Class 11th | Applied Maths

प्रारंभ BATCH

Unit : 1

Indices

प्रारंभ BATCH

Next Toppers

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

$$a^m \div a^n = a^{m-n}$$

$$a^m \times b^m = (a \times b)^m$$

$$a^m \div b^m = (a \div b)^m$$

$$a^0 = 1$$

$$a^{-m} = \frac{1}{a^m}$$

$$\frac{1}{a^{-m}} = a^m$$

$$a^m = b^m \Rightarrow a = b \quad , m \neq 0$$

$$a^m = a^n \Rightarrow m = n \quad , a \neq 1$$

$\rightarrow \sqrt{3} = (3)^{1/2}$

$\rightarrow \sqrt[3]{5} = (3)^{1/5}$

$\rightarrow \sqrt[5]{7^2} = (7^2)^{1/5}$

$= 7^{2/5}$

$$\sqrt[n]{a^m} = a^{m/n}$$

$$(a^m)^n = a^{mn}$$

$x^4 \times x^3 = x^7$ $\quad \frac{x^4}{x^3} = x^{4-3}$ $\quad a^{-m} = \frac{1}{a^m}$

Simplify the following:

(i) $(3x^4y^3)(18x^3y^5)$ (ii) $\frac{3x^4y^3}{18x^3y^5}$ (iii) $\left(-\frac{2x^2}{y^3}\right)^3$ (iv) $\sqrt[3]{27^{-2}}$

$\rightarrow 3x^4y^3 \times 18x^3y^5$

$\Rightarrow 54x^7y^8$

$\frac{3}{6\cancel{18}} x^{4-3} y^{3-5}$

$\frac{x^1 y^{-2}}{6}$

$\frac{x}{6y^2}$

$\frac{(-2x^2)^3}{(y^3)^3}$

$\frac{-8x^6}{y^9}$

$(27^{-2})^{1/3}$

$\left[(3^3)^{-2}\right]^{1/3}$

$\left[3^{3\times-2}\right]^{\frac{1}{3}}$

$3^{\cancel{3}\times(-2)\times\frac{1}{\cancel{3}}}$

$3^{-2} = \frac{1}{3^2} = \frac{1}{9}$

$(3)^{\times}\ \frac{1}{12}$

$\frac{3}{12}\ \frac{1}{4}$

$12 \xleftarrow{\times 3} 4 \xrightarrow{\times 3} 1$

$3 \xrightarrow{\times 4} 12 \xrightarrow{\times 4} 4$

LCM(4,3) = 12

(i) $\left[\left\{(625)^{\frac{-1}{2}}\right\}^{\frac{-1}{4}}\right]^{2}$

$\left[\left\{(5^4)^{-\frac{1}{2}}\right\}^{-\frac{1}{4}}\right]^{2}$

$5^{4\times -\frac{1}{2}\times -\frac{1}{4}\times 2}$

$5^1 = 5$

$\sqrt[4]{28} \div \sqrt[3]{7}$

$(28)^{1/4} \div (7)^{1/3}$

$\frac{28^{1/4}}{7^{1/3}}$

$\frac{(28)^{3/12}}{(7)^{4/12}}$

$\frac{(28^3)^{1/12}}{(7^4)^{1/12}}$

$\left(\frac{28^3}{7^4}\right)^{1/12}$

$\left(\frac{\overset{4}{\cancel{28}}\times\overset{4}{\cancel{28}}\times\overset{4}{\cancel{28}}}{\cancel{7}\times\cancel{7}\times\cancel{7}\times 7}\right)^{1/12}$

$\left(\frac{4\times4\times4}{7}\right)^{1/12}$

$\left(\frac{64}{7}\right)^{1/12}$

$\frac{a}{b} \div \frac{c}{d} \Rightarrow \boxed{\frac{a}{b} \times \frac{d}{c}}$

$\frac{a}{b} \times \frac{c}{d} \times \frac{e}{f} \rightarrow$ Asan

Simplify:

$$\left(\frac{81}{16}\right)^{-\frac{3}{4}} \times \left[\left(\frac{25}{9}\right)^{-\frac{3}{2}} \div \left(\frac{5}{2}\right)^{-3}\right]$$

$$\left(\frac{3^4}{2^4}\right)^{-\frac{3}{4}} \times \left[\left(\frac{5^2}{3^2}\right)^{-3/2} \div \left(\frac{5}{2}\right)^{-3}\right]$$

$$\frac{3^{4\times -3/4}}{2^{4\times -3/4}} \times \left[\frac{5^{2\times -3/2}}{3^{2\times -3/2}} \div \frac{5^{-3}}{2^{-3}}\right]$$

$$\left(\frac{3^{-3}}{2^{-3}}\right) \times \left[\frac{5^{-3}}{3^{-3}} \div \frac{5^{-3}}{2^{-3}}\right]$$

