QUANTITATIVE APTITUDE

SURDS AND INDICES
CONCEPTS & FORMULAS

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Quantitative Aptitude – Surds and Indices – Formulas

Introduction to Quantitative Aptitude:

Quantitative Aptitude is an important section in the employment-related competitive exams in India. Quantitative **Aptitude** Section is one of the key sections in recruitment exams in India including but not limited to **Banking, Railways, and Staff Selection Commission, Insurance, Teaching, UPSC** and many others. The Quantitative Aptitude section has questions related to **Profit and Loss, Percentage and Discount, Simple Equations, Time and Work and Quadratic Equations, Surds and Indices etc.**

Surds and Indices – Important Terms:

1. What is Surd?

- Number which cannot be expressed in the fraction form of two integers is called as surd. Hence, the numbers in the form of $\sqrt{3}$, $\sqrt[3]{2}$, ……. $\sqrt[n]{x}$
- For example: $\frac{\sqrt{1}}{\sqrt{9}}$ can be written as $\frac{1}{3}$ but 3 cannot be written in the form of fraction
- Irrational numbers which contain the radical sign (√) are called as surds.

2. What is Indices?

- Indices refer to the power to which a number is raised. Index is used to show that a number is repeatedly multiplied by itself.
- Example: a^3 is a number with an index of 3 and base ‘a’. It is called as “a to the power of 3”

QUICK TIPS AND TRICKS

1. The laws of indices and surds are to be remembered to solve problems on surds and indices.

a. Laws of Indices

1) $x^m \times x^n = a^{m+n}$

2) $(x^m)^n = x^{mn}$

3) $(xy)^n = x^n y^n$

4) $\frac{x^m}{x^n}$ = x^{m-n}

5) $(\frac{x}{y})^n = \frac{x^n}{y^n}$

6) $x^{-1} = \frac{1}{x}$

b. Laws of Surds

1. $\sqrt[n]{x} = x^{(1/n)}$

2. $\sqrt[n]{x\,y} = \sqrt[n]{x} \times \sqrt[n]{y}$

3. $\sqrt[n]{\frac{x}{y}} = \frac{\sqrt[n]{x}}{\sqrt[n]{y}}$

4. $(\sqrt[n]{x})^n = X$

5. $\sqrt[m]{n} \quad \sqrt{x} = mnx \sqrt[mn]{x}$

6. $(\sqrt[n]{x})^m = .\ (\sqrt[n]{x^m})$

2. Expressing a number in radical form

Example: I $x^{(m/n)}$ I = $\sqrt[n]{x^m}$

The exponential form I $x^{(m/n)}$ I is expressed in radical form as $\sqrt[n]{x^m}$

QUICK LOOKS:

- Any number raised to the power zero is always equals to one. (Eg: x 0 = 1)
- Surd nx can be simplified if factor of x is a perfect square
- If denominator in a fraction has any surds, then rationalize the denominator by multiplying both numerator and denominator by a conjugate surd.
- Every surd is an irrational number, but every irrational number is not a surd.
- The conjugate of (2 + 7i) is (2 – 7i)
- Different expressions can be simplified by rationalizing the denominator and eliminating the surd.

Rationalizing the denominator:

To rationalize the denominator $\sqrt{7}$ multiply with its conjugate to both numerator and denominator

Example 1: $\frac{1}{\sqrt{7}} = \frac{1}{\sqrt{7}} \text{ X } \frac{\sqrt{7}}{\sqrt{7}} = \frac{\sqrt{7}}{7}$

Example 2: $\frac{1}{\sqrt{7}+\sqrt{3}} = \frac{1}{\sqrt{7}+\sqrt{3}} = \frac{\sqrt{7}-\sqrt{3}}{7}$

EXAMPLE:

1. (1331) $^{-(2/3)}$

A. $-\frac{1}{11}$
B. $-\frac{11}{121}$
C. $-\frac{1}{121}$
D. $-\frac{121}{11}$

Answer: C

Explanation:

Cube root of 1331 is 11. Therefore,

(113)– $^{(2/3)}$

Hint:

Remember the law of indices (xm)n = xmn

$(11)^{-3 \times (2/3)} = 11^{-2}$

Hint:

$x^{-1} = \frac{1}{x}$

Hence, $11^{-2} = \frac{1}{11^2} = \frac{1}{121}$

2. $\frac{(32)^{(n/5)} \times (2)^{2n+1}}{4^n \text{ X } 2^{n-1}}$

A. 4
B. 8
C. 2n
D. 2^{n+1}

Answer: A

Explanation:

32 = 2^5 and 4 = 2^2

Substituting these values, we get

$$\frac{(32)^{(n/5)} \times (2)^{2n+1}}{4^n \text{ X } 2^{n-1}} = \frac{(2^5)^{(\frac{n}{5})} \times (2)^{2n+1}}{2^n \text{ X } 2^{n-1}}$$

