

VIII Exponents and Powers (Revision)

- 1) Express 4^{-3} as power with base 2
2) Simplify and write the answer in the exponential form:

(i) $(2^5 \div 2^8)^5 \times 2^{-5}$ (ii) $(-4)^{-3} \times (5)^{-3} \times (-5)^{-3}$

(iii) $\frac{1}{8} \times (3)^{-3}$ (iv) $(-3)^4 \times \left(\frac{5}{3}\right)^4$

- 3) Find the value of:

(i) $(3^0 + 4^{-1}) \times 2^2$ (ii) $(2^{-1} \times 4^{-1}) \div 2^{-2}$

(iii) $\left(\frac{1}{3}\right)^{-2} + \left(\frac{1}{4}\right)^{-2} + \left(\frac{1}{5}\right)^{-2}$ (iv) $(3^{-1} + 4^{-1} + 5^{-1})^0$

(v) $\left(\left(-\frac{2}{3}\right)^{-2}\right)^3$ (vi) $\left[\left(\left(-\frac{1}{5}\right)^{-2}\right)^2\right]^{-1}$

- 4) Find the value of m for which

$$(-3)^{m+1} \times (-3)^5 = (-3)^7$$

- 5) Evaluate: (i) $\left[\left(\frac{1}{3}\right)^{-1} - \left(\frac{1}{4}\right)^{-1}\right]^{-1}$

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

- 6) Evaluate: $\frac{9^{-1} \times 5^3}{3^{-3}}$

- 7) Simplify:

(i) $\left(\frac{2}{3}\right)^{-2}$ (ii) $\left(\frac{5}{8}\right)^{-7} \times \left(\frac{8}{5}\right)^{-5}$

(iii) $(5^{-1} \times 2^{-1}) \div 6^{-1}$ (iv) $\frac{3^{-5} \times 10^{-5} \times 125}{5^{-7} \times 6^{-5}}$

VIII

EXPONENTS AND POWERS

(Answers)

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

$$[(a^m)^n = a^{mn}; a^{-1} = \frac{1}{a}]$$

$$2) (i) (2^{5-8})^5 \times 2^{-5}$$

$$= (2^{-3})^5 \times 2^{-5} = 2^{-15} \times 2^{-5} = 2^{-15-5} = 2^{-20} = \frac{1}{2^{20}}$$

$$[(a^m)^n = a^{mn}; a^m \times a^n = a^{m+n}]$$

$$(ii) (-4 \times 5 \times -5)^{-3}$$

$$= (100)^{-3} = \frac{1}{100^3} = \frac{1}{(10^2)^3} = \frac{1}{10^6}$$

$$[a^m \times b^m = (ab)^m]$$

$$(iii) \frac{1}{8} \times 3^{-3} = \frac{1}{2^3} \times 3^{-3} = 2^{-3} \times 3^{-3} = (2 \times 3)^{-3}$$

$$= 6^{-3} = \frac{1}{6^3} \quad [a^m \times b^m = (ab)^m]$$

$$(iv) (-3)^4 \times \frac{5^4}{3^4} = \frac{3^4 \times 5^4}{3^4} = 5^4$$

$$3) (i) (3^0 + 4^{-1}) \times 2^2 = (1 + \frac{1}{4}) \times 4 = \frac{5}{4} \times 4 = 5 //$$

$$(ii) (2^{-1} \times 4^{-1}) \div 2^{-2} = (\frac{1}{2} \times \frac{1}{4}) \times 2^2 = \frac{1}{8} \times 4 = \frac{1}{2} //$$

$$(iii) (\frac{1}{3})^{-2} + (\frac{1}{4})^{-2} + (\frac{1}{5})^{-2} = 3^2 + 4^2 + 5^2 = 9 + 16 + 25 = 50 //$$

$$(iv) (3^{-1} + 4^{-1} + 5^{-1})^0 = (\frac{1 \times 20}{3 \times 20} + \frac{1 \times 15}{4 \times 15} + \frac{1 \times 12}{5 \times 12})^0 = (\frac{20+15+12}{60})^0 = (\frac{47}{60})^0 = 1$$

$$(v) [(-\frac{2}{3})^{-2}]^3 = (-\frac{2}{3})^{-6} = (\frac{2}{3})^{-6} = (\frac{3}{2})^6 = \frac{3^6}{2^6} = \frac{729}{64}$$

$$(vi) [((-\frac{1}{5})^{-2})^2]^{-1} = (-\frac{1}{5})^{-2 \times 2 \times -1} = (-\frac{1}{5})^4 = \frac{1}{5^4} = \frac{1}{625}$$

$$4) (-3)^{m+1+5} = (-3)^7$$

$$\therefore m+6 = 7$$

$$m = 7-6 = \underline{1}$$

$$5) (i) \left[\left(\frac{1}{3} \right)^{-1} - \left(\frac{1}{4} \right)^{-1} \right]^{-1}$$

$$= (3-4)^{-1} = (-1)^{-1} = \underline{-1}$$

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

$$= (3^2 - 2^3) \times \left(\frac{1}{4} \right)^2$$

$$= (9-8) \times \frac{1}{16} = \underline{\underline{\frac{1}{16}}}$$

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

$$= 3^{-2+3} \times 5^3 = 3 \times 125$$

$$= \underline{\underline{375}}$$

$$7) (i) \left(\frac{2}{8} \right)^{-2} = \left(\frac{3}{2} \right)^2 = \frac{9}{4}$$

$$(ii) \left(\frac{5}{8} \right)^{-7} \times \left(\frac{8}{5} \right)^{-5} = \left(\frac{5}{8} \right)^{-7} \times \left(\frac{5}{8} \right)^5$$
$$= \left(\frac{5}{8} \right)^{-7+5} = \left(\frac{5}{8} \right)^{-2}$$
$$= \left(\frac{8}{5} \right)^2 = \underline{\underline{\frac{64}{25}}}$$

$$(iii) \left(\frac{1}{5} \times \frac{1}{2} \right) \times 6 = \frac{1}{10} \times 6 = \underline{\underline{\frac{3}{5}}}$$

$$(iv) \frac{3^{-5} \times (2 \times 5)^{-5} \times 5^3}{5^{-7} \times (2 \times 3)^{-5}}$$

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