EXPRESSWALA ACADEMY

Rationalization (Surds)

MCQ Test, Set 01

Time: 30 minutes | Maximum marks: 25

Name: _____ Class: _____ Date: _____

1. There are 25 questions. Each has exactly one correct answer: choose A, B, C or D.
2. Each correct answer carries 1 mark. There is no negative marking.
3. The key sheet and worked solutions are at the end of this test.

1. Which of the following is a rational number?

A. $\sqrt[3]{64}$ **B.** $\sqrt{54}$ **C.** $\sqrt{12}$ **D.** $\sqrt[4]{17}$

2. $\sqrt[6]{15}$ and e are both irrational. Which of them is a surd?

A. e only **B.** $\sqrt[6]{15}$ only **C.** Both **D.** Neither

3. $9\sqrt[3]{n}$ is a mixed surd when n is

A. 64 **B.** 729 **C.** 512 **D.** 19

4. The conjugate surd of $12 - \sqrt{30}$ is

A. $-12 - \sqrt{30}$ **B.** $12 + \sqrt{30}$ **C.** $-12 + \sqrt{30}$ **D.** $\frac{1}{12-\sqrt{30}}$

5. $\sqrt{10} \times \sqrt{10} =$

A. $2\sqrt{10}$ **B.** 10 **C.** $\sqrt{10}$ **D.** 100

6. $\frac{\sqrt{171}}{\sqrt{19}} =$

A. $\sqrt{152}$ **B.** 9 **C.** 3 **D.** $3\sqrt{19}$

7. $64^{\frac{1}{6}} =$

A. 4 **B.** 2 **C.** $\frac{64}{6}$ **D.** 12

8. $\frac{\sqrt[4]{80}}{\sqrt[4]{5}} =$

A. 2 **B.** $\sqrt[4]{85}$ **C.** 16 **D.** $\sqrt[4]{75}$

9. $(4\sqrt{2})^2 =$

A. 32 **B.** $16\sqrt{2}$ **C.** 64 **D.** 8

10. $(5 - \sqrt{7})(7 + \sqrt{7}) =$

A. $42 - 2\sqrt{7}$ **B.** $28 - 2\sqrt{7}$ **C.** 28 **D.** $28 + 2\sqrt{7}$

11. A rationalising factor of $4\sqrt{10}$ is

A. $\sqrt{10}$ **B.** 4 **C.** $4 + \sqrt{10}$ **D.** 10

12. $(\sqrt[3]{11}-\sqrt[3]{4})\left((\sqrt[3]{11})^2+\sqrt[3]{11}\cdot\sqrt[3]{4}+(\sqrt[3]{4})^2\right)=$

A. 1267 **B.** 15 **C.** 7 **D.** $\sqrt[3]{7}$

13. $\sqrt{175}+\sqrt{252}=$

A. $\sqrt{427}$ **B.** $30\sqrt{7}$ **C.** $11\sqrt{14}$ **D.** $11\sqrt{7}$

14. $\sqrt{28}$ in simplest form is

A. $4\sqrt{7}$ **B.** $7\sqrt{2}$ **C.** $2\sqrt{7}$ **D.** $2\sqrt{14}$

15. $(\sqrt{2})^{13}=$

A. $64\sqrt{2}$ **B.** 64 **C.** $32\sqrt{2}$ **D.** $128\sqrt{2}$

16. $(\sqrt{10}-\sqrt{2})^2=$

A. $12-4\sqrt{5}$ **B.** 8 **C.** $104-4\sqrt{5}$ **D.** $12+4\sqrt{5}$

17. $(\sqrt{6}-\sqrt{3})(\sqrt{6}+\sqrt{3})=$

A. 9 **B.** 27 **C.** 3 **D.** $\sqrt{3}$

18. $\frac{1}{\sqrt{17}-\sqrt{10}}=$

A. $\frac{\sqrt{17}+\sqrt{10}}{27}$ **B.** $\sqrt{17}+\sqrt{10}$

C. $\frac{\sqrt{17}-\sqrt{10}}{7}$ **D.** $\frac{\sqrt{17}+\sqrt{10}}{7}$

19. $\frac{1}{7+\sqrt{13}}=$

A. $\frac{7-\sqrt{13}}{62}$ **B.** $\frac{\sqrt{13}-7}{6}$ **C.** $\frac{7+\sqrt{13}}{36}$ **D.** $\frac{7-\sqrt{13}}{36}$