Hint:

Laws of indices $(x^m)^n = x^{mn}$ and $x^m \times x^n = a^{m+n}$

$$\frac{(2^5)^{(\frac{n}{5})} \times (2)^{2n+1}}{4^n \text{ X } 2^{n-1}} = \frac{(2^5)^{(\frac{n}{5})} \times (2)^{2n+1}}{(2^2)^n \text{ X } 2^{n-1}}$$

In the expression, bases are same, hence add the indices.

$$\frac{2^n \times 22n \ \ 2^{2n}+1}{2^{2n} \times 2^{n-1}} = \frac{2^{n+2n+1}}{2^{2n+2n-1}} = \frac{2^{2n+1}}{2^{3n-1}}$$

$$\frac{x^m}{x^n} = x^{m-n}$$

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

3. Find the value of $\frac{1}{125^{-(\frac{2}{3})}} + \frac{1}{625^{-(3/4)}} + \frac{1}{729^{-(3/6)}}$

- **A.** 132
- **B.** 177
- **C.** 185
- **D.** 225

Answer: B

Explanation:

5^3 = 125, 54 = 625, 36 = 729

$$\frac{1}{(5^3)^{-(\frac{2}{3})}} + \frac{1}{(5^3)^{-(3/4)}} + \frac{1}{(5^3)^{-(3/6)}}$$

Hint:

Law of indices $(x^m)^n = x^{mn}$

$\frac{1}{(5)^{-2}} + \frac{1}{(5)^{-3}} + \frac{1}{(3)^{-3}}$

Therefore,

$\frac{1}{(5)^{-2}} + \frac{1}{(5)^{-3}} + \frac{1}{(3)^{-3}}$ = 52 + 53 + 33 = 177

4. If x = 5 + 26, then find the value of $[\sqrt{x} - \frac{1}{\sqrt{x}}]$

a. $2\sqrt{6}$

b. $\sqrt{6}$

c. 8

d. 6

Answer: C

Explanation:

We have to find the value of $[\sqrt{x} - \frac{1}{\sqrt{x}}]$ firstly simplify this term without any radical sign.

Hence, square the given expression

$[\sqrt{x} - \frac{1}{\sqrt{x}}]^2 = x - 2 \times x \times \frac{1}{x} + \frac{1}{x} = x - 2 + \frac{1}{x}$ - - - -$[(a - b)^2 = a^2 - 2ab + b^2]$

Now, substitute the value of x = 5 + 26 in the simplified expression $x - 2 + (\frac{1}{x})$

$x + \frac{1}{x} - 2 = 5 + 2\sqrt{6} + \frac{1}{5 + 2\sqrt{6}} - 2$

To rationalize the denominator, multiply numerator and denominator by its conjugate $5 - 2\sqrt{6}$

$= 5 + 2\sqrt{6} \times \quad 5 - 2\sqrt{6} \frac{1}{5 + 2\sqrt{6}} \quad - 2$

$= 5 + 2\sqrt{6} \times \frac{5 + 2\sqrt{6}}{25-24} 5 - 2$ - - - $(a + b)(a - b) = (a^2 - b^2)$

= 5 + 5 – 2

= 8

5. If $2^x \times 8^{(1/4)} = 2^{(1/4)}$ then find the value of x

- **A.** $-\frac{1}{2}$
- **B.** $\frac{1}{2}$
- **C.** $\frac{1}{4}$
- **D.** $-\frac{1}{4}$

Answer: A

Explanation:

$2^x \times 8^{(1/4)} = 2^{(1/4)}$

As bases are not equal we cannot add the indices, hence first convert all the numbers with same base.

$2^x \times (2^3)^{(1/8)} = 2^{(1/4)}$

Hint:

Law of Indices $(x^m)^n = x^{mn}$

$2^x \times 2^{(3/4)} = 2^{(1/4)}$

$2^{[x + (3/4)]} = 2^{(1/4)}$

$x + \frac{3}{4} = \frac{1}{4}$

$x + \frac{3}{4} = \frac{1}{4} = \frac{-2}{4} = \frac{-1}{2}$

6. If $9^x - 9^x - 1 = 648$, then find the value of x^x

- **A.** 4
- **B.** 9
- **C.** 27
- **D.** 64

Answer: D

Explanation:

Hint:

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

$9^x - 9^{x-1} = 648$

9x – 1 (9 – 1) = 648

9x – 1 = ($\frac{648}{8}$) = 81

$9^{x-1} = 9^2$

x – 1 = 2

x = 2 + 1 = 3

$x^x = 3^3 = 27$

Alternate solution:

Select the given options and substitute the value of x = 5, 6, 1.5 and 3 in the given expression.

