$= (3+11) = (9+11) = 20^2 = \underline{\underline{400}}$ (d)

22) $(256)^{0.16} \times (256)^{0.09} =$

(a) 4 (b) 16 (c) 64 (d) 256.25

Solution:-

$$(256)^{0.16} \times (256)^{0.09} = (256)^{0.16+0.09} \quad [a^m \times a^n = a^{m+n}]$$

$$= (256)^{0.25}$$

$$= (256)^{\frac{1}{4}} = 4^{4\times\frac{1}{4}} = 4 \text{ (a)}$$

23) If $10^{2y} = 25$, then 10^{-y} equals

(a) $-\frac{1}{5}$ (b) $\frac{1}{50}$ (c) $\frac{1}{625}$ (d) $\frac{1}{5}$

Solution:-

$$10^{2y} = 25$$

$$\Rightarrow 10^{2y} = 5^2$$

$$\Rightarrow (10^{2y})^{\frac{1}{2}} = (5^2)^{\frac{1}{2}} \quad \text{[taking square root on both sides]}$$

$$\Rightarrow 10^{y} = 5$$

$$\Rightarrow \frac{1}{10^y} = \frac{1}{5} \quad \text{[taking reciprocal on both sides]}$$

$$\Rightarrow 10^{-y} = \frac{1}{5} \text{ (d)}$$

24) If $9^{x+2} = 240 + 9^x$, then $x =$

(a) 0.5 (b) 0.2 (c) 0.4 (d) 0.1

Solution:-

$$9^x \cdot 9^2 = 240 + 9^x$$

$\Rightarrow 9^x \times 81 - 9^x = 240$

$\Rightarrow 9^x (81-1) = 240$

$\Rightarrow 9^x \times 80 = 240$

$9^x = \frac{240}{80} = 3$

$3^{2x} = 3^1$

$\therefore 2x = 1$

$x = \frac{1}{2} = 0.5$ (a)

25) If x is a positive real number and $x^2 = 2$, then $x^3 =$ __

(a) $\sqrt{2}$ (b) $2\sqrt{2}$ (c) $3\sqrt{2}$ (d) 4

Solution:-

$x^2 = 2$

$\Rightarrow x = \sqrt{2}$ [taking square root on both sides]

$\Rightarrow x^3 = (\sqrt{2})^3$ [Cubing on both sides]

$\Rightarrow x^3 = 2\sqrt{2}$ (b) [$\sqrt{2} \times \sqrt{2} \times \sqrt{2} = 2\sqrt{2}$]

26) If $\frac{x}{x^{1.5}} = 8x^{-1}$ and $x > 0$, then $x =$

(a) $\frac{\sqrt{2}}{4}$ (b) $2\sqrt{2}$ (c) 4 (d) 64

Solution:-

$\frac{x}{x^{1.5}} = \frac{8}{x}$

$\Rightarrow \frac{x^2}{x^{1.5}} = 8$

$\Rightarrow x^{2-1.5} = 8$ [$\frac{a^m}{a^n} = a^{m-n}$]

$\Rightarrow x^{0.5} = 8$

$\Rightarrow x^{\frac{1}{2}} = 8$

$\Rightarrow x = 8^2 = 64$ (d) [Squaring on both sides]

27) If $g = t^{\frac{2}{3}} + 4t^{-\frac{1}{2}}$, what is the value of g when $t = 64$?

(a) $\frac{31}{2}$ (b) $\frac{33}{2}$ (c) 16 (d) $\frac{257}{16}$

Solution:-

$$g = 64^{\frac{2}{3}} + 4 \times 64^{-\frac{1}{2}}$$

$$\Rightarrow g = 4^{\cancel{3}^{1} \times \frac{2}{\cancel{3}_{1}}} + 4 \times 8^{\cancel{2}^{1} \times -\frac{1}{\cancel{2}_{1}}}$$

$$= 4^{2} + 4 \times 8^{-1}$$

$$= 16 + \frac{\cancel{4}^{1}}{\cancel{8}_{2}} = 16 + \frac{1}{2} = \frac{32+1}{2} = \frac{33}{2} \text{ (b)}$$

28) If $4^{x} - 4^{x-1} = 24$, then $(2x)^{x}$ equals
(a) $5\sqrt{5}$ (b) $\sqrt{5}$ (c) $25\sqrt{5}$ (d) 125

