5. RATIONALISATION OF SURDS.

2025/26

class: XII Mathematics

FOUNDATION SOLUTIONS

TEACHING TASK

JEE MAINS LEVEL

01. Given $(5+\sqrt{3})K$.

option verification.

opt: A: Let $K = 5-\sqrt{3}$

$\therefore (5+\sqrt{3})(5-\sqrt{3}) = 25-3 = 12$, a rational No.

Ans: A

02 $\sqrt{19-4\sqrt{x}} = \sqrt{12}-\sqrt{7}$

S.O.B.S

$19-4\sqrt{x} = 12+7-2\sqrt{12\times 7}$

$\Rightarrow 19-4\sqrt{x} = 19-2\sqrt{84}$

$\Rightarrow -4\sqrt{x} = -2\sqrt{84}$

$\Rightarrow 2\sqrt{x} = \sqrt{84}$

$\Rightarrow 4x = 84 \Rightarrow x = 21$

Ans. C

03 option verification Technique.

option D). $(3+\sqrt{5})^2 = 9+5+2\cdot 3\cdot\sqrt{5}$

$= 14+6\sqrt{5}$

Ans. D

04 $\frac{10}{\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}} = 5\sqrt{2}$

$= 5 \times 1.414 = 7.070 = 7.07$ Ans D

05 $A+B = \frac{3\sqrt{2}-2}{3\sqrt{2}+2} + \frac{3\sqrt{2}+2}{3\sqrt{2}-2}$

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

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

$= \frac{2[18+4]}{18-4} = \frac{2 \times 22}{14} = \frac{22}{07}$ Ans. D

06 $\frac{1}{(\sqrt{5}-\sqrt{3})-1} \times \frac{(\sqrt{5}-\sqrt{3})+1}{(\sqrt{5}-\sqrt{3})+1}$

$= \frac{\sqrt{5}-\sqrt{3}+1}{(\sqrt{5}-\sqrt{3})^2-(1)^2} = \frac{\sqrt{5}-\sqrt{3}+1}{8-2\sqrt{15}-1} = \frac{\sqrt{5}-\sqrt{3}+1}{7-2\sqrt{15}}$

$= \frac{(\sqrt{5}-\sqrt{3}+1)}{(7-2\sqrt{15})} \times \frac{(7+2\sqrt{15})}{(7+2\sqrt{15})}$

$= \frac{7\sqrt{5}+2\sqrt{75}-7\sqrt{3}-2\sqrt{45}+7+2\sqrt{15}}{49-60}$

$= \frac{7\sqrt{5}+10\sqrt{3}-7\sqrt{3}-6\sqrt{5}+7+2\sqrt{15}}{-11}$

$= \frac{-1}{11}(7+3\sqrt{3}+\sqrt{5}+2\sqrt{15})$ Ans. B

07. $\frac{1+\sqrt{2}}{\sqrt{5}+\sqrt{3}} + \frac{1-\sqrt{2}}{\sqrt{5}-\sqrt{3}}$

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

$= \frac{\sqrt{5} - \sqrt{3} + \sqrt{10} - \sqrt{6} + \sqrt{5} + \sqrt{3} - \sqrt{10} - \sqrt{6}}{5-3}$

$= \frac{2\sqrt{5} - 2\sqrt{6}}{2} = \sqrt{5} - \sqrt{6}$

$= 2.236 - 2.449$

$= -0.213$ Ans. B

08. $\frac{\sqrt{5}+\sqrt{3}}{2\sqrt{5}-3\sqrt{3}} \times \frac{2\sqrt{5}+3\sqrt{3}}{2\sqrt{5}+3\sqrt{3}}$

$= \frac{10 + 3\sqrt{15} + 2\sqrt{15} + 9}{20 - 27}$

$= \frac{19 + 5\sqrt{15}}{-7} = \frac{-19}{7} - \frac{5}{7}\sqrt{15} = a - b\sqrt{15}$

$\therefore a = \frac{-19}{7}$ and $b = \frac{5}{7}$

Ans.