Substituting value of x = 3,

$9^x - 9^x - 1$ =?

$9^3 - 9^3 - 1 = 648$

Value of x = 3

$x^x = 3^3 = 27$

7. If $4^{(x-y)} = 64$ and $4^{(x+y)} = 1024$, then find the value of x.

- **A.** 3
- **B.** 1
- **C.** 6
- **D.** 4

Answer: D

Explanation:

$4^{(x-y)} = 64$

$4^{(x-y)} = 64 = 4^3$

Equation 1) x – y = 3

$4^{(x+y)} = 1024 = 4^5$

Equation 2) x + y = 5

Solving equation (1) and (2), we get

x = 4 and y = 1

Crosscheck the answers by substituting the values of x and y in the given expression.

$4^{(4-1)} = 43 = 64$ and $4^{(4+1)} = 4^5 = 1024$

Hence, the answers x = 4 and y = 1 are correct.

8. If a and b are whole numbers such that ab = 121, then find the value of (a – 1) b + 1

- **A.** 0
- **B.** 10
- **C.** 102
- **D.** 103

Answer: D

Explanation:

$121 = 11^2$, hence value of a = 11 and b = 2 can be considered.

Therefore, the value of $(a-1)^{b+1} = (11-1)^{2+1} = 103$

9. The value of $(256)^{5/4}$ is:

- **A.** 512
- **B.** 984
- **C.** 1024
- **D.** 1032

Answer: C

Explanation:

From the given equation:

$(256)^{5/4}$

$= (4^4)^{5/4}$

$= 4^{(4 \times 5/4)}$

$= 4^5$

= 1024.

10. $\frac{1}{(216)^{2/3}} + \frac{1}{(256)^{-3/4}} + \frac{1}{(32)^{-1/5}}$

- **A.** 102
- **B.** 105
- **C.** 107
- **D.** None of these

Answer: A

Explanation:

Given expression

$$\frac{1}{(216)^{2/3}} + \frac{1}{(256)^{-3/4}} + \frac{1}{(32)^{-1/5}}$$

$= \frac{1}{6^{3x\,(-\frac{2}{3})}} + \frac{1}{4^{4x\,(-\frac{3}{4})}} + \frac{1}{2^{5x(-\frac{1}{5})}}$

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

$= (6^2 + 4^3 + 2^1)$

= (36 + 64 + 2)

= 102.

11. (2.4 × 103) ÷ (8 × 10–2) =?

- **A.** 3×10^{-5}
- **B.** 3×10^4
- **C.** 3×10^5
- **D.** D .30

Answer: B

Explanation:

Given equation

$= (2.4 \times 10^3) \div (8 \times 10^{-2})$

Then, $\frac{2.4 \times 10^3}{8 \text{ X } 10^{-2}}$

$= \frac{24 \times 10^3}{8 \text{ X } 10^{-2}}$

$= (3 \times 10^4)$

12. $\left(\frac{1}{216}\right)^{-2/3} \div \left(\frac{1}{27}\right)^{-4/3}$ **=?**

A. $\frac{3}{4}$

B. $\frac{2}{3}$

C. $\frac{4}{9}$

D. $\frac{1}{8}$

Answer: C

Explanation:

Given equation:

$\left(\frac{1}{216}\right)^{-2/3} \div \left(\frac{1}{27}\right)^{-4/3}$

$(216)^{-2/3} \div 27^{-4/3}$

$\frac{(216)^{2/3}}{(27)^{4/3}} = \frac{(6\wedge 3)^{X\left(\frac{2}{3}\right)}}{(3\wedge 3)^{X(4/3)}}$

$= \frac{6^2}{3^4} = \frac{36}{81} = \frac{4}{9}$

13. $(1000)^7 \div 1018$ =?

- **A.** 10
- **B.** 100
- **C.** 1000
- **D.** 10000

Answer: C

Explanation:

Given equation = $(1000)^7 \div 10^{18}$.

$\Rightarrow \quad \frac{(1000)^7}{(10)^{18}} \Rightarrow \frac{(10\wedge 3^7)}{(10)^{18}} \Rightarrow \frac{10^{(3 \times 7)}}{(10)^{18}}$

$\Rightarrow \quad \frac{10^{21}}{(10)^{18}}$ = $10^{(21 - 18)}$ ⇒ 103 = 1000.

14. If $2^{2n-1} \frac{1}{8^{n-3}}$, then the value of n is:

A. 3
B. 2
C. 0
D. –2

Answer: B

Explanation:

2^{2n-1}

$= \frac{1}{8^{n-3}}$

$= \frac{1}{(2\hat{}3)^{n-3}}$ = 1

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

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

$= 2^{(9-3n)}$

Let's take power from the equation:

2n–1 = 9–3n

⇒ 5n = 10

⇒ n = 2.