Solution:-

$$4^{x} - 4^{x} . 4^{-1} = 24$$

$$\Rightarrow 4^{x}(1 - 4^{-1}) = 24$$

$$\Rightarrow 4^{x}\left(1 - \frac{1}{4}\right) = 24$$

$$\Rightarrow 4^{x} \times \frac{3}{4} = 24$$

$$\Rightarrow 4^{x} = \frac{\cancel{24}^{8} \times 4}{\cancel{3}_{1}}$$

$$\Rightarrow 4^{x} = 32$$

$$\Rightarrow 2^{2x} = 2^{5}$$

$$\therefore 2x = 5$$

$$x = \frac{5}{2}$$

$$\therefore (2x)^{x} = \left(\cancel{2}^{1} \times \frac{5}{\cancel{2}_{1}}\right)^{\frac{5}{2}} = 5^{\frac{5}{2}} = \sqrt{5^{5}} = \sqrt{5 \times 5 \times 5 \times 5 \times 5}$$

$$= 25\sqrt{5} \text{ (c)}$$

29) When simplified $(256)^{-\left(4^{-3/2}\right)}$ is
(a) 8 (b) $\frac{1}{8}$ (c) 2 (d) $\frac{1}{2}$

Solution:-

$$(256)^{-\left(2^{\cancel{2}^{1} \times -\frac{3}{\cancel{2}_{1}}}\right)} = (256)^{-2^{-3}}$$

$$= 256^{-\frac{1}{2^{3}}} = 256^{-\frac{1}{8}}$$

$$= (2^{8})^{-\frac{1}{8}} = 2^{8 \times -\frac{1}{8}} = 2^{-1} = \frac{1}{2} \text{ (d)}$$

30) If $\frac{3^{2x-8}}{225} = \frac{5^3}{5^x}$, then $x =$

(a) 2 (b) 3 (c) 5 (d) 4

Solution:-

$$\frac{3^{2x}}{3^8 . 15^2} = \frac{5^3}{5^x}$$

$$\Rightarrow 3^{2x} . 5^x = 3^8 \times 15^2 \times 5^3$$

$$\Rightarrow 3^{2x} \times 5^x = 3^8 \times 3^2 \times 5^2 \times 5^3$$

$$\Rightarrow 3^{2x} \times 5^x = 3^{10} \times 5^5$$

On comparing, $x = 5$ (c)

31) The value of $64^{-\frac{1}{3}}\left(64^{\frac{1}{3}} - 64^{\frac{2}{3}}\right)$ is

(a) 1 (b) $\frac{1}{3}$ (c) -3 (d) -2

Solution:-

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

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

$$= \frac{-12}{4} = -3 \text{ (c)}$$

32) If $\sqrt{5^n} = 125$, then $5^{\sqrt[n]{64}} =$

(a) 25 (b) $\frac{1}{125}$ (c) 625 (d) $\frac{1}{5}$

Solution:-

$$\sqrt{5^n} = 5^3$$

$$\Rightarrow 5^{\frac{n}{2}} = 5^3$$

$$\therefore \frac{n}{2} = 3 \Rightarrow n = 6$$

$$5^{\sqrt[n]{64}} = 5^{\sqrt[6]{64}} = 5^{\sqrt[6]{2^6}} = 5^{2^{\cancel{6}\times\frac{1}{\cancel{6}}}} = 5^2 = 25 \text{ (a)}$$

33) If $(16)^{2x+3} = (64)^{x+3}$, then $4^{2x-2} =$

(a) 64 (b) 256 (c) 32 (d) 512

Solution:-

$$4^{2(2x+3)} = 4^{3(x+3)}$$

$$\therefore 2(2x+3) = 3(x+3)$$
$$\Rightarrow 4x+6 = 3x+9$$
$$\Rightarrow 4x-3x = 9-6$$
$$x = 3$$

Thus, $4^{2x-2} = 4^{2\times3-2} = 4^{6-2} = 4^4 = 256$ (b)

34) If $2^{-m} \times \frac{1}{2^m} = \frac{1}{4}$, then $\frac{1}{14}\left[(4^m)^{\frac{1}{2}} + \left(\frac{1}{5^m}\right)^{-1}\right]$ is equal to

(a) $\frac{1}{2}$ (b) 2 (c) 4 (d) $-\frac{1}{4}$

Solution:-

$$2^{-m} \times 2^{-m} = 4^{-1}$$
$$\Rightarrow 2^{-m-m} = 2^{-2}$$
$$\Rightarrow 2^{-2m} = 2^{-2}$$
$$\therefore -2m = -2$$
$$m = 1$$

$$\therefore \frac{1}{14}\left[(4)^{\frac{1}{2}} + \left(\frac{1}{5}\right)^{-1}\right] = \frac{1}{14}\left[2^{\cancel{2}\times\frac{1}{\cancel{2}}} + 5\right] = \frac{1}{14}(2+5)$$
$$= \frac{1}{14} \times 7 = \frac{1}{2} \text{ (a)}$$