09. $\frac{5+2\sqrt{3}}{7+7\sqrt{3}} = \frac{5+2\sqrt{3}}{7(1+\sqrt{3})} \times \frac{\sqrt{3}-1}{\sqrt{3}-1}$

$= \frac{5\sqrt{3} - 5 + 6 - 2\sqrt{3}}{7(3-1)} = \frac{1 + 3\sqrt{3}}{14}$

$= \frac{1}{14} + \frac{3}{14}\sqrt{3}$

$a = \frac{1}{14}$, $b = \frac{3}{14}$ | $(a+b)^2 = \left(\frac{2}{7}\right)^2 = \frac{4}{49}$

Ans.

10. $x = \dfrac{5+\sqrt{6}}{5-\sqrt{6}}$, $y = \dfrac{5-\sqrt{6}}{5+\sqrt{6}}$

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

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

$$= \frac{2\left[5^2+(\sqrt{6})^2\right]}{19} = \frac{62}{19}$$

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

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

$$= \frac{4\cdot 5\cdot\sqrt{6}}{19} = \frac{20\sqrt{6}}{19}$$

Now $\dfrac{x+y}{x-y} = \dfrac{62}{20\sqrt{6}} = \dfrac{31\sqrt{6}}{60}$

Ans: D

JEE ADVANCED LEVEL

01. $\sqrt[3]{2} - \sqrt[3]{3}$

$= \left(2^{\frac{1}{3}} - 3^{\frac{1}{3}}\right)\left(2^{\frac{2}{3}} + 2^{\frac{1}{3}}\cdot 3^{\frac{1}{3}} + 3^{\frac{2}{3}}\right)$

$= \left(2^{\frac{1}{3}}\right)^3 - \left(3^{\frac{1}{3}}\right)^3 = 2-3 = -1$ a Rational Number

$\therefore$ R.F $= 2^{\frac{2}{3}} + \sqrt[3]{6} + 3^{\frac{2}{3}}$

Ans. A

02 $\left(\sqrt{l^3} - \sqrt{m^5}\right)\left(\sqrt{l^3} + \sqrt{m^5}\right)$ (5)

$= l^3 - m^5$, a rational Number

R.F $= \sqrt{l^3} + \sqrt{m^5}$ Ans: D

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03 Statement I: $\frac{\sqrt[6]{2}}{\sqrt{3} \times \sqrt[3]{2}} = \frac{\sqrt[6]{2}}{\sqrt[6]{3^3} \cdot \sqrt[6]{2^2}}$

$= \sqrt[6]{\frac{2}{3^3 \times 2^2}} = \sqrt[6]{\frac{1}{54}}$

$\neq \sqrt[3]{\frac{1}{3}}$ (False)

Statement II: Mathematically (False) Ans: B

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04. Statement I:

We know $(a+b+c)(a^2+b^2+c^2-ab-bc-ca)$

$= a^3+b^3+c^3-3abc$

Now,

$\left(a^{\frac{1}{3}} + b^{\frac{1}{3}} + c^{\frac{1}{3}}\right)\left(a^{\frac{2}{3}} + b^{\frac{2}{3}} + c^{\frac{2}{3}} - a^{\frac{1}{3}}.b^{\frac{1}{3}} - b^{\frac{1}{3}}.c^{\frac{1}{3}} - c^{\frac{1}{3}}.a^{\frac{1}{3}}\right)$

$= \left(\frac{1}{a}\right)^3 + \left(b^{\frac{1}{3}}\right)^3 + \left(c^{\frac{1}{3}}\right)^3 - 3a^{\frac{1}{3}}.b^{\frac{1}{3}}.c^{\frac{1}{3}}$

$= a+b+c-3(abc)^{1/3}$ which is not a rational No (False)

Statement II: Conceptual (False) Ans. B

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05 Assertion: Conceptual (true)

Reason: Conceptual (true)

Ans. A

06 Assertion: Conceptual (true)

Reason: Conceptual (true)