15. If $\frac{9^n \text{ X } 3^5 \text{ x } 27^3}{3 \text{ X } 81^4}$ = 27, then the value of n is:

A. 0
B. 2
C. 3
D. 4

Answer: C

Explanation:

$\frac{9^n \text{ X } 3^5 \text{ x } 27^3}{3 \text{ X } 81^4}$

$= 27 \Leftrightarrow \frac{(3\hat{}2)^n \text{ X } 3^5 \text{ x } (3\hat{}3)^3}{3 \text{ X } (3\hat{}4)^4}$

$= 3^3 \Leftrightarrow \frac{3^{2n} \times 3^5 \times 3^{(3 \times 3)}}{3 \times 3^{(4 \times 4)}} = 3^3$

$\Leftrightarrow \quad \frac{3^{2n+5+9}}{3 \times 3^{16}}$

$= 3^3 \Leftrightarrow \frac{3^{2n+14}}{3^{17}}$

$= 3^3 \Leftrightarrow 3^{(2n+14-17)} = 3^3$

$\Leftrightarrow 3^{2n-3} = 3^3$

From the equation powers :

$\Leftrightarrow 2n - 3 = 3 \Leftrightarrow 2n = 6 \Leftrightarrow n = 3.$

16. If $2^{n+4} - 2^{n+2} = 3$, then n is equal to:

- **A.** 0
- **B.** 2
- **C.** −1
- **D.** −2

Answer: D

Explanation:

Given expression:

$2^{n+4} - 2^{n+2} = 3 \Leftrightarrow 2^{n+2} (2^2 - 1) = 3 \Leftrightarrow 2^{n+2} = 1 = 2^0$

[Bcz 2^0 is equal to 1]

From the equation power:

$\Leftrightarrow n + 2 = 0 \Leftrightarrow n = -2$

17. If $2^{n-1} + 2^{n+1} = 320$, then n is equal to:

- **A.** 6
- **B.** 8
- **C.** 5
- **D.** 7

Answer: D

Explanation:

Given equation:

$2^{n-1} + 2^{n+1} = 320$

$\Leftrightarrow 2^{n-1} (1+2^2) = 320$

$\Leftrightarrow 5 \times 2^{n-1} = 320$

$\Leftrightarrow 2^{n-1} = \frac{320}{5}$

$= 64 = 2^6$

From the equation power:

$\Leftrightarrow n-1 = 6 \Leftrightarrow n = 7.$

18. If $3^x - 3^{x-1} = 18$, then the value of x^x is:

- **A.** 3
- **B.** 8
- **C.** 27
- **D.** 216

Answer: C

Explanation:

From the given expression:

$3^x - 3^{x-1} = 18$

$\Leftrightarrow 3^{x-1} (3 - 1) = 18$

$\Leftrightarrow 3x^{-1} = 9 = 3^2$

From the equation power:

$\Leftrightarrow x - 1 = 2 \Leftrightarrow x = 3.$

$\therefore Xx = 3^3 = 27$

19. The number of prime factors in $6^{333} \times 7^{222} \times 8^{111}$

A. 1221

B. 1222

C. 1111

D. 1211

Answer: A

Explanation:

$(6)^{333} \times (7)^{222} \times (8)^{111}$

$\therefore$ $(2 \times 3)^{333} \times (7)^{222} \times (23)^{111}$

$\therefore$ $2^{333} \times 3^{333} \times 7^{222} \times 2333$

$\therefore$ $2^{666} \times 3^{333} \times 7^{222}$

$\therefore$ Number of prime factors

= 666 + 333 + 222 = 1221

20. Simplify $(\frac{1}{64})^0 + (64)^{-1/2} + (-32)^{4/5}$

- **A.** $17\frac{1}{8}$
- **B.** $7\frac{1}{8}$
- **C.** $7\frac{1}{3}$
- **D.** $17\frac{1}{2}$

Answer: A

Explanation:

$(\frac{1}{64})^0 + (64)^{-1/2} + (-32)^{4/5}$

$= 1 + (8^2)^{-1/2} + (-1 \times 32)^{4/5}$

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

$= 1 + \frac{1}{8} + [2^4] = 17\frac{1}{8}$

21. Simplify: $(\frac{256}{576})^{1/4} \times (\frac{64}{27})^{-1/3} \times (\frac{216}{8})^{-1}$

- **A.** $\frac{1}{\sqrt[3]{16}}$
- **B.** $\frac{1}{\sqrt[18]{6}}$
- **C.** $\frac{1}{\sqrt[2]{6}}$
- **D.** $\frac{1}{\sqrt[3]{7}}$

Answer: B

Explanation:

