2. SQUARE, SQUARE ROOTS AND CUBE, CUBE ROOTS

2025/26

Class: VIII Mathematics

FOUNDATION: SOLUTIONS

2025-26

TEACHING TASK
JEE MAINS

01. We have $32 = 2^5$

To make it a perfect square we have to multiply it by 2 since

$2^5 \times 2 = 2^6 \quad \therefore \sqrt{2^6} = 2^3 = 8$

Ans: B

02. $28\sqrt{x} + 1426 = \frac{3}{4} \times 2872$

$28\sqrt{x} + 1426 = 2154$

$\Rightarrow 28\sqrt{x} = 728$

$\Rightarrow \sqrt{x} = 26$

$\Rightarrow x = 676$

Ans: B

03 We have $4320 = 2^3 \times 3^3 \times 2^2 \times 5$

clearly, to make it a perfect cube we have to multiply with $2 \times 5^2 = 2 \times 25 = 50$

Ans: C

04. option verification.

take 29.

$$3\overline{)29}\,(9$$
$$\underline{27}$$
$$2$$

Quotient = $\frac{4}{3}$ × Divisor

$= \frac{4}{3} \times 3 = 4.$

Remainder = 17.

∴ Ans: 29

05. $\sqrt{1^3+2^3+3^3+\cdots+10^3}$

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

$= \sqrt{\left[\frac{10(10+1)}{2}\right]^2} = \frac{10\times 11}{2} = 55$

Ans: B

06. Let $\sqrt[3]{x} = a$

$\Rightarrow a + \frac{48}{a} = 16$

$\Rightarrow a^2 + 48 = 16a$

$\Rightarrow a^2 - 16a + 48 = 0$

$\Rightarrow (a-4)(a-12) = 0$

$\Rightarrow a = 4$ or $a = 12$

$\sqrt[3]{x} = 4$ | $\sqrt[3]{x} = 12$

$x = 4^3$ | $x = 12^3$

$x = 64$ | $x = 1728$

Ans: D

07. $\sqrt[3]{1+3+5+7+\cdots 53}$

$a + (n-1)d = 53$

$\Rightarrow 1 + (n-1)\times 2 = 53$

$\Rightarrow n = 27$

$\therefore \sqrt[3]{(27)^2}$

$= (27)^{\frac{2}{3}}$

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

$= 3^2$

$= 9$

Ans: D

08. $a^b = 512$

clearly, we have $8^3 = 512$

$a = 8, \quad b = 3$

Now $\sqrt[b]{a} = \sqrt[3]{8} = \left(2^3\right)^{\frac{1}{3}} = 2$

Ans: 2

09. $\sqrt[3]{5832} = 18$

Ans: A

10. $5832 = 18^3, \quad 512 = 8^3$

Ans: A, C

JEE ADVANCED

01. $\left(5 - \sqrt{y^2-25}\right)^2 = 25 + y^2 - 25 - 10\sqrt{y^2-25}$

$= y^2 - 10\sqrt{y^2-25}$

$= y^2 - \sqrt{(10y)^2 - 50^2}$

Ans: C, D

02. $\sqrt[3]{0.125} + \sqrt[3]{0.729}$

$= 0.5 + 0.9$

$= 1.4$

$\sqrt{\frac{49}{25}} = \frac{7}{5} = 1.4$

Ans: A, B

03 Statement I: $1^2 + 2^2 + 3^2 = 1 + 4 + 9 = 14$ (True)

Statement II: $3n^2 + 2 = 3(3)^2 + 2 =$

03. Statement I: $1^2+2^2+3^2 = 1+4+9 = 14$. (True) (4)

Statement II: Let three consecutive integers be

$n-1,\ n,\ n+1$

Now $(n-1)^2 + n^2 + (n+1)^2$

$= n^2 - 2n + 1 + n^2 + 2n + 1$

$= 3n^2 + 2$ (True)

