

Rationalization (Surds)

MCQ Test, Set 05

Time: 30 minutes

Maximum marks: 25

Name: _____ Class: _____ Date: _____

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

1. Pick the surd from the following.

- A. $\sqrt[3]{1000}$ B. $\sqrt[5]{33}$ C. $\sqrt{36}$ D. $\sqrt[5]{1024}$

2. $\sqrt[3]{38}$ and π are both irrational. Which of them is a surd?

- A. π only B. Neither C. Both D. $\sqrt[3]{38}$ only

3. Which of the following is a mixed surd?

- A. $3\sqrt{25}$ B. $\sqrt{37}$ C. $\sqrt[4]{81}$ D. $4\sqrt{23}$

4. Which of the following is the conjugate of $12 + \sqrt{19}$?

- A. $\frac{1}{12+\sqrt{19}}$ B. $-12 + \sqrt{19}$ C. $12 - \sqrt{19}$ D. $-12 - \sqrt{19}$

5. $\sqrt{10} \times \sqrt{21} =$

- A. $\sqrt{210}$ B. $\sqrt{31}$ C. $10\sqrt{21}$ D. 210

6. $\frac{\sqrt{68}}{\sqrt{17}} =$

- A. $\sqrt{51}$ B. 4 C. 2 D. $2\sqrt{17}$

7. $19^{\frac{1}{4}} =$

- A. $\sqrt[19]{4}$ B. $\sqrt[4]{19}$ C. $\frac{19}{4}$ D. $4\sqrt{19}$

8. $\frac{\sqrt[4]{162}}{\sqrt[4]{2}} =$

- A. 81 B. $\sqrt[4]{160}$ C. 3 D. $\sqrt[4]{164}$

9. If $(k\sqrt{10})^2 = 250$ and $k > 0$, then $k =$

- A. 25 B. 5 C. $5\sqrt{10}$ D. 10

10. $(7 - \sqrt{6})(3 - \sqrt{6}) =$

- A. $27 + 10\sqrt{6}$ B. $27 - 10\sqrt{6}$ C. 27 D. $15 - 10\sqrt{6}$

11. A rationalising factor of $2\sqrt{29}$ is

- A. $\sqrt{29}$ B. $2 + \sqrt{29}$ C. 2 D. 29

12. $(\sqrt[3]{14} + \sqrt[3]{10})((\sqrt[3]{14})^2 - \sqrt[3]{14} \cdot \sqrt[3]{10} + (\sqrt[3]{10})^2) =$
A. 3744 **B.** 24 **C.** 4 **D.** $\sqrt[3]{24}$
-
13. $\sqrt{75} + \sqrt{147} =$
A. $35\sqrt{3}$ **B.** $12\sqrt{3}$ **C.** $12\sqrt{6}$ **D.** $\sqrt{222}$
-
14. $(\sqrt{2})^9 =$
A. $8\sqrt{2}$ **B.** $32\sqrt{2}$ **C.** 16 **D.** $16\sqrt{2}$
-
15. $(4\sqrt{2})^3 =$
A. $128\sqrt{2}$ **B.** $8\sqrt{2}$ **C.** $64\sqrt{2}$ **D.** 128
-
16. $(7 + \sqrt{13})^2 =$
A. $218 + 14\sqrt{13}$ **B.** 62 **C.** $62 + 7\sqrt{13}$ **D.** $62 + 14\sqrt{13}$
-
17. $(\sqrt{15} - \sqrt{13})(\sqrt{15} + \sqrt{13}) =$
A. 2 **B.** 56 **C.** 28 **D.** $\sqrt{2}$
-
18. $\frac{1}{\sqrt{6}-\sqrt{2}} =$
A. $\frac{\sqrt{6}+\sqrt{2}}{4}$ **B.** $\frac{\sqrt{6}+\sqrt{2}}{8}$
C. $\sqrt{6} + \sqrt{2}$ **D.** $\frac{\sqrt{6}-\sqrt{2}}{4}$
-
19. If $\frac{1+\sqrt{7}}{3-\sqrt{7}} = a + b\sqrt{7}$, then $b =$
A. 1 **B.** -2 **C.** 2 **D.** 5
-
20. If $\frac{2+2\sqrt{7}}{6-2\sqrt{7}} = a + b\sqrt{7}$, then $b =$
A. -2 **B.** 5 **C.** 8 **D.** 2
-
21. $\frac{\sqrt{13}+\sqrt{10}}{\sqrt{13}-\sqrt{10}} + \frac{\sqrt{13}-\sqrt{10}}{\sqrt{13}+\sqrt{10}} =$
A. $\frac{4\sqrt{130}}{3}$ **B.** $-\frac{46}{3}$ **C.** $\frac{46}{3}$ **D.** $\frac{23}{3}$
-
22. $\frac{1}{\sqrt{19}+\sqrt{3}} + \frac{1}{\sqrt{19}-\sqrt{3}} =$
A. $\frac{\sqrt{3}}{8}$ **B.** $\frac{\sqrt{19}}{11}$ **C.** 0 **D.** $\frac{\sqrt{19}}{8}$
-
23. If $x = 5 - 2\sqrt{6}$, then $x^2 - 10x =$
A. -1 **B.** 0 **C.** 1 **D.** -13
-
24. $\sqrt{17 - 2\sqrt{66}} =$
A. $\sqrt{66} - 1$ **B.** $\sqrt{11} - \sqrt{6}$ **C.** $\sqrt{11} + \sqrt{6}$ **D.** $\sqrt{6} - \sqrt{11}$
-
25. $\sqrt{6 - \sqrt{35}} =$
A. $\frac{\sqrt{7}-\sqrt{5}}{2}$ **B.** $\sqrt{7} - \sqrt{5}$
C. $\frac{\sqrt{7}+\sqrt{5}}{\sqrt{2}}$ **D.** $\frac{\sqrt{7}-\sqrt{5}}{\sqrt{2}}$
-

Key sheet

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

Solutions

1. Pick the surd from the following.

$2^5 = 32$ and $3^5 = 243$, so 33 is not a perfect fifth power. So $\sqrt[5]{33}$ is a surd.

The others are rational: $\sqrt{36} = \sqrt{6 \times 6} = 6$, $\sqrt[5]{1024} = \sqrt[5]{4 \times 4 \times 4 \times 4 \times 4} = 4$, $\sqrt[3]{1000} = \sqrt[3]{10 \times 10 \times 10} = 10$

Ans: (B) $\sqrt[5]{33}$

2. $\sqrt[3]{38}$ and π are both irrational. Which of them is a surd?

$3^3 = 27$ and $4^3 = 64$, so 38 is not a perfect cube. So $\sqrt[3]{38}$ is a surd.

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

Ans: (D) $\sqrt[3]{38}$ only

3. Which of the following is a mixed surd?

$4\sqrt{23} = 4 \cdot \sqrt{23}$: a rational number times a surd.

$\sqrt{37}$ is a pure surd; $3\sqrt{25} = 15$ and $\sqrt[4]{81} = 3$ are rational.

Ans: (D) $4\sqrt{23}$

4. Which of the following is the conjugate of $12 + \sqrt{19}$?

Only the sign of the surd part changes: the conjugate of $12 + \sqrt{19}$ is $12 - \sqrt{19}$.

Ans: (C) $12 - \sqrt{19}$

5. $\sqrt{10} \times \sqrt{21} =$

$\sqrt{10} \times \sqrt{21} = \sqrt{10 \times 21} = \sqrt{210}$ (multiply the numbers under the roots).

Ans: (A) $\sqrt{210}$

6. $\frac{\sqrt{68}}{\sqrt{17}} =$

$$\frac{\sqrt{68}}{\sqrt{17}} = \sqrt{\frac{68}{17}}$$

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

Ans: (C) 2

7. $19^{\frac{1}{4}} =$

$$a^{\frac{1}{n}} = \sqrt[n]{a}, \text{ so } 19^{\frac{1}{4}} = \sqrt[4]{19}$$

Ans: (B) $\sqrt[4]{19}$

8. $\frac{\sqrt[4]{162}}{\sqrt[4]{2}} =$

$$\frac{\sqrt[4]{162}}{\sqrt[4]{2}} = \sqrt[4]{\frac{162}{2}}$$

$$= \sqrt[4]{81} = \sqrt[4]{3^4} = 3$$

Ans: (C) 3

9. If $(k\sqrt{10})^2 = 250$ and $k > 0$, then $k =$

$$(k\sqrt{10})^2 = k^2 \times 10 = 10k^2$$

$$10k^2 = 250, \text{ so } k^2 = 25 \text{ and } k = 5$$

Ans: (B) 5

10. $(7 - \sqrt{6})(3 - \sqrt{6}) =$

$$(7 - \sqrt{6})(3 - \sqrt{6}) = 21 - 7\sqrt{6} - 3\sqrt{6} + 6$$

$$= 27 - 10\sqrt{6}$$

Ans: (B) $27 - 10\sqrt{6}$

11. A rationalising factor of $2\sqrt{29}$ is

$$2\sqrt{29} \times \sqrt{29} = 2 \times 29 = 58, \text{ a rational number.}$$

Ans: (A) $\sqrt{29}$

12. $(\sqrt[3]{14} + \sqrt[3]{10})((\sqrt[3]{14})^2 - \sqrt[3]{14} \cdot \sqrt[3]{10} + (\sqrt[3]{10})^2) =$

$$\text{Use } (x + y)(x^2 - xy + y^2) = x^3 + y^3 \text{ with } x = \sqrt[3]{14}, y = \sqrt[3]{10}.$$

$$\text{Product} = (\sqrt[3]{14})^3 + (\sqrt[3]{10})^3 = 14 + 10 = 24$$

Ans: (B) 24

13. $\sqrt{75} + \sqrt{147} =$

$$\sqrt{75} = \sqrt{25 \times 3} = 5\sqrt{3}$$

$$\sqrt{147} = \sqrt{49 \times 3} = 7\sqrt{3}$$

$$5\sqrt{3} + 7\sqrt{3} = 12\sqrt{3} \text{ (add like surds)}$$

Ans: (B) $12\sqrt{3}$

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

$$(\sqrt{2})^9 = [(\sqrt{2})^2]^4 \times \sqrt{2} = 2^4 \times \sqrt{2} = 16\sqrt{2}$$

Ans: (D) $16\sqrt{2}$

15. $(4\sqrt{2})^3 =$

$$(4\sqrt{2})^3 = 4^3 \times (\sqrt{2})^3 = 64 \times 2\sqrt{2} = 128\sqrt{2}$$

Ans: (A) $128\sqrt{2}$

16. $(7 + \sqrt{13})^2 =$

$$(7 + \sqrt{13})^2 = 7^2 + (\sqrt{13})^2 + 2(7)(\sqrt{13}) = 62 + 14\sqrt{13}$$

Ans: (D) $62 + 14\sqrt{13}$

17. $(\sqrt{15} - \sqrt{13})(\sqrt{15} + \sqrt{13}) =$

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

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

Ans: (A) 2

18. $\frac{1}{\sqrt{6}-\sqrt{2}} =$

Multiply above and below by $\sqrt{6} + \sqrt{2}$: $(\sqrt{6} - \sqrt{2})(\sqrt{6} + \sqrt{2}) = 6 - 2 = 4$

$$= \frac{\sqrt{6}+\sqrt{2}}{4}$$

Ans: (A) $\frac{\sqrt{6}+\sqrt{2}}{4}$

19. If $\frac{1+\sqrt{7}}{3-\sqrt{7}} = a + b\sqrt{7}$, then $b =$

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

Numerator: $3 + \sqrt{7} + 3\sqrt{7} + 7 = 10 + 4\sqrt{7}$

Denominator: $3^2 - (\sqrt{7})^2 = 9 - 7 = 2$

$$\frac{10+4\sqrt{7}}{2} = 5 + 2\sqrt{7}$$

So $a = 5, b = 2$

Ans: (C) 2

20. If $\frac{2+2\sqrt{7}}{6-2\sqrt{7}} = a + b\sqrt{7}$, then $b =$

$$\frac{2+2\sqrt{7}}{6-2\sqrt{7}} = \frac{(2+2\sqrt{7})(6+2\sqrt{7})}{(6-2\sqrt{7})(6+2\sqrt{7})}$$

Numerator: $12 + 4\sqrt{7} + 12\sqrt{7} + 28 = 40 + 16\sqrt{7}$

Denominator: $6^2 - (2\sqrt{7})^2 = 36 - 28 = 8$

$$\frac{40+16\sqrt{7}}{8} = 5 + 2\sqrt{7}$$

So $a = 5, b = 2$

Ans: (D) 2

21. $\frac{\sqrt{13}+\sqrt{10}}{\sqrt{13}-\sqrt{10}} + \frac{\sqrt{13}-\sqrt{10}}{\sqrt{13}+\sqrt{10}} =$

$$= \frac{(\sqrt{13}+\sqrt{10})^2 + (\sqrt{13}-\sqrt{10})^2}{(\sqrt{13}+\sqrt{10})(\sqrt{13}-\sqrt{10})} = \frac{46}{3}$$

The $\sqrt{130}$ terms cancel and $(\sqrt{13} + \sqrt{10})(\sqrt{13} - \sqrt{10}) = 13 - 10 = 3$.

Ans: (C) $\frac{46}{3}$

22. $\frac{1}{\sqrt{19}+\sqrt{3}} + \frac{1}{\sqrt{19}-\sqrt{3}} =$

$$= \frac{(\sqrt{19}-\sqrt{3}) + (\sqrt{19}+\sqrt{3})}{(\sqrt{19}+\sqrt{3})(\sqrt{19}-\sqrt{3})} = \frac{2\sqrt{19}}{16} = \frac{\sqrt{19}}{8}$$

Ans: (D) $\frac{\sqrt{19}}{8}$

23. If $x = 5 - 2\sqrt{6}$, then $x^2 - 10x =$

$x - 5 = -2\sqrt{6}$, so $(x - 5)^2 = 24$

$x^2 - 10x + 25 = 24$, so $x^2 - 10x = -1$

Ans: (A) -1

24. $\sqrt{17 - 2\sqrt{66}} =$

$$\sqrt{17 - 2\sqrt{66}} = \sqrt{11 + 6 - 2\sqrt{11 \times 6}}$$

$$= \sqrt{(\sqrt{11})^2 + (\sqrt{6})^2 - 2(\sqrt{11})(\sqrt{6})}$$

$$= \sqrt{(\sqrt{11} - \sqrt{6})^2} = \sqrt{11} - \sqrt{6}$$

Ans: (B) $\sqrt{11} - \sqrt{6}$

25. $\sqrt{6 - \sqrt{35}} =$

$$\begin{aligned}\sqrt{6 - \sqrt{35}} &= \sqrt{\frac{2(6 - \sqrt{35})}{2}} = \frac{\sqrt{12 - 2\sqrt{35}}}{\sqrt{2}} \\&= \frac{\sqrt{7+5-2\sqrt{7 \times 5}}}{\sqrt{2}} \\&= \frac{\sqrt{(\sqrt{7})^2 + (\sqrt{5})^2 - 2(\sqrt{7})(\sqrt{5})}}{\sqrt{2}} \\&= \frac{\sqrt{(\sqrt{7} - \sqrt{5})^2}}{\sqrt{2}} = \frac{\sqrt{7} - \sqrt{5}}{\sqrt{2}}\end{aligned}$$

Ans: (D) $\frac{\sqrt{7} - \sqrt{5}}{\sqrt{2}}$