As 256 = 2^8; 576 = 24^2; 64 = 2^6; 27 = 3^3

$(\frac{256}{576})^{1/4} \times (\frac{64}{27})^{-1/3} \times (\frac{216}{8})^{-1}$

$(\frac{2^8}{24^2})^{1/4} \times (\frac{3^3}{2^6})^{-1/3} \times (\frac{8}{216})$

$= \frac{2^2}{\sqrt{24}} X \frac{3}{4} X \frac{1}{27} = \frac{1}{\sqrt[2]{6 X 9}} = \frac{1}{\sqrt[18]{6}}$

22. Simplify the following $(\frac{a^4b^6}{c^8})^3 \times (\frac{b^8c^4}{a^{-6}})^{-2} \times (\frac{c^6a^6}{b^4})^2$

- **A.** $\frac{a^{12}}{b^6.c^{20}}$
- **B.** $\frac{a^6}{b^6.c^{22}}$
- **C.** $\frac{a^7}{b^6.c^{20}}$
- **D.** None of these

Answer: A

Explanation:

$(\frac{a^4b^6}{c^8})^3 \times (\frac{b^8c^4}{a^{-6}})^{-2} \times (\frac{c^6a^6}{b^4})^2$

$= \frac{a^{4 X 3}b^{6 X 3}}{c^{8 X 3}}$

$X \frac{a^{4X(-2)}c^{4X(-2)}}{a^{-6X(-2)}}$

$X \frac{c^{6X2}a^{6X2}}{b^{4X2}}$

$= a^{12-12+12} \quad b^{18-16-8} \ c^{-8+12-24}$

$= \frac{a^{12}}{b^6.c^8}$

23. $(\frac{216}{1})^{-2/3} \div (\frac{27}{1})^{-4/3}$ =?

- **A.** $\frac{4}{9}$
- **B.** $\frac{9}{4}$
- **C.** $\frac{9}{2}$
- **D.** $\frac{3}{2}$

Answer: B

Explanation:

Putting x for (?), we get

$(\frac{216}{1})^{-2/3} \div (\frac{27}{1})^{-4/3} = x$

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

$= \frac{1}{36} \div \frac{1}{81} = \frac{1}{36} \times \frac{81}{1}$

$\Rightarrow x = \frac{81}{36} = \frac{9}{4}$

24. Given 2 = 1.414 and the value of 8 + 232 – 3128 + 450 is

- **A.** 8.484
- **B.** 8.526
- **C.** 8.426
- **D.** 8.876

Answer: A

Explanation:

$\sqrt{8} + \sqrt[2]{32} - \sqrt[3]{128} + \sqrt[4]{50}$

$= \sqrt[2]{2} + \sqrt[8]{2} - 3 \text{ X } \sqrt[8]{2+4} \text{ X} \sqrt[5]{2}$

$= (2 + 8 - 24 + 20)\sqrt{2}$

$= \sqrt[6]{2} = 6 \times 1.414 = 8.484$

25. The simplified value of $(\sqrt{3\ +\ 1})$ $(10 + \sqrt{12})(\sqrt{12} - 2)(5 - \sqrt{3})$ is

- **A.** 16
- **B.** 88
- **C.** 176
- **D.** 132

Answer: C

Explanation:

Expression = $(\sqrt{3\ +\ 1})$ $(10 + \sqrt{12})(\sqrt{12} - 2)(5 - \sqrt{3})$

= $(\sqrt{3\ +\ 1})(10 + \sqrt[2]{3})(\sqrt[2]{3-2})(5 - \sqrt{3})$

= (3 + 1) × 2(5 + 3) × 2(3 – 1)(5 – 3)

= $4(\sqrt{3\ +\ 1})(\sqrt{3-\ 1})(5 - \sqrt{3})(5 + \sqrt{3})$

= 4(3 – 1) (25 – 3)

[(a + b)(a – b) = a2 – b2]

= 4 × 2 × 22 = 176.

26. If $\sqrt{15}$ = 3.88, then what is the value of $\sqrt{\frac{5}{3}}$?

- **A.** 1.293
- **B.** 1.2934
- **C.** 1.29
- **D.** 1.295

Answer: A

Explanation:

Given,

$\sqrt{15}$ = 3.88

Now, $\sqrt{\frac{5}{3}} = \sqrt{\frac{5 \text{ X } 3}{3 \text{ x } 3}} = \sqrt{\frac{15}{3}}$

= $\frac{3.88}{3}$ = $1.29\bar{}3$ =

27. Simplify: $\frac{(6.25)^{1/2} \text{ x } (0.0144)^{1/2}+1}{(0.027)^{1/3} \text{ x } (81)^{1/4}}$

- **A.** 0.14
- **B.** 1.4
- **C.** 1
- **D.** 1.4

Answer: D

Explanation:

$\frac{(6.25)^{1/2} \text{ x } (0.0144)^{1/2} + 1}{(0.027)^{1/3} \text{ x } (81)^{1/4}}$

$= \frac{(2.5)^{2X(\frac{1}{2})} \text{ x } (0.144)^{2X(\frac{1}{2})} + 1}{(0.3)^{3X\,1/3} \text{ x } (3)^{4X(\frac{1}{4})}}$

$= \frac{2.5 \text{ x } 0,12+1}{(0.3) \text{ x } (3)} = \frac{0.3+1}{0.9}$

$= \frac{1.3}{0.9} = 1.4444 = 1.\bar{4}$

28. If $\sqrt{3}$ = 1.732 is given. then the value of

$\frac{2+\sqrt{3}}{2-\sqrt{3}}$ **=?**

- **A.** 11.732
- **B.** 13.928
- **C.** 12.928
- **D.** 13.925

Answer: B

Explanation:

Given expression = $\frac{2+\sqrt{3}}{2-\sqrt{3}}$

$= \frac{(2+\sqrt{3})(2+\sqrt{3})}{(2-\sqrt{3})(2+\sqrt{3})}$

[On rationalizing the denominator]

$= \frac{2+\sqrt{3}}{4-3} = (2 + 3)^2$

$= 2^2 + (\sqrt{3})^2 + 2 \times 2 \times \sqrt{3}$

$= 4 + 3 + \sqrt[4]{3}$

$= 7 + 4 \times 1.732$

$= 7 + 6.928 = 13.928$

29. $[\sqrt[3]{2} \times \sqrt{2} \times \sqrt[3]{3} \times \sqrt{3}]$ **is equals to**

- **A.** 6^5
- **B.** $5^{5/6}$
- **C.** 6
- **D.** None of these

Answer: B

Explanation:

$\sqrt[3]{2} \times \sqrt{2} \times \sqrt[3]{3} \times \sqrt{3} \times 3 = 2^{\frac{1}{3}} X\ 2^{\frac{1}{3}}\ X\ 3^{\frac{1}{3}}\ X\ 3^{\frac{1}{2}} = 2^{\frac{5}{6}}\ X\ 3^{\frac{5}{6}} = (6)^{\frac{5}{6}}$

30. $[8 - (\frac{\sqrt[9]{44\sqrt{22^2}}}{\sqrt[2]{2^{-2}}})^{1/2}]$ **is equals to:**

- **A.** 32
- **B.** 8
- **C.** 1
- **D.** 0

Answer: D

Explanation:

$[8 - (\frac{\sqrt[9]{44\sqrt{22^2}}}{\sqrt[2]{2^{-2}}})^{1/2}] = [8 - (\frac{(2)^{2x\frac{9}{4}} \times 2^{\frac{3}{2}}}{2x\ (2^{-2})^{\frac{1}{2}}})^{1/2}]$

$= [8 - (\frac{2^{\frac{9}{4}} \times 2^{\frac{3}{2}}}{2^1 \times 2^{-2}})^{1/2}] = [8 - (\frac{2^{\frac{9}{2}+\frac{3}{2}}}{2^{1-2}})^{1/2}]$

$= [8 - (2^6)^{1/2}] = [8 - 2^3]$

= 8 -8 = 0

31. Simplify $\frac{1}{\sqrt{100}-\sqrt{99}} - \frac{1}{\sqrt{99}-\sqrt{98}} + \frac{1}{\sqrt{98}-\sqrt{97}} - \frac{1}{\sqrt{97}-\sqrt{96}} + \cdots + \frac{1}{\sqrt{2}-\sqrt{1}}$

- **A.** 0
- **B.** 9
- **C.** 10
- **D.** 11

Answer: D

Explanation:

$\frac{1}{\sqrt{100}-\sqrt{99}} = \frac{\sqrt{100}+\sqrt{99}}{(\sqrt{100}-\sqrt{99})(\sqrt{100}+\sqrt{99})} = \sqrt{100} - \sqrt{99}$

∴ Expression = $\sqrt{100} + \sqrt{99}$ - $\sqrt{99}$ - $\sqrt{98}$ + $\sqrt{98}$ + $\sqrt{97}$........+ $\sqrt{2+1}$ = $\sqrt{100}$ + 1 = 10 + 1 = 11

32. Q6. Given that √5 = 2.24, then the value of is $\frac{\sqrt[3]{5}}{\sqrt[2]{5}-0.48}$

- **A.** 0.168
- **B.** 1.68
- **C.** 16.8
- **D.** 168

Answer: B

Explanation:

$\frac{\sqrt[3]{5}}{\sqrt[2]{5}-0.48} = \frac{3\ x\ 2.24}{2\ x\ 2.24\ -0.48} = \frac{6.72}{4.48\ -0.48} = \frac{6.72}{4}$ = 1.68

33. $\sqrt{8 - \sqrt[2]{15}}$ is equals to:

- **A.** √5 + √3
- **B.** 5 – √3
- **C.** √5-√3
- **D.** 3 – √5

Answer: C

Explanation:

$\sqrt{8 - \sqrt[2]{15}} = \sqrt{5 + 3 - \sqrt[2]{15}}$ x $\sqrt{3}$

= $\sqrt{(\sqrt{5})^2 + (\sqrt{3})\text{^}2 - \sqrt[2]{5}\ x\ (\sqrt{3})}$

= $\sqrt{(\ \sqrt{5}\ x\ \sqrt{3}} = \sqrt{5} - \sqrt{3}$

34. Among the numbers $\sqrt{3}$, $\sqrt[3]{9}$, $\sqrt[4]{16}$, $\sqrt[5]{32}$ the greatest one is:

- **A.** √2
- **B.** $\sqrt[3]{9}$
- **C.** $\sqrt[4]{16}$
- **D.** $\sqrt[5]{32}$

Answer: B

Explanation:

$(16)^{\frac{1}{4}} = (2^4)^{\frac{1}{4}} = 2;\ \sqrt[5]{32} = (32)^{\frac{1}{5}} = 2;\ \sqrt[3]{9} > \sqrt[2]{2} > 2$

35. $\frac{1}{3-\sqrt{3}} - \frac{1}{\sqrt{8}-\sqrt{3}} + \frac{1}{\sqrt{7}-\sqrt{6}} - \frac{1}{\sqrt{6}-\sqrt{5}} + \frac{1}{\sqrt{5}-2}$

- **A.** 5
- **B.** 4
- **C.** 3
- **D.** 2

Answer: A

Explanation:

Here, $\frac{1}{3-\sqrt{3}} = \frac{(3+\sqrt{8})}{(3-\sqrt{8})\,(3+\sqrt{8})} = \frac{3+\sqrt{8}}{9-8} = 3+\sqrt{8} = \frac{1}{\sqrt{8}-\sqrt{7}} = \frac{\sqrt{8}+\sqrt{7}}{(\sqrt{8}-\sqrt{7})\,(\sqrt{8}+\sqrt{7})} = \sqrt{8}+\sqrt{7}$ etc

$(3+\sqrt{8}) - (\sqrt{8}-\sqrt{7}) + (\sqrt{7}-\sqrt{6}) - (\sqrt{6}-\sqrt{5}) + (\sqrt{5}-\sqrt{2})$

$= 3+\sqrt{8} - \sqrt{8} - \sqrt{7} + \sqrt{7} + \sqrt{6} - \sqrt{6} - \sqrt{5} + \sqrt{5} + \sqrt{2} = 3 + 2 = 5$

36. If 2x = $\sqrt[3]{32}$, then x is equal to

- **A.** $\frac{5}{2}$
- **B.** $\frac{2}{5}$
- **C.** $\frac{3}{5}$
- **D.** $\frac{5}{3}$

Answer: D

Explanation:

$(32)^{\frac{1}{3}}$

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

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

$\Rightarrow x = \frac{5}{3}$

37. If 3^{x-y} = 27 and 3^{x+y} = 243, then find the value of x

- **A.** 1

B. 2
C. 3
D. 4

Answer: D

Explanation:

$$3^{x-y} = 27 = 3^3 <=> x - y = 3 \ldots \text{(i)}$$
$$3^{x+y} = 243 = 3^5 <=> x + y = 5 \ldots \text{(ii)}$$
$$\text{adding (i) and (ii)} => 2x = 8$$
$$=> x = 4$$

38. Find the value of $(10)^{150} \div (10)^{146}$

A. 10
B. 100
C. 1000
D. 10000

Answer: D

Explanation:

$\frac{(10)^{150}}{(10)^{146}} = 10^4 = 10000$

39. $6^m = 46656$, What is the value of 6^{m-2}

A. 7776
B. 7782
C. 1296
D. 1290

Answer: C

Explanation:

6^{m-2}

$= \frac{6^m}{6^2}$

$= \frac{46656}{36} = 1296$

40. Evaluate $256^{0.16}$ X $(256)^{0.16}$

A. 2
B. 4
C. 8
D. 16

Answer: B

Explanation:

$= 256^{0.16+0.09} = 256^{0.25} = 256^{\frac{25}{100}}$

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

41. If m and n are whole number such that m^n = 121, the value $(m - 1)^{n+1}$ is

A. 1
B. 10
C. 100
D. 1000

Answer: D

Explanation:

We know that $(11)^2 = 121$

So, putting value in said equation we get,

$(11- 1)^{2+1} = (10)^3 = 1000$

42. $(\frac{a}{b})^{x-2} = (\frac{a}{b})^{x-7}$ what value of x?

A. 1.5
B. 4.5
C. 7.5
D. 9.5

Answer: B

Explanation:

$$\left(\frac{a}{b}\right)^{x-2}=\left(\frac{b}{a}\right)^{x-7}$$

$$\Rightarrow\left(\frac{a}{b}\right)^{x-2}=\left(\frac{a}{b}\right)^{-(x-7)}$$

$$\Rightarrow x-2=-(x-7)$$

$$\Rightarrow x-2=-x+7$$

$$\Rightarrow x-2=-x+7$$

$$\Rightarrow 2x=9$$

$$\Rightarrow x=\frac{9}{2}=4.5$$

48. $(\mathbf{1000})^7 \div (10)^{18}$ **=?**

- **A.** 10
- **B.** 100
- **C.** 1000
- **D.** 10000

Answer: C

Explanation:

$$\frac{(10^3)^7}{(10)^{18}}$$

$\frac{(10)^{21}}{(10)^{18}}$ = 10^3= 1000

44. If = (8 + $\sqrt[3]{7}$), What is the value of ($\sqrt{x}-\frac{1}{\sqrt{x}}$)?

- **A.** $\sqrt{13}$
- **B.** $\sqrt{14}$
- **C.** $\sqrt{15}$
- **D.** $\sqrt{16}$

Answer: B

Explanation:

$$\left(\sqrt{x}-\frac{1}{\sqrt{x}}\right)^2$$

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

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

$$=(8+3\sqrt{7})+\frac{1}{(8+3\sqrt{7})}-2$$

$$=(8+3\sqrt{7})+\frac{(8-3\sqrt{7})}{(8+3\sqrt{7})\,(8-3\sqrt{7})}-2$$

$$=(8+3\sqrt{7})+\frac{(8-3\sqrt{7})}{8^2-(3\sqrt{7})^2}-2$$

$$=(8+3\sqrt{7})+\frac{(8-3\sqrt{7})}{64-63}-2$$

$$=(8+3\sqrt{7})+\frac{(8-3\sqrt{7})}{1}-2$$

$$=8+3\sqrt{7}+8-3\sqrt{7}-2$$

$$=14$$

$$\text{as }\left(\sqrt{x}-\frac{1}{\sqrt{x}}\right)^2=14$$

$$\text{so , }\left(\sqrt{x}-\frac{1}{\sqrt{x}}\right)=\sqrt{14}$$

45. $\frac{1}{1+a^{(n-m)}}+\frac{1}{1+a^{(m-n)}}=?$

- **A.** 1
- **B.** 2
- **C.** 3
- **D.** 4

Answer: A

Explanation:

$$= \frac{1}{(1+\frac{a^n}{a^m})} + \frac{1}{(1+\frac{a^m}{a^n})}$$
$$= \frac{a^m}{(a^m+a^n)} + \frac{a^n}{(a^m+a^n)}$$
$$= \frac{(a^m+a^n)}{(a^m+a^n)} = 1$$

46. x = 3 + $\sqrt[2]{2}$ then the value of ($\sqrt{x}$ - $\frac{1}{\sqrt{x}}$)

A. 1
B. 2
C. 3
D. 4

Answer: B

Explanation:

$(\sqrt{x} - \frac{1}{\sqrt{x}})^2 = x + \frac{1}{x} - 2$

(Now put the value of x to calculate the answer :)

47. If $5^{(a+b)}$ = 5 X 25 X 125, What is $(a + b)^2$

A. 25
B. 28
C. 36
D. 44

Answer: C

48. Value of $(256)^{54}$

A. 1012
B. 1024
C. 1048
D. 525

Answer: B

Explanation:

$$= (256)^{\frac{5}{4}} = (4^4)^{\frac{5}{4}} = 4^5 = 1024$$

49. By how much does $\sqrt[5]{7} - \sqrt[2]{5}$ exceed $\sqrt[3]{7} - \sqrt[4]{5}$

- **A.** $5(\sqrt{7} + \sqrt{5})$
- **B.** $\sqrt{7} + \sqrt{5}$
- **C.** $2(\sqrt{7} + \sqrt{5})$
- **D.** $7(\sqrt{7} + \sqrt{5})$

Answer: A

Explanation:

$5\sqrt{7} - 2\sqrt{5} - 3\sqrt{7} + 4\sqrt{5} = 2\sqrt{7} + 2\sqrt{5} = 2(\sqrt{7} + \sqrt{5})$

50. The rationalizing factor of $\sqrt[3]{3}$

- **A.** $\frac{1}{3}$
- **B.** 3
- **C.** -3
- **D.** $\sqrt{3}$

Answer: D

Explanation:

$\sqrt[3]{3} \times \sqrt[3]{3} = 3 \times 3$

∴ required rationalizing factor

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