

ANSWERS

In an indices test, a student has made an error in each question. You need to explain the error and then solve the question correctly in the space next to each problem

<p>Simplify $\frac{3^6 2^7}{3^4 2^3} = \frac{6^{13}}{6^7} = 6^6$</p> <p>Error was: CANNOT multiply the bases!!</p>	<p>$\frac{3^6 2^7}{3^4 2^3} = 3^{6-4} \times 2^{7-3}$ $= 3^2 \times 2^4$ $= 9 \times 16$ $= 144$</p>
<p>Simplify: $2^n \times (2^{-n})^3 \times 2^{2n}$</p> <p>$= 2^n \times 2^{3-n} \times 2^{2n}$ $= 2^{n+3-n+2n}$ $= 2^{2n+3}$</p> <p>Error was: Power of a power \rightarrow multiply indices</p>	<p>$2^n \times (2^{-n})^3 \times 2^{2n}$ $= 2^n \times 2^{-3n} \times 2^{2n}$ $= 2^{n-3n+2n}$ $= 2^0$ $= 1$</p>
<p>Simplify: $(4ab^2c)^3 = 4a^3b^6c^3$</p> <p>Forgot to cube 4</p>	<p>$(4^1 a^1 b^2 c^1)^3 = 4^3 a^3 b^6 c^3$ $= 64 a^3 b^6 c^3$</p>
<p>Simplify: $3^m \times 27^m \times 9^{-m}$</p> <p>$= (3 \times 27 \times 9)^{m+m-m}$ $= 729^m$</p> <p>Error was: CANNOT multiply bases</p>	<p>$3^m \times 27^m \times 9^{-m}$ $= 3^m \times (3^3)^m \times (3^2)^{-m}$ $= 3^m \times 3^{3m} \times 3^{-2m}$ $= 3^{m+3m-2m}$ $= 3^{2m}$</p>

Question: Solve for w without using your calculator:

$$5^{w+3} = \frac{1}{(25)^{3w}}$$

$$5^{w+3} = \frac{1}{(5^2)^{3w}} \quad \left. \begin{array}{l} \rightarrow w+3 = -6w \\ \therefore 3 = -7w \\ w = -\frac{3}{7} \end{array} \right\}$$

$$5^{w+3} = \frac{1}{5^{6w}}$$

$$5^{w+3} = 5^{-6w}$$

<p>Simplify: $\frac{7^2(5^2)^{-2}}{5^{-3}}$</p> $\frac{7^2 \times 5^{2-2}}{5^{-3}}$ $= \frac{7^2 \times 5^0}{5^{-3}}$ $= \frac{7^2 \times 1}{5^{-3}} = 7^2 \times 5^3$ <p>Error was: Power of power \rightarrow multiply bases</p>	$\frac{7^2 \times (5^2)^{-2}}{5^{-3}}$ $= \frac{7^2 \times 5^{-4}}{5^{-3}}$ $= 7^2 \times 5^{-4-(-3)}$ $= 7^2 \times 5^{-1} = \frac{49}{5}$
<p>Simplify: $\frac{a^2b}{(2ab^2)^3} \div \frac{ab}{16a^0}$</p> $= \frac{(2ab^2)^3}{a^2b} \times \frac{ab}{16a^0}$ $= \frac{8a^3b^6}{a^2b} \times \frac{ab}{16}$ $= \frac{8a^1b^7}{16a^2b} = \frac{a^2b^6}{2}$ <p>Error was: Must lip the <u>second</u> fraction!!</p>	$= \frac{a^2b}{(2ab^2)^3} \times \frac{16a^0}{ab}$ $= \frac{a^2b}{8a^3b^6} \times \frac{16}{ab}$ $= \frac{16a^2b}{8a^4b^7}$ $= \frac{2a^{2-4}b^{1-7}}{1} = \frac{2}{a^2b^6}$

Question 1

Simplify each of the following.

(a) $\frac{(m^x)^y \times (n^x)^{\frac{1}{y}}}{m^3 \times n^{-2}}$

$$\frac{m^{xy} n^{\frac{x}{y}}}{m^3 n^{-2}} = m^{xy-3} n^{\frac{x}{y}-(-2)}$$

$$= m^{xy-3} n^{\frac{x}{y}+2}$$

(b) $\frac{((m^y n^x)^0 + nm^0)}{(m^y n^x)^{-2}}$

$$(1 + n \times 1) \times \frac{1}{m^{-2y} n^{-2x}}$$

$$= \frac{1+n}{m^{-2y} n^{-2x}} = (1+n) m^{2y} n^{2x}$$

Question 2

Simplify: $\frac{7^m \times 8^{2p} \times 56^{-p}}{7^{2p-m}}$

$$\frac{7^m \times 8^{2p} \times (7 \times 8)^{-p}}{7^{2p-m}} = \frac{7^m \times 8^{2p} \times 7^{-p} \times 8^{-p}}{7^{2p-m}}$$