$$\frac{2^3}{3^3} \times \left[\frac{3^3}{5^3} \div \frac{2^3}{5^3}\right]$$

$$\frac{\cancel{2^3}}{\cancel{3^3}} \times \frac{\cancel{3^3}}{\cancel{5^3}} \times \frac{\cancel{5^3}}{\cancel{2^3}}$$

$$1$$

$2^3 \times 3^3$

2	216
2	108
2	54

3	27
3	9
3	3

$36 \times 4 = 144$

Find the value of

$$\frac{4}{(216)^{-\frac{2}{3}}} + \frac{1}{(256)^{-\frac{3}{4}}} + \frac{2}{(243)^{-\frac{1}{5}}}$$

$$\frac{4}{(2^3 \times 3^3)^{-2/3}} + \frac{1}{(2^8)^{-3/4}} + \frac{2}{(3^5)^{-1/5}}$$

$$\Rightarrow \frac{4}{(2^3)^{-2/3} \times (3^3)^{-2/3}} + \frac{1}{2^{8 \times -3/4}} + \frac{2}{3^{5 \times -1/5}}$$

$$\Rightarrow \frac{4}{2^{-2} \times 3^{-2}} + \frac{1}{2^{-6}} + \frac{2}{3^{-1}}$$

$$4 \times 2^2 \times 3^2 + 2^6 + 2 \times 3^1$$

$$\Rightarrow 4 \times 4 \times 9 + 64 + 6$$

$$144 + 64 + 6$$

$$214$$

$0.01 = \frac{1}{100} = \frac{1}{10^2}$

Evaluate: $\sqrt{\frac{1}{4}} + (0.01)^{-\frac{1}{2}} - (27)^{\frac{2}{3}}$ **. Leave your answer as a fraction.**

$$\left(\frac{1}{4}\right)^{1/2} + (0.01)^{-1/2} - (3^3)^{2/3}$$

$$\frac{1^{1/2}}{(2^2)^{1/2}} + \left(\frac{1}{10^2}\right)^{-1/2} - 3^{3\times 2/3}$$

$$\Rightarrow \frac{1}{2} + \frac{1}{(10^2)^{-1/2}} - 3^2$$

$$\frac{1}{2} + \frac{1}{10^{-1}} - 9$$

$$\frac{1}{2} + 10 - 9$$

$$\frac{1}{2} + 1$$

$$\frac{3}{2}$$

Simplify:

$$(\frac{1}{4})^{-2} - 3(8)^{\frac{2}{3}}(4)^0 + (\frac{9}{16})^{-\frac{1}{2}}$$

$$\frac{(1)^{-2}}{4^{-2}} - 3\times(2^{\cancel{3}})^{2/\cancel{3}}\times 4^0 + \left(\frac{3^2}{4^2}\right)^{-1/2}$$

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

$$\Rightarrow 4^2 - 12 + \frac{3^{-1}}{4^{-1}}$$

$$\Rightarrow 16 - 12 + \frac{4}{3}$$

$$4 + \frac{4}{3}$$

$$\frac{16}{3}$$

$2^{3+4} = 2^3 \times 2^4 \qquad 2^{x+y} = 2^x \cdot 2^y \Rightarrow 2^{m+2} = 2^m \cdot 2^2$

Simplify the following:

(i) $\dfrac{5^{n+2} - 6.5^{n+1}}{13.5^n - 2.5^{n+1}}$ (ii) $\left(\dfrac{x^m}{x^n}\right)^{m+n}\left(\dfrac{x^m}{x^l}\right)^{n+l}\left(\dfrac{x^l}{x^m}\right)^{l+m}$ (iii) $\left(x^{\frac{1}{3}} + x^{-\frac{1}{3}}\right)\left(x^{\frac{2}{3}} - 1 + x^{-\frac{2}{3}}\right)$

$\Rightarrow \dfrac{5^n \cdot 5^2 - 6 \cdot 5^n \cdot 5^1}{13 \cdot 5^n - 2 \cdot 5^n \cdot 5^1}$

$\Rightarrow \dfrac{\cancel{5^n}[5^2 - 6 \times 5]}{\cancel{5^n}[13 - 10]}$

$\Rightarrow \dfrac{25 - 30}{3} = -\dfrac{5}{3}$

$(x^{m-n})^{m+n} \quad x^{(m-l)(m+l)} \quad x^{(l-m)(l+m)}$

$x^{m^2-n^2} \times x^{m^2-l^2} \times x^{l^2-m^2}$

$x^{\cancel{m^2}-\cancel{n^2}+\cancel{m^2}-\cancel{l^2}+\cancel{l^2}-\cancel{m^2}}$

x^0

1

$$(x^{1/3}+x^{-1/3})(x^{2/3}+x^{-2/3}-1)$$

$$x^{1/3}\times x^{2/3}+x^{1/3}\times x^{-2/3}-x^{1/3}+x^{-1/3}\times x^{2/3}+x^{-1/3}\times x^{-2/3}-x^{-1/3}$$

$$x^{1/3+2/3}+x^{1/3-2/3}-x^{1/3}+x^{-1/3+2/3}+x^{-1/3-2/3}-x^{-1/3}$$

$$x^{\cancel{3/3}\,1}+\cancel{x^{-1/3}}-\cancel{x^{1/3}}+\cancel{x^{1/3}}+x^{\cancel{-3/3}\,-1}-\cancel{x^{-1/3}}$$

$$x+x^{-1}$$

$$x+\frac{1}{x}$$

If $a = b^{2x}$, $b = c^{2y}$ and $c = a^{2z}$, prove that $xyz = 1/8$.