Ans. A

07 $$\frac{\sqrt[6]{12}}{\sqrt{3}\times\sqrt[3]{2}} \neq \frac{\sqrt[6]{12}}{\sqrt[6]{3^3}\times\sqrt[6]{2^2}} = \frac{\sqrt[6]{12}}{\sqrt[6]{27\times4}}$$

$$= \sqrt[6]{\frac{12}{27\times4}} = \sqrt[6]{\frac{3}{27}} = \sqrt[6]{\frac{1}{9}}$$

$$= \left(\frac{1}{3^2}\right)^{\frac{1}{6}} = \frac{1}{3^{1/3}} = \frac{1}{\sqrt[3]{3}}$$

Ans: C

08 $$\frac{\sqrt[12]{a^3\cdot b^4}\cdot\sqrt[14]{a^2\cdot b^3}}{\sqrt[15]{ab}} = \frac{a^{\frac{1}{4}}\cdot b^{\frac{1}{3}}\cdot a^{\frac{1}{7}}\cdot b^{\frac{3}{14}}}{a^{\frac{1}{15}}\cdot b^{1/15}}$$

$$= a^{\frac{1}{4}+\frac{1}{7}-\frac{1}{15}}\cdot b^{\frac{1}{3}+\frac{3}{14}-\frac{1}{15}}$$

$$= a^{\frac{127}{420}}\cdot b^{\frac{101}{210}}$$

Ans: ——

09. $\sqrt{9^3}\times\sqrt{9^4} = \sqrt{9^7} = 9$, a rational no.

$\therefore$ R.F. $= \sqrt{9^4}$

Ans: C

10 $\sqrt[11]{12^7\times5^{10}} = \sqrt[11]{12^7\times5^{10}}\times\sqrt[11]{12^4\cdot5^1}$

$\therefore$ The R.F $= \sqrt[11]{12^4\cdot5^1}$

Ans: D

11. $\sqrt[15]{23^{11} \times 2^{10} \times 5^{15} \times}$.

$\sqrt[15]{23^{11} \times 2^{10} \times 5^{15}} \times \sqrt[15]{23^{4} \times 2^{5} \times 5^{2}}$

$\therefore$ The R.F $= \sqrt[15]{23^{4} \times 2^{5} \times 5^{2}}$ Ans: A

12 $\sqrt{2} + \sqrt{3} = 1.414 + 1.732 = 3.146$

$\therefore$ Integral part = 3 Ans: 3

13 $\sqrt[7]{2^{2} \times 2^{4} \times 2^{8}} = \sqrt[7]{2^{14}} = 2^{2} = 4$

Ans. 4

14 a) $\frac{5}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = \frac{5\sqrt{3}}{3}$ (s)

b) $\frac{7}{2\sqrt{13}} \times \frac{\sqrt{13}}{\sqrt{13}} = \frac{7\sqrt{13}}{26}$ (t)

c) $\frac{5 \cdot \sqrt[5]{3}}{\sqrt[5]{45}} = 5 \cdot \sqrt[5]{\frac{3}{45}} =$

$= \sqrt[5]{\frac{5^{5} \times 3}{45}} = \sqrt[5]{\frac{625}{3}}$ (r)

d) $\frac{3\sqrt{5}}{\sqrt{11}} \times \frac{\sqrt{11}}{\sqrt{11}} = \frac{5\sqrt{55}}{11}$ (q) Ans: s, t, r, q

15 a) $\frac{1}{x} = \frac{1}{2+\sqrt{3}} \times \frac{2-\sqrt{3}}{2-\sqrt{3}} = 2-\sqrt{3}$

$x + \frac{1}{x} = 2 + \sqrt{3} + 2 - \sqrt{3} = 4$ (r, t)

b) $\frac{1}{x} = \frac{1}{\sqrt{5}+2} \times \frac{\sqrt{5}-2}{\sqrt{5}-2} = \sqrt{5}-2$

$x - \frac{1}{x} = (2+\sqrt{5}) - (\sqrt{5}-2) = 4$ (rational)

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

$x + \frac{1}{x} = (5+2\sqrt{6}) + (5-2\sqrt{6}) = 10$

d) $\frac{1}{x} = \frac{1}{6-\sqrt{35}} \times \frac{6+\sqrt{35}}{6+\sqrt{35}} = 6+\sqrt{35}$

$\therefore x + \frac{1}{x} = 12$

$x^3 + \frac{1}{x^3} = \left(x+\frac{1}{x}\right)^3 - 3 \cdot x \cdot \frac{1}{x}\left(x+\frac{1}{x}\right)$

$= (12)^3 - 3(12)$

$= 1692$ (q)

Ans: (r, t), (s, t), —, q

LEARNERS TASK

CONCEPTUAL UNDERSTANDING QUESTIONS (CUQs)

01. $\sqrt{2}$ — Ans: A

02. $\sqrt{3}, 2\sqrt{3}, 3\sqrt{3}$ — Ans: D

03. $\sqrt[3]{4} \times \sqrt[3]{4^2} = \sqrt[3]{4^3} = 4$, a rational No: B

04. $\sqrt{5}+\sqrt{6}$ — Ans: C

05. $4+\sqrt{5}$ — Ans: C

06. $\sqrt[n]{a^x} \cdot \sqrt[n]{a^{n-x}} = \sqrt[n]{a^n} = a$, a rational No. Ans: C

07. R.F. of $\sqrt[5]{5} = \sqrt[5]{5^4} = \sqrt[5]{625}$

R.F. of $\sqrt[5]{25} = \sqrt[5]{5^3} = \sqrt[5]{125}$ — Ans: D

8 $\sqrt[p+q]{a} \times \sqrt[p+q]{a^{(p+q)-1}} = a$, a rational no.

$\Downarrow$

$a^{\frac{p+q-1}{p+q}} = a^{1-\frac{1}{p+q}}$ ✓

Ans: C

09. $\sqrt[m]{a^n} \times \sqrt[m]{a^{m-n}} = \sqrt[m]{a^m} = a$, a rational no.

$\Downarrow$

$a^{\frac{m-n}{m}}$

Ans. A

10 $\sqrt[3]{25} = \sqrt[3]{5^2} \times \sqrt[3]{5} = \sqrt[3]{5^3} = 5$, a rational no

$\therefore R \cdot F = \sqrt[3]{5}$

Ans: C

JEE MAINS LEVEL

01. $4\sqrt{3} \times 2\sqrt{3} = 24$, a rational no. Ans: C

02 $\frac{\sqrt[3]{4} \times \sqrt[3]{8}}{\sqrt{4}} = \frac{\sqrt[3]{4 \times 8}}{2} = \frac{\sqrt[3]{32}}{2}$

$= \frac{\sqrt[3]{2^3 \times 2^2}}{2} = \frac{2\sqrt[3]{4}}{2} = \sqrt[3]{4}$

Ans. B

03 Conceptual

Ans: D

04 $\sqrt[3]{6^2} \times \sqrt[3]{6} = \sqrt[3]{6^3} = 6$, a rational no

$\therefore R \cdot F = \sqrt[3]{6}$

Ans: C

05 $\frac{\sqrt{28}}{3\sqrt{7}} = \frac{1}{3}\sqrt{\frac{28}{7}} = \frac{\sqrt{4}}{3} = \frac{2}{3}$ Ans. A

06 $\sqrt[3]{192} = \sqrt[3]{2^6 \times 3} = 2^2 \times \sqrt[3]{3} = 4\sqrt[3]{3}$

R.F is $\sqrt[3]{3^2} = \sqrt[3]{9}$ Ans: C

07. $\frac{1}{\sqrt{5}} \times \frac{\sqrt{5}}{\sqrt{5}} = \frac{\sqrt{5}}{5} = \frac{2.2360}{5} = 0.4472$ Ans: B

08 Conceptual Ans. C

09 Conceptual Ans. C

10 R.F. of $\sqrt[3]{5} = \sqrt[3]{5^2} = \sqrt[3]{25}$

R.F. of $\sqrt[5]{2^3} = \sqrt[5]{2^2} = \sqrt[5]{4}$

Now, $\sqrt[3]{25} \times \sqrt[5]{4}$

$= \sqrt[15]{25^5} \times \sqrt[15]{4^3}$

$= \sqrt[15]{5^{10} \times 2^6}$ Ans. B

JEE ADVANCED

01. All $2\sqrt{6}$, $-3\sqrt{6}$, $4\sqrt{6}$ are R.F of $\sqrt{6}$ Ans: A, B, C

02 $\sqrt[6]{1331}$ R.F is $\sqrt[6]{(1331)^5}$ Ans. D

03 $\left(x^3 - \sqrt[3]{y}\right)\left((x^3)^2 + x^3 \cdot \sqrt[3]{3} + (\sqrt[3]{y})^3\right)$

$= (x^3)^3 - (\sqrt[3]{y})^3 = x^9 - y$

(True)

Statement II:

R.F. of $\sqrt{3}-\sqrt{2} = \sqrt{3}+\sqrt{2}$

R.F. of $\sqrt{7}+\sqrt{5} = \sqrt{7}-\sqrt{5}$

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

Ans. A

04 Statement I:

$\sqrt[9]{10^2 \times} \sqrt[9]{10^7} = \sqrt[9]{10^9} = 10$, a rational no. (True)

Statement II:

$\sqrt[m]{a^n} \times \sqrt[m]{a^{m-n}} = \sqrt[m]{a^m} = a$, rational no (True)

Ans. A

05 Assertion: Conceptual (True)

Reason: Conceptual (True)

Ans. A

06 Assertion: Conceptual (~~False~~ True): Reason: False

Ans: C

07 $\sqrt{2+\sqrt[3]{6}} = \sqrt{x}+\sqrt{y}$

S.O.B.S

$2+\sqrt[3]{6} = x+y+2\sqrt{xy}$

$x+y = 2$ and $2\sqrt{xy} = \sqrt[3]{6}$

$\Rightarrow 4xy = 6$

$\Rightarrow 2xy = 3$

options: A, B, C does not satisfies the above equations

∴ Ans. D

08 $\sqrt{7+2\sqrt{12}} = \sqrt{l} + \sqrt{m}$

S.O.B.S

$7+2\sqrt{12} = l+m+2\sqrt{lm}$

$\therefore l+m=7$

$lm=12$

Clearly: $l=3, m=4$ (or)

$l=4, m=3$

Ans. D

09 $\sqrt{225+\sqrt{117}}$

$= 15 + 3\sqrt{13}$

Conjugat surd $= 15 - 3\sqrt{3}$

Ans: B

10 A) $\sqrt{7}+\sqrt{2}$, $\sqrt{2}-\sqrt{7}$ are not conjugate surds

Since, Sum $= (\sqrt{7}+\sqrt{2}) + (\sqrt{2}-\sqrt{7}) = 2\sqrt{2}$, not a rational

product $= (\sqrt{7}+\sqrt{2})(\sqrt{2}-\sqrt{7})$

$= 2-7 = -5$, a rational number

(B) Similarly B) $\sqrt{10}-\sqrt{11}$, $\sqrt{11}-\sqrt{10}$

D) $\sqrt{13}+\sqrt{11}$, $\sqrt{11}-\sqrt{13}$

Ans: A, B, D

11. $\frac{10}{\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}} = 5\sqrt{2} = 5 \times 1.414 = 7.070$

Integral part $= 7$

Ans. 7

12 $x+y = (5+2\sqrt{6})+(5-2\sqrt{6}) = 10$

$x-y = (5+2\sqrt{6})-(5-2\sqrt{6}) = 4\sqrt{6}$

$\therefore (x+y)^2 + (x-y)^2 = (10)^2 + (4\sqrt{6})^2$

$= 100 + 96$

$= 196$

$\therefore \sqrt{(x+y)^2+(x-y)^2} = \sqrt{196} = 14$ Ans: 14

13 a) $\sqrt{75}+\sqrt{72}$

$= 5\sqrt{3}+6\sqrt{2}$

R.F is $5\sqrt{3}-6\sqrt{2}$ ( )

b) $\sqrt{98}-\sqrt{50}$

$= 7\sqrt{2}-5\sqrt{2} = 2\sqrt{2}$

R.F is ~~$7\sqrt{2}+5\sqrt{2}$~~ $5\sqrt{2}$ (t)

c) $\sqrt{192}-\sqrt{162}$

$= 8\sqrt{3}-9\sqrt{2}$

R.F is $8\sqrt{3}+9\sqrt{2}$ (p)

d) $\sqrt{175}-\sqrt{245}$

$= 5\sqrt{7}-7\sqrt{5}$

R.F. is $5\sqrt{7}+7\sqrt{5}$ (q)

Ans: —, t, p, q

14 a) $\sqrt{8} \times \sqrt{2} = \sqrt{16} = 4$ (s)

b) $\sqrt[3]{2 \times 2 \times 2} = \sqrt[3]{8} = 2 \sqrt[3]{8}$ (t)

c) $\frac{\sqrt[4]{2}}{\sqrt[8]{4}} = \frac{\sqrt[8]{4}}{\sqrt[8]{4}} = 1$ (q)

d) $\frac{3-3}{\sqrt{4} \times \sqrt{2}} = 0$ (p)

Ans: s, t, q, p

ADDITIONAL PRACTICE QUESTIONS

01 $A \times B = \frac{1}{\sqrt{5}-\sqrt{3}} \times \frac{1}{\sqrt{5}+\sqrt{3}} = \frac{1}{5-3} = \frac{1}{2}$ Ans. D

02 $A = \frac{5+2\sqrt{2}}{3-2\sqrt{2}} \times \frac{3+2\sqrt{2}}{3+2\sqrt{2}}$

$= \frac{15 + 10\sqrt{2} + 6\sqrt{2} + 8}{9-8}$

$= 23 + 16\sqrt{2}$ Ans. D

03 $\sqrt{75} + \sqrt{32}$

$= 5\sqrt{3} + 4\sqrt{2}$

R.F is $5\sqrt{3} - 4\sqrt{2}$ Ans: C

04 $\frac{1+\sqrt{2}}{\sqrt{5}+\sqrt{3}} + \frac{1-\sqrt{2}}{\sqrt{5}-\sqrt{3}}$

$= \frac{\sqrt{5} - \sqrt{3} + \sqrt{10} - \sqrt{6} + \sqrt{5} - \sqrt{10} + \sqrt{3} - \sqrt{6}}{(\sqrt{5}+\sqrt{3})(\sqrt{5}-\sqrt{3})}$

$= \frac{2(\sqrt{5}-\sqrt{6})}{5-6} = \sqrt{5}-\sqrt{6}$

$= 2.236 - 2.449$

$= -0.213$

Ans. B

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05 $\frac{7+3\sqrt{5}}{3+\sqrt{5}} + \frac{7-3\sqrt{5}}{3-\sqrt{5}}$

$= \frac{21 - 7\sqrt{5} + 9\sqrt{5} - 15 + 21 - 9\sqrt{5} + 7\sqrt{5} - 15}{(3+\sqrt{5})(3-\sqrt{5})}$

$= \frac{12}{9-5} = \frac{12}{4} = 3$

Ans. D

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06. $\frac{1}{\sqrt{3}-\sqrt{2}} \times \frac{\sqrt{3}+\sqrt{2}}{\sqrt{3}+\sqrt{2}} = \sqrt{3}+\sqrt{2} = 1.732 + 1.414$

$= 3.146$ Ans B

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07 $\frac{1}{x} = \frac{2}{5-\sqrt{21}} \times \frac{5+\sqrt{21}}{5+\sqrt{21}}$

$= \frac{2(5+\sqrt{21})}{4} = \frac{5+\sqrt{21}}{2}$

$x^2 + \frac{1}{x^2} = \left(x + \frac{1}{x}\right)^2 - 2 \cdot x \cdot \frac{1}{x}$

$= \left(\frac{5-\sqrt{21}}{2} + \frac{5+\sqrt{21}}{2}\right)^2 - 2$

$= (5)^2 - 2$

$= 23$

Ans. C

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08 $(1-\sqrt{5}^2)(1+\sqrt{5}^2) = 1-52 = -51$ Ans. A

(16)

09 $$\frac{4}{3\sqrt{3}-2\sqrt{2}} + \frac{3}{3\sqrt{3}+2\sqrt{2}}$$

$$= \frac{12\sqrt{3}+8\sqrt{2}+9\sqrt{3}-6\sqrt{2}}{27-8}$$

$$= \frac{21\sqrt{3}+2\sqrt{2}}{19}$$

$$= \frac{21(1.732)+2(1.414)}{19}$$

$$= \frac{36.372+2.828}{19} = \frac{39.2}{19} = 2.0631$$ Ans. A

10. $$x = \frac{\sqrt{5}+\sqrt{3}}{\sqrt{5}-\sqrt{3}} \times \frac{\sqrt{5}+\sqrt{3}}{\sqrt{5}+\sqrt{3}}$$

$$= \frac{5+3+2\sqrt{10}}{2} = 4+\sqrt{10}$$

$$\frac{1}{x} = \frac{1}{4+\sqrt{10}} \times \frac{4-\sqrt{10}}{4-\sqrt{10}} = \frac{4-\sqrt{10}}{6}$$

Now $x^2 + \frac{1}{x^2} = \left(x+\frac{1}{x}\right)^2 - 2 \cdot x \cdot \frac{1}{x}$

$$= \left(4+\sqrt{10}+\frac{4-\sqrt{10}}{6}\right)^2 - 2$$

=

10 $x^2+\frac{1}{x^2}=\left(x+\frac{1}{x}\right)^2-2\cdot x\cdot\frac{1}{x}$

$=\left(\frac{\sqrt{5}+\sqrt{3}}{\sqrt{5}-\sqrt{3}}+\frac{\sqrt{5}-\sqrt{3}}{\sqrt{5}+\sqrt{3}}\right)^2-2$

$=\left(\frac{(\sqrt{5}+\sqrt{3})^2+(\sqrt{5}-\sqrt{3})^2}{2}\right)^2-2$

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

$=64-2$

$=62$

Ans: A

11 $\frac{\sqrt{2}-1}{\sqrt{2}+1}\times\frac{\sqrt{2}-1}{\sqrt{2}-1}=\frac{2+1-2\sqrt{2}}{1}=3-2\sqrt{2}$

$\therefore 3-2\sqrt{2}=a+b\sqrt{2} \Rightarrow a=3,\ b=-2$

Ans: B

12 $\frac{\sqrt[3]{2}\times\sqrt[6]{6}}{\sqrt[6]{3}\times\sqrt[6]{8}}=\frac{\sqrt[6]{4}\times\sqrt[6]{6}}{\sqrt[6]{3}\times\sqrt[6]{8}}$

$=\sqrt[6]{\frac{4\times6}{3\times8}}=\sqrt[6]{1}=1$

Ans. B

13 $(a+\sqrt{b})(a-\sqrt{b})=c+\sqrt{d}$

$a^2-b=c+\sqrt{d} \Rightarrow d=0$

Ans. D

14. $\sqrt{3+\sqrt{2}} = \sqrt{c}+\sqrt{d}$

S.O.B.S

$\Rightarrow 3+\sqrt{2} = c+d+2\sqrt{cd}$

$\therefore c+d=3 \Rightarrow (c+d)^2 = 9$

Ans: A

15 $\sqrt[3]{2} \times \sqrt[3]{4} = \sqrt[3]{8} = \sqrt[3]{2^3} = 2$

$\sqrt[3]{2} \times \sqrt[3]{256} = \sqrt[3]{2 \times 256} = \sqrt[3]{2^9} = 2^3 = 8$

Ans. A, D

16 $\sqrt{a}-\sqrt{b}$

Ans: A

17 $\frac{\sqrt{3}+\sqrt{2}}{\sqrt{3}-\sqrt{2}} = a+x\cdot\sqrt{d}$

$\therefore x = \frac{2}{a-b} = \frac{2}{3-2} = \frac{2}{1} = 2$

Ans: A

18 $\frac{\sqrt{5}+\sqrt{6}}{\sqrt{5}-\sqrt{6}} = c+y\sqrt{d}$

$c = \frac{a+b}{a-b} = \frac{5+6}{5-6} = -11$

$d = ab = 5\times 6 = 30$

Ans: A

19 $\Rightarrow$ THE END $\in$