$$= \frac{7^{m-p} \times 8^{2p-p}}{7^{2p-m}}$$

$$= 7^{m-p-2p+m} \times 8^p = 7^{2m-3p} \times 8^p$$

Question 3

$$\begin{aligned} \text{Simplify: } \frac{6^{t-3} \times 4^t}{3^{t+1}} &= \frac{(2 \times 3)^{t-3} \times (2^2)^t}{3^{t+1}} \\ &= \frac{2^{t-3} \times 3^{t-3} \times 2^{2t}}{3^{t+1}} \\ &= 2^{t-3+2t} \times 3^{t-3-(t+1)} \end{aligned}$$

Question 4

$$\begin{aligned} \text{Simplify: } \frac{6^{2n} \times 9^3}{27^n \times 8^n \times 16^n} &= \frac{(3 \times 2)^{2n} \times (3^2)^3}{(3^3)^n \times (2^3)^n \times (2^4)^n} \\ &= \frac{3^{2n} \times 2^{2n} \times 3^6}{3^{3n} \times 2^{3n} \times 2^{4n}} \\ &= \frac{3^{2n+6} \times 2^{2n}}{3^{3n} \times 2^{7n}} = 3^{2n+6-3n} \times 2^{2n-7n} \\ &= 3^{6-n} \times 2^{-5n} \end{aligned}$$

Question 5

Evaluate without a calculator:

<p>a. $125^{-\frac{4}{3}}$</p> $= \frac{1}{(125)^{4/3}}$ $= \frac{1}{(\sqrt[3]{125})^4}$ $= \frac{1}{5^4}$ $= \frac{1}{625}$	<p>b. $(\frac{1}{49})^{-\frac{3}{2}}$</p> $= (49)^{3/2}$ $= (\sqrt{49})^3$ $= 7^3$ $= 343$	<p>c. $(32)^{\frac{4}{5}}$</p> $= (\sqrt[5]{32})^4$ $= (2)^4$ $= 16$
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Question 6

a. Simplify: $\sqrt[7]{128p^{14}q^{35}}$

$$= 128^{\frac{1}{7}} \times p^{\frac{14}{7}} \times q^{\frac{35}{7}}$$

$$= 2^7 p^2 q^5$$

b. Simplify: $\frac{45^{\frac{1}{3}}}{\frac{3}{94} \times \frac{3}{152}}$

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

$$\begin{aligned} &= \frac{5^{\frac{1}{3}} \times 3^{\frac{2}{3}}}{3^{\frac{3}{2}} \times 3^{\frac{1}{2}} \times 5^{\frac{1}{2}}} \\ &= \frac{5^{\frac{1}{3}} \times 3^{\frac{2}{3}}}{3^{\frac{3+1}{2}} \times 5^{\frac{1}{2}}} \\ &= \frac{5^{\frac{1}{3}} \times 3^{\frac{2}{3}}}{3^2 \times 5^{\frac{1}{2}}} \end{aligned}$$

$$\begin{aligned} &= 5^{\frac{1-3}{6}} \times 3^{\frac{2-3}{3}} \\ &= 5^{-\frac{2}{6}} \times 3^{-\frac{1}{3}} \\ &= 5^{-\frac{1}{3}} \times 3^{-\frac{1}{3}} \end{aligned}$$

Question 7

If $\sqrt[3]{ma^2b^5} \times \sqrt[4]{a^p b^q} = 3a^{\frac{23}{12}} b^{\frac{7}{4}}$, find the values of m , p and q .

$$m^{\frac{1}{3}} a^{\frac{2}{3}} b^{\frac{5}{3}} \times a^{\frac{p}{4}} b^{\frac{q}{4}} = 3 a^{\frac{23}{12}} b^{\frac{7}{4}}$$

$$\therefore m^{\frac{1}{3}} = 3$$

$$\therefore m = 27$$

$$a^{\frac{2}{3} + \frac{p}{4}} = a^{\frac{23}{12}}$$

$$\therefore \frac{2}{3} + \frac{p}{4} = \frac{23}{12}$$

$$\therefore \frac{p}{4} = \frac{23}{12} - \frac{2}{3}$$

$$\frac{p}{4} = \frac{23}{12} - \frac{8}{12}$$

$$\frac{p}{4} = \frac{15}{12} = \frac{5}{4} \quad \therefore p = 5$$

$$b^{\frac{5}{3} + \frac{q}{4}} = b^{\frac{7}{4}}$$

$$\therefore \frac{5}{3} + \frac{q}{4} = \frac{7}{4}$$

$$\frac{q}{4} = \frac{7}{4} - \frac{20}{12}$$

$$\frac{q}{4} = \frac{21}{12}$$

$$\frac{q}{4} = \frac{7}{4}$$

$$\therefore q = 7.$$