9^{4x}$

$\Rightarrow (9^2)^{-4} \div (9^3)^{2-x} = 9^{4x}$

$\Rightarrow 9^{-8} \div 9^{6-3x} = 9^{4x}$

$\therefore -8-6+3x = 4x$

$-14+3x = 4x$

$4x = -14+3x$

$4x-3x = -14$

$x = -14$ //