Ans: A

04. Statement I: $64 = 4^3$ (True)

Statement II: $\sqrt[3]{64} = \sqrt[3]{4^3} = 4$. (False)

Ans: C

05. Assertion: $\sqrt{49} = 7$ (True)

Reason: Conceptual (True)

Ans: A

06. Assertion: Conceptual (True)

Reason: Conceptual (True)

Ans: A

07. option Verification:

$1752 + 12 = 1764$

$\therefore \sqrt{1764} = 42$

Ans: C

08. Option Verification

$1300 - 4 = 1296$

$\therefore \sqrt{1296} = 36$

Ans: B

09. option verification

~~882 × 4 = 3528~~

882 × 2 = 1764

$\therefore \sqrt{1764} = 42$

Ans : C

10. A) $27 = 3^3$, B) $64 = 4^3$ Ans : A, B

11. $\sqrt[3]{64} = \sqrt[3]{4^3} = 4$. Ans : B

12. A) $1^3 = 1$, $1^2 = 1$

B) ~~$2^6 = 64$~~ $\sqrt{64} = 8 \rightarrow$ perfect square

$\sqrt[3]{64} = 4 \rightarrow$ perfect cube

C) $\sqrt{729} = 27 \rightarrow$ perfect square

$\sqrt[3]{729} = 9 \rightarrow$ perfect cube

Ans : A, B, C

13. a, a+2, a+4

let a = 3, 3, 5, 7 → prime numbers

only one possibility Ans : 1

14. two digit perfect cubes

27, 64. Sum = 27 + 64 = 91. Ans : 91

15 a) $11^2 = 121$

b) $111^2 = 12321$

c) $1111^2 = 1234321$

d) $15^2 = 225$

Ans: p, q, r, t

16 a) prime factorisation

$2025 = 3^5 \times 5$

b) Repeated subtraction → 49.

c) Long Division method → 2.25

d) Estimation → 2.

Ans: q, p, s, r

LEARNER'S TASK

CUQ'S

01. 91 is not a perfect square since

$91 = 1, 7, 13, 19$ Ans: C

02. Twin prime pair = (29, 31) Ans: C

03. $\sqrt[3]{-8} = \sqrt[3]{(-2)^3} = -2$ Ans: A

04. clearly 343 is not a perfect cube Ans: A

05. $\sqrt[3]{(-343)} = \sqrt[3]{(-7)^3} = -7$ Ans: C

06. $32 \times 2 = 64$

$\therefore \sqrt{64} = 8$

Ans : C

07. $\sqrt[3]{1331} = \sqrt[3]{(11)^3} = 11$

Ans : B

08. $(1+2+3+\cdots 10)^2 = (55)^2 = 3025$ Ans : A

09. $\sqrt[3]{2} \times \sqrt[3]{3} \times \sqrt[3]{36}$

$= \sqrt[3]{2 \times 3 \times 36} = \sqrt[3]{6^3} = 6$

Ans : B

10. A) $7^2 = 49$, 7 is prime number

C) $11^2 = 121$, 11 is prime number

Ans : A, C

JEE MAINS LEVEL

01) $3(x-2)^2 = 507$

$\Rightarrow (x-2)^2 = 169$

$\Rightarrow x-2 = \pm 13$

$x = 15$ or -12

Ans : C

02 $\sqrt{\frac{32.4}{x}} = 2$

$\Rightarrow \frac{32.4}{x} = 4$

$x = 8.1$

Ans : B

03 $\sqrt{272^2 - 128^2}$

$= \sqrt{(272+128)(272-128)}$

$= \sqrt{400 \times 144} = 20 \times 12 = 240$

Ans: B

04. $3a = 4b = 6c$

$\Rightarrow$ ~~3a~~ $\Rightarrow$ ~~4b~~ $3a = 4b \Rightarrow \frac{a}{b} = \frac{4}{3} \Rightarrow a:b = 4:3$

$4b = 6c \Rightarrow \frac{b}{c} = \frac{6}{4} = \frac{3}{2} \Rightarrow b:c = 3:2$