20. If $\frac{3+5\sqrt{3}}{3-\sqrt{3}}=a+b\sqrt{3}$, then $b=$

A. 12 **B.** 4 **C.** 3 **D.** -3

21. $\frac{11+\sqrt{17}}{11-\sqrt{17}}+\frac{11-\sqrt{17}}{11+\sqrt{17}}=$

A. $\frac{69}{52}$ **B.** $-\frac{69}{26}$ **C.** $\frac{11\sqrt{17}}{26}$ **D.** $\frac{69}{26}$

22. $\frac{1}{8+\sqrt{6}}+\frac{1}{8-\sqrt{6}}=$

A. $\frac{8}{29}$ **B.** $\frac{\sqrt{6}}{29}$ **C.** 0 **D.** $\frac{8}{35}$

23. If $x=\sqrt[3]{13+2\sqrt{42}}$, then $x^3+\frac{1}{x^3}=$

A. $4\sqrt{42}$ **B.** 13 **C.** 0 **D.** 26

24. $\sqrt{15+10\sqrt{2}}=$

A. $\sqrt{10}-\sqrt{5}$ **B.** $\sqrt{50}+1$ **C.** $\sqrt{10}+\sqrt{5}$ **D.** $\sqrt{5}-\sqrt{10}$

25. $\sqrt{16-\sqrt{87}}=$

A. $\frac{\sqrt{29}-\sqrt{3}}{\sqrt{2}}$ **B.** $\frac{\sqrt{29}-\sqrt{3}}{2}$

C. $\sqrt{29}-\sqrt{3}$ **D.** $\frac{\sqrt{29}+\sqrt{3}}{\sqrt{2}}$

Key sheet

1. A	**2.** B	**3.** D	**4.** B	**5.** B
6. C	**7.** B	**8.** A	**9.** A	**10.** B
11. A	**12.** C	**13.** D	**14.** C	**15.** A
16. A	**17.** C	**18.** D	**19.** D	**20.** C
21. D	**22.** A	**23.** D	**24.** C	**25.** A

Solutions

1. Which of the following is a rational number?

$\sqrt[3]{64} = \sqrt[3]{4 \times 4 \times 4} = 4$, a rational number, so it is not a surd.

The other three are roots of numbers that are not perfect powers, so they are surds.

Ans: (A) $\sqrt[3]{64}$

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2. $\sqrt[6]{15}$ and e are both irrational. Which of them is a surd?

$1^6 = 1$ and $2^6 = 64$, so 15 is not a perfect sixth power. So $\sqrt[6]{15}$ is a surd.

e is irrational but it is not a root of a rational number, so it is not a surd.

Ans: (B) $\sqrt[6]{15}$ **only**

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3. $9\sqrt[3]{n}$ is a mixed surd when n is

$2^3 = 8$ and $3^3 = 27$, so 19 is not a perfect cube. So $9\sqrt[3]{19}$ is a mixed surd.

For the others $\sqrt[3]{n}$ is a whole number, so the product is rational.

Ans: (D) 19

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4. The conjugate surd of $12 - \sqrt{30}$ is

Only the sign of the surd part changes: the conjugate of $12 - \sqrt{30}$ is $12 + \sqrt{30}$.

Ans: (B) $12 + \sqrt{30}$

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5. $\sqrt{10} \times \sqrt{10} =$

$\sqrt{10} \times \sqrt{10} = \sqrt{10^2} = 10$

Ans: (B) 10

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6. $\frac{\sqrt{171}}{\sqrt{19}} =$

$\frac{\sqrt{171}}{\sqrt{19}} = \sqrt{\frac{171}{19}}$

$= \sqrt{9} = \sqrt{3 \times 3} = 3$

Ans: (C) 3

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7. $64^{\frac{1}{6}} =$

$64^{\frac{1}{6}} = \sqrt[6]{64} = \sqrt[6]{2^6} = 2$

Ans: (B) 2

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8. $\frac{\sqrt[4]{80}}{\sqrt[4]{5}} =$

$\frac{\sqrt[4]{80}}{\sqrt[4]{5}} = \sqrt[4]{\frac{80}{5}}$

$= \sqrt[4]{16} = \sqrt[4]{2^4} = 2$

Ans: (A) 2

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9. $(4\sqrt{2})^2 =$

$(4\sqrt{2})^2 = 4^2 \times (\sqrt{2})^2$

$= 16 \times 2 = 32$

Ans: (A) 32

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10. $(5-\sqrt{7})(7+\sqrt{7}) =$

$(5-\sqrt{7})(7+\sqrt{7}) = 35+5\sqrt{7}-7\sqrt{7}-7$

$= 28-2\sqrt{7}$

Ans: (B) $28-2\sqrt{7}$

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11. A rationalising factor of $4\sqrt{10}$ is

$4\sqrt{10}\times\sqrt{10} = 4\times 10 = 40$, a rational number.

Ans: (A) $\sqrt{10}$

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12. $(\sqrt[3]{11}-\sqrt[3]{4})\left((\sqrt[3]{11})^2+\sqrt[3]{11}\cdot\sqrt[3]{4}+(\sqrt[3]{4})^2\right) =$

Use $(x-y)(x^2+xy+y^2) = x^3-y^3$ with $x=\sqrt[3]{11}$, $y=\sqrt[3]{4}$.