35) If $\frac{2^{m+n}}{2^{n-m}} = 16$; $\frac{3^p}{3^n} = 81$ and $a = 2^{\frac{1}{10}}$, then

$\frac{a^{2m+n-p}}{(a^{m-2n+2p})^{-1}} =$ ____ (a) 2 (b) $\frac{1}{4}$ (c) 9 (d) $\frac{1}{8}$

Solution:-

$$2^{m+\cancel{n}-\cancel{n}+m} = 2^4$$
$$\Rightarrow 2^{2m} = 2^4$$
$$\therefore 2m = 4$$
$$m = 2$$
$$3^{p-n} = 3^4$$
$$\therefore p-n = 4$$

Thus, $\frac{a^{2m+n-p}}{(a^{m-2n+2p})^{-1}} = a^{2m+n-p} \times a^{m-2n+2p}$
$$= a^{2m+m+n-2n-p+2p} = a^{3m-n+p}$$

$= a^{6+4} = a^{10}$

$= \left(2^{\frac{1}{10}}\right)^{10} = 2^{\frac{10}{10}} = 2$ (a)

36) If $\dfrac{3^{5x} \times 81^{2} \times 6561}{3^{2x}} = 3^{7}$, then $x =$

(a) 3 (b) -3 (c) $\frac{1}{3}$ (d) $-\frac{1}{3}$

Solution:-

$$\frac{3^{5x} \times 3^{4\times2} \times 3^{8}}{3^{2x}} = 3^{7}$$

3	6561
3	2187
3	729
3	243
3	81
3	27
3	9
	3

$\Rightarrow 3^{5x+8+8-2x} = 3^{7}$

$\Rightarrow 3^{3x+16} = 3^{7}$

$\therefore 3x+16 = 7$

$3x = -9$

$x = -3$ (b)

37) If $0<y<x$, which statement must be true?

(a) $\sqrt{x}-\sqrt{y} = \sqrt{x-y}$ (b) $\sqrt{x}+\sqrt{x} = \sqrt{2x}$

(c) $x\sqrt{y} = y\sqrt{x}$ (d) $\sqrt{xy} = \sqrt{x}\cdot\sqrt{y}$

Solution:-

$\sqrt{xy} = \sqrt{x} \times \sqrt{y}$ (d)

38) If $10^{x} = 64$, what is the value of $10^{\frac{x}{2}+1}$?

(a) 18 (b) 42 (c) 80 (d) 81

Solution:-

$10^{x} = 8^{2}$

$\Rightarrow 10^{\frac{x}{2}} = 8^{\frac{2}{2}}$ [taking square root on both sides]

$\Rightarrow 10^{\frac{x}{2}} = 8$

$\Rightarrow 10^{\frac{x}{2}} \times 10 = 8 \times 10$

$\Rightarrow 10^{\frac{x}{2}+1} = 80$ (c)

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39) $\dfrac{5^{n+2} - 6\times 5^{n+1}}{13\times 5^{n} - 2\times 5^{n+1}}$ is equal to

(a) $\frac{5}{3}$ (b) $-\frac{5}{3}$ (c) $\frac{3}{5}$ (d) $-\frac{3}{5}$

Solution:-

$$\frac{5^n\times 5^2 - 6\times 5^n\times 5^1}{13\times 5^n - 2\times 5^n\times 5^1}$$

$$= \frac{\cancel{5^n}^{1}(5^2 - 6\times 5)}{\cancel{5^n}_{1}(13 - 2\times 5)} = \frac{25-30}{13-10} = -\frac{5}{3} \text{ (b)}$$

40) If $\sqrt{2^n} = 1024$, then $3^{2\left(\frac{n}{4}-4\right)} =$

(a) 3 (b) 9 (c) 27 (d) 81

Solution:-

$$(2^n)^{\frac{1}{2}} = 2^{10}$$

$$\Rightarrow 2^{\frac{n}{2}} = 2^{10}$$

$$\therefore \frac{n}{2} = 10$$

$$n = 20$$

Thus, $3^{2\left(\frac{20}{4}-4\right)} = 3^{2(5-4)} = 3^2 = 9$ (b)