$\therefore a:b:c = 4:3:2$

$a+b+c = 27\sqrt{29}$

$\Rightarrow 4x + 3x + 2x = 27\sqrt{29}$

$\Rightarrow 9x = 27\sqrt{29}$

$\Rightarrow x = 3\sqrt{29}$

$\therefore$ ~~$a = 12\sqrt{29}, \quad b = 9\sqrt{29}, \quad c =$~~

$\sqrt{a^2+b^2+c^2} = \sqrt{16x^2 + 9x^2 + 4x^2}$

$= \sqrt{29x^2} = \sqrt{29} \cdot x$

$= \sqrt{29} \times 3\sqrt{29}$

$= 87$

Ans: C

05. $x = \sqrt{2\sqrt{2\sqrt{2}}}\ldots$

$x = \sqrt{2x}$

$\Rightarrow x^2 = 2x$

$\Rightarrow x^2 - 2x = 0$

$\Rightarrow x(x-2) = 0$

$\Rightarrow x = 2$

Similarly $y = 3$

I $\rightarrow$ $x + y \leq 5$

$2 + 3 \leq 5$ (True)

II $\rightarrow$ $x^2 + y^2 = 6xy$

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

$\Rightarrow 13 \neq 36$ (False)

III $\rightarrow$ $x - y^2 = 6xy$

$4 \times 9 = 6 \times 2 \times 3$

$\Rightarrow 36 = 36$ (True)

Ans: C

06. $\sqrt{x} + \sqrt{y} = \sqrt{1980} = \sqrt{36 \times 55} = 6\sqrt{55}$

$\therefore$ Let $\sqrt{x} = p\sqrt{55}$, $\sqrt{y} = q\sqrt{55}$

$\Rightarrow p\sqrt{55} + q\sqrt{55} = 6\sqrt{55}$ | $x = 55p^2$, $y = 55q^2$

$\Rightarrow p + q = 6$

$(p, q) \in (1,5), (2,4), (3,3), (4,2), (5,1)$

$(p^2, q^2) \in (1,25), (4,16), (9,9), (16,4), (25,1)$

No. of pairs $= 5$

Ans: C

07. Given $x^2+y^2+z^2=6$ (10)

Now, $\left(\frac{x}{y}+\frac{y}{x}\right)^2+\left(\frac{y}{z}+\frac{z}{y}\right)^2+\left(\frac{x}{z}+\frac{z}{x}\right)^2=165$

$\Rightarrow \frac{x^2}{y^2}+\frac{y^2}{x^2}+2+\frac{y^2}{z^2}+\frac{z^2}{y^2}+2+\frac{x^2}{z^2}+\frac{z^2}{x^2}+2=165$

$\Rightarrow \frac{x^2+z^2}{y^2}+\frac{y^2+z^2}{x^2}+\frac{x^2+y^2}{z^2}=159$

$\Rightarrow \frac{6-y^2}{y^2}+\frac{6-x^2}{x^2}+\frac{6-z^2}{z^2}=159$

$\Rightarrow 6\left(\frac{1}{x^2}+\frac{1}{y^2}+\frac{1}{z^2}\right)=159+3$

$\Rightarrow \frac{1}{x^2}+\frac{1}{y^2}+\frac{1}{z^2}=27$

Ans: C

08. $\sqrt[3]{9261}=\sqrt[3]{(21)^3}=21$ Ans: A

09. $\sqrt{0.000625}=\sqrt{(0.025)^2}=0.025$ Ans: A

10. $3^3=27$ Ans: A

JEE ADVANCED

01. $\sqrt{625}=\sqrt{5^4}=5^2=25$

$\sqrt{49}=\sqrt{7^2}=7$

Ans: A, C

02. Rational Numbers $= \frac{3}{1000}, \frac{13}{2^8, 5}$

Ans: B, C

03. Statement I: $1^2 + 2^2 + 3^2 + 4^2 + \cdots + 10^2 = 55$ (False)

Statement II: Conceptual (True)