$a = b^{2x}$

$a = (c^{2y})^{2x}$

$a = c^{4xy}$

$a = (a^{2z})^{4xy}$

$a^{1} = a^{8xyz}$

$1 = 8xyz$

$\frac{1}{8} = xyz$

$2^x = 3^y = 4^z$

$2 \times \frac{1}{y}$

If $a^x = b^y = c^z$ and $b^2 = ac$ prove that $y = \dfrac{2xz}{z+x}$.

$\frac{2}{y} = \frac{z+x}{xz} \Rightarrow \frac{y}{2} \rightarrow \frac{xz}{x+z} \Rightarrow y = \frac{2xz}{x+z}$

$a^x = b^y = c^z = K$

$a^x = K$

$(a^x)^{1/x} = (K)^{1/x}$

$a = K^{1/x}$

$b^y = K$

$(b^y)^{1/y} = (K)^{1/y}$

$b = K^{1/y}$

$c^z = K$

$(c^z)^{1/z} = (K)^{1/z}$

$c = K^{1/z}$

$b^2 = ac$

$(K^{1/y})^2 = K^{1/x} \times K^{1/z}$

$K^{2/y} = K^{1/x + 1/z}$

$\frac{2}{y} = \frac{1}{x} + \frac{1}{z}$

$\frac{ab}{1} = \frac{1}{c}$ $\frac{1}{ab} = c$ $\frac{1+b}{ab}$ $\frac{1}{ab} + \frac{1}{a}$

If abc = 1, show that

$$\frac{1}{1+a+b^{-1}} + \frac{1}{1+b+c^{-1}} + \frac{1}{1+c+a^{-1}} = 1$$

$$\frac{1}{1+a+\frac{1}{b}} + \frac{1}{1+b+\frac{1}{c}} + \frac{1}{\frac{1}{1}+\frac{1}{ab}+\frac{1}{a}}$$

$$\frac{1}{\frac{b+ab+1}{b}} + \frac{1}{1+b+ab} + \frac{1}{\frac{ab+1+b}{ab}}$$

$$\frac{b}{1+ab+b} + \frac{1}{1+ab+b} + \frac{ab}{1+ab+b}$$

$$\frac{\cancel{b+1+ab}}{\cancel{1+ab+b}}$$

$$1$$

$x^3 = [(28)^{1/3}]^3 = 28$

$x^3 - y^3 = (x-y)(x^2+y^2+xy)$

If x = $\sqrt[3]{28}$ and y = $\sqrt[3]{27}$, find the value of $x + y - \dfrac{1}{x^2+xy+y^2}$.

$x = (28)^{1/3}$ $\quad y = (27)^{1/3}$

$\Rightarrow (x+y) - \dfrac{(x-y)}{(x-y)(x^2+xy+y^2)}$

$\Rightarrow (x+y) - \dfrac{(x-y)}{x^3-y^3}$

$x^3 = 28$
$y^3 = 27$

$(x+y) - \dfrac{(x-y)}{28-27}$

$(x+y) - (x-y)$

$x+y-x+y$

$2y = 2(27)^{1/3}$

$= 2\times(3^3)^{1/3}$

$= 2\times 3 = 6$

Given $1176 = 2P \cdot 3^q \cdot 7^r$ find

$1176 = 2^P \cdot 3^q \cdot 7^r$ $\quad P, q, r$

$2 \times 2 \times 2 \times 3 \times 7 \times 7 = 2^P \times 3^q \times 7^r$

$2^3 \times 3^1 \times 7^2 = 2^P \times 3^q \times 7^r$

$P = 3$

$q = 1$

$r = 2$

2	1176
2	588
2	294
3	147
7	49
7	7
	1

$\frac{1}{2} \times 2x$ $\quad 4 \times 27 = 108$

Solve the following equations for x:

(i) $4^{2x} = \frac{1}{32}$ **(ii)** $\sqrt{\left(\frac{3}{5}\right)^{1-2x}} = 4\frac{17}{27}$

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

$2^{4x} = 2^{-5}$

$4x = -5$

$x = -5/4$

$\left[\left(\frac{3}{5}\right)^{1-2x}\right]^{1/2} = \frac{125}{27}$

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

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

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

$\frac{1}{2} - x = -3$

$\frac{1}{2} + 3 = x$

$\frac{7}{2} = x$

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