Product $= (\sqrt[3]{11})^3-(\sqrt[3]{4})^3 = 11-4 = 7$

Ans: (C) 7

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13. $\sqrt{175}+\sqrt{252} =$

$\sqrt{175} = \sqrt{25\times 7} = 5\sqrt{7}$

$\sqrt{252} = \sqrt{36\times 7} = 6\sqrt{7}$

$5\sqrt{7}+6\sqrt{7} = 11\sqrt{7}$ (add like surds)

Ans: (D) $11\sqrt{7}$

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14. $\sqrt{28}$ in simplest form is

$\sqrt{28} = \sqrt{4\times 7} = 2\sqrt{7}$

Ans: (C) $2\sqrt{7}$

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15. $(\sqrt{2})^{13} =$

$(\sqrt{2})^{13} = [(\sqrt{2})^2]^6\times\sqrt{2} = 2^6\times\sqrt{2} = 64\sqrt{2}$

Ans: (A) $64\sqrt{2}$

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16. $(\sqrt{10}-\sqrt{2})^2 =$

$(\sqrt{10}-\sqrt{2})^2 = 10+2-2\sqrt{20} = 12-4\sqrt{5}$

Ans: (A) $12-4\sqrt{5}$

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17. $(\sqrt{6}-\sqrt{3})(\sqrt{6}+\sqrt{3}) =$

$(a+b)(a-b) = a^2-b^2$

$= (\sqrt{6})^2-(\sqrt{3})^2 = 6-3 = 3$

Ans: (C) 3

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18. $\frac{1}{\sqrt{17}-\sqrt{10}} =$

Multiply above and below by $\sqrt{17}+\sqrt{10}$: $(\sqrt{17}-\sqrt{10})(\sqrt{17}+\sqrt{10}) = 17-10 = 7$

$= \frac{\sqrt{17}+\sqrt{10}}{7}$

Ans: (D) $\frac{\sqrt{17}+\sqrt{10}}{7}$

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19. $\frac{1}{7+\sqrt{13}} =$

Multiply above and below by $7-\sqrt{13}$: $(7+\sqrt{13})(7-\sqrt{13}) = 49-13 = 36$

$= \frac{7-\sqrt{13}}{36}$

Ans: (D) $\frac{7-\sqrt{13}}{36}$

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20. If $\frac{3+5\sqrt{3}}{3-\sqrt{3}} = a + b\sqrt{3}$, then $b =$

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

Numerator: $9 + 3\sqrt{3} + 15\sqrt{3} + 15 = 24 + 18\sqrt{3}$

Denominator: $3^2 - (\sqrt{3})^2 = 9 - 3 = 6$

$\frac{24+18\sqrt{3}}{6} = 4 + 3\sqrt{3}$

So $a = 4$, $b = 3$

Ans: (C) 3

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21. $\frac{11+\sqrt{17}}{11-\sqrt{17}} + \frac{11-\sqrt{17}}{11+\sqrt{17}} =$

$= \frac{(11+\sqrt{17})^2+(11-\sqrt{17})^2}{(11+\sqrt{17})(11-\sqrt{17})} = \frac{276}{104} = \frac{69}{26}$

The $\sqrt{17}$ terms cancel and $(11+\sqrt{17})(11-\sqrt{17}) = 104$.

Ans: (D) $\frac{69}{26}$

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22. $\frac{1}{8+\sqrt{6}} + \frac{1}{8-\sqrt{6}} =$

$= \frac{(8-\sqrt{6})+(8+\sqrt{6})}{(8+\sqrt{6})(8-\sqrt{6})} = \frac{16}{58} = \frac{8}{29}$

Ans: (A) $\frac{8}{29}$

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23. If $x = \sqrt[3]{13+2\sqrt{42}}$, then $x^3 + \frac{1}{x^3} =$

$x^3 = 13 + 2\sqrt{42}$, so $\frac{1}{x^3} = \frac{1}{13+2\sqrt{42}} = 13 - 2\sqrt{42}$

$x^3 + \frac{1}{x^3} = (13 + 2\sqrt{42}) + (13 - 2\sqrt{42}) = 26$

Ans: (D) 26

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24. $\sqrt{15+10\sqrt{2}} =$

$10\sqrt{2} = 2 \times 5\sqrt{2} = 2\sqrt{50}$

$\sqrt{15+10\sqrt{2}} = \sqrt{10+5+2\sqrt{10\times 5}}$

$= \sqrt{(\sqrt{10})^2 + (\sqrt{5})^2 + 2(\sqrt{10})(\sqrt{5})}$

$= \sqrt{(\sqrt{10}+\sqrt{5})^2} = \sqrt{10}+\sqrt{5}$

Ans: (C) $\sqrt{10}+\sqrt{5}$

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25. $\sqrt{16-\sqrt{87}} =$

$\sqrt{16-\sqrt{87}} = \sqrt{\frac{2(16-\sqrt{87})}{2}} = \frac{\sqrt{32-2\sqrt{87}}}{\sqrt{2}}$

$= \frac{\sqrt{29+3-2\sqrt{29\times 3}}}{\sqrt{2}}$

$= \frac{\sqrt{(\sqrt{29})^2+(\sqrt{3})^2-2(\sqrt{29})(\sqrt{3})}}{\sqrt{2}}$

$= \frac{\sqrt{(\sqrt{29}-\sqrt{3})^2}}{\sqrt{2}} = \frac{\sqrt{29}-\sqrt{3}}{\sqrt{2}}$

Ans: (A) $\frac{\sqrt{29}-\sqrt{3}}{\sqrt{2}}$