Ans: D

04. Statement I: $\sqrt{225} = \sqrt{3^2 \times 5^2} = 3 \times 5 = 15$ (True)

Statement II: Conceptual (False)

Ans: C

05. Assertion: $\sqrt[3]{64} = \sqrt[3]{4^3} = 4$. (True)

Reason: $4 \times 4 \times 4 = 64$ (True)

Ans: A

06. Assertion: $\sqrt{1225} = 35$ (True)

Reason: Conceptual (True)

Ans: A

07. $1 + 3 + 5 + \cdots + 99$

$a + (n-1)d = 99$

$\Rightarrow 1 + (n-1) \times 2 = 99$

$\Rightarrow n = 50$.

Sum $= 50^2 = 2500$

Ans: C

08. ~~$3+9+15+21+\cdots+63$~~

$a+(n-1)d=63$

$\Rightarrow 3+(n-1)6=63$

$\Rightarrow n=11$

08. $S = 3+9+15+21+\cdots+63$

$= 3(1+3+5+7+\cdots+21)$

here $a+(n-1)d=21$

$\Rightarrow 1+(n-1)2=21$

$\Rightarrow n=11.$

$\therefore Sum = 3\times 11^2 = 3\times 121 = 363$

Ans: A

09. $S = 2+4+6+\cdots+400.$

$a+(n-1)d=400$

$\Rightarrow 2+(n-1)\cdot 2=400$

$\Rightarrow n=200.$

$Sum = n(n+1) = 200\times 201 = 40,200$ Ans: D

10. $\sqrt{324} = 18$

Ans: B

~~10.~~ ~~$\sqrt{180}=\sqrt{16\times 5}=4\sqrt{5}$~~

11. $\sqrt{180} = \sqrt{36\times 5} = 6\sqrt{5}$

Ans: A

12. $\sqrt{2.56} = \sqrt{(1.6)^2} = 1.6$ Ans: B

13. Let the number be a

Given $\sqrt[3]{\frac{a}{25}} = x \Rightarrow \frac{a}{25} = x^3 \Rightarrow a = 25x^3$

$\sqrt[3]{5a} = y \Rightarrow 5a = y^3 \Rightarrow a = \frac{y^3}{5}$

$\therefore \frac{25x^3}{5} = \frac{y^3}{5}$

$\Rightarrow 125x^3 = y^3$

$\Rightarrow (5x)^3 = y^3$

$\Rightarrow 5x = y$

Now, $x + y = 36$

$x + 5x = 36$

$\Rightarrow x = 6.$

Now $a = 25 \times 6^3 = 5400$

$\therefore 5395 + a = 5400$

$\Rightarrow a = 5$

Ans: 5

14. Largest two digit perfect cube is 64

$\therefore \sqrt[3]{64} = 4$ Ans: 4

15 a) $(x+y+z)^2 = x^2+y^2+z^2+2(xy+yz+zx)$

$= x^2+y^2+z^2+2xyz\left(\frac{1}{x}+\frac{1}{y}+\frac{1}{z}\right)$

b) $x+y+z=0 \Rightarrow x^3+y^3+z^3 = 3xyz$

c) $(x^{1/3})^3+(y^{1/3})^3+(z^{1/3})^3 = 3\cdot x^{1/3}\cdot y^{1/3}\cdot z^{1/3}$

$\Rightarrow (x+y+z)^3 = 27xyz$

$= 27\sqrt[3]{x^3y^3z^3}$

d) $x+y=z \Rightarrow x+y+(-z)=0$

$x^3+y^3-z^3 = x^3+y^3+(-z)^3 = 3(x)(y)(-z)$

$= -3xyz$

Ans: t, q, p, r

16 a) $\sqrt[3]{27} = 3$

b) $\sqrt[3]{64} = 4$

c) $\sqrt[3]{8} = 2$

d) $\sqrt[3]{125} = 5$

Ans: s, p